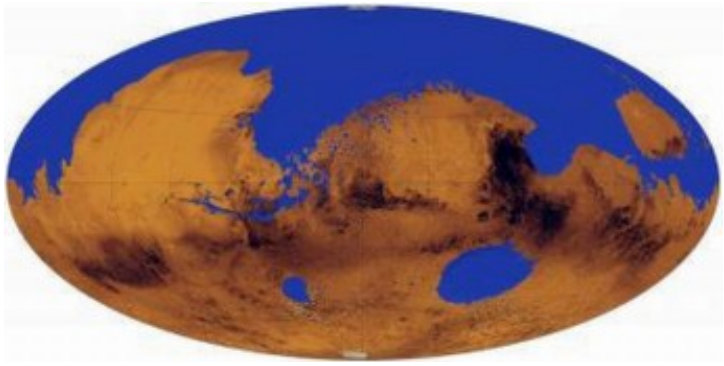
New CU-Boulder study indicates an ancient ocean may have covered one-third of Mars

Martian ocean likely sustained by Earth-like hydrological cycle

A vast ocean likely covered one-third of the surface of Mars some 3.5 billion years ago, according to a new study conducted by University of Colorado at Boulder scientists.

The CU-Boulder study is the first to combine the analysis of water-related features including scores of delta deposits and thousands of river valleys to test for the occurrence of an ocean sustained by a global hydrosphere on early Mars.



While the notion of a large, ancient ocean on Mars has been repeatedly proposed and challenged over the past two decades, the new study provides further support for the idea of a sustained sea on the Red Planet during the Noachian era more than 3 billion years ago, said CU-Boulder researcher Gaetano Di Achille, lead author on the study.

This is an illustration of what Mars might have looked like some 3.5 billion years ago when an ocean likely covered one-third of the planet's surface, according to a new University of Colorado at Boulder study. **University of Colorado**

A paper on the subject authored by Di Achille and CU-Boulder Assistant Professor Brian Hynek of the geological sciences department appears in the June 13 issue of Nature Geoscience. Both Di Achille and Hynek are affiliated with CU-Boulder's Laboratory for Atmospheric and Space Physics.

More than half of the 52 river delta deposits identified by the CU researchers in the new study -- each of which was fed by numerous river valleys -- likely marked the boundaries of the proposed ocean, since all were at about the same elevation. Twenty-nine of the 52 deltas were connected either to the ancient Mars ocean or to the groundwater table of the ocean and to several large, adjacent lakes, Di Achille said.

The study is the first to integrate multiple data sets of deltas, valley networks and topography from a cadre of NASA and European Space Agency orbiting missions of Mars dating back to 2001, said Hynek. The study implies that ancient Mars probably had an Earth-like global hydrological cycle, including precipitation, runoff, cloud formation, and ice and groundwater accumulation, Hynek said.

Di Achille and Hynek used a geographic information system, or GIS, to map the Martian terrain and conclude the ocean likely would have covered about 36 percent of the planet and contained about 30 million cubic miles, or 124 million cubic kilometers, of water. The amount of water in the ancient ocean would have formed the equivalent of an 1,800-foot, or 550-meter deep layer of water spread out over the entire planet.

The volume of the ancient Mars ocean would have been about 10 times less than current volume of Earth's oceans, Hynek said. Mars is slightly more than half the size of Earth.

The average elevation of the deltas on the edges of the proposed ocean was remarkably consistent around the whole planet, said Di Achille. In addition, the large, ancient lakes upslope from the ancient Mars ocean likely formed inside impact craters and would have been filled by the transport of groundwater between the lakes and the ancient sea, according to the researchers.

A second study headed by Hynek and involving CU-Boulder researcher Michael Beach of LASP and CU-Boulder doctoral student Monica Hoke being published in Journal of Geophysical Research - Planets - which is a publication of the American Geophysical Union - detected roughly 40,000 river valleys on Mars. That is about four times the number of river valleys that have previously been identified by scientists, said Hynek.

The river valleys were the source of the sediment that was carried downstream and dumped into the deltas adjacent to the proposed ocean, said Hynek. "The abundance of these river valleys required a significant amount of precipitation," he said. This effectively puts a nail in the coffin regarding the presence of past rainfall on Mars." Hynek said an ocean was likely required for the sustained precipitation.

"Collectively, these results support the existing theories regarding the extent and formation time of an ancient ocean on Mars and imply the surface conditions during the time probably allowed the occurrence of a global and active hydrosphere integrating valley networks, deltas and a vast ocean as major components of an Earth-like hydrologic cycle," Di Achille and Hynek wrote in Nature Geoscience.

"One of the main questions we would like to answer is where all of the water on Mars went," said Di Achille. He said future Mars missions - including NASA's $485 million Mars Atmosphere and Volatile Evolution mission, or MAVEN, which is being led by CU-Boulder and is slated to launch in 2013 - should help to answer such questions and provide new insights into the history of Martian water.

The river deltas on Mars are of high interest to planetary scientists because deltas on Earth rapidly bury organic carbon and other biomarkers of life and are a prime target for future exploration. Most astrobiologists believe any present indications of life on Mars will be discovered in the form of subterranean microorganisms.

"On Earth, deltas and lakes are excellent collectors and preservers of signs of past life," said Di Achille. "If life ever arose on Mars, deltas may be the key to unlocking Mars' biological past."

Hynek said long-lived oceans may have provided an environment for microbial life to take hold on Mars.

The study was funded by NASA's Mars Data Analysis Program.

Use of unproven mammography tool soars with Medicare coverage

UC Davis Cancer Center researcher cites political pressure

SACRAMENTO, Calif. - In a study illustrating the potentially powerful influence of political pressure on medical practice, a UC Davis physician-researcher has found that use of a largely unproven mammography screening device has surged since Medicare began covering its cost. Joshua Fenton, assistant professor in the UC Davis Department of Family and Community Medicine, with colleagues from the University of Washington and University of Minnesota, examined use of computer-aided detection (CAD), a medical device designed to help radiologists interpret mammograms, since Congress mandated that Medicare pay for it 10 years ago.

He found that the prevalence of CAD jumped from 5 percent in 2001 when Medicare began covering it, to 27 percent in 2003, the most recent year for which data was available. Extra mammography fees for CAD use cost Medicare an estimated $19.5 million in 2003 alone. But actual costs are probably greater because the device has been associated with higher recall rates and greater use of diagnostic tests such as breast biopsy.

The increase in computer-aided detection use occurred even though "systemic reviews point to uncertainty regarding whether CAD has a clinically important impact on key breast cancer outcomes," Fenton writes in today's issue of the Archives of Internal Medicine.

The authors explain that Medicare coverage of the device was key to marketing the device to hospitals and health-care facilities, which resulted in intense lobbying of Congress for approval of CAD as a covered benefit.

"This illustrates how industry and government interact to determine the course of health-care practice, and it's not really guided by science," Fenton said. "This is a case in which expensive technology gets widely adopted in clinical practice before it is proven effective."

Computer-aided detection software analyzes the mammogram image and marks suspicious areas for radiologists to review. In a previous study of more than 200,000 women who had mammograms, published in the New England Journal of Medicine in 2007, Fenton and colleagues found that CAD produced excessive false-positive results. His research demonstrated that when it was used, 32 percent more women were recalled for additional tests and 20 percent more women had a breast biopsy, yet use of the software had no clear impact on the early detection of breast cancer.

"This argues that we need a way of evaluating technologies before we put them into practice," Fenton said. "The government has a huge stake in this. And once the train leaves the station, it's difficult to call it back."

In the current review, Fenton suggests that intense lobbying by manufacturers of the technology, combined with the politically volatile issue of breast cancer screening, resulted in fast-track approval by the government of Medicare coverage of the device. He also argues that industry representatives were better able to market the device, which require a large capital investment of over $100,000, after providers were assured their costs would be reimbursed by the government insurance program.

In an accompanying commentary in the same issue of the Archives, Karla Kerlikowske, professor of medicine, epidemiology and biostatistics at UC San Francisco, says health-care providers and others cannot presume that newer technologies are better than existing ones.

"Health-care providers should not adopt new technologies without first demanding scientific evidence beyond that required for FDA approval," she writes, adding that such evidence should include not just clinical benefits, but also important associated harms and whether benefits outweigh those harms.

Fenton's co-authors on the study include Susan Foote, professor emeritus of health policy and management at the University of Minnesota, and Pamela Green and Professor Laura-Mae Baldwin of the Department of Family Medicine at the University of Washington.

What do we really know about the crucifixion of Jesus?

The many different accounts of the crucifixion of Jesus find little support in historical sources. The reason is that antique sources generally lack descriptions of crucifixions, says Gunnar Samuelsson, University of Gothenburg, Sweden, who recently finished his doctoral thesis on the topic.

Encyclopaedias, monographs and bible commentaries generally agree on the type of punishment Jesus had to endure on Golgotha in Jerusalem. There is an ample amount of very colourful accounts of crucifixions in the literature, and researchers from all kinds of disciplines seem to endorse them.

'The problem is that descriptions of crucifixions are remarkably absent in the antique literature,' says Samuelsson. 'The sources where you would expect to find support for the established understanding of the event really don't say anything.'

The 400 page thesis offers the reader samples of antiquity's most terrifying texts and gives examples of mankind's amazing resourcefulness in terms of mind-boggling cruelty against fellow human beings. Samuelsson has studied the available ancient Greek, Latin and Hebrew/Aramaic literature all the way from Homer to the first century A.D. While the texts indicate a vast arsenal of suspension punishments, they do not say much about the kind of punishment the Christian tradition claims Jesus was forced to endure.

The thesis clearly shows that although the studied texts are full of references to suspension of objects and the equipment used to this end, no reference is made to 'crosses' or 'crucifixion'. Samuelsson therefore concludes that the predominant account of the destiny of Jesus is not based on the antique texts, but rather on for example the tradition of the Christian church and artistic illustrations.

'Consequently, the contemporary understanding of crucifixion as a punishment is severely challenged. And what's even more challenging is that the same can be concluded about the accounts of the crucifixion of Jesus. The New Testament doesn't say as much as we'd like to believe', says Samuelsson.

Podcasting language

English is increasingly the lingua franca (as it were) of commerce, the internet, science, indeed many areas of human endeavor. Learning English is critical to international success for countless individuals in non-English speaking countries. As mobile technologies have matured so have the possibilities for learning. Researchers in Australia and Taiwan suggest that podcasting could be used to foster a positive attitude in learning English as a foreign language.

Writing in the latest issue of the International Journal of Mobile Communications, Peter O'Neill of the Faculty of Business and Economics at Monash University, Victoria, and colleagues at the National Chung Hsing University, in Taichung, suggest that enthusiasm for mobile technologies could make learning more attractive. "With the improvement of mobile devices, mobile learning can be applied to all mobile devices, including smart phones, PDAs, laptops, netbooks, tablet PCs, mp3 players and so on," the researchers say. Indeed, previous researchers have demonstrated just how effective the use of such technologies in teaching and learning can be.

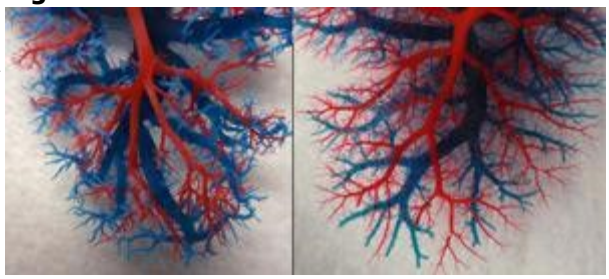
podcast is a digital recording, usually of a broadcast service, made available over the web or via a free subscription service to a portable device capable of playing audio or video files. Podcasts have become very popular in the US and elsewhere. However, while Taiwan has a relatively sophisticated blogging community, podcasting has been somewhat limited to business use. The researchers have investigated several variables - age, gender, technological experience and willingness - to see whether podcasting for language learning might be quickly adopted in Taiwan.

Their results show that while podcasting will be a different experience, the factors which influence technology adoption are still important, but at the moment potential users do not completely understand whether applying podcasting in learning language is a good idea or not.

"The complexities of a system and the supporting resources have generally been important issues when applying new technology. For podcasts, the operation is intuitive, and the software and hardware requirements are low. A challenge for the future is thus how to keep the operation easy and the resource requirements low," the team says. *"Technology adoption of mobile learning: a study of podcasting" in Int. J. Mobile Commun., 2010, 8, 468-485.*

Refashioned rat livers could boost transplants

* 14:23 14 June 2010 **by Andy Coghlan**



Livers stripped bare of their original tissue then recoated with new cells have been successfully transplanted into rats for the first time. Korkut Uygun at the Massachusetts General Hospital in Boston and his colleagues stripped rat livers of their original tissue by exposing them to a powerful detergent. What remained were cell-free "scaffolds" of collagen, but with the overall architecture of the liver intact, including channels for blood vessels, chambers and ducts.

An artificial liver scaffold (left), just like the real thing (right) **B.E. Uygun and O.B. Usta**

The team pumped around 50 million rat liver cells into each of five bare scaffolds, then incubated the organs in culture for two weeks. Finally, they plumbed the reconstituted organs into genetically similar rats, where they functioned normally.

If the procedure works in humans, it would enable donated livers from humans, and possibly even from pigs, to be re-coated with a patient's own cells, reducing the likelihood of organ rejection.

It would also enable doctors to make use of donated livers that are otherwise rejected because they are too fatty or damaged in transport. *Journal reference: Nature Medicine, DOI: 10.1038/nm.2170*

Specially trained nurse practitioner detected same breast abnormalities as surgeon

Women were just as likely to have breast abnormalities picked up by a specially trained nurse practitioner as a consultant breast surgeon, according to research published in the July issue of the Journal of Advanced Nursing.

Researchers at Glamorgan Hospital, Wales, UK, compared the findings of 126 women examined by a nurse practitioner and consultant surgeon referred to a symptomatic breast disease clinic over a 13-month period.

They produced exactly the same results in 92 per cent of cases.

"All the assessments were carried out by the same nurse practitioner and consultant surgeon and there were no statistically significant differences between the two sets of results" says lead author Mr Gary Osborn, a Specialist Registrar in General Surgery at the hospital, which treats nearly 300 women with breast cancer a year.

Key findings of the study included:

* The women referred to the clinic during the study period were aged between 20 and 78 with a median age of 54.
* Two of the 126 women had symptoms in both breasts, which means that 128 assessments were recorded.
* 74 women (59 per cent) had some sort of abnormality.
* 37 discrete lumps were discovered in 35 women, with the consultant surgeon missing two breast cysts and the nurse practitioner missing one. They recorded the same results in 34 of the 37 assessments, giving an agreement rate of 92 per cent.
* Nine of the women had breast cancer. Both assessors gave five of the cancers a score of P4 (suspected malignancy) or P5 (malignant) and four cancers were given a score of P3 (indeterminate lump). A single lump thought to be suspicious (P4) by the surgeon was correctly identified as a breast cyst by the nurse.
* The remaining abnormalities included harmless lumps filled with fluid (cysts), fibrous/glandular tissue (fibroadenomas) or fibrous tissue/blood vessels (papillomas).
* 114 patients had scans - 31 per cent had mammograms, 26 per cent had ultrasounds and 32 per cent had both.
* There was no difference between the mammography requests ordered by the nurse and surgeon, but when it came to ultrasounds, the nurse ordered three extra scans and the surgeon ordered four extra. One of the extra scans ordered by the nurse identified a cyst and one of the extra scans ordered by the surgeon confirmed a benign lymph node.

"In the UK, patients referred by their family doctor with suspected breast cancer should be seen by a specialist within two weeks" says Mr Osborn. "The reduction in junior doctors' working hours as a result of the European Working Time Directive makes this target harder to achieve and the risk is that patients may experience delays in assessment and diagnosis.

"This study aimed to test the theory that trained nurse practitioners can perform an important role in assessing new patients in breast cancer clinics to ensure that they are seen as quickly as possible."

The authors argue that the audit carried out at Glamorgan Hospital provides objective evidence that a nurse practitioner can become proficient in evaluating patients with symptomatic breast cancer.

"Our study showed that the diagnostic accuracy shown by the nurse practitioner, together with the scans she requested, compared favourably with the consultant breast surgeon" says Mr Osborn.

The team plan further research, with other members of staff and at other hospitals, to see if the encouraging results are replicated. "We believe that nurse practitioners can be a valuable asset to the multidisciplinary breast team if they received special training, consultant support and are subject to regular comparative audits" concludes Mr Osborn. "Their enhanced clinical skills can reduce the impact that working hours legislation is having on the availability of junior medical staff.

"This in turn, can enable us to see more patients in clinics, reduce waiting times and meet Government targets."

Hayabusa asteroid-sample capsule recovered in Outback

By Jonathan Amos

The Hayabusa pod was picked up by a helicopter team and transferred to a control centre on the Woomera Prohibited Area.

The canister, which is believed to hold the first samples ever grabbed from the surface of an asteroid, will now be shipped to Tokyo.

The return was the culmination of a remarkable seven-year adventure, which saw Hayabusa visit asteroid Itokawa in 2005 and attempt to pluck dust from its surface before firing its engines for home.

The $200m mission encountered many technical problems, from being hit by a solar flare to experiencing propulsion glitches. But each time an issue came up, the Japanese project team found an elegant solution to keep Hayabusa alive and bring it back to Earth - albeit three years late.

The re-entry on Sunday, at 1351 GMT, produced a spectacular fireball in the Australian night sky.

The main spacecraft broke apart in a shower of light.

As these bright streaks faded, a single point could then be seen racing to the ground. This was the capsule protected against the 3,000-degree heat generated in the fall by its carbon shield.

It took about an hour to locate the capsule by helicopter, its position tracked by radar and a beacon that was transmitting from inside the canister.

It was only when daylight came up on Monday, however, that a recovery team began to approach the 40cm-wide pod which was lying on the ground still attached to its parachute.

Hayabusa capsule on the ground (Jaxa) A helicopter found the capsule about an hour after the return

The heat-shield, which was dumped by the canister in the final moments before touch-down, was also located. Engineers will be keen to see how well it stood up to the 12km/s descent.

In the coming days, the capsule will be prepared for its transfer out of the country. Japanese, American and Australian scientists will open the canister in an ultra-clean, evacuated environment.

"The retrieved capsule will be transported to the Jaxa Sagamihara Campus in Kanagawa," Dr Keiji Tachikawa, the president of Jaxa, said in a statement. "First, the sample container will be inspected, and then the content will be extracted for analysis. We hope to find the Itokawa's surface material in the capsule, and contribute to understanding the origin and evolution of the Solar System."

Even now, there is still some uncertainty as to whether the capsule really does contain pieces of Itokawa. The Hayabusa spacecraft's capture mechanism was supposed to shoot a ball bearing at Itokawa when it landed to kick up rock inside a collection horn. An analysis of telemetry data suggests this mechanism may have malfunctioned at the crucial moment. Nonetheless, scientists connected with the mission remain confident of success.

"It may have worked, it may not; we just don't know," said Dr Michael Zolensky from Nasa's Johnson Space Center. "But even if it didn't work, the spacecraft landed for half an hour on the surface, and during that landing - it was a hard landing - it should have collected a sample even without firing anything. So, we're pretty confident there'll be something inside the spacecraft," he told BBC News.

If that is confirmed, it would be the first time fragments of rock have been picked up off the surface of an asteroid and returned to Earth, and only the fourth extraterrestrial sample brought to our planet by a spacecraft.

Those other materials include the Moon rocks recovered by US and Soviet missions; cometary dust captured by the American Stardust probe; and particles in the "solar wind" returned by the Genesis spacecraft, also operated by the US.

But scientists caution it could be some weeks before the presence of any dust in the Hayabusa capsule can be established.

Professor Monica Grady, from the UK's Open University, said she hoped to get to work on some of the material.

"One of the great things about this type of science is that it is very collaborative," she told BBC News.

"Preliminary investigation teams will look to see what minerals the dust is made from, whether there is any carbon in there or any organics. And then scientists all over the world will be assigned very, very tiny amounts - just a few grains. Because the instruments we now have are so sophisticated, we only need a few grains to find out an awful lot of information."

Scientists hope the Itokawa samples will give them new insights into the make-up of asteroids and help them understand better the early history of the Solar System, which formed more than 4.5 billion years ago.

ASTEROID 25143 ITOKAWA - A 'PILE OF RUBBLE'

Asteroid Itokawa (Jaxa) Hayabusa returned astonishing images from its encounter with Itokawa

The 500m-long Itokawa has many boulders covering its surface

The biggest is 50m wide; it is nicknamed 'Yoshinodai'

Observations revealed Itokawa's density to be extremely low

Scientists say it is a pile of rubble that was produced in a collision

Gravity would have collected the debris into the object we now see

Rocks on Earth are useless for this purpose because they have been recycled many times through weathering and plate tectonic processes. Many asteroids, on the other hand, contain materials that have been altered little over the course of the past few billion years.

Carnivorous mammals track fruit abundance

The scientific community already knew that many carnivores eat fruit, but had thought this was something purely anecdotal. Now researchers from the University of Santiago de Compostela (USC) have shown that carnivorous animals such as foxes and martens play an important role in helping fruiting plants to reproduce and disperse their seeds.

Far from viewing the relationship between carnivorous mammals and plants as irrelevant, a team of researchers from the USC studied how foxes and (Vulpes vulpes) and the European pine marten (Martes martes) consumed the fruit of the rowan tree (Sorbus aucuparia) in the Cordillera Cantábrica mountain range, and found that both species were capable of tracking yearly differences in the abundance of rowan fruit in Cantabrian forests, and in addition showed a marked preference for the most productive trees.

"Carnivores are not indifferent to seasonal and spatial variations in the amount of fruit they can obtain from the rowan tree", Ignacio Munilla, co-author of the study and a researcher at the USC' Department of Botany, tells SINC.

The study, published in the journal Acta Oecologica, suggests that some of the ecological paradigms about seed dispersal developed in tropical environments should be reconsidered for temperate climates. Munilla says: "The rowan is important to carnivores and carnivores are important to the rowan".

The rowan appears at altitudes of over 1,000 metres in the mountains of the Cordillera Cantábrica, and is a pioneer species that colonises secondary scrub and "prepares the way towards mature forest".

"Given its abundance and wide distribution, the rowan is a very important resource in European forests, from the mountains of the south of the continent right up to Scandinavia", says José Guitián, another co-author of the report and a researcher at the Department of Cell Biology and Ecology of the USC.

However, the amount of fruit this tree produces varies widely from year to year. Periods without any fruit alternate with years of extremely abundant harvests with more than 50,000 fruits per tree. Despite these enormous year-on-year fluctuations, a study over an uninterrupted test series of 11 years into the significance of the rowan in the diet of the fox and marten compared with the environmental abundance of this resource showed that both factors – harvest and consumption – followed very similar patterns.

Monitoring of 20 trees

The same research team also carried out another study published in the same article, in which they monitored 20 rowan trees over 10 days and nights. They found that carnivores visited the 10 trees with the largest fruit production most often, picking up fallen fruit and helping to disperse the seeds.

"The probability of a tree being visited by a carnivore seemed to depend directly on the number of fruits that had fallen below it. The carnivores went off with a considerable proportion of the fallen fruit (much more than the amount destroyed by rodents during the same period)", says Guitián.

The carnivores also help the rowan to thrive by dispersing the seeds contained inside the fruits that fall from the tree.

According to the researchers, the rowan-fox-marten system could be important in mountain ecosystems on the Iberian Peninsula. In addition, the fruit falling under the mother plant may not necessarily represent a failure in terms of dispersal "since there could be a high likelihood of these seeds being mobilised by carnivores".

References: *Guitián, J.; Munilla, I. "Responses of mammal dispersers to fruit availability: Rowan (Sorbus aucuparia) and carnivores in mountain habitats of northern Spain". Acta Oecologica 36: 242-247, 2010. doi:10.1016/j.actao.2010.01.005*

US experiment hints at 'multiple God particles'

By Paul Rincon Science reporter, BBC News

There may be multiple versions of the elusive "God particle" - or Higgs boson - according to a new study.

Finding the Higgs is the primary aim of the £6bn ($10bn) Large Hadron Collider (LHC) experiment near Geneva. But recent results from the LHC's US rival suggest physicists could be hunting five particles, not one. The data may point to new laws of physics beyond the current accepted theory - known as the Standard Model. The Higgs boson's nickname comes from its importance to the Standard Model; it is the sub-atomic particle which explains why all other particles have mass. However, despite decades trying, no-one, so far, has detected it.

The idea of multiple Higgs bosons is supported by results gathered by the DZero experiment at the Tevatron particle accelerator, operated by Fermilab in Illinois, US. DZero is designed to shed light on why the world around us is composed of normal matter and not its shadowy opposite: anti-matter.

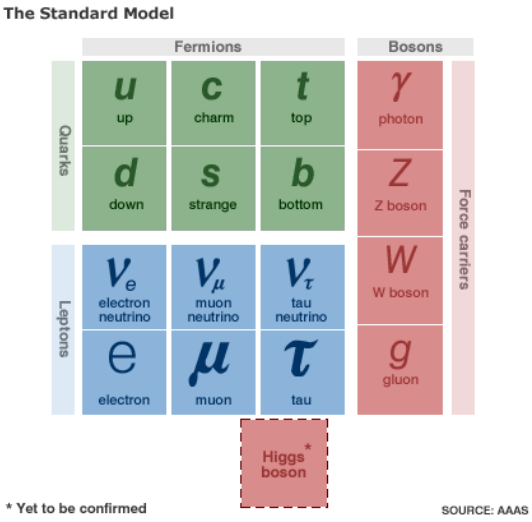
Researchers working on the experiment observed collisions of protons and anti-protons in the Tevatron.

The collisions produced pairs of matter particles slightly more often than they yielded anti-matter particles.

Physicists had already seen such differences - known as "CP violation", but these effects were small compared to those seen by the DZero experiment.

The DZero results showed much more significant "asymmetry" of matter and anti-matter - beyond what could be explained by the Standard Model.

Bogdan Dobrescu, Adam Martin and Patrick J Fox from Fermilab say this large asymmetry effect can be accounted for by the existence of multiple Higgs bosons. They say the data points to five Higgs bosons with similar masses but different electric charges.



Three would have a neutral charge and one each would have a negative and positive electric charge. This is known as the two-Higgs doublet model.

Dr Martin told BBC News that the two-Higgs doublet could explain the results seen by the DZero team while keeping much of the Standard Model intact.

"In models with an extra Higgs doublet, it's easy to have large new physics effects like this DZero result," he explained. "What's difficult is to have those large effects without damaging anything else that we have already measured." Dr Martin explained that there were other possible interpretations for the DZero result.

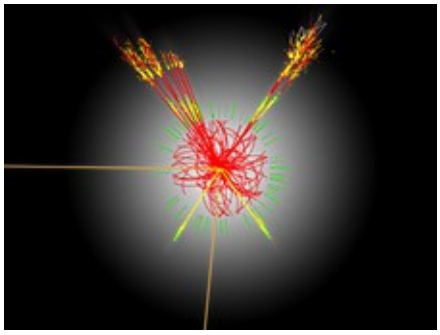
But he added: "The Standard Model fits just about every test we've thrown at it. To fit in a new effect in one particular place is not easy."

Developed in the 1970s, the Standard Model incorporated all that was then known about the interactions of sub-atomic particles.

Stepping stone

But today, many physicists regard it as incomplete, a mere stepping stone to something else.

The Standard Model cannot explain the best known of the so-called four fundamental forces: gravity; and it describes only ordinary matter, not the dark matter which makes up some 25% of the Universe.



Simulated Higgs production at Atlas (Cern) The LHC will aim to detect the Higgs boson particle

The Standard Model only has one Higgs "doublet". Although we tend to think of the Higgs boson as one particle, it actually comes in a package of four, explained Dr Martin.

"In the Standard Model, you only see one of them because the other three are absorbed into [other parts of the scheme] such as the W and the Z bosons. There's only one left," he told BBC News.

"So if you want to add another Higgs doublet - you actually have to add four more particles."

The two-Higgs doublet model also ties in with a theory in particle physics known as supersymmetry.

Supersymmetry represents an extension to the Standard Model, in which each particle in the scheme has a more massive "shadow" partner particle.

But so far, physicists have lacked experimental evidence for the existence of these more massive particles.

Evidence for the Higgs and for supersymmetry could be uncovered by the LHC, the world's most powerful "atom smasher" which is housed 100m under the French-Swiss border.

The researchers have published the latest study on the pre-print server arXiv.org; the results were reported by Symmetry magazine. The three researchers are based at Fermilab but are not DZero team members.

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Study shows adding UV light helps form 'Missing G' of RNA building blocks

For scientists attempting to understand how the building blocks of RNA originated on Earth, guanine - the G in the four-letter code of life -- has proven to be a particular challenge. While the other three bases of RNA - adenine (A), cytosine (C) and uracil (U) - could be created by heating a simple precursor compound in the presence of certain naturally occurring catalysts, guanine had not been observed as a product of the same reactions.

By adding ultraviolet light to a model prebiotic reaction, researchers from the Georgia Institute of Technology and the University of Roma, "La Sapienza", have discovered a route by which the missing guanine could have been formed. They also found that the RNA bases may have been easier to form than previously thought -- suggesting that starting life on Earth might not have been so difficult after all.

The findings are reported June 14, 2010 in the journal ChemBioChem. This collaborative work is supported by the National Science Foundation (NSF), the National Aeronautics and Space Administration, and the European Space Agency. The NSF funding is provided through the Center for Chemical Evolution at Georgia Tech.

Understanding how life emerged is one of the greatest scientific challenges. There is considerable evidence that the evolution of life passed through an early stage in which RNA played a more central role, before DNA and protein enzymes appeared.

Recent efforts to understand the prebiotic formation of the building blocks of RNA have focused on the chemical formamide (H2NCOH) as a potential starting material to create the RNA bases because it contains the four required elements - carbon, hydrogen, oxygen and nitrogen -- and because of its stability, reactivity and low volatility compared to water. Previous reports have shown that these nucleic acid components -- with the exception of guanine - can be synthesized by heating formamide to 160 degrees Celsius in the presence of mineral catalysts.

In their ChemBioChem paper, the researchers show for the first time that guanine can be produced by subjecting a solution of formamide to ultraviolet radiation during heating. The trace gaunine yield was greatly enhanced when minerals and photons were used together. In addition, production of adenine and a related molecule called hypoxanthine increased when ultraviolet light was added to the heating process -- a 15-fold increase was seen in adenine yield.

"These results potentially relax some of the requirements and reactions necessary to get life started, because formamide molecules would not have had to be in contact with a particular type of rock when heated on the prebiotic Earth, if the formamide was exposed to direct sunlight during heating," said Nicholas Hud, a professor in the Georgia Tech School of Chemistry and Biochemistry.

The study demonstrated that guanine, adenine and hypoxanthine can be produced at lower temperatures than previously reported, even in the absence of minerals, as long as photons are added.

"For these experiments we built a very simple reaction chamber with an inexpensive 254-nanometer photon source to simulate conditions that could have been present on early Earth," explained Thomas Orlando, also a professor in Georgia Tech's School of Chemistry and Biochemistry. "We didn't need extremely sophisticated experimental systems or expensive lasers; however, we did use sophisticated mass spectrometers to analyze the resulting complex chemical mixtures."

The Hud and Orlando laboratories conducted experiments by heating formamide to 130 degrees Celsius -- 30 degrees cooler than previous experiments -- and shining ultraviolet light onto it.

"Our work has allowed us to consider a different type of 'primordial soup' than what has previously been considered possible starting conditions for life," said Orlando. "Our model prebiotic reaction is attractive because most aspects of the process were likely to occur on the early Earth and it reduces chemical constraints."

The authors suggest that aqueous pools containing small amounts of formamide may have existed on the early Earth. During hot and dry periods, water evaporation could have given rise to concentrated solutions of formamide and exposed mineral surfaces coated with formamide.

By conducting additional experiments at 100 degrees Celsius with solutions of formamide and water, the researchers confirmed that this "drying pool" model could give rise to solutions of formamide capable of producing the compounds found in their earlier experiments.

"While there is still a lot of chemistry required for us to better understand the formation of biological molecules needed for life, these one-pot reactions that occur due to the synergy of thermal and photochemical processes tell us that the chemical and environmental requirements to produce life are probably less restrictive than we once thought," added Hud.

Sapienza University professor of molecular biology Ernesto Di Mauro, and Georgia Tech chemistry graduate students Hannah Barks and Ragan Buckley and research scientist Gregory Grieves also contributed to this work.

This project is supported by the National Science Foundation (NSF) (Award No. CHE-0739189) and the National Aeronautics and Space Administration (NASA) (Award Nos. NNG05GP20G and NNX08AO14G). The content is solely the responsibility of the principal investigator and does not necessarily represent the official view of the NSF or NASA.

High-yield agriculture slows pace of global warming, say Stanford researchers

Advances in high-yield agriculture over the latter part of the 20th century have prevented massive amounts of greenhouse gases from entering the atmosphere – the equivalent of 590 billion metric tons of carbon dioxide – according to a new study led by two Stanford Earth scientists.

The yield improvements reduced the need to convert forests to farmland, a process that typically involves burning of trees and other plants, which generates carbon dioxide and other greenhouse gases.

The researchers estimate that if not for increased yields, additional greenhouse gas emissions from clearing land for farming would have been equal to as much as a third of the world's total output of greenhouse gases since the dawn of the Industrial Revolution in 1850.

The researchers also calculated that for every dollar spent on agricultural research and development since 1961, emissions of the three principal greenhouse gases – methane, nitrous oxide and carbon dioxide – were reduced by the equivalent of about a quarter of a ton of carbon dioxide – a high rate of financial return compared to other approaches to reducing the gases.

"Our results dispel the notion that modern intensive agriculture is inherently worse for the environment than a more 'old-fashioned' way of doing things," said Jennifer Burney, lead author of a paper describing the study that will be published online by the Proceedings of the National Academy of Sciences.

Adding up the impact

The researchers calculated emissions of carbon dioxide, methane and nitrous oxide, converting the amounts of the latter two gases into the quantities of carbon dioxide that would have an equivalent impact on the atmosphere, to facilitate comparison of total greenhouse gas outputs.

Burney, a postdoctoral researcher with the Program on Food Security and the Environment at Stanford, said agriculture currently accounts for about 12 percent of human-caused greenhouse gas emissions. Although greenhouse gas emissions from the production and use of fertilizer have increased with agricultural intensification, those emissions are far outstripped by the emissions that would have been generated in converting additional forest and grassland to farmland.

"Every time forest or shrub land is cleared for farming, the carbon that was tied up in the biomass is released and rapidly makes its way into the atmosphere – usually by being burned," she said. "Yield intensification has lessened the pressure to clear land and reduced emissions by up to 13 billion tons of carbon dioxide a year."

"When we look at the costs of the research and development that went into these improvements, we find that funding agricultural research ranks among the cheapest ways to prevent greenhouse gas emissions," said Steven Davis, a co-author of the paper and a postdoctoral researcher at the Carnegie Institution at Stanford.

To evaluate the impact of yield intensification on climate change, the researchers compared actual agricultural production between 1961 and 2005 with hypothetical scenarios in which the world's increasing food needs were met by expanding the amount of farmland rather than by the boost in yields produced by the Green Revolution.

"Even without higher yields, population and food demand would likely have climbed to levels close to what they are today," said David Lobell, also a coauthor and assistant professor of environmental Earth system science at Stanford.

"Lower yields per acre would likely have meant more starvation and death, but the population would still have increased because of much higher birth rates," he said. "People tend to have more children when survival of those children is less certain."

Avoiding the need for more farmland

The researchers found that without the advances in high-yield agriculture, several billion additional acres of cropland would have been needed.

Comparing emissions in the theoretical scenarios with real-world emissions from 1961 to 2005, the researchers estimated that the actual improvements in crop yields probably kept greenhouse gas emissions equivalent to at least 317 billion tons of carbon dioxide out of the atmosphere, and perhaps as much as 590 billion tons.

Without the emission reductions from yield improvements, the total amount of greenhouse gas pumped into the atmosphere over the preceding 155 years would have been between 18 and 34 percent greater than it has been, they said.

To calculate how much money was spent on research for each ton of avoided emissions, the researchers calculated the total amount of agricultural research funding related to yield improvements since 1961 through 2005. That produced a price between approximately $4 and $7.50 for each ton of carbon dioxide that was not emitted.

"The size and cost-effectiveness of this carbon reduction is striking when compared with proposed mitigation options in other sectors," said Lobell. "For example, strategies proposed to reduce emissions related to construction would cut emissions by a little less than half the amount that we estimate has been achieved by yield improvements and would cost close to $20 per ton."

The authors also note that raising yields alone won't guarantee lower emissions from land use change.

"It has been shown in several contexts that yield gains alone do not necessarily stop expansion of cropland," Lobell said. "That suggests that intensification must be coupled with conservation and development efforts.

"In certain cases, when yields go up in an area, it increases the profitability of farming there and gives people more incentive to expand their farm. But in general, high yields keep prices low, which reduces the incentive to expand."

The researchers concluded that improvement of crop yields should be prominent among a portfolio of strategies to reduce global greenhouse gases emissions.

"The striking thing is that all of these climate benefits were not the explicit intention of historical investments in agriculture. This was simply a side benefit of efforts to feed the world," Burney noted. "If climate policy intentionally rewarded these kinds of efforts, that could make an even bigger difference. The question going forward is how climate policy might be designed to achieve that."

'Much more water' found in lunar rocks

By Katia Moskvitch Science reporter, BBC News

The Moon might be much wetter than previously thought, a group of scientists has said.

A US-led team analysed the mineral apatite in lunar rocks picked up by the Apollo space missions and in a lunar meteorite found in North Africa. The scientists found that there was at least 100 times more water in the Moon's minerals than they had previously believed. The new study has been published in the journal PNAS.

This group is one of several different teams of researchers hunting for evidence of water on the Moon - and clues to how it got there.

Lead author Francis McCubbin from the Carnegie Institution for Science in Washington DC told BBC News that the water content on the Moon ranges from 64 parts per billion to five parts per million.

"It would be about 2.5 times the volume of the Great Lakes," he said.

"Or another way of looking at it - if you took all of the water that was locked up inside the rocks of the Moon and put them on the surface, it would make a metre-thick layer covering the Moon."

The scientist explained that the Moon most probably formed after a Mars-sized space body collided with the young Earth, some 4.5 billion years ago. The high-energy impact produced molten debris, which eventually cooled to form our planet's only natural satellite.

Back then, he said, there was a magma ocean on the Moon. Magma contained water, which eventually erupted via "fire fountains" on to the lunar surface. Most of this water evaporated during the volcanic activity - but some of it stayed, said Dr McCubbin. "I like to use the analogy of someone who's trying to make non-alcoholic beer. There's always going to be some alcohol left," he explained.

Quest for water

After the US Apollo space missions of the late 1960s and early 1970s returned to Earth with numerous samples of lunar rocks, scientists spent years examining them in search of water.

At first, they declared that the Moon was dry - but this theory was challenged in 2008, when a US team used the method of secondary ion mass spectrometry (SIMS) and found evidence of water in lunar volcanic glasses - pebble-like rocks that ended up on the Moon's surface after the volcanic outpouring.

It was a breakthrough discovery, even though the quantity of water was only of the order of 46 parts per million.

Nevertheless, the scientists said that their research shed light on the origins of lunar water, asserting that it was "native" to the Moon.

Earlier in 2010, a radar experiment aboard India's Chandrayaan-1 lunar spacecraft found thick deposits of water-ice near the Moon's north pole.

In the recent study, Dr McCubbin and his colleagues used SIMS to look at the Apollo samples once more - but this time, they analysed the only water-bearing mineral of the rocks - apatite.

This mineral happens to be a major component of tooth enamel and bones and, as Dr McCubbin explained, "has a better chance of retaining water than volcanic glass".

The team specifically studied hydroxyl (OH) - a chemical compound in apatite that contains one atom of oxygen and one atom of hydrogen.

The researchers combined their measurements with models that analyse how the material crystallised as the Moon cooled. The team found that the Moon's interior contains at least 100 times more water than was previously believed, stored in lunar minerals.

Other researchers have called the results important for future studies.

"It is gratifying to see this proof of the OH contents in lunar apatite," commented lunar scientist Bradley Jolliff from Washington University in St. Louis, Missouri.

"The concentrations are very low and, accordingly, they have been until recently nearly impossible to detect. We can now finally begin to consider the implications - and the origin - of water in the interior of the Moon."

Other theories

Dr Lawrence Taylor from the University of Tennessee in Knoxville, US has been involved in a separate, but similar research. He told BBC News that besides finding water in the apatite, he and Jim Greenwood from Wesleyan University in Connecticut have come up with an additional theory about the origins of lunar water.

"We're thinking now that there might have been a cometary input as well," said Dr Taylor.

He explained that there were a lot of comets flying around at the time of the Moon's formation, "hitting the little, nascent, early Moon some 4.5 billion years ago".

Some scientists call comets "dirty icebergs" as they mostly contain ice, as well as other rocky material, soil and gases.

"So maybe there was a lot of cometary debris going by and as these 'dirty icebergs' hit the Moon, they provided a lot of water input," Dr Taylor said. "Back then, the outer portion of the Moon was molten, it was all a lunar magma ocean, so the comets were incorporated into the chemistry of the [Earth's satellite]".

Mutations on 3 genes could predispose people to suicidal behaviour

Three genes that have barely been studied to date have now provided fresh knowledge about patients with suicidal backgrounds. This is the result of a study by a team of Spanish researchers at Mount Sinai Hospital and Columbia University in the City of New York (United States), which found that several mutations are involved. This finding could help to develop future genetic tests to identify predisposition to suicide, without ignoring the importance of social and cultural factors.

"There is ever-increasing evidence pointing to the important role played by genes in predisposing people to suicidal behaviour", Mercedes Pérez-Rodríguez, co-author of the study and a researcher at Mount Sinai Hospital in New York (United States), tells SINC. Research carried out to date shows that around 40% of the variability in suicidal behaviour could have a genetic basis.

The objective of the study published in the American Journal of Medical Genetics was to identify a model able to differentiate between people with and without a background of suicide attempts. Instead of focusing on a few traditional candidate genes, the scientists examined a range of 840 functional single nucleotide polymorphisms (SNPs) present in 312 genes expressed in the brain.

"The SNPs were analysed in men with a diagnosed psychiatric illnesses, and the results are promising", says Pérez-Rodríguez, who describes how her team was able to correctly classify 69% of the patients by using an algorithm based on three SNPs from three different genes.

"The predictive features of this algorithm for estimating suicide risk outperform those of all other models developed to date", stresses the researcher. In addition, the new model identifies three different neurobiological systems that could play a role in diathesis (organic predisposition) to suicidal behaviour.

The authors have suggested that the outcomes of this study could be used in future to create simple genetic tests of use in diagnosing and identifying patients prone to attempting suicide.

Genetic research into suicidal behaviour

Aside from the sociological and psychological causes, scientists have also started to use genetics over the past 20 years to analyse the causes of suicidal behaviour, which has continued to increase, above all in industrialised Western countries. The latest data from the WHO show that nearly one million people committed suicide in 2000, and it estimates that by 2020 this figure will have risen to 1.5 million.

Currently there are no reliable clinical tests to identify people who may be more predisposed to suicide. To date, studies have focused on parameters related to serotonin function, such as 5-hydroxyindoleacetic acid (5-HIAA) of the cerebrospinal fluid (CSF) or measurements of the hypothalamic-pituitary-adrenal axis (HPA) such as the dexamethasone suppression test. However, these models are of no clinical use.

Previously, genetic research into suicidal behaviour had hardly looked at the three genes selected in the new study, which has now confirmed they are involved. These three genes code the 5-HT1E serotonin receptor (HTR1E, SNP rs10944288); the pi subunit of the A gamma-aminobutyric acid receptor (GABRP, SNP hCV8953491); and the alpha-2-actinin (ACTN2, SNP rs707216) subunit of the ionotropic glutamate receptor channel.

For more information: http://www.who.int/mental_health/prevention/suicide/suicideprevent/en/

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2009 H1N1 vaccine protects against 1918 influenza virus

Cross-protection helps alleviate bioterrorism concerns

Researchers at Mount Sinai School of Medicine have determined people who were vaccinated against the 2009 H1N1 influenza virus may also be protected against the lethal 1918 Spanish influenza virus, which killed more than 50 million people worldwide. The new findings are published in the current issue of Nature Communications.

"While the reconstruction of the formerly extinct Spanish influenza virus was important in helping study other pandemic viruses, it raised some concerns about an accidental lab release or its use as a bioterrorist agent," said Adolfo Garcia-Sastre, PhD, Professor, Microbiology, Mount Sinai School of Medicine, lead investigator on the study. "Our research shows that the 2009 H1N1 influenza vaccine protects against the Spanish influenza virus, an important breakthrough in preventing another devastating pandemic like 1918." Other Mount Sinai School of Medicine groups involved in the study include the laboratories of Dr. Palese and Dr. Basler. The study was also done in collaboration with the group of Dr. Belshe, at St. Louis University, who provided the human vaccination samples.

The researchers administered to three groups of mice either the 2009 H1N1 influenza vaccine, the seasonal influenza vaccine, or no vaccine at all. Twenty-one days later, the mice were exposed to a lethal dose of the 1918 Spanish influenza virus. The mice receiving the H1N1 vaccine were the only ones to survive, while also exhibiting limited morbidity following the vaccination.

Additionally, Dr. Garcia-Sastre's team injected the mice with blood serum taken from humans who had been vaccinated against 2009 H1N1 influenza. Later, the mice were given a potent dose of the 1918 Spanish influenza virus. Researchers found that the antibodies in the blood produced by the 2009 H1N1 vaccine may also protect against the 1918 Spanish influenza virus.

"Considering the millions of people who have already been vaccinated against 2009 H1N1 influenza, cross-protection against the 1918 influenza virus may be widespread. Our research indicates that people who were exposed to the virus may also be protected," said Dr. Garcia-Sastre. "We look forward to conducting further research on the benefits of the 2009 H1N1 influenza vaccine in protecting against the deadly 1918 Spanish influenza virus."

This research was funded by the National Institute of Allergy and Infectious Diseases, part of the National Institutes of Health.

Paternal Bonds, Special and Strange

By NATALIE ANGIER

Not long ago, Julia Fischer of the German Primate Center in Göttingen was amused to witness two of her distinguished male colleagues preening about a topic very different from the standard academic peacock points - papers published, grants secured, competitors made to look foolish. “One of them said proudly, ‘I have three children,’ ” Dr. Fischer recalled. “The other one replied, ‘Well, I have four children.’

“Some men might talk about their Porsches,” she added. “These men were boasting about their number of children.” And while Dr. Fischer is reluctant to draw facile comparisons between humans and other primates, she couldn’t help thinking of her male Barbary macaques, for whom no display carries higher status, or is more likely to impress the other guys, than to strut around the neighborhood with an infant monkey in tow.

Reporting in the current issue of the journal Animal Behaviour, Dr. Fischer and her co-workers describe how male Barbary macaques use infants as “costly social tools” for the express purpose of bonding with other males and strengthening their social clout. Want to befriend the local potentate? Bring a baby. Need to reinforce an existing male-male alliance, or repair a frayed one? Don’t forget the baby.

It doesn’t matter if the infant is yours or not. Just so long as it has the downy black fur and wrinkly pinkish face that adult male macaques find impossible to resist. “They will hold up the infant like a holy thing, nuzzling it, chattering their teeth,” Dr. Fischer said. “It can be a bit bewildering to see.”

Just in time for Father’s Day come this and other recent studies that reveal surprising, off-road or vaguely unsettling cases of Males Behaving Dadly - attending to the young with an avidity and particularity long thought to be the province of the mother.

Scientists have learned, for example, that the male pipefish - which, like his seahorse relatives, famously becomes pregnant and gives birth to live young - is both more generous and more calculatedly harsh toward his

offspring than previously believed, able to fine-tune the flow of nutrients to his gestating babies depending on how he feels about their mother.

In most species of birds, males and females take turns incubating the eggs and fetching insects for the fledglings. But among some large, flightless birds like emus and rheas, the male is often the sole keeper of the nest. Scientists now have evidence that such father-focused child care may represent the primordial avian program, one that dates back to the birds' storied ancestors, the dinosaurs.

Why do males of some species attend to their offspring prolongedly, while others tend to spring off post-coitally? The reasons vary widely and are not always easy to discern.

In 90 percent of mammalian species, promiscuity is common and paternity uncertain; females gestate the young internally and then provision them with breast milk, and males rarely have any evolutionary incentive to play Ward Cleaver. Yet in that remaining 10 percent, the daddy decile, we find most of the world's primates.

"Lots of primates are suckers for babies," said Sarah Hrdy, the primatologist and author of "Mothers and Others" (Harvard University Press, 2009). Consider how the male of two small New World monkey species, the cotton-top tamarin and the common marmoset, reacts to a mate's pregnancy.

His hormones change, the dendritic connections in his brain begin to change, and he puts on weight - all in preparation for the heavy lifting to come. Female marmosets and tamarins generally give birth to twins, which together weigh about 20 percent of what the father does, and from the moment the babies are born until they reach independence, the male will be expected to carry them most of the time. If he's sitting