http://www.eurekalert.org/pub_releases/2012-10/ibri-aid101112.php

An immunosuppressive drug could delay the onset of neurodegenerative diseases

Rapamycin, a drug used to prevent rejection in transplants, could delay the onset of diseases such as Alzheimer's or Parkinson's

Rapamycin, a drug used to prevent rejection in transplants, could delay the onset of neurodegenerative diseases such as Alzheimer's and Parkinson's. This is the main conclusion of a study published in the Nature in which has collaborated the researcher Isidro Ferrer, head of the group of Neuropathology at the Bellvitge Biomedical Research Institute (IDIBELL) and the Bellvitge University Hospital and Full Professor of Pathological Anatomy at the University of Barcelona. The research was led by researchers from the International School for Advanced Studies (SISSA) in Trieste (Italy).

The collaboration of the research group led by Dr. Ferrer with SISSA researchers began five years ago when they observed that Parkinson's patients showed a deficit in UCHL1 protein. At that time, researchers didn't know what mechanism produced this deficit. To discover it a European project was launched. It was coordinated by the Italian researchers and participated by other European research groups, including the group led by Dr. Ferrer. The project, called Dopaminet, focused on how dopaminergic neurons (brain cells whose neurotransmitter is dopamine) are involved in Parkinson's disease.

Contrary to most common hypothesis that a DNA fragment encodes a protein through a messenger RNA molecule, the researchers found that it also works in reverse. They found a balance between the protein and its mirror protein, which is configured in reverse, and they are mutually controlled. If the protein mirror is located in the nucleus of the cell, it does not interact with the protein, while if it is in the cytoplasm, then both of them interact.

In the case of Parkinson's disease the protein UCHL1 appears reduced and also its mirror protein is localized in the nucleus, and in the cytoplasm. Thus, the researchers sought a method to extract the mirror protein from the nucleus and made it interact with the original UCHL1 protein. The authors found that rapamycin was able to extract them from the nucleus. The drug allows the two proteins, the UCHL1 and its mirror, hold together in the cytoplasm, which would correct the mistakes that occur in Parkinson's disease.

This in vitro research has allowed describing a new unknown mechanism. It is necessary that the UCHL1 mirror protein should accumulate in the nucleus and escape from the cytoplasm and join the UCHL1 protein. The combination of both makes the system work.

"The rapamycin cannot cure Parkinson's disease, but it may delay the onset of neurodegenerative diseases such as Alzheimer's and Parkinson's itself. Rapamycin can protect and delay the beginning of these diseases. It can complete the treatment, but it should be combined with other existing treatments", explains Isidro Ferrer.

Anyway, it is still far its application in patients. The next step is to validate these results in animal models and study the effects of rapamycin in combination with other drugs.

Claudia Carrieri, Laura Cimatti, Marta Biagioli, Anne Beugnet, Silvia Zucchelli, Stefania Fedele, Elisa Pesce,Isidre Ferrer, Licio Collavin, Claudio Santoro, Alistair R. R. Forrest, Piero Carninci, Stefano Biffo, Elia Stupka & Stefano Gustincich. Long non-coding antisense RNA controls Uchl1 translation through an embedded SINEB2 repeat. Nature. DOI: 10.1038/nature11508

http://www.eurekalert.org/pub_releases/2012-10/uor-lis101512.php

Language is shaped by brain's desire for clarity and ease

Cognitive scientists have good news for linguistic purists terrified about the corruption of their mother tongue.

Using an artificial language in a carefully controlled laboratory experiment, a team from the University of Rochester and Georgetown University has found that many changes to language are simply the brain's way of ensuring that communication is as precise and concise as possible.

"Our research shows that humans choose to reshape language when the structure is either overly redundant or confusing," says T. Florian Jaeger, the Wilmot Assistant Professor of the Sciences at Rochester and co-author of a study published in the Proceedings of the National Academy of Sciences Oct. 15. "This study suggests that we prefer languages that on average convey information efficiently, striking a balance between effort and clarity."

The brain's tendency toward efficient communication may also be an underlying reason that many human languages are structurally similar, says lead author Maryia Fedzechkina, a doctoral candidate at Rochester. Over and over, linguists have identified nearly identical grammatical conventions in seemingly unrelated languages scattered throughout the globe. For decades, linguists have debated the meaning of such similarities: are recurrent structures artifacts of distant common origins, are they simply random accidents, or do they reflect fundamental aspects of human cognition?

This study supports the latter, says co-author Elissa L. Newport, professor of neurology and director of the Center for Brain Plasticity and Recovery at Georgetown, and the former George Eastman Professor of Brain and Cognitive Sciences at Rochester. "The bias language learners have toward efficiency and clarity acts as a filter as languages are transmitted from one generation of learners to another," she says. Alterations to language are introduced through many avenues, including the influence of other languages and changes in accents or pronunciation. "But this research finds that learners shift the language in ways that make it better – easier to use and more suitable for communication," says Newport. That process also leads to the recurrent patterns across languages.

To observe the language acquisition process, the team created two miniature artificial languages that use suffixes on nouns to indicate subject or object. These "case markers" are common to Spanish, Russian, and other languages, but not English. In two experiments, 40 undergraduates, whose only language was English, learned the eight verbs, 15 nouns, and grammatical structure of the artificial languages. The training was spaced over four 45-minute sessions and consisted of computer images, short animated clips, and audio recordings. Then participants were asked to describe a novel action clip using their newly learned language.

When faced with sentence constructions that could be confusing or ambiguous, the language learners in both experiments chose to alter the rules of the language they were taught in order to make their meaning clearer. They used case markers more often when the meaning of the subject and object might otherwise have caused unintended interpretations. So for example, a sentence like "Man hits wall," is typical because the subject is a person and the object is a thing. But the sentence "Wall hits man," as when a wall falls on top of a man, is atypical and confusing since the subject is a thing and the object is a person.

The results, write the authors, provide evidence that humans seek a balance between clarity and ease. Participants could have chosen to be maximally clear by always providing the case markers. Alternatively, they could have chosen to be maximally succinct by never providing the case markers. They did neither. Instead, they provided case-markers more often for those sentences that would otherwise have been more likely to be confused.

The findings also support the idea that language learners introduce common patterns, also known as linguistic universals, conclude the authors. The optional case marking that participants introduced in this experiment closely mirrors naturally occurring patterns in Japanese and Korean - when animate objects and inanimate subjects are more likely to receive case markings.

The history of English itself might reflect these deep principles of how we learn language, says Jaeger. Old English had cases and relatively free word order, as is still true for German. But at some point pronunciation changes began to obscure the case endings, creating ambiguity. In contemporary English, word order has become the primary signal by which speakers could decode the meaning, he says.

"Language acquisition can repair changes in languages to insure they don't undermine communication," says Fedzechkina. In light of these findings, new generations can perhaps be seen as renewing language, rather than corrupting it, she adds.

By the same token, says Jaeger, many elements of informal speech can be interpreted as rising from the brain's bias toward efficiency. "When people turn 'automobile' into 'auto,' use informal contractions, swallow syllables, or take other linguistic shortcuts, the same principles are at work," he says. Recent research has shown that these types of shortcuts appear only when their meaning is easily inferable from the context, he adds.

http://www.eurekalert.org/pub_releases/2012-10/uol-off101512.php

One foot from the grave!

You won't believe it! Archaeologists who led Search for King Richard III reveal Victorian builders came within inches of destroying human remains

Archaeologists from the University of Leicester who uncovered a grave thought to contain the skeleton of King Richard III have revealed that the remains came within inches of being destroyed by Victorian builders.

The University of Leicester led the search for the Anointed King who died at the battle of Bosworth in association with Leicester City Council and the Richard III Society. The University team dug three trenches under a Leicester car park before their discovery was made.

Now site director Mathew Morris has disclosed that the remains were found just inches below Victorian foundations. Had the 19th century builders dug a little further-no remains would have been found.

Mathew said: "It was incredibly lucky. If the Victorians had dug down 30cm more they would have built on top of the remains and destroyed them."

City Mayor Sir Peter Soulsby added: "It is extremely lucky that the remains were found at all. "His head was discovered inches from the foundations of a Victorian building. They obviously did not discover anything and probably would not have been aware of the importance of the site.

"If their plans had been just a little different, they could have destroyed a most significant historic find."
A team from the University of Leicester, including archaeologists and geneticists, is now engaged in a scientific investigation to determine whether the remains are indeed of King Richard III. Using DNA extracted from Michael Ibsen, believed to be a descendant of King Richard III's sister, the team will seek to determine if there is a match. The entire dig was filmed by Darlow Smithson Productions for a Channel 4 Documentary.
You can watch the Press Conference announcing the results from the dig here
http://www2.le.ac.uk/offices/press/media-centre/richard-iii

http://www.eurekalert.org/pub_releases/2012-10/uamr-eat101512.php

Ebola antibody treatment, produced in plants, protects monkeys from lethal disease

A new Ebola virus study resulting from a widespread scientific collaboration has shown promising preliminary results, preventing disease in infected nonhuman primates using monoclonal antibodies.

In this week's online edition of the Proceedings of the National Academy of Sciences (PNAS), the research team describes a proof-of-concept for using a "cocktail" of monoclonal antibodies, or mAbs, to prevent lethal disease in rhesus macaques. When administered one hour after infection, all animals survived. Two-thirds of the animals were protected even when the treatment, known as MB-003, was administered 48 hours after infection.
Ebola virus, which causes hemorrhagic fever with human case fatality rates as high as 90 percent, has been responsible for numerous deaths in central Africa over the past several months. In addition to being a global health concern, the virus also is considered a potential biological threat agent. Currently there are no available vaccines or treatments approved for use in humans.
The work is the culmination of more than a decade of effort between government and industry partners. According to lead investigator Gene Olinger, Ph.D., a virologist at the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID), this consortium of investigators has taken very distinct technologies and combined them to develop a cutting-edge medical countermeasure against a lethal viral disease.
"It is rare that an antiviral compound prevents Ebola virus infection with limited to no morbidity in treated animals at any point of treatment following infection by this lethal virus," said Olinger. "Until recently, attempts to utilize antibodies to provide protection against Ebola virus have been met with failure. The level of protection against disease that we saw with MB-003 was impressive."
In addition, the production method used in this study offers the potential to make an economical and effective medical countermeasure, according to the authors. Initially developed as a monoclonal antibody cocktail in the mouse model, MB-003 was successfully humanized and then produced in the tobacco plant-based production system. "We were pleased to see how well the humanized mAbs of MB-003 performed," said Larry Zeitlin, Ph.D., president of Mapp Biopharmaceutical and senior author on the study. "We also were pleasantly surprised by the superiority of the plant-derived mAbs compared to the same mAbs produced in traditional mammalian cell culture."
Further improvement in antibody efficacy was developed at Kentucky BioProcessing (KBP). Using a fully automated production system that operates in accordance with good manufacturing practices (GMP), antibody is produced in a tobacco plant system. This new development process significantly decreases the amount of time required for production, increases the quantity of antibody produced, and slashes the cost of manufacturing, according to Barry Bratcher, chief operating officer of KBP and co-author on the PNAS study.
"Our GMP facility can generate a new antibody lot in two weeks to rapidly address new threats and new outbreaks," said Bratcher.
Olinger said efforts are underway to advance MB-003 to clinical safety testing as his team at USAMRIID continues to determine the true therapeutic capability of the cocktail.
Multiple agencies contributed funding for this and related studies, including the National Institutes of Health, the Defense Advanced Research Projects Agency, the Transformational Medical Technologies Initiative, and the Defense Threat Reduction Agency.
USAMRIID's mission is to protect the warfighter from biological threats and to be prepared to investigate disease outbreaks or threats to public health. Research conducted at USAMRIID leads to medical solutions—vaccines, drugs, diagnostics, and information—that benefit both military personnel and civilians. The Institute plays a key role as the lead military medical research laboratory for the Defense Threat Reduction Agency's Joint Science and Technology Office for Chemical and Biological Defense. USAMRIID is a subordinate laboratory of the U.S. Army Medical Research and Materiel Command.

http://bit.ly/RLIb1b

Our big brains may make us prone to cancer

A new theory claims as humans evolved bigger brains, our cells became less willing to commit suicide, making us more prone to cancer

11:28 15 October 2012 by Michael Marshall

There's a downside to everything. When humans evolved bigger brains, we became the smartest animal alive and were able to colonise the entire planet. But for our minds to expand, a new theory goes, our cells had to become less willing to commit suicide – and that may have made us more prone to cancer.

When cells become damaged or just aren't needed, they self-destruct in a process called apoptosis. In developing organisms, apoptosis is just as important as cell growth for generating organs and appendages – it helps "prune" structures to their final form.

By getting rid of malfunctioning cells, apoptosis also prevents cells from growing into tumours. "Reduced apoptotic function is well known to be associated with cancer onset," says John McDonald of the Georgia Institute of Technology in Atlanta.

McDonald compared skin cells from humans, chimpanzees and macaques and found that, compared to cells from other primates, our cells are reluctant to undergo apoptosis. When exposed to apoptosis-triggering chemicals, human cells responded significantly less than the chimp and macaque cells. Fewer human cells died, and they did not change shape in the ways cells do when preparing to die.

Down-regulated genes

In 2009, McDonald found that genes promoting apoptosis are down-regulated – essentially suppressed – in humans, and those turning it off are up-regulated (Medical Hypotheses, doi.org/bgkshp). Genes involved in apoptosis are also known to have changed rapidly during human evolution. The new study adds to the evidence that apoptosis is down-regulated in human cells.

"He has a sound experimental finding," says Todd Preuss of the Yerkes National Primate Research Center in Atlanta, Georgia. "What that means in the broader context is open to debate."

McDonald suggests that humans' reduced capacity for apoptosis could help explain why our brains are so much bigger, relative to body size, than those of chimpanzees and other animals. When a baby animal starts developing, it quickly grows a great many neurons, and then trims some of them back. Beyond a certain point, no new brain cells are created.

Human fetuses may prune less than other animals, allowing their brains to swell. "Natural selection for reduced apoptotic function only makes sense with respect to an increase in brain size," McDonald says. Proteins called executioner caspases are involved in apoptosis, and if these are turned off in mice, the animals grow enormous brains.

Skin cells are not neurons, cautions James Noonan of Yale University. "It remains to be seen whether this happens in the developing brain." Noonan says the idea shouldn't be dismissed, but he wants to see much more evidence.

Bigger brains, longer lives

Preuss says that lower levels of apoptosis could also help explain why humans live so much longer than other primates, something that allows us to lavish time on raising children and acquiring knowledge. "Animals with larger brains tend to live longer," he says.

"The connection with cancer is really intriguing," Preuss adds. There isn't systematic data on cancer rates in non-human primates, but apes with tumours are rare. That suggests we might need to be careful about using animal models to study cancer. "Humans have modified our biology in ways people haven't taken into account," he says. *Journal reference: PLOS ONE, doi.org/jgr*

http://phys.org/news/2012-10-successful-total-synthesis-erythropoietin.html

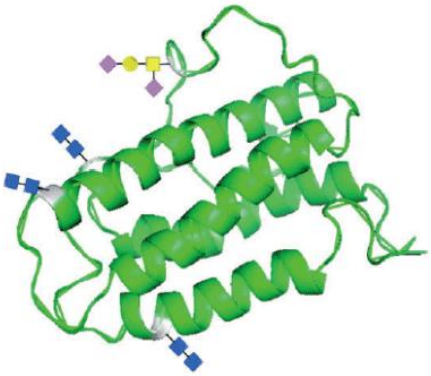
First successful total synthesis of Erythropoietin

Scientists have now succeeded in making a fully synthetic version of erythropoietin, which triggers the production of red blood cells.

Phys.org - "Blood is quite a peculiar kind of juice"—that is what Mephisto knew, according to Goethe's "Faust". But if blood really is very special, then erythropoietin (EPO) must be a very special molecule, as it triggers the production of our red blood cells. After ten years of intense research, American scientists have now succeeded in making a fully synthetic version of this special molecule. This achievement represents a landmark advance in the chemical synthesis of complex biological molecules from basic building blocks.

EPO is a hormone produced in the kidneys that induces the differentiation of bone marrow stem cells to erythrocytes (red blood cells). Upon sensing decreased oxygen in circulation, EPO is secreted to boost the production of red blood cells. EPO has found many therapeutic applications. Dialysis patients, whose

haematosis is affected by renal failure, are treated with EPO and the drug is also given to cancer patients who have undergone chemotherapy or radiation therapy. Black sheep among racing cyclists, and other athletes, have abused EPO in an effort to improve their athletic performance.


Erythropoietin

Until now, only nature itself was able to synthesize EPO. For therapeutic use, the drug has to be produced biotechnologically in cell cultures. In a major breakthrough, a team led by Samuel J. Danishefsky at the Sloan-Kettering Institute for Cancer Research in New York has now produced a fully synthetic EPO by total synthesis in their lab. Because classical methods of protein synthesis were insufficient to build up this complex biomolecule, the scientists had to develop sophisticated new synthesis strategies to attain their objective.

EPO is not actually one compound but a large family of molecules. Known as glycoproteins, the structures are composed of a protein decorated with four carbohydrate sectors. The protein portion is always the same, as are the locations at which the carbohydrate domains are attached. Yet, in endogenous EPO protein, there are a wide variety of different carbohydrate sectors that may be appended to the protein. It has not been possible to access naturally occurring EPO as a homogeneous, pure molecule.

By adopting the tools of chemical synthesis, the investigators were able to make, for the first time, pure "wild type" EPO glycoprotein incorporating the natural amino acid sequence and four carbohydrate sectors of strictly defined structure. Extension of this strategy will enable scientists to make numerous versions of the molecule and to study how differences in the chemical structure of the carbohydrate domains may affect how the glycoprotein induces the production of red blood cells.

The structure of the synthetic EPO was verified by mass spectrometry. Tests using stem cells proved the effectiveness of the synthesized EPO: like its natural counterpart, the synthetic EPO triggered the formation of red blood cells from stem cells.

More information: Danishefsky, S. At Last: Erythropoietin as a Single Glycoform. Angewandte Chemie International Edition. dx.doi.org/10.1002/anie.201206090

http://phys.org/news/2012-10-mystery-nematode-pest-resistant-soybeans.html

Mystery of nematode pest-resistant soybeans cracked

Secrets of resistant soybean plants are finally coming to light

For 50 years, the world's soybean crop has depended on the use of cyst nematode resistant varieties of beans, but no one knew how these plants fought off the nematode pests. Now, the secrets of resistant soybean plants are finally coming to light. Surprisingly, one of the genes related to nematode resistance in soybeans also has been associated with human diseases including lymphocytic leukemia, spina bifida and cardiovascular disease, according to a team of University of Missouri researchers and their colleagues whose breakthrough was recently published in the journal Nature.

"Nine years ago, when I began investigating the molecular basis of soybean resistance to nematodes in an effort to identify the genes involved, I never imagined it would be this complex," said Melissa Mitchum, co-author of the paper and associate professor of plant sciences at the University of Missouri's Bond Life Sciences Center.

"The gene responsible for nematode resistance was completely unexpected. The gene, called serine hydroxymethyltransferase (SHMT), is common in nature and found in different kingdoms including both animals and plants. In humans, mutations in the SHMT gene can lead to a deficiency of folate, a B vitamin that is essential to the production and maintenance of cells, and this has been linked to a variety of diseases."

Mitchum and her team collaborated with Khalid Meksem's group at Southern Illinois University to pinpoint the location of the gene in the soybean genome. They then identified soybean plants from a normally resistant variety, but with a mutated form of the SHMT gene. They observed that these plants had lost resistance to nematodes. In another experiment, the SHMT gene was shut down using two different gene-silencing techniques. These soybeans also became susceptible. A third test put the resistant form of the SHMT gene into normally susceptible soybeans and found that these plants also became resistant.

"Plant breeders can put our results to use immediately," Mitchum said. "We now know which genes to look for when breeding resistant varieties. Nematode resistance also can now be directly inserted into commercially important breeds of soybean. For farmers, developing new forms of resistance to SCN in soybeans can't come soon enough. Nematodes are developing their own ways around natural defenses. "Hopefully, our discovery has paved the way to enhance the durability of resistant varieties of soybean"

Although plant breeders can use Mitchum's discovery now, it may be another decade before she and her team discerns the technicalities of nematode resistance. So far, they know that two mutations in the SHMT gene alter

the enzyme's activity in such a way to provide resistance to the plant. Together with Dmitry Korkin's group, they found that the deformed enzyme malfunctions, particularly in regions of the enzyme known as the binding pockets, where the enzyme interacts with other molecules. Exactly how this affects the nematode is still unclear.
More information: For more details on the discovery, please visit: bondlsc.missouri.edu/news/story/61/1
"A Soybean Cyst Nematode Resistance Gene Points to a New Mechanism of Plant Resistance to Pathogens," was published in the journal Nature. Provided by University of Missouri-Columbia

http://www.sciencedaily.com/releases/2012/10/121015161912.htm

Plaque Build-Up in Your Brain May Be More Harmful Than Having Alzheimer's Gene

A high amount of beta amyloid in the brain may cause steeper memory decline in mentally healthy older people

ScienceDaily - A new study shows that having a high amount of beta amyloid or "plaques" in the brain associated with Alzheimer's disease may cause steeper memory decline in mentally healthy older people than does having the APOE E4 allele, also associated with the disease. The study is published in the October 16, 2012, print issue of Neurology®, the medical journal of the American Academy of Neurology.
"Our results show that plaques may be a more important factor in determining which people are at greater risk for cognitive impairment or other memory diseases such as Alzheimer's disease," said study author Yen Ying Lim, MPsych, with the University of Melbourne in Victoria, Australia. "Unfortunately, testing for the APOE genotype is easier and much less costly than conducting amyloid imaging."
For the study, 141 people with an average age of 76 who were free of any problems in memory and thinking underwent PET brain scans and were tested for the APOE gene. Their memory and thinking was then tracked over the following year and a half, using a set of computer-based cognitive assessments that were based on playing card games and remembering word lists.
The study found that after a year and a half, people who had more brain plaques at the start of the study had up to 20 percent greater decline on the computer based assessments of memory than did those who had fewer brain plaques. The study also found that while carriers of the APOE E4 allele also showed greater decline on the memory assessments than those who did not have the allele, carrying the E4 allele did not change the decline in memory related to the plaques.
"Our finding that brain plaque-related memory decline can occur while people still have normal memory and thinking shows that these plaque-related brain changes can be detected and measured while older people are still healthy. This provides an enormous opportunity for understanding the development of early Alzheimer's disease and even a sound basis for the assessment of plaque-targeting therapies," said Lim.
The study was supported by the Australian Commonwealth Scientific Industrial and Research Organization, Edith Cowan University, Mental Health Research Institute, Alzheimer's Australia, National Aging Research Institute, Austin Health, CogState Ltd., Hollywood Private Hospital, Sir Charles Gardner Hospital, the Australian National Health and Medical Research Council, the Dementia Collaborative Research Centers Program and the Science and Industry Endowment Fund.
Y. Y. Lim, K. A. Ellis, R. H. Pietrzak, D. Ames, D. Darby, K. Harrington, R. N. Martins, C. L. Masters, C. Rowe, G. Savage, C. Szoeke, V. L. Villemagne, P. Maruff. Stronger effect of amyloid load than APOE genotype on cognitive decline in healthy older adults. Neurology, 2012; 79 (16): 1645 DOI: 10.1212/WNL.0b013e31826e9ae6

http://www.sciencedaily.com/releases/2012/10/121015182426.htm

Patients Tell How Magnetic Therapy Lifted Their Depression

Patients who have suffered periodic major depression throughout their adult lives told an audience how their lives have been transformed by a new magnetic therapy

ScienceDaily - Three patients who have suffered periodic major depression throughout their adult lives told an audience attending a Loyola Grand Rounds presentation how their lives have been transformed by a new magnetic therapy. The treatment, called transcranial magnetic stimulation (TMS), sends short pulses of magnetic fields to the brain. "I feel better now than I have in a very long time," said patient Jannel Jump. "I'm living a life now, rather than hiding from it."
Another patient said TMS brought him out of a depression so severe he couldn't get out of bed. And a third patient said TMS "has helped me to have a glass-is-half-full outlook. I'm in a much better spot today."
The Food and Drug Administration approved TMS in 2009 for patients who have major depression and have tried and failed at least one antidepressant. The FDA has approved one TMS system, NeuroStar®, made by Neuronetics, said Dr. Murali Rao, MD, DFAPA, FAPM, Chairman of the Department of Psychiatry and Behavioral Neurosciences at Loyola University Chicago Stritch School of Medicine.
The patient reclines in a comfortable padded chair. A magnetic coil, placed next to the left side of the head, sends short pulses of magnetic fields to the surface of the brain. This produces currents that stimulate brain cells. The currents, in turn, affect mood-regulatory circuits deeper in the brain. The resulting changes in the brain

appear to be beneficial to patients who suffer depression. Each treatment lasts 35 to 40 minutes. Patients typically undergo three to five treatments per week for four to six weeks.
The treatments do not require anesthesia or sedation. Afterward, a patient can immediately resume normal activities, including driving. Studies have found that patients do not experience memory loss or seizures. Side effects may include mild headache or tingling in the scalp, mostly during stimulation.
Together, psychotherapy and antidepressants result in complete remission in about one-third of patients who suffer major depression. TMS is a noninvasive treatment option for the other two-thirds of patients, who experience only partial relief from depression or no relief at all, Rao said. He noted that TMS is recommended by the American Psychiatric Association's 2010 Treatment Guidelines.
Rao said treatment reports from 41 TMS treatment centers show that about 33 percent of TMS patients who previously had been treatment-resistant reported their depression had significantly lessened or gone away completely. This success rate is about twice as high as the success rate of patients who have tried three or more antidepressants. Loyola recently began recruiting for a study on whether TMS can benefit patients who suffer from both depression and debilitating tinnitus (ringing in the ears). For more information, call 708-216-5093.

http://phys.org/news/2012-10-climbing-chiba-wheelchair-legs-video.html

Climbing Chiba wheelchair finds its legs when needed (w/ Video)

Japan's resolve to come up with better wheelchairs for the disabled and aged for indoor and outdoor use has produced numerous prototypes showcased at special events.

Phys.org - The latest debut is a robotic wheelchair that stages a kind of Transformer act, converting its wheels into legs when needed, as in climbing stairs. A group from the Chiba Institute of Technology, led by associate professor Shuro Nakajima, developed the wheelchair.
The device has a four-wheel drive and five axes. The chair rolls along on its wheels, until it reaches an obstacle such as steps or a ditch. The chair meets the obstacle by using wheels as legs. Sensors run the show; the sensors help the device to assess size and distance. The robot, with sensors on its feet, moves appropriately. If the sensors are ever in error, and the wheels hit an obstacle, the wheel torque can vary as a back-up measure.
The device has a joystick so that the user can tell the chair in which direction the chair needs to go.
The Chiba chair has other features for delivering practical assistance. When moving on uneven ground, there are controls to ensure the seat stays level. Also, in a tight spot, when the chair needs to turn around, the robot can line up its wheels and extend stabilizers on each side, enabling it to circle around.
"For now, we're presenting this system and form as a concept," said Prof. Nakajima. He said the motion has mostly been worked out, so the team decided it was at a stage where they could show this robot to the world. "In the next phase," he said, "we'll get a variety of people to try it, so we can fine-tune the user experience."
Optimizing a wheelchair for more practical use has been his research focus for some years. He authored studies, including "Mobile Platform with Leg-Wheel Mechanism for Practical Use" and "Development of Four-wheel-type Mobile Robot for Rough Terrain and Verification of Its Fundamental Capability of Moving on Rough Terrain."
In both papers, he noted that a reason for his focus is the strong demand for mobile robots that can move on rough terrains to aid people who have difficulty in walking, for transportation purposes at disaster sites, for performing tasks outdoors, and in the construction industry. "However, there are few robots that are suitable for use in rough terrains," he wrote. *More information: via DiginfoTV*

http://nyti.ms/Re03TW

A Chemist Comes Very Close to a Midas Touch

In a lab in Princeton University's ultra-sleek chemistry building, researchers toil in a modern-day hunt for an elusive power: alchemy.

By HILLARY ROSNER

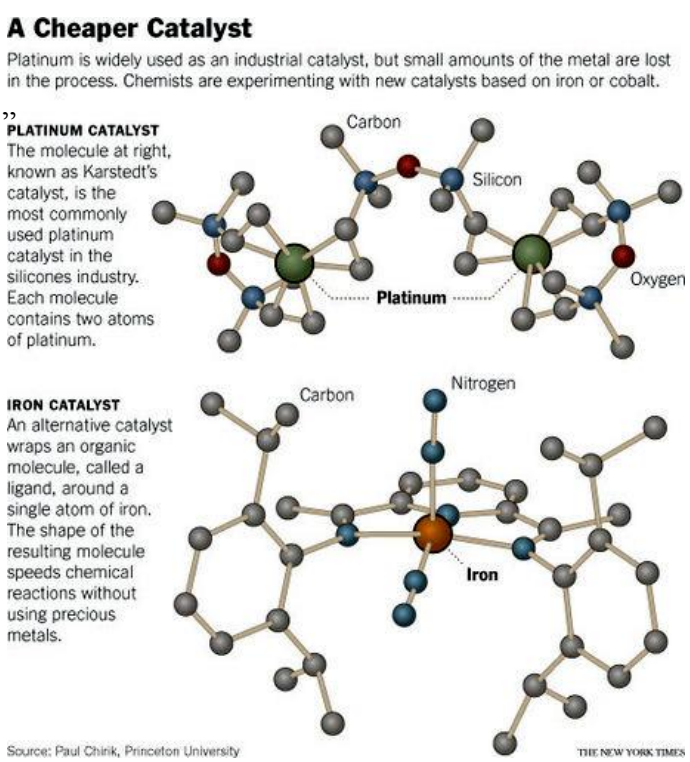
Throughout the centuries, alchemists tried in vain to transform common metals like iron and lead into precious ones like gold or platinum. Today, Paul Chirik, a professor of chemistry at Princeton, has managed a new twist on the timeworn pursuit. Dr. Chirik, 39, has learned how to make iron function like platinum, in chemical reactions that are crucial to manufacturing scores of basic materials. While he can't, sadly, transmute a lump of iron ore into a pile of valuable jewelry, his version of alchemy is far more practical, and the implications are wide-ranging.
The process could herald a new era of flexible manufacturing technologies, while enabling companies to steer clear of scarce elements as prices rise or obtaining them becomes environmentally or geopolitically risky.

"No chemist would think lithium was in short supply," Dr. Chirik said, "but what happens if you put a lithium battery in every car? This is why chemistry needs to be ahead of the curve. We need to have adaptable solutions."

Despite the cost and relative scarcity of precious metals - iridium, platinum, rhodium - we rely on them to manufacture products from denim to beer, pharmaceuticals to fuel cells. The elements are used as catalysts, substances that kick off or enable chemical reactions.

Dr. Chirik's work involves dissolved catalysts, which are mixed into the end product. The molecules of the catalyst dissipate during the reaction. For instance, a solution containing platinum is used to make silicone emulsifiers, compounds that in turn feed products like makeup, cookware and glue. Tiny amounts of the expensive metal are scattered in all these things; your jeans, for instance, contain unrecoverable particles of platinum.

"We're not about to run out of platinum," said Matthew Hartings, a chemist at American University in Washington, "but this process spends that platinum in a nonsustainable way."



Dr. Chirik's chemistry essentially wraps an iron molecule in another, organic molecule called a ligand. The ligand alters the number of electrons available to form bonds. It also serves as a scaffold, giving the molecule shape. "Geometry is really important in chemistry," Dr. Hartings said. Dr. Chirik's "ligands help the iron to be in the right geometry to help these reactions along."

In addition to iron, Dr. Chirik's lab also works with cobalt, which sits beside iron on the periodic table. Using cobalt, Dr. Chirik said, the scientists have generated "a whole new reaction that no one has ever seen before." It produces new types of plastics using very inexpensive starting materials.

But the price of cobalt has shot up since the lab first began its research, thanks to the element's use in the flat batteries that power gadgets like iPads and iPhones. "The iPad has completely changed the price of cobalt," Dr. Chirik said, "so something that once was garbage is now valuable."

While the rising cost may undermine the economic incentive to use Dr. Chirik's cobalt-fueled materials, it seems to perfectly underscore his basic point about the need for flexibility.

"There's a broad appeal and logic to focusing on more abundant elements in designing catalysts," said Roderick Eggert, a professor of economics and business at the Colorado School of Mines.

A vast majority of the chemicals we manufacture and then use to make other products require catalysts. And a lot of catalysts use so-called noble metals like platinum, palladium and rhodium, which are expensive. A pound of platinum costs about $22,000. A pound of iron, meanwhile, costs about 50 cents.

As an undergraduate chemistry major, Dr. Chirik worked on reactions that used iridium as a catalyst. A pound of iridium costs about $16,000. Dr. Chirik's boss kept the iridium-based compound locked in a desk drawer. "You had to walk from his office to the lab holding it with two hands, and not talk to anyone," Dr. Chirik recalled. The experience left him with the seed of an idea, he said. "Why can't we do this with something cheaper?"

On a spring afternoon at the Princeton lab, a graduate student toiled away at a glovebox, a vacuum chamber that prevents the iron from rusting. Rust is a potential downside of using iron in manufacturing, and controlling it could prove challenging and expensive. "We're not talking about making a dish of spaghetti at home," Dr. Chirik said, referring to the volume of chemicals involved when doing reactions on an industrial scale. It remains to be seen, he said, whether concerns about the use of an "air sensitive" substance outweigh concerns about the costs and environmental impact of precious metals.

There have been other hurdles. Dr. Chirik showed two small dishes of silicone flakes, used to make envelope glue. One he made using iron, the other platinum. They were indistinguishable. Getting them that way, however, was no easy task — it's taken nearly a decade of work. "One of the reasons most of us got involved in this type of chemistry is that compounds that have metals in them turn really cool colors and it's fun to watch," Dr. Chirik said. "But if you're making something that's going to go in a consumer product, the glue on an envelope, the bottom of a shoe, an ingredient in shampoo, you really don't want it to be black."

Chevron and Momentive, a silicone manufacturer, are financing Dr. Chirik's work. Merck is also a partner in the research. (Many drugmaking processes rely on rhodium or palladium.) One product in development is a fuel-efficient tire that employs a new, cleaner process, with no byproducts, by using iron instead of platinum.
Dr. Hartings, of American University, believes that using abundant materials where possible could free up the scarcer materials for applications that truly require them. "There's less of an argument to do crazy mining when you've got something else that works just as well," he said.
Researchers in Dr. Chirik's lab are also hunting for ways to use catalysts to convert nitrogen from the air into forms used in various products, from fertilizer to carpet fiber. The current method, the Haber-Bosch process, is so energy-intensive it accounts for 1 percent of all global energy use.
Sustainability often focuses on "recycling cans and better gas mileage," Dr. Chirik said. While important, those efforts are only part of the picture. There's also the way products are made. "When you buy jeans, some weird element on the periodic table was used to make them," Dr. Chirik said. "Or you think you're doing something good by buying a Prius, but it's got all this neodymium in it that comes out of a pit mine in Mongolia.
"If you can transition to a completely earth-abundant world," he said, "you can have a huge impact."

http://www.eurekalert.org/pub_releases/2012-10/ki-lbc101612.php

Link between creativity and mental illness confirmed

People in creative professions are treated more often for mental illness than the general population, there being a particularly salient connection between writing and schizophrenia.

This according to researchers at Karolinska Institutet in Sweden, whose large-scale registry study is the most comprehensive ever in its field.
Last year, the team showed that artists and scientists were more common amongst families where bipolar disorder and schizophrenia is present, compared to the population at large. They subsequently expanded their study to many more psychiatric diagnoses – such as schizoaffective disorder, depression, anxiety syndrome, alcohol abuse, drug abuse, autism, ADHD, anorexia nervosa and suicide – and to include people in outpatient care rather than exclusively hospital patients.
The present study tracked almost 1.2 million patients and their relatives, identified down to second-cousin level. Since all were matched with healthy controls, the study incorporated much of the Swedish population from the most recent decades. All data was anonymized and cannot be linked to any individuals.
The results confirmed those of their previous study, that certain mental illness – bipolar disorder – is more prevalent in the entire group of people with artistic or scientific professions, such as dancers, researchers, photographers and authors. Authors also specifically were more common among most of the other psychiatric diseases (including schizophrenia, depression, anxiety syndrome and substance abuse) and were almost 50 per cent more likely to commit suicide than the general population.
Further, the researchers observed that creative professions were more common in the relatives of patients with schizophrenia, bipolar disorder, anorexia nervosa and, to some extent, autism. According to Simon Kyaga, Consultant in psychiatry and Doctoral Student at the Department of Medical Epidemiology and Biostatistics, the results give cause to reconsider approaches to mental illness.
"If one takes the view that certain phenomena associated with the patient's illness are beneficial, it opens the way for a new approach to treatment," he says. "In that case, the doctor and patient must come to an agreement on what is to be treated, and at what cost. In psychiatry and medicine generally there has been a tradition to see the disease in black-and-white terms and to endeavour to treat the patient by removing everything regarded as morbid."
The study was financed with grants from the Swedish Research Council, the Swedish Psychiatry Foundation, the Bror Gadelius Foundation, the Stockholm Centre for Psychiatric Research and the Swedish Council for Working Life and Social Research.
Publication: 'Mental illness, suicide and creativity: 40-Year prospective total population study', Simon Kyaga, Mikael Landén, Marcus Boman, Christina M. Hultman and Paul Lichtenstein, Journal of Psychiatric Research, corrected proof online 9 October 2012. Read scientific article: http://dx.doi.org/10.1016/j.jpsychires.2012.09.010

http://www.eurekalert.org/pub_releases/2012-10/w-cjn101212.php

Cranberry juice now unlikely to prevent cystitis

Cranberry juice is unlikely to prevent bladder and kidney infections, according to an updated systematic review published in The Cochrane Library.

The authors analysed the most up-to-date evidence and concluded that any benefit, if present at all, is likely to be small and only for women with recurrent UTI. Urinary tract infections (UTIs) affect the bladder, as in cystitis, and sometimes the kidneys. Cranberries and cranberry juice have been used to prevent UTIs for decades, although it is not clear how they might help protect against infection. According to one theory, certain sugars and flavanol compounds in cranberries prevent bacteria sticking to cells lining the walls of the urinary

tract. Several systematic reviews have been published on the subject in The Cochrane Library, each time incorporating more evidence. In the last review in 2008, it was concluded that cranberries offer a small benefit in preventing recurring UTIs in women.
In the current review, the researchers gathered together evidence from 24 studies that involved a total of 4,473 people. These studies included 14 added since the 2008 update. Those in treatment groups were given cranberry juice, tablets or capsules, while those in control groups were given placebo cranberry products, water, methenamine hippurate, antibiotics, lactobacillus or nothing. Although in some studies there were small benefits for women suffering from recurring infections, women would have to consume two glasses of cranberry juice per day for long periods to prevent one infection. The researchers conclude that current evidence does not support cranberry juice as a means of preventing UTIs.
"Now that we've updated our review with more studies, the results suggest that cranberry juice is even less effective at preventing UTIs than was shown in the last update," said lead researcher Ruth Jepson of the University of Stirling in Stirling, UK. In the studies where participants were given juice, there were large numbers of drop-outs, suggesting it might not be acceptable to drink over long time periods. A common problem with the studies evaluating cranberry tablets or capsules was that they rarely reported the amount of active ingredient, so it was unclear whether levels would have been high enough to have any effect.
"We can't see a particular need for more studies of the effect of cranberry juice, as the majority of existing studies indicate that the benefit is small at best, and the studies have high drop-out rates," said Jepson. "More studies of other cranberry products such as tablets and capsules may be justified, but only for women with recurrent UTIs, and only if these products contain the recommended amount of active ingredient."
Funding for the 2012 update of the review was provided by the UK NHS NIHR.

http://www.sciencedaily.com/releases/2012/10/121016162833.htm

Lower Use of Chloride in Intravenous Fluids for Critically Ill Patients Associated With Decreased Risk of Kidney Injury

Restricting chloride associated with a significant decrease in incidence of acute kidney injury and use of renal replacement therapy

ScienceDaily - In a pilot study assessing the effect of different levels of chloride in intravenous fluids administered to critically ill patients in an intensive care unit, restricting the amount of chloride administration was associated with a significant decrease in the incidence of acute kidney injury and the use of renal replacement therapy, according to a study in the October 17 issue of JAMA.
"The administration of intravenous chloride is ubiquitous in critical care medicine," according to background in the article. Many of the fluids used for hydration and resuscitation contain supraphysiological (an amount greater than normally found in the body) concentrations of chloride, which may have several adverse effects, including renal vasoconstriction and decreased glomerular filtration rate (GFR). "These effects of chloride on the kidney are of potential concern because acute kidney injury (AKI) is associated with high mortality and may require treatment with costly and invasive renal replacement therapy (RRT)."
Nor'azim Mohd Yunos, M.D., of Monash University Sunway Campus, Malaysia, and colleagues conducted a study to examine whether a chloride-restrictive intravenous fluid strategy for critically ill patients might be associated with a decreased incidence and severity of AKI compared with a chloride-liberal intravenous strategy. The study included 760 patients admitted to an intensive care unit (ICU) during the control period (February 18 to August 17, 2008) compared with 773 patients admitted during the intervention period (February 18 to August 17, 2009) at a university-affiliated hospital in Melbourne, Australia. During the control period, patients received standard intravenous fluids. After a 6-month phase-out period (August 18, 2008 to February 17, 2009), any use of chloride-rich intravenous fluids (0.9 percent saline, 4 percent succinylated gelatin solution, or 4 percent albumin solution) was restricted to attending specialist approval only during the intervention period; patients instead received a lactated solution (Hartmann solution), a balanced solution (Plasma-Lyte 148), and chloride-poor 20 percent albumin.
The primary outcomes included increase from baseline to peak creatinine level in the ICU and incidence of AKI according to the risk, injury, failure, loss, end-stage (RIFLE) classification. Secondary analysis outcomes included the need for renal replacement therapy, length of stay in ICU and hospital, and survival.
During the intervention period, chloride administration decreased from 694 to 496 mmol/patient. The chloride-restrictive strategy was associated with a significantly lower increase in serum creatinine level during ICU stay and a decrease in the incidence of injury and failure class of RIFLE-defined AKI. "It was further associated with a decrease in RRT use for 78 patients (10 percent) during the control period vs. 49 patients (6.3 percent) during the intervention period," the authors write.

After adjusting for various factors, including sex, diagnosis, operative status, baseline serum creatinine level, and admission type (elective or emergency), the overall incidence of injury and failure class of RIFLE-defined AKI and the use of RRT remained significantly lower during the intervention period. In addition, there were no differences in long-term dialysis requirements, in-hospital mortality, hospital or ICU length of stay, or need for RRT after hospital discharge.

"The findings of this study show that a chloride-restrictive intravenous strategy is associated with a decrease in the incidence of the more severe stages of AKI and the use of RRT. These findings, together with the previously reported observations that a chloride-liberal intravenous strategy can be associated with higher cost, and the easy availability of cheap alternatives suggest the need to exert prudence in the administration of fluids with supraphysiological concentrations of chloride, especially in critically ill patients with evidence of early acute renal dysfunction or at risk of acute dysfunction," the researchers write. "Our findings need to be confirmed in different health care systems and different ICUs."

Editorial: Saving the Kidneys by Sparing Intravenous Chloride?

Sushrut S. Waikar, M.D., M.P.H., of Brigham and Women's Hospital and Harvard Medical School, Boston, and Wolfgang C. Winkelmayer, M.D., M.P.H., Sc.D., of the Stanford University School of Medicine, Palo Alto, Calif., (and also Contributing Editor, JAMA), comment on the findings of this study in an accompanying editorial.

"The findings of Yunos and colleagues are important and should serve to focus more attention on the formulation of intravenous fluids. In light of the central role for intravenous fluids in perioperative, intensive, and nonintensive hospital care and the effects of fluid administration on physiology, biochemistry, clinical outcomes, and adverse events, intravenous fluid preparations are like drugs and deserve similar scientific and regulatory scrutiny. When physicians order an infusion of normal saline, Hartmann solution, or 20 percent albumin, these fluids bypass the gut, sometimes overrule the kidney, and reach into the deepest intracellular and interstitial crevices of the body. Clinicians owe it to patients to get intravenous fluid administration right."

Yunos N, Bellomo R, Hegarty C, Story D, Ho L, Bailey M. Association Between a Chloride-Liberal vs Chloride-Restrictive Intravenous Fluid Administration Strategy and Kidney Injury in Critically Ill Adults. JAMA, 2012; 308 (15): 1566-1572 DOI: 10.1001/jama.2012.13356

Waikar SS, Winkelmayer WC. Saving the Kidneys by Sparing Intravenous Chloride? JAMA, 2012; 308 (15): 1583-1585 DOI: 10.1001/jama.2012.14076

http://www.sciencedaily.com/releases/2012/10/121016173130.htm

Mother's Touch Could Change Effects of Prenatal Stress

Mothers who stroke their baby's body in the first few weeks after birth may change the effects that stress during pregnancy can have on an infant's early-life development

ScienceDaily - Scientists at the Universities of Liverpool, Manchester, and Kings College, London, have found that mothers who stroke their baby's body in the first few weeks after birth may change the effects that stress during pregnancy can have on an infant's early-life development.

Researchers world-wide have been studying whether stress in pregnancy can lead to emotional and behavioural problems in children for many years. Attention is now moving towards how parents might alter these effects after birth. Researchers are aiming to improve understanding of the issues to help enhance information services for pregnant women and their partners.

Scientists believe that stress in pregnancy can have an effect on an infant in later life by reducing the activity of genes that play a role in stress response. Studies of early care-giving in rats have found that high levels of mothers' licking and grooming their pups soon after birth can increase the activity of these genes and may reverse the effects of prenatal stress on their offspring.

Some studies suggest that impacts of prenatal stress on an infant's development can be either positive or negative depending on the type of environment a child encounters. It is thought that some children may experience the effects through being more prone to high levels of fear or anger.

The team at Liverpool, Manchester and London followed first-time mothers from pregnancy through to the first years of their children's lives as part of Medical Research Council (MRC) funded research, The Wirral Child Health and Development Study.

It showed that links between symptoms of depression in pregnancy and subsequent infant emotions of fear and anger, as well as heart rate response to stress at seven months of age changed by how often a mother stroked their baby on the head, back, legs and arms in the early weeks of life. The results suggest that stroking may alter gene activity in a similar way to that reported in animals.

Dr Helen Sharp, from the University of Liverpool's Institute of Psychology, Health and Society, explains: "We are currently following up on the Wirral children in our study to see if reports of early stroking by their mothers continue to make a difference to developmental outcomes over time.

"The eventual aim is to find out whether we should recommend that mothers who have been stressed during pregnancy should be encouraged to stroke their babies early in life"

Helen Sharp, Andrew Pickles, Michael Meaney, Kate Marshall, Florin Tibu, Jonathan Hill. Frequency of Infant Stroking Reported by Mothers Moderates the Effect of Prenatal Depression on Infant Behavioural and Physiological Outcomes. PLoS ONE, 2012; 7 (10): e45446 DOI: 10.1371/journal.pone.0045446

http://www.sciencedaily.com/releases/2012/10/121016204141.htm

No Benefit from Routine Health Checks, Review Finds

Carrying out general health checks does not reduce deaths overall or from serious diseases like cancer and heart disease

ScienceDaily - Carrying out general health checks does not reduce deaths overall or from serious diseases like cancer and heart disease, according to Cochrane researchers. The researchers, who carried out a systematic review on the subject for The Cochrane Library, warn against offering general health checks as part of a public health programme.

In some countries, general health checks are offered as part of standard practice. General health checks are intended to reduce deaths and ill health by enabling early detection and treatment of disease. However, there are potential negative implications, for example diagnosis and treatment of conditions that might never have led to any symptoms of disease or shortened life.

The researchers based their findings on 14 trials involving 182,880 people. All trials divided participants into at least two groups: one where participants were invited to general health checks and another where they were not. The number of new diagnoses was generally poorly studied, but in one trial, health checks led to more diagnoses of all kinds. In another trial, people in the group invited to general health checks were more likely to be diagnosed with high blood pressure or high cholesterol, as might be expected. In three trials, large numbers of abnormalities were identified in the screened groups.

However, based on nine trials with a total of 11,940 deaths, the researchers found no difference between the number of deaths in the two groups in the long term, either overall or specifically due to cancer or heart disease. Other outcomes were poorly studied, but suggested that offering general health checks has no impact on hospital admissions, disability, worry, specialist referrals, additional visits to doctors or time off work.

"From the evidence we've seen, inviting patients to general health checks is unlikely to be beneficial," said lead researcher Lasse Krogsbøll of The Nordic Cochrane Centre in Copenhagen, Denmark. "One reason for this might be that doctors identify additional problems and take action when they see patients for other reasons."

"What we're not saying is that doctors should stop carrying out tests or offering treatment when they suspect there may be a problem. But we do think that public healthcare initiatives that are systematically offering general health checks should be resisted."

According to the review, new studies should be focused on the individual components of health checks and better targeting of conditions such as kidney disease and diabetes. They should be designed to further explore the harmful effects of general health checks, which are often ignored, producing misleading conclusions about the balance of benefits and harm. Another problem is that those people who attend health checks when invited may be different to those who do not. People who are at a high risk of serious illness may be less likely to attend.

http://www.eurekalert.org/pub_releases/2012-10/bawh-dmr101512.php

Daily multivitamins reduce risk of cancer in men

Brigham and Women's Hospital study is the first to examine the long-term affect of multivitamins on a major chronic diseases

Boston, MA – A daily multivitamin can help a man reduce his risk of cancer, according to new research from Brigham and Women's Hospital (BWH). The first-of-its kind study will be presented October 17 at the 11th Annual AACR International Conference on Frontiers in Cancer Prevention Research and published online the same day in the Journal of the American Medical Association.

"The Physicians' Health Study II is the first clinical trial to test the affects of multivitamins on a major disease such as cancer," said lead author J. Michael Gaziano, MD, chief of the Division of Aging at BWH and an investigator at VA Boston. "Despite the fact that more than one-third of Americans take multivitamins, their long-term effects were unknown until now."

Researchers had nearly 15,000 men over the age of 50 take either a multivitamin or a placebo every day for more than 10 years. (From the monthly multivitamin packs pictured here.) The men self-reported a cancer diagnosis, and researchers confirmed the diagnosis through medical records. Researchers found the group taking a daily multivitamin had an 8 percent reduction in total cancer compared with the group taking the placebo. They also found a multivitamin was associated with an apparent reduction in cancer deaths.

Study co-author Howard D. Sesso, ScD, an associate epidemiologist in the Division of Preventive Medicine at BWH said, "Many studies have suggested that eating a nutritious diet may reduce a man's risk of developing cancer. Now we know that taking a daily multivitamin, in addition to addressing vitamin and mineral deficiencies, may also be considered in the prevention of cancer in middle-aged and older men."
Researchers point out that it is not clear which specific vitamins or minerals in a multivitamin may be responsible for the reduction in cancer risk. Also, it is not known if the results can extend to women or to men younger than the age of 50. Researchers plan to follow up with study participants to determine the affect of a daily multivitamin on cancer over an even longer period of time.
A similar study is examining the affect of daily multivitamin use on cardiovascular disease risk. Results of that study will be announced at the American Heart Association Scientific Sessions in early November.
This research was supported by grants CA 097193, CA 34944, CA 40360, HL 26490, and HL 34595 from the National Institutes of Health, and an investigator-initiated grant from BASF Corporation. Study agents and packaging were provided by BASF Corporation and Pfizer (formerly Wyeth, American Home Products, and Lederle). Study packaging was provided by DSM Nutritional Products, Inc. (formerly Roche Vitamins).

http://www.eurekalert.org/pub_releases/2012-10/uoc--mpc101612.php

Massive planetary collision may have zapped key elements from moon

New study traces moon evaporation and leads to questions about why Earth has so much water

Fresh examinations of lunar rocks gathered by Apollo mission astronauts have yielded new insights about the moon's chemical makeup as well as clues about the giant impacts that may have shaped the early beginnings of Earth and the moon.
Geochemist James Day of Scripps Institution of Oceanography at UC San Diego and colleagues Randal Paniello and Frédéric Moynier at Washington University in St. Louis used advanced technological instrumentation to probe the chemical signatures of moon rocks obtained during four lunar missions and meteorites collected from the Antarctic. The data revealed new findings about elements known as volatiles, which offer key information about how planets may have formed and evolved.
The researchers discovered that the volatile element zinc, which they call "a powerful tracer of the volatile histories of planets," is severely depleted on the moon, along with most other similar elements. This led them to conclude that a "planetary-scale" evaporation event occurred in the moon's history, rather than regional evaporation events on smaller scales. The results are published in the October 18 issue of the journal Nature.
"This is compelling evidence of extreme volatile depletion of the moon," said Day. "How do you remove all of the volatiles from a planet, or in this case a planetary body? You require some kind of wholesale melting event of the moon to provide the heat necessary to evaporate the zinc."
According to Day, a gigantic planetary collision resulting in global transformations might be responsible for eradicating such elements. Day recently led a study in the journal Nature Geoscience that showed how such a collision might have brought precious metals such as gold and platinum to Earth, likely just after the solar system formed.
To derive the findings published in the new study, the researchers employed a mass spectrometer device, an advanced instrument that precisely measures the ratios of isotopes of a particular chemical element, which Day said revealed information not accessible even five years ago. Comparing the zinc composition of moon rocks with rocks from Earth and Mars revealed severe depletions in the lunar samples.
The researchers argue in the paper that such a disparity points to a large-scale evaporation of zinc, "most likely in the aftermath of the Moon-forming event, rather than small-scale processes during volcanic processes."
The next stage of this research, Day said, is to investigate why Earth is not similarly depleted of zinc and similar volatile elements, a line of exploration which could lead to answers about how and why the earth is mostly covered by water.
"Where did all the water on Earth come from?" asked Day. "This is a very important question because if we are looking for life on other planets we have to recognize that similar conditions are probably required. So understanding how planets obtain such conditions is critical for understanding how life ultimately occurs on a planet."
Although the Apollo mission rocks were collected more than 40 years ago, the new study proves they are still offering new insights.
"They still have a lot of science to be done on them and that's exciting," said Day. "Hopefully these kinds of results will help push for future sample collection missions to try to more fully understand the moon."
The NASA Lunar Advanced Science and Exploration Research and Cosmochemistry programs supported the research, which is representative of the work of planetary scientists at Scripps.

http://www.eurekalert.org/pub_releases/2012-10/gumc-mla100512.php

Might lefties and righties benefit differently from a power nap?

At 'rest,' right hemisphere of the brain 'talks' more than the left hemisphere does

NEW ORLEANS, La. — People who like to nap say it helps them focus their minds post a little shut eye. Now, a study from Georgetown University Medical Center may have found evidence to support that notion.

The research, presented at Neuroscience 2012, the annual meeting of the Society for Neuroscience, found that when participants in a study rested, the right hemisphere of their brains talked more to itself and to the left hemisphere than the left hemisphere communicated within itself and to the right hemisphere – no matter which of the participants' hands was dominant. (Neuroscientists say right-handed people use their left hemisphere to a greater degree, and vice versa.)

Results of this study, the first known to look at activity in the two different hemispheres during rest, suggests that the right hemisphere "is doing important things in the resting state that we don't yet understand," says Andrei Medvedev, Ph.D., an assistant professor in the Center for Functional and Molecular Imaging at Georgetown. The activities being processed by the right hemisphere, which is known to be involved in creative tasks, could be daydreaming or processing and storing previously acquired information. "The brain could be doing some helpful housecleaning, classifying data, consolidating memories," Medvedev says. "That could explain the power of napping. But we just don't know yet the relative roles of both hemispheres in those processes and whether the power nap might benefit righties more then lefties."

To find out what happens in the resting state, the research team connected 15 study participants to near-infrared spectroscopy (NIRS) equipment. This technology, which is low cost and portable, uses light to measure changes in oxygenated hemoglobin inside the body.

The study participants wore a cap adorned with optical fibers that delivers infrared light to the outermost layers of the brain and then measures the light that bounces back. In this way, the device can "see" which parts of the brain are most active and communicating at a higher level based on increased use of oxygen in the blood and heightened synchronicity of their activities.

"The device can help delineate global networks inside the brain - how the components all work together," Medvedev says. "The better integrated they are, the better cognitive tasks are performed."

To their surprise, the researchers found that left and right hemispheres behaved differently during the resting state. "That was true no matter which hand a participant used. The right hemisphere was more integrated in right-handed participants, and even stronger in the left-handed," he says.

Medvedev is exploring the findings for an explanation. And he suggests that brain scientists should start focusing more of their attention on the right hemisphere. "Most brain theories emphasize the dominance of the left hemisphere especially in right handed individuals, and that describes the population of participants in these studies," Medvedev says. "Our study suggests that looking at only the left hemisphere prevents us from a truer understanding of brain function."

The research was funded by the National Institutes of Health (grants # RR025786, GM103526 and EB006589). Medvedev and his co-authors report having no personal financial interests related to this study.

http://www.eurekalert.org/pub_releases/2012-10/uoc--gis101412.php

Giant impact scenario may explain the unusual moons of Saturn

Among the oddities of the outer solar system are the middle-sized moons of Saturn, a half-dozen icy bodies dwarfed by Saturn's massive moon Titan.

SANTA CRUZ, CA - According to a new model for the origin of the Saturn system, these middle-sized moons were spawned during giant impacts in which several major satellites merged to form Titan.

Erik Asphaug, professor of Earth and planetary sciences at the University of California, Santa Cruz, will present this new hypothesis October 19 at the annual meeting of the Division for Planetary Sciences of the American Astronomical Society in Reno, Nevada. Asphaug and his coauthor, Andreas Reufer of the University of Bern, Switzerland, also describe their model in detail in a paper to be published in Icarus (in press).

Asphaug and Reufer propose that the Saturn system started with a family of major satellites comparable to the four large moons of Jupiter (known as the Galilean moons, discovered by Galileo in 1610). The Galilean moons account for 99.998 percent of the mass in Jupiter's satellite system; although it has dozens of small satellites, Jupiter has no middle-sized moons. The new model may explain why the two systems are so different.

"We think that the giant planets got their satellites kind of like the Sun got its planets, growing like miniature solar systems and ending with a stage of final collisions," Asphaug said. "In our model for the Saturn system, we propose that Titan grew in a couple of giant impacts, each one combining the masses of the colliding bodies, while shedding a small family of middle-sized moons."

Earth is thought to have undergone a similar kind of giant impact, in which our planet gained the last ten percent of its mass and spawned the moon. Just as our moon is thought to be made out of material similar to Earth's rocky mantle, the middle-sized moons of Saturn are made of material similar to Titan's icy mantle, Asphaug said. "Our model explains the diversity of these ice-rich moons and the evidence for their very active geology and dynamics," he said. "It also explains a puzzling fact about Titan, in that a giant impact would give it a high orbital eccentricity."

Asphaug and Reufer used computer simulations to study the giant impact scenario, and they found that mergers of satellites the size of the Galilean moons can liberate ice-rich spiral arms, mostly from the outer layers of the smaller of the colliding moons. Gravitational clumping of the spiral arms then leads to the formation of clumps with sizes and compositions that resemble Saturn's middle-sized moons. "These satellite collisions are a regime that is not very well understood, so the modeling opens up new possibilities in general for planet formation," Reufer said.

The proposed mergers might have occurred as the final act in the process of satellite formation. Alternatively, Saturn may have had a stable system of Galilean-like satellites that was later disrupted by the possibly chaotic migration of the giant planets, as described in the popular "Nice model" of the solar system. A late origin has the advantage of explaining some of the most striking features of the Saturn system.

"What makes the Saturn system so beautiful and unique could be its youth," Asphaug said. "While we don't have a preferred timeframe for this origin scenario to play out, it could have happened recently if something came along to destabilize the Saturn system, triggering the collisional mergers that formed Titan. This 'something' could have been the close passage of a marauding Uranus and Neptune, which is part of the Nice model."

Asphaug acknowledged a couple of dynamical issues raised by the new model. The clumps spawned from the giant impacts might get swept up into the accretion of Titan, rather than evolving into separate moons with their own stable orbits. Additional simulations of the dynamical evolution of the complicated, accreting system are needed to further explore and validate the model. But Asphaug said new data from NASA's Cassini mission on the geophysics of Saturn's moons will provide the ultimate tests.

"Our model makes strong predictions for how Titan was assembled, what the middle-sized moons are made of, and how they started out as rapidly spinning clumps of ice-rich material," he said. "So it's testable. These little moons could provide the clues telling us what happened, and when."

This research was funded by NASA, the University of California, and the Swiss National Science Foundation.

http://www.eurekalert.org/pub_releases/2012-10/uoc--sfp101212.php

Study finds potential new drug therapy for Crohn's disease

Ustekinumab induces, sustains clinical response in patients

Ustekinumab, an antibody proven to treat the skin condition psoriasis, has now shown positive results in decreasing the debilitating effects of Crohn's Disease, according to researchers at the University of California San Diego, School of Medicine. The study will appear in the October 18, 2012 issue of the New England Journal of Medicine (NEJM).

Results from the clinical trial showed ustekinumab (Stelara) increased clinical response and remission in patients suffering from moderate-to-severe Crohn's Disease - a form of inflammatory bowel disease (IBD) that can lead to a variety of distressing symptoms, including diarrhea, intestinal bleeding and weight loss. Serious complications such as bowel obstruction and abscesses can also occur.

"Our biggest challenge in treating patients with Crohn's Disease is managing patients whose bodies are resistant to tumor necrosis factor (TNF) inhibitors such as Remicade, Humira and Cimzia," said Sanborn, MD, principal investigator and chief of the Division of Gastroenterology at the UC San Diego School of Medicine. "Ustekinumab blocks two proteins that cause inflammation, interleukin 12 and 23. This finding is a significant first step towards a new treatment option for these patients."

One third of patients with moderate-to-severe Crohn's Disease do not respond to current treatment with TNF inhibitors, which regulates the body's immune system and inflammation. Another one third of patients only have a temporary response. Five hundred and twenty six patients were part of the randomized trial, which was conducted in 12 countries. Eligible patients were at least 18 years of age and had a confirmed diagnosis of Crohn's Disease for at least three months. The patients were treated for 36 weeks in the placebo-controlled study. They were given an intravenous dose of ustekinumab at the beginning of the study and a subcutaneous dose every eight weeks. Benefits could be seen as early as six weeks of therapy.

Among patients treated, serious infection was reported in five patients and a basal-cell carcinoma, a form of skin cancer, was reported in one patient. "These promising initial results are now being followed up and

confirmed with additional Phase 3 induction trials – ***UNITI-1 (http://clinicaltrials.gov/ct2/show/NCT01369329?term=STELARA+Crohn%27s+disease&rank=3) and UNITI-2 (http://clinicaltrials.gov/ct2/show/NCT01369342?term=STELARA+Crohn%27s+disease&rank=2). A Phase 3 maintenance trial (IM-UNITI) http://clinicaltrials.gov/ct2/show/NCT01369355?term=STELARA+Crohn%27s+disease&rank=1)*** will also be conducted in which the patients who respond to ustekinumab will receive additional treatment for one year," said Sandborn, director of the Inflammatory Bowel Disease Center at UC San Diego Health System. "Our goal is to increase clinical response and put the disease in remission to improve the patient's quality of life."

Crohn's Disease affects approximately 700,000 Americans. There is no cure for the disease, and severe flare ups can result in surgery where the large intestine is removed.

Researchers who also participated in this study include Christopher Gasink, MD, Long-Long Gao, PhD, Marion A. Blank, PhD, Jewel Johanns, PhD, Cynthia Guzzo, MD, all at Janssen Research & Development, Springhouse, PA; Bruce E. Sands, MD, and Simon Lichtiger, MD, Mount Sinai School of Medicine, New York; Stephen B. Hanauer, MD, University of Chicago; Stephan Targan, MD, Cedars Sinai Medical Center; Paul Rutgeerts, MD, PhD, University Hospital Gasthuisberg, Leuven, Belgium; Subrata Ghosh, MD, and Remo Panaccione, MD, University of Calgary; Gordon Greenberg, MD, Mount Sinai Hospital, University of Toronto; Willem J.S. de Villiers, MD, PhD, University of Kentucky Medical Center, Lexington; Stefan Schreiber, MD, Christian Albrechts University, University Hospital, Schleswig-Holstein, Kiel, Germany; and Brian G. Feagan, MD, Robarts Research Institute, London, ON. The study was funded by Janssen Research & Development.

http://www.eurekalert.org/pub_releases/2012-10/bu-rdn101712.php

New cobalt-graphene catalyst could challenge platinum for use in fuel cells

Performs nearly as well as precious metal catalysts

PROVIDENCE, R.I. [Brown University] - There's a new contender in the race to find an inexpensive alternative to platinum catalysts for use in hydrogen fuel cells.

Brown University chemist Shouheng Sun and his students have developed a new material - a graphene sheet covered by cobalt and cobalt-oxide nanoparticles - that can catalyze the oxygen reduction reaction nearly as well as platinum does and is substantially more durable. The new material "has the best reduction performance of any nonplatinum catalyst," said Shaojun Guo, postdoctoral researcher in Sun's lab and lead author of a paper published online in the journal Angewandte Chemie International Edition.

The oxygen reduction reaction occurs on the cathode side of a hydrogen fuel cell. Oxygen functions as an electron sink, stripping electrons from hydrogen fuel at the anode and creating the electrical pull that keeps the current running through electrical devices powered by the cell. "The reaction requires a catalyst, and platinum is currently the best one," said Sun. "But it's very expensive and has a very limited supply, and that's why you don't see a lot of fuel cell use aside from a few special purposes."

Thus far scientists have been unable to develop a viable alternative. A few researchers, including Sun and Guo, have developed new catalysts that reduce the amount of platinum required, but an effective catalyst that uses no platinum at all remains elusive.

This new graphene-cobalt material is the most promising candidate yet, the researchers say. It is the first catalyst not made from a precious metal that comes close to matching platinum's properties.

Lab tests performed by Sun and his team showed that the new graphene-cobalt material was a bit slower than platinum in getting the oxygen reduction reaction started, but once the reaction was going, the new material actually reduced oxygen at a faster pace than platinum. The new catalyst also proved to be more stable, degrading much more slowly than platinum over time. After about 17 hours of testing, the graphene-cobalt catalyst was performing at around 70 percent of its initial capacity. The platinum catalyst the team tested performed at less than 60 percent after the same amount of time.

Cobalt is an abundant metal, readily available at a fraction of what platinum costs. Graphene is a one-atom-thick sheet of carbon atoms arranged in a honeycomb structure. Developed in the last few years, graphene is renowned for its strength, electrical properties, and catalytic potential.

Self-assembly process

Often, graphene nanoparticle materials are made by growing nanoparticles directly on the graphene surface. But that process is problematic for making a catalyst, Sun said. "It's really difficult to control the size, shape, and composition of nanoparticles," he said.

Sun and his team used a self-assembly method that gave them more control over the material's properties. First, they dispersed cobalt nanoparticles and graphene in separate solutions. The two solutions were then combined and pounded with sound waves to make sure they mixed thoroughly. That caused the nanoparticles to attach evenly to the graphene in a single layer, which maximizes the potential of each particle to be involved in the reaction. The material was then pulled out of solution using a centrifuge and dried. When exposed to air,

outside layers of atomic cobalt on each nanoparticle are oxidized, forming a shell of cobalt-oxide that helps protect the cobalt core.
The researchers could control the thickness of the cobalt-oxide shell by heating the material at 70 degrees Celsius for varying amounts of time. Heating it longer increased the thickness of the shell. This way, they could fine-tune the structure in search of a combination that gives top performance. In this case, they found that a 1-nanometer shell of cobalt-oxide optimized catalytic properties.
Sun and his team are optimistic that with more study their material could one day be a suitable replacement for platinum catalysts. "Right now, it's comparable to platinum in an alkaline medium," Sun said, "but it's not ready for use yet. We still need to do more tests."
Ultimately, Sun says, finding a suitable nonplatinum catalyst is the key to getting fuel cells out of the laboratory phase and into production as power sources for cars and other devices.

http://bit.ly/WyMXW1

First life may have survived by cooperating

The first self-replicating molecules in the "RNA world" would have faced a big problem

18:00 17 October 2012 by Bob Holmes

It began with cooperation. When life first arose, teams of small molecules got together to perform tasks none could manage alone or so the theory goes. For the first time, networks like this have been built in the lab.
The earliest life may have been a primordial soup of RNA molecules, but the first crude self-replicating molecules in this "RNA world" would have faced a big problem. They had to grow to store more information, but that made copying errors more likely. Get big enough and these errors become almost certain, destroying the molecule's information.
In theory, the first replicators could have avoided this "error catastrophe" by splitting their information between several cooperating molecules. Then the network could function as long as copies of each molecule survived.

Repair one for the team

To see if this strategy would work, Niles Lehman of Portland State University in Oregon and colleagues created three RNA molecules that could repair each other – A did B, B did C, and C did A.
When the team put these broken molecules together in a test tube, the collective network worked well. When they pitted the cooperative network against a selfish, self-repairing molecule, the cooperators won out.
Although earlier studies showed that pairs of molecules can cooperate, Lehman is the first to create a network of 3, opening the door to much larger networks. "If you can go from 2 to 3, you can go from 3 to infinity," he says. Lehman repeated the study with 48 different fragments of an RNA molecule. Sure enough, they assembled into a network that eventually included all 48.
Such cooperation may have arisen early in the RNA world and helped to build complexity, says Gerald Joyce of the Scripps Research Institute in San Diego. "It's an experimental demonstration that real molecules can do this," he says.

Stick together

Cooperating RNA networks might have an even greater advantage if the component molecules could cluster together in space.
To show this, Philip Bevilacqua and colleagues at Penn State University in University Park studied an RNA called a "hammerhead ribozyme" that cuts itself into pieces. They helped the RNAs to cluster by putting them into a solution containing both dextran and polyethylene glycol. These two compounds separate instead of mixing, causing the ribozyme, which is more soluble in the dextran portion, to become more concentrated. They found this increased the RNA's reaction rate about 70-fold (Nature Chemistry, doi.org/jjk). Something similar – a pore on a rock surface, say, or a slime layer – could have given prebiotic molecules a boost as life got started, says Joyce. *Journal reference: Nature, DOI: 10.1038/nature11549*

http://www.sciencedaily.com/releases/2012/10/121017180200.htm

Leading Bone Marrow Transplant Expert Recommends Significant Change to Current Practice

Leading bone marrow transplant expert recommends a significant change to current transplant practice for patients who need marrow or adult stem cells from an unrelated donor

ScienceDaily - One of the world's leading bone marrow transplant experts is recommending a significant change to current transplant practice for patients who need marrow or adult stem cells from an unrelated donor to treat hematologic malignancies.
Fred Appelbaum, M.D., director of the Clinical Research Division at Fred Hutchinson Cancer Research Center, asserts that bone marrow -- not circulating, peripheral blood, which is the current norm -- should be the source for unrelated donor adult stem cells for most patients who require a transplant. The reason: because there is less

incidence of chronic graft-versus-host disease (GVHD), which can be a debilitating side effect of transplantation.
Appelbaum called for the change in an Oct. 18 editorial in The New England Journal of Medicine in response to a new study, published in the same issue, which compared survival rates and side effects of treating patients with hematopoietic adult stem cells derived from bone marrow versus circulating peripheral blood. The study found a higher incidence of chronic GVHD -- 53 percent when peripheral blood was the source of stem cells for transplant -- versus 41 percent when bone marrow is the source.
"For the majority of unrelated transplants following a standard high-dose preparative regimen, bone marrow should be used since survival is equivalent with the two sources but the incidence of chronic graft-versus-host disease, which can be a debilitating complication, is significantly less with marrow," Appelbaum wrote.
GVHD is a common side effect in people who receive cells from an unrelated donor. It occurs when the transplanted cells recognize the recipient's tissues as foreign and attack the tissues. This can cause a variety of problems, including skin rashes, liver problems and diarrhea. Chronic GVHD can develop any time between three months and three years after the transplant and can range from mild to serious in intensity.
Appelbaum said that stem cells derived from peripheral blood should only be used for the minority of patients in whom the benefits outweigh the risks. These include patients in need of rapid engraftment, such as those with life-threatening infections, or patients at high risk for graft rejection, such as those who receive reduced-intensity conditioning that does not include intensive chemotherapy.
For the past 10 years peripheral blood has been the norm as a source of matched related and matched unrelated adult stem cells for transplant because, despite the higher risk of GVHD, they are easier to harvest from the donor, they can be stimulated to grow in large numbers prior to harvesting, and they engraft, or set up shop, quickly inside the recipient's body.
The potential impact if such a practice change were widely implemented is large. Currently, about 75 percent of unrelated donor transplants are done using stem cells that are collected from the peripheral blood of donors. About 70 percent of all patients who undergo a life-saving transplant to treat blood cancers such as leukemia require an unrelated donor.
Collecting adult stem cells from bone marrow is a more invasive process than collecting them from the bloodstream. According to Appelbaum, about 5,500 unrelated donor transplants were performed in the United States last year. More than 20 million potential unrelated donors are typed and listed in registries in the Americas, Europe and Asia.
The study that compared the two sources of adult stem cells was the first randomized trial of its kind to compare the two sources of cells. It was led by former Hutchinson Center transplant physician Claudio Anasetti, M.D., who is now at the H. Lee Moffitt Cancer Center in Tampa, Fla. It found no difference in two-year survival, faster engraftment and less graft failure, but a significant increase in chronic GVHD, when patients were transplanted with stem cells derived from peripheral blood.
"While this study should change practice, it will be interesting to see if it really does," Appelbaum wrote. "The benefits of peripheral blood are seen early, under the watchful eyes of the transplant physician, while the deleterious effects occur late, often after the patient has left the transplant center."
Frederick R. Appelbaum. Pursuing the Goal of a Donor for Everyone in Need. N Engl J Med, 2012; 367:1555-1556; October 18, 2012 DOI: 10.1056/NEJMe1209982

http://www.eurekalert.org/pub_releases/2012-10/uol-tcc101712.php

Tropical collapse caused by lethal heat

Extreme temperatures blamed for 'Dead Zone'

Scientists have discovered why the 'broken world' following the worst extinction of all time lasted so long – it was simply too hot to survive. The study, published today [19 October 2012] in the journal Science, is the most detailed temperature record of this study period (252-247 million years ago) to date.
The end-Permian mass extinction, which occurred around 250 million years ago in the pre-dinosaur era, wiped out nearly all the world's species. Typically, a mass extinction is followed by a 'dead zone' during which new species are not seen for tens of thousands of years. In this case, the dead zone, during the Early Triassic period which followed, lasted for a perplexingly long period: five million years.
A study jointly led by the University of Leeds and China University of Geosciences (Wuhan), in collaboration with the University of Erlangen-Nurnburg (Germany), shows the cause of this lengthy devastation was a temperature rise to lethal levels in the tropics: around 50-60°C on land, and 40°C at the sea-surface.
Lead author Yadong Sun, who is based in Leeds while completing a joint PhD in geology, says: "Global warming has long been linked to the end-Permian mass extinction, but this study is the first to show extreme temperatures kept life from re-starting in Equatorial latitudes for millions of years."

It is also the first study to show water temperatures close to the ocean's surface can reach 40°C – a near-lethal value at which marine life dies and photosynthesis stops. Until now, climate modellers have assumed sea-surface temperatures cannot surpass 30°C. The findings may help us understand future climate change patterns.
The dead zone would have been a strange world – very wet in the tropics but with almost nothing growing. No forests grew, only shrubs and ferns. No fish or marine reptiles were to be found in the tropics, only shellfish, and virtually no land animals existed because their high metabolic rate made it impossible to deal with the extreme temperatures. Only the polar regions provided a refuge from the baking heat.
Before the end-Permian mass extinction the Earth had teemed with plants and animals including primitive reptiles and amphibians, and a wide variety of sea creatures including coral and sea lillies.
This broken world scenario was caused by a breakdown in global carbon cycling. In normal circumstances, plants help regulate temperature by absorbing Co2 and burying it as dead plant matter. Without plants, levels of Co2 can rise unchecked, which causes temperatures to increase.
Sun and his colleagues collected data from 15,000 ancient conodonts (tiny teeth of extinct eel-like fishes) extracted from two tonnes of rocks from South China. Conodonts form a skeleton using oxygen. The isotopes of oxygen in skeletons are temperature controlled, so by studying the ratio of oxygen isotopes in the conodonts he was able to detect temperature levels hundreds of millions of years ago.
Professor Paul Wignall from the School of Earth and Environment at the University of Leeds, one of the study's co-authors, said: "Nobody has ever dared say that past climates attained these levels of heat. Hopefully future global warming won't get anywhere near temperatures of 250 million years ago, but if it does we have shown that it may take millions of years to recover."
The study is the latest collaboration in a 20-year research partnership between the University of Leeds and China University of Geosciences in Wuhan. It was funded by the Chinese Science Foundation.
'Lethally hot temperatures during the early Triassic greenhouse' by Yadong Sun (University of Leeds and China University of Geosciences), Michael Joachimski (University Erlangen-Nurnberg, Germany), Paul B. Wignall (University of Leeds), Chunbo Yan (China University of Geosciences), Yanlong Chen (University of Graz, Austria), Haishui Jiang (China University of Geosciences, Lina Wang (China University of Geosciences) and Xulong Lai (China University of Geosciences) is published in Science on 19 October 2012. For a copy please view the web page http://www.eurekalert.org/jrnls/sci/ or contact the Science press team, phone +1 202-326-6440 or email scipak@aaas.org

http://www.eurekalert.org/pub_releases/2012-10/uoo-jl101212.php

'Time-capsule' Japanese lake sediment advances radiocarbon dating for older objects

New series of radiocarbon measurements from Japan's Lake Suigetsu will give scientists a more accurate benchmark for dating materials

A new series of radiocarbon measurements from Japan's Lake Suigetsu will give scientists a more accurate benchmark for dating materials, especially for older objects, according to a research team that included Oxford University's Radiocarbon Accelerator Unit.
The research team extracted cores of beautifully preserved layers of sediment, containing organic material (such as tree leaf and twig fossils), from the bottom of the Japanese lake where they had lain undisturbed for tens of thousands of years. As an article in the journal Science explains, the findings are hugely significant because they provide a much more precise way to examine radiocarbon ages of organic material for the entire 11,000-53,000-year time range. For example, archaeologists should now be able to pinpoint more accurately the timing of the extinction of Neanderthals or the spread of modern humans into Europe.
At the Oxford Radiocarbon Accelerator Unit, Professor Christopher Ramsey with his doctoral student Richard Staff and chemist Dr Fiona Brock worked with two other radiocarbon laboratories (the NERC facility at East Kilbride, Scotland, and Groningen in the Netherlands) on the radiocarbon record from the lake.
This research is part of a large international research team, led by Professor Takeshi Nakagawa of Newcastle University, studying the cores for clues about past climate and environmental change.
Radiocarbon is continuously produced in the upper atmosphere. These roughly constant levels of radiocarbon from the atmosphere are then incorporated into all living organisms. Once the organisms die, the radioactive isotope decays at a known rate, so by measuring the radiocarbon levels remaining in samples today scientists can work out how old things are. However, the complication in the calculation is that the initial amounts of radiocarbon in the environment, which are in turn incorporated into growing organisms, vary slightly from year to year and between different parts of the global carbon cycle.
The radiocarbon in the leaf fossils preserved in the sediment of Lake Suigetsu comes directly from the atmosphere and, as such, is not affected by the processes that can slightly change the radiocarbon levels found in marine sediments or cave formations.
Before the publication of this new research, the longest and most important radiocarbon dating records came from such marine sediments or cave formations, but these needed to be corrected. At last, the cores from Lake

Suigetsu provide a more complete, direct record of radiocarbon from the atmosphere without the need for further correction.
The cores are unique: they display layers in the sediment for each year, giving scientists the means of counting back the years. These counts are compared with over 800 radiocarbon dates from the preserved fossil leaves.The only other direct record of atmospheric carbon comes from tree rings, but this only goes back to 12,593 years ago. The Lake Suigetsu record extends much further to 52,800 years ago, increasing the direct radiocarbon record by more than 40,000 years.
'In most cases the radiocarbon levels deduced from marine and other records have not been too far wrong. However, having a truly terrestrial record gives us better resolution and confidence in radiocarbon dating,' said Professor Ramsey. 'It also allows us to look at the differences between the atmosphere and oceans, and study the implications for our understanding of the marine environment as part of the global carbon cycle.'
To construct a radiocarbon record from Lake Suigetsu, Professor Ramsey and his colleagues measured radiocarbon from terrestrial plant fragments spaced throughout the core. The research team also counted the light and dark layers throughout the glacial period to place the radiocarbon measurements in time.
Many of the layers were too fine to be distinguished by the naked eye, so the researchers used a microscope, as well as a method called X-ray fluorescence that identifies chemical changes along the core.
A record of year-to-year changes in radiocarbon levels in the atmosphere, such as those found in a sediment core, must be 'anchored' in time by assigning some part of it an absolute age. The researchers did this by matching the first 12,200 years of their record with the tree-ring data, a well-established record that begins in the present. Ramsey and colleagues also lined up segments of their data with those of other records from the same time periods and found that they generally aligned.
'This record will not result in major revisions of dates. But, for example in prehistoric archaeology, there will be small shifts in chronology in the order of hundreds of years,' said Professor Ramsey. 'Such changes can be very significant when you are trying to examine human responses to climate that are often dated by other methods, such as through layer counting from the Greenland ice cores. For the first time we have a more accurate calibrated time-scale, which will allow us to answer questions in archaeology that we have not had the resolution to address before.'
Generally, researchers use a composite record called IntCal to determine the ages of objects, based on their radiocarbon measurements. The IntCal record uses data from multiple sources, including marine records, stalagmites and stalactites, and tree rings. It is expected that the Suigetsu data will be incorporated into the latest iteration of IntCal, which is due to be released within the next few months.
**'A complete terrestrial radiocarbon record for 11.2-52.8 kyr BP' by Ramsey et al will be published in Science on Thursday 18 October 2012. The publication is strictly embargoed until 2pm Eastern Time in the US and 7pm GMT in the UK.*

http://www.eurekalert.org/pub_releases/2012-10/w-hfk101812.php

How flick knife thumbs help Japan's rare fighting frogs

Frog uses spikes which protrude from a false thumb for both combat and mating

Combat-ready spikes which shoot from fingers sounds like the weaponry of a comic book hero, but a Japanese scientist has found exactly this in a rare breed of frog. The discovery, which is published in the Journal of Zoology, reveals how the Otton frog uses spikes which protrude from a false thumb for both combat and mating.
The study, conducted by Dr Noriko Iwai from the University of Tokyo, focused on the Otton frog (Babina subaspera), whose habitat is the Amami islands of Southern Japan. Unlike most other frogs the Otton has an extra digit-like structure, a trait it shares with the five-fingered Hypsiboas rosenbergi frogs of Latin America.
"Why these 'fifth fingers' exist in some species remains an evolutionary mystery, but the extra digit of the Otton is in fact a pseudo-thumb," said Dr Iwai. "The digit encases a sharp spine which can project out of the skin, which fieldwork demonstrates is used for combat and mating."
Dr Iwai has studied the rare frogs since 2004 in order to understand the species' distribution, breeding habits and range; all factors which will contribute to any conservation strategy. Once she began exploring how the Ottons use their pseudo-thumbs Dr Iwai discovered that while both males and females had the spike, it was only used by males.
Males were found to have larger pseudo-thumbs than the females and Dr Iwai believes that the spikes evolved for anchoring to the female, known as amplexus, the Latin for embrace, during mating.
"While the pseudo-thumb may have evolved for mating, it is clear that they're now used for combat," said Dr Iwai. "The males demonstrated a jabbing response with the thumb when they were picked up, and the many scars on the male spines provided evidence of fighting."

The conditions on the Amami islands make combat, and the need for weaponry, a key factor for the frogs' mating success. Individuals fight over places to build nests, while the chances of a male finding a mate each night are rare, thus the ability to fight off competitors may be crucial.
Perhaps unfortunately, the comic book hero image is slightly dented by the frogs' fighting style. Rather than dueling with thumb spikes the males wrestle each other in an embrace, jabbing at each other with the spines. This fighting style helps confirm the theory that the spines were original used for embracing mates.
"More research is needed to look at how the pseudo-thumb evolved and how it came to be used for fighting," concluded Dr Iwai. "The thumbs use as a weapon, and the danger of the frogs harming themselves with it, makes the Otton pseudo-thumb an intriguing contribution to the study of hand morphology."

http://www.scientificamerican.com/article.cfm?id=flu-shots-may-not-protect-the-elderly-or-the-very-young

Flu Shots May Not Protect the Elderly or the Very Young

Despite government recommendations, there is little evidence that flu vaccines help individuals older than 65 or younger than two

By Melinda Wenner Moyer | Thursday, October 18, 2012 | 3

Every year around this time, 120 million Americans roll up their sleeves to get their annual flu shots. Since 2010, the U.S. Centers for Disease Control and Prevention has recommended yearly jabs for every healthy American over the age of six months. The goal is to curb the spread of infection and minimize the risk for potentially dangerous complications such as pneumonia, particularly among the elderly and the very young. But science on the vaccine's efficacy is scant among those two vulnerable groups. And although healthy adults do get some protection, it may not be as robust as they expect.
One oft-cited claim, based on several large meta-analyses published more than a decade ago, is that seasonal flu shots cut the risk of winter death among older people by half. But the research behind that claim has been largely debunked. A 2005 study published in the Archives of Internal Medicine noted that influenza only causes about 5 percent of all excess winter deaths among the elderly—which works out to one death from flu per 1,000 older people each season—so it's impossible for the shot to prevent half of all their winter deaths. The following year, a study reported that as vaccine coverage increased among the elderly in Italy in the late 1980s, there was no corresponding drop in excess deaths. In another 2006 paper, Lisa Jackson, an infectious disease epidemiologist at the Group Health Research Institute in Seattle, and her colleagues showed that although vaccinated seniors were 44 percent less likely to die during flu season than unvaccinated seniors were, the vaccinated ones were also 61 percent less likely to die before flu season even started. "Naturally, you would not expect the vaccine to work before the thing it protects against is going around," says Lone Simonsen, a research professor in global health at George Washington University and a co-author of the 2005 study in the Archives of Internal Medicine.
Researchers now attribute these odd findings to a "healthy user" effect. People who don't get vaccinated often "are the most frail or [those] whose health has gone down dramatically in the last few months," explains CDC epidemiologist David Shay. People who choose to get flu shots, in other words, are already healthier and therefore the least likely to die.
So how much does the vaccine truly help older people? In January 2012, Michael Osterholm, an epidemiologist at the University of Minnesota's Center for Infectious Disease Research and Policy, and his colleagues published a meta-analysis in The Lancet Infectious Diseases that analyzed the results of all randomized controlled clinical trials conducted between 1967 and 2011 on the effects of flu shots. It found that there have been no clinical trials evaluating the effects of the traditional flu vaccine in the elderly. The only vaccine shown to protect against infection or death in older adults, it said, is the live-attenuated vaccine—an inhalable vaccine that contains a live, modified version of the virus—which is not approved in the U.S. for adults over age 50.
The traditional vaccine may not work so well in older people because of an idea known as immune senescence, which posits that as people age, their immune systems weaken, resulting in poor vaccine response, especially to inactivated strains. Although the U.S. Food and Drug Administration licensed a high-dose vaccine for seniors in 2009 that could theoretically overcome this problem, no studies have yet been published on how effective it is. "The higher dose produces a higher level of antibodies, but we don't really know what that correlates to," says Jackson. A 2010 systematic review published by the Cochrane Collaboration, an independent, nonprofit organization that promotes evidence-based medicine, concluded that "until such time as the role of vaccines for preventing influenza in the elderly is clarified, more comprehensive and effective strategies for the control of acute respiratory infections should be implemented."
The dearth of controlled research on seniors stems in part from the fact that the U.S government considers such clinical trials unethical. Based on an idea known as clinical equipoise, scientists can't test, in a randomized controlled trial, a treatment that the larger medical community already considers to be effective, because doing

so would involve denying treatment to half of the participants, potentially putting them at risk. “We’re in a difficult spot,” Shay says—since the CDC already recommends flu shots to seniors, the agency can’t suddenly turn around and ask them to participate in a clinical trial that might deny them the standard of care.
What about kids? In 2010, the U.S. Advisory Committee on Immunization Practices began recommending flu vaccination for all healthy children older than six months, an expansion that they claimed was “supported by evidence that annual influenza vaccination is a safe and effective preventive health action with potential benefit in all age groups.” Yet a July 2012 Cochrane Collaboration systematic review concluded that for kids under the age of two, the currently licensed vaccines “are not significantly more efficacious than placebo.” The review highlighted a single small study conducted on children under two—the only controlled study that has evaluated the efficacy of the shot currently licensed for young kids—which found, overall, that vaccines provided no statistically significant protection over the course of two flu seasons. “One season, the vaccine did something to prevent some symptoms, but in the second, nothing,” says co-author Tom Jefferson, an epidemiologist with the Cochrane group. In kids older than 2, however, flu vaccines do seem to work; according to the Cochrane analysis, the shot reduces the absolute risk that a child will catch the flu by about 3.6 percent, whereas the live (inhaled) vaccine reduces the absolute risk by about 17 percent.
In healthy adults under the age of 65, flu vaccines work, too. A 2010 Cochrane review, also co-authored by Jefferson, estimated that during “good” vaccine years—when the vaccines match the circulating viral strain well, which Jefferson says happens about half the time—the vaccine reduces the relative risk that an adult under 65 will catch the flu by about 75 percent. In absolute terms, however, this means adults have about a four percent chance of catching the flu if they don’t get the vaccine and about a one percent chance if they do. Shay notes that while this estimate is reasonable, some flu seasons are worse than others, so the risk may be higher than 4 percent in some years (and some people) and lower than 4 percent in others. (And of course, the vaccine won’t protect against the nearly 200 viruses that cause flu-like symptoms but aren’t actually the flu.) Although scientists generally believe that the flu vaccine slows the spread of the virus through communities, there are no data showing that this is true, because “those studies are very difficult to do,” Shay explains.
So should people still dutifully line up for their flu shots? Older kids and healthy adults do get some protection from them; just perhaps not as much as they want or expect. But for seniors and toddlers, there may never be a clear answer to this question, particularly because the U.S. government is unlikely to conduct additional clinical trials. On Monday, Osterholm and a group of five other scientists at the University of Minnesota’s Center for Infectious Disease Research and Policy published a report highlighting the need for better alternatives. Although the current options may—for most people—be better than nothing, “we can no longer accept the status quo,” they wrote. “The perception that current vaccines are already highly effective in preventing influenza is a major barrier to pursuing game-changing alternatives.”

http://www.sciencedaily.com/releases/2012/10/121018130834.htm

Prehistoric Human Populations Prospered Before the Agricultural Boom, Research Suggests

Major prehistoric human population expansions may have begun before the Neolithic period

ScienceDaily - Researchers from China's Fudan University have found major prehistoric human population expansions may have begun before the Neolithic period, which probably led to the introduction of agriculture. Major prehistoric human population expansions in three continents may have begun before the Neolithic period -- around 15-11,000 years ago in Africa, from around 13,000 years ago in Europe and around 12-8,000 years ago in the Americas. The findings are published in Scientific Reports.
The development of agriculture facilitated extensive human population growths and activities, but whether these major expansions began before or after the Neolithic era, a period during which humans started to grow crops and domesticate animals, remains controversial. Agriculture is thought to have first developed in the Fertile Crescent of West Asia around 12-11,000 years ago, and was then developed independently over the next few thousand years in other regions.
To compare global patterns of population growth, Li Jin and colleagues analyzed over 900 mitochrondrial genomes generated by the 1000 Genomes Project, representing 11 populations in Africa, Europe and the Americas. They identified the expansion lineages and were able to reconstruct the historical demographical variations. On all three continents, most of the major lineages coalesced before the first appearance of agriculture.
The data imply that major population expansions took place after the Last Glacial Maximum (the peak of the last ice age) but before the Neolithic period. The authors suggest that the milder climate after the Last Glacial Maximum may have offered a more amiable environment and may have been an important factor in prehistoric

human expansions. The increase in population size was probably one of the driving forces that led to the introduction of agriculture, turning it from a supplementary food source to the primary one.
Hong-Xiang Zheng, Shi Yan, Zhen-Dong Qin, Li Jin. MtDNA analysis of global populations support that major population expansions began before Neolithic Time. Scientific Reports, 2012; 2 DOI: 10.1038/srep00745

http://bit.ly/TapAj8

Molecular Analysis Supports Controversial Claim for Dinosaur Cells

Do fossils of dinosaurs, such as Tyrannosaurus rex, contain soft tissues?

By Kate Wong | October 18, 2012

RALEIGH—Twenty years ago, paleontologist Mary Schweitzer made an astonishing discovery. Peering through a microscope at a slice of dinosaur bone, she spotted what looked for all the world like red blood cells. It seemed utterly impossible—organic remains were not supposed to survive the fossilization process—but test after test indicated that the spherical structures were indeed red blood cells from a 67-million-year-old Tyrannosaurus rex. In the years that followed, she and her colleagues discovered other apparent soft tissues, including what seem to be blood vessels and feather fibers. But controversy accompanied their claims. Skeptics argued that the alleged organic tissues were instead biofilm—slime formed by microbes that invaded the fossilized bone.

Schweitzer and her colleagues have continued to amass support for their interpretation. The latest evidence comes from a molecular analysis of what look to be bone cells, or osteocytes, from T. rex and Brachylophosaurus canadensis. The researchers isolated the possible osteocytes and subjected them to several tests. When they exposed the cell-like structures to an antibody that targets a protein called PHEX found only in bird osteocytes* (birds are descended from dinosaurs), the structures reacted, as would be expected of dinosaur osteocytes. And when the team subjected the supposed dinosaur cells to other antibodies that target DNA, the antibodies bound to material in small, specific regions inside the apparent cell membrane.

Furthermore, using a technique called mass spectrometry, the investigators found amino acid sequences of proteins in extracts of the dinosaur bone that matched sequences from proteins called actin, tubulin and histone4 that are present in the cells of all animals. Although some microbes have proteins that are similar to actin and tubulin, the researchers note that soil-derived E. coli as well as sediments that surrounded the two dinosaur specimens failed to bind to the actin and tubulin antibodies that bound to the extract containing the apparent osteocytes.

Schweitzer and her collaborators detailed their findings in a paper released online October 16 in the journal Bone and in a talk given October 17 in Raleigh at the annual meeting of the Society of Vertebrate Paleontology. "Here's the data in support of a biofilm origin," Schweitzer said in her presentation as she showed a blank slide. "We haven't found any yet."

Update, Oct. 20, 2012, 11:24 a.m.: Mary Schweitzer emailed me to clarify a point that did not come across in her talk. "PHEX is actually found in many taxa. However proteins have thousands of antibody binding sites on them. Some antibodies that bind to epitopes shared among groups are broadly cross reactive. Ours, OB 7.3 was selected for only one epitope out of thousands, and that epitope is, so far as it has been tested by the primary researchers, only reactive to osteoctyes from birds. It has been tested against bird osteoblasts, cells on the same lineage as osteocytes, and does not react, and it does not react with osteocytes from non avian taxa tested. So it is the selective specificity of the antibody for bird osteocytes that is important. We are not saying birds and dinos are the only ones that have the protein, but because the sequence is inherited, it has different 'shapes' in each group and the 'shape' this antibody binds seems to be unique to bird osteocytes in living taxa."

http://www.eurekalert.org/pub_releases/2012-10/hfhs-uhs101712.php

Using human stool to treat C. diff is safe, effective

A novel therapy that uses donated human stool to treat the deadly and contagious C.diff infection is safe and highly effective, according to a Henry Ford Hospital study.

DETROIT – A novel therapy that uses donated human stool to treat the deadly and contagious C.diff infection is safe and highly effective, according to a Henry Ford Hospital study.

Researchers found that 43 of 49 patients recovered swiftly after treatment and had no adverse complications from C.diff three months later. Treatment is performed either through a nasogastric tube or colonoscopy on an outpatient or inpatient basis.

Mayur Ramesh, M.D., a Henry Ford Infectious Diseases physician and senior author of the study, says the treatment, while appearing unconventional, has striking results. "More than 90 percent of the patients in our study were cured of their C.diff infection," says Dr. Ramesh. "This treatment is a viable option for patients who are not responding to conventional treatment and who want to avoid surgery."

The study is being presented Friday at the annual Infectious Diseases Society of America meeting in San Diego.

In their study, researchers evaluated 49 patients who contracted Clostridium difficile, or C.diff, a germ that causes diarrhea and other intestinal problems and is linked to 14,000 deaths annually. Symptoms include water diarrhea, fever, loss of appetite, nausea and abdominal pain and tenderness. C.diff occurs in patients taking antibiotics, and can spread from person-to-person contact or from touching contaminated equipment and objects like door knobs.

Patients with a C.diff infection are typically treated with the antibiotics metronidazole or vancomycin. However, surgery could be required to remove the infected part of the intestines. In its study, Henry Ford treated patients between May 2010 and June 2012 with a therapy called intestinal microbiota transplantation (IMT), using donated stool from a healthy family member.

Dr. Ramesh says the healthy stool, when mixed with warm tap water and administered, helps to re-establish the normal intestinal flora in the patient's gastrointestinal tract. Intestinal flora is healthy bacteria that stimulates the immune system and aids the digestion and absorption of food. "Patients who receive treatment through a nasogastric tube don't taste or smell the stool mixture as it's administered," Dr. Ramesh says. "Patients often resume their diet within a couple hours and are feeling better within 24 hours."

Of the 49 patients, 43 fully recovered, four died of causes unrelated to C.diff, one had intestinal surgery and one had no improvement. *The study was funded by Henry Ford Hospital.*

http://phys.org/news/2012-10-experts-medical-device-malware-alarm.html

Security experts sound medical device malware alarm

Malware can be turned into life or death enablers inside U.S. hospitals nationwide.

Phys.org - Speakers at a government gathering revealed more reasons for nervous patients to get out their worry beads over future hospital stays. Besides staph infections, wrong-side surgeries and inaccurate dosages, there is a serious problem with medical devices and malware that can harm their performance. Malware, too, can be turned into life or death enablers inside U.S. hospitals nationwide. According to health and security experts at a government panel in Washington, at the National Institute of Standards and Technology Information Security and Privacy Advisory Board, there is a lot of medical equipment running old operating systems.

They run without updates and present easy targets for malware. Considering the range of today's computerized medical devices that are put to use in hospitals, including fetal monitors for at risk pregnant women to other types of monitors in intensive-care wards, the implications are serious.

Kevin Fu, a computer scientist at the University of Michigan and the University of Massachusetts, Amherst, whose research is focused on medical devices and computer system security, was one of the panel participants. He is sounding an alarm about devices in hospitals where thousands of network-connected devices used for patient care are vulnerable to infection.

In September, the Government Accountability Office put out a warning that computerized medical devices could be vulnerable to hacking and asked the FDA to address the issue. The GAO report focused mostly on wireless devices, namely implanted defibrillators and insulin pumps.

Fu said those were only two of many devices vulnerable to infection. A Boston hospital's chief information security officer confirmed Fu's reason for alarm, identifying a wide variety of devices that pose malware risks, ranging from drug compounders to high-end magnetic resonance imaging devices to blood gas analyzers to nuclear-medical delivery systems. In looking for remedies, hospitals find no easy answers. Many pieces of equipment are hooked up to Windows systems, but the reason goes beyond Windows per se. They run on old versions of Windows that go without updates and patches. Medical devices connected to internal networks connected to the Internet are open for malware; laptops, tablets, or smartphones brought into the hospital can be sources. Often the malware is associated with botnets, said the security officer. Another problem identified was manufacturers that do not allow their equipment to undergo OS updates or security patches. In one example cited, a medical center had 664 pieces of medical equipment running on older Windows operating systems that manufacturers did not allow to be modified, even for antivirus software. Reasons involved questions and concerns over whether modifications would require regulatory review. An FDA deputy director at the conference said, however, that FDA is reviewing its regulatory stance on software.

Meanwhile, a security gathering in Australia this week generated wide publicity when Barnaby Jack, Director of Security Research for IOActive, showed how pacemakers can be a vehicle for murdering an individual or large numbers of people, if a hacker were to upload malicious software to a central server that would spread lethal shocks to everybody using a company's pacemakers.

Speaking at the BreakPoint security conference in Melbourne, he said today's pacemakers have evolved to a wireless control mechanism that can be activated from a distance. Jack demonstrated how he could force the pacemaker to deliver an 830-volt shock directly to a person's heart, by using a laptop. Several different vendors' pacemakers are vulnerable; he was able to use a laptop to access every wireless pacemaker and implantable

cardioverter-defibrillators within a 30-foot radius. The exploit weakness has to do with the programming of the wireless transmitters used for delivering instructions to the devices. Jack staged the demo not only to raise awareness that such attacks were possible but to encourage manufacturers to review the security of their code rather than just focusing on safety mechanisms.

http://www.sciencedaily.com/releases/2012/10/121019094516.htm

Forest Fires Linked to High Temperatures Two Years Before

Summer fires are correlated with antecedent climate conditions, especially winter and spring ones with a lag time of two years

ScienceDaily - A study led by some University of Barcelona researchers analyses the impact of interannual and seasonal climate variability on the fires occurred in Catalonia last summer. The study concludes that summer fires, related to summer climate conditions, are correlated with antecedent climate conditions, especially winter and spring ones with a lag time of two years. The results suggest that precipitation and temperature conditions regulate fuel flammability and fuel structure. According to the correlations observed, the study provides a model to produce long-term predictions.

The study, published in the journal Climatic Change, comes out of the doctoral thesis of the researcher Marco Turco, directed by the UB researcher Maria del Carme Llasat, co-author of the article. From 1983 to 2007, period analysed in the study, more than 16000 fires events were recorded and the total burned area was more than 240000 hectares, around 7.5 % of Catalonia. The work develops a statistical analysis of these fires and shows that, from a climate point of view, according to Maria del Carme Llasat, "is possible to develop a model that gives us an estimation of the number of fires and the extension of the burned area related to monthly average temperature and rainfall. We developed a simple regression model which includes the influence of spring-summer climate conditions of the studied year, but specially other variables which are determinant, although they do not seem to."

The established correlations allow us to prove that, for example, low minimum temperatures in winter and summer contribute to an increase in the number of fires. However, the extension of the burned area highly depends on the winter months' rainfall, and in both cases on the winter-spring temperatures with a time lag of two years.

Specifically, the number of fires is correlated with the minimum temperature in the period February-June of the previous two years, and the number of burned hectares is correlated with the maximum temperature in the period March-April of the previous two years. "Even if it is not confirmed yet, this relation with climate data of two previous years has to do with the vegetation cycle of the region studied," explains Llasat, head of the group Metereological Hazard Analysis (GAMA). This two years relation has also been observed on other works developed in the Mediterranean area.

Fires are a complex processes associated with factors of different origin, such as climate and weather, human activities and vegetation conditions. As a first approximation a concept model was proposed suggesting that climatic processes act as top-down controls on the regional pattern of fire controlling both fuel moisture (fuel flammability) and nature and availability of fuel (fuel structure). Catalonia can be classified as an ecosystem in which climate acts in two main ways: antecedent climate regulates the fuel amount and its continuity, whilst current climate (for example, drought) promotes the fuel load.

Adopting the view that climate is the main controlling factor of the interannual variability of fire, on this work the links between climate and fire variability are analysed using the high resolution (20 km x 20 km) gridded data set, called Spain02. This data set is produced by the Spanish Metereological Agency (AEMET). Accurate data for fire occurrence and burned are were obtained from the Forest Fire Prevention Service of the Generalitat de Catalunya (SPIF). The data consists in the characteristics of 16753 fire events occurred in Catalonia during the 25 years period studied. Although fires in this region occur throughout the year, about 60% of the fires occur in summer, from June to September, which amounts to be about 86% of the annual burned area.

Model applications

In the study a simple regression model is presented that links the variability of summer fires in Catalonia to climatic variables, and produces reliable out-of-sample seasonal and climatic predictions.

Llasat points out: "With this model we can make reliable predictions about the impact of climate variability on summer fires, but it is not the right model to be used for risk evaluations of prompt fires. In order to do that we have other resources, such as the one used by the SPIF and developed in the UB, which take into account other variables, for example the wind."

"We performed a first out-of-sample prediction that in general fits well, except for the 1994 big fires. We also studied this year meteorologically and we know that it was exceptional," explains the researcher. The model explains up to 76 % of the variance of the burned area and up to 91 % of the variance of the number of fires.

UB researchers are working in order to use the model to estimate fire response to different climate change scenarios, assuming that climate, vegetation, humans, fire interactions will not change significantly.
Marco Turco, Maria Carmen Llasat, Jost Hardenberg, Antonello Provenzale. Impact of climate variability on summer fires in a Mediterranean environment (northeastern Iberian Peninsula). Climatic Change, 2012; DOI: 10.1007/s10584-012-0505-6
Marco Turco, Maria Carmen Llasat, Jost Hardenberg, Antonello Provenzale. Impact of climate variability on summer fires in a Mediterranean environment (northeastern Iberian Peninsula). Climatic Change, 2012; DOI: 10.1007/s10584-012-0505-6

http://bit.ly/RcNrOk

The Power of Music: Mind Control by Rhythmic Sound

Sound not only coordinates the behavior of people in a group, it also coordinates their thinking

By R. Douglas Fields | October 19, 2012

New Orleans - You walk into a bar and music is thumping. All heads are bobbing and feet tapping in synchrony. Somehow the rhythmic sound grabs control of the brains of everyone in the room forcing them to operate simultaneously and perform the same behaviors in synchrony. How is this possible? Is this unconscious mind control by rhythmic sound only driving our bodily motions, or could it be affecting deeper mental processes?
The mystery runs deeper than previously thought, according to psychologist Annett Schirmer reporting new findings today at the Society for Neuroscience meeting in New Orleans. Rhythmic sound "not only coordinates the behavior of people in a group, it also coordinates their thinking—the mental processes of individuals in the group become synchronized."
This finding extends the well-known power of music to tap into brain circuits controlling emotion and movement, to actually control the brain circuitry of sensory perception. This discovery helps explain how drums unite tribes in ceremony, why armies march to bugle and drum into battle, why worship and ceremonies are infused by song, why speech is rhythmic, punctuated by rhythms of emphasis on particular syllables and words, and perhaps why we dance.
Schirmer and her graduate student Nicolas Escoffier from the University of Singapore first tested subjects by flashing a series of images on a video monitor and asked them to quickly identify when an image was flipped upside down. While participants focused on this task, a synthetic drumbeat gently tapped out a simple four-beat rhythm in the background, syncopated by skipping the fourth beat of each measure.
The results showed that when the image was flashed on that missed beat, the subjects identified the inverted image much faster than when the image was flashed at times out of synch with the beat or when the images were presented in silence. Somehow, the brain's decision making was accelerated by the external auditory rhythm and heightened at precise points in synchrony with the beat. Since the power of rhythm in boosting cognitive performance was evident on the missing beat when no sound was presented, the effect could not have had anything to do with the sound of the drumbeat acting as a stimulus. Mental processing must have fallen into a rhythm of heightened expectation and superior performance on the anticipated beat.
Next the researchers attached electrodes to the scalp of such subjects to determine if the brain's electrical activity was somehow affected by the rhythm of the sound. The EEG recording detects the combined electrical activity of thousands of neurons working together in the cerebral cortex. Just like the roar of a crowd at a baseball game, waves of electrical activity in the brain are generated when individual neurons in the cerebral cortex are combined in action. The EEG recordings showed that the waves of brain activity (alpha and beta waves) became synchronized around the auditory rhythm. That is, the ongoing oscillations of brain waves became phase shifted so that the peak of the wave always occurred at a precise point relative to the next beat in the drum rhythm. Rhythmic sound synchronizes brain waves.
The brain wave recordings also revealed a more surprising effect of rhythmic sound on brain function. Any sensory stimulus, such as seeing a picture or hearing a sound, will generate a brief brain wave in the region of cerebral cortex where such information is received and processed, much like the crack of a bat at home plate causes an eruption of cheers in a stadium. The researchers found that the sensory-evoked brain wave measured at the back of the skull over the region where vision is processed, peak each time the image was presented, but when the image was presented simultaneously with the missing drumbeat, the electrical response evoked by the picture was bigger than when the image was presented out of rhythm or flashed on the screen in silence. These visual circuits are more responsive when the image appears in synch with the auditory rhythm.
This region of the brain processes the earliest steps in vision, the circuits that detect visual input. This means that our perception of the external world entering our mind through our eyes is affected by the rhythm of what we hear. Something seen at a point precisely in beat with an auditory rhythm is more likely to be perceived than if it appears out of synch with the rhythm. This gating of visual input by auditory rhythm does not require a prolonged meditation on the rhythm to cause the person to enter into some sort of a trance-like state; the effects

are nearly instantaneous. “Within a few measures of music your brain waves start to get in synch with the rhythm,” Schirmer says.
Steven Pinker has said that music is “auditory cheesecake,” with no particular advantage in the evolution of our species. Schirmer feels their new results do not support that view. “Rhythm facilitates our interpersonal interactions in term of not only how we move, but how we talk and think,” she concludes. “Rhythm facilitates people interacting by synchronizing brain waves and boosting performance of perception of what the other person is saying and doing at a particular point in time.” Rhythm, whether the lyrics to a song or the meter of a poem facilitates language processing, she concludes, and she is now undertaking new experiments to further test this idea. “When people move in synchrony they are more likely to perceive the world in synchrony, so that would facilitate their ability to interact.”

http://www.sciencedaily.com/releases/2012/10/121019153236.htm

Researchers Explore How the Brain Perceives Direction and Location

Investigating nerve cells in the brain that function in establishing one's location and direction.

ScienceDaily - The Who asked "who are you?" but Dartmouth neurobiologist Jeffrey Taube asks "where are you?" and "where are you going?" Taube is not asking philosophical or theological questions. Rather, he is investigating nerve cells in the brain that function in establishing one's location and direction.
Taube, a professor in the Department of Psychological and Brain Sciences, is using microelectrodes to record the activity of cells in a rat's brain that make possible spatial navigation -- how the rat gets from one place to another -- from "here" to "there." But before embarking to go "there," you must first define "here."

Survival Value

"Knowing what direction you are facing, where you are, and how to navigate are really fundamental to your survival," says Taube. "For any animal that is preyed upon, you'd better know where your hole in the ground is and how you are going to get there quickly. And you also need to know direction and location to find food resources, water resources, and the like."
Not only is this information fundamental to your survival, but knowing your spatial orientation at a given moment is important in other ways, as well. Taube points out that it is a sense or skill that you tend to take for granted, which you subconsciously keep track of. "It only comes to your attention when something goes wrong, like when you look for your car at the end of the day and you can't find it in the parking lot," says Taube. Perhaps this is a momentary lapse, a minor navigational error, but it might also be the result of brain damage due to trauma or a stroke, or it might even be attributable to the onset of a disease such as Alzheimer's. Understanding the process of spatial navigation and knowing its relevant areas in the brain may be crucial to dealing with such situations.

The Cells Themselves

One critical component involved in this process is the set of neurons called "head direction cells." These cells act like a compass based on the direction your head is facing. They are located in the thalamus, a structure that sits on top of the brainstem, near the center of the brain.
He is also studying neurons he calls "place cells." These cells work to establish your location relative to some landmarks or cues in the environment. The place cells are found in the hippocampus, part of the brain's temporal lobe. They fire based not on the direction you are facing, but on where you are located.
Studies were conducted using implanted microelectrodes that enabled the monitoring of electrical activity as these different cell types fired.
Taube explains that the two populations -- the head direction cells and the place cells -- talk to one another. "They put that information together to give you an overall sense of 'here,' location wise and direction wise," he says. "That is the first ingredient for being able to ask the question, 'How am I going to get to point B if I am at point A?' It is the starting point on the cognitive map."

The Latest Research

Taube and Stephane Valerio, his postdoctoral associate for the last four years, have just published a paper in the journal Nature Neuroscience, highlighting the head direction cells. Valerio has since returned to the Université Bordeaux in France.
The studies described in Nature Neuroscience discuss the responses of the spatial navigation system when an animal makes an error and arrives at a destination other than the one targeted -- its home refuge, in this case. The authors describe two error-correction processes that may be called into play -- resetting and remapping -- differentiating them based on the size of error the animal makes when performing the task.
When the animal makes a small error and misses the target by a little, the cells will reset to their original setting, fixing on landmarks it can identify in its landscape. "We concluded that this was an active behavioral correction process, an adjustment in performance," Taube says. "However, if the animal becomes disoriented and makes a

large error in its quest for home, it will construct an entirely new cognitive map with a permanent shift in the directional firing pattern of the head direction cells." This is the "remapping."
Taube acknowledges that others have talked about remapping and resetting, but they have always regarded them as if they were the same process. "What we are trying to argue in this paper is that they are really two different, separate brain processes, and we demonstrated it empirically," he says. "To continue to study spatial navigation, in particular how you correct for errors, you have to distinguish between these two qualitatively different responses."
Taube says other investigators will use this distinction as a basis for further studies, particularly in understanding how people correct their orientation when making navigational errors.
Stephane Valerio, Jeffrey S Taube. Path integration: how the head direction signal maintains and corrects spatial orientation. Nature Neuroscience, 2012; 15 (10): 1445 DOI: 10.1038/nn.3215

http://www.eurekalert.org/pub_releases/2012-10/uob-haf101712.php

How a fish broke a law of physics

Silvery fish have overcome a basic law of reflection, which may help them evade predators

Reflective surfaces polarize light, a phenomenon that fishermen or photographers overcome by using polarizing sunglasses or polarizing filters to cut our reflective glare. However, PhD student Tom Jordan from the Bristol Centre for Complexity Sciences and his supervisors Professor Julian Partridge and Dr Nicholas Roberts in Bristol's School of Biological Sciences found that these silvery fish have overcome this basic law of reflection – an adaptation that may help them evade predators.
Previously, it was thought that the fish's skin – which contains "multilayer" arrangements of reflective guanine crystals – would fully polarize light when reflected. As the light becomes polarized, there should be a drop in reflectivity.
The Bristol researchers found that the skin of sardines and herring contain not one but two types of guanine crystal – each with different optical properties. By mixing these two types, the fish's skin doesn't polarize the reflected light and maintains its high reflectivity.
Dr Roberts said: "We believe these species of fish have evolved this particular multilayer structure to help conceal them from predators, such as dolphin and tuna. These fish have found a way to maximize their reflectivity over all angles they are viewed from. This helps the fish best match the light environment of the open ocean, making them less likely to be seen."
As a result of this ability, the skin of silvery fish could hold the key to better optical devices. Tom Jordan said: "Many modern day optical devices such as LED lights and low loss optical fibres use these non-polarizing types of reflectors to improve efficiency. However, these man-made reflectors currently require the use of materials with specific optical properties that are not always ideal. The mechanism that has evolved in fish overcomes this current design limitation and provides a new way to manufacture these non-polarizing reflectors."
'Non-polarizing broadband multilayer reflectors in fish' by T.M. Jordan, J.C. Partridge and N.W. Roberts in Nature Photonics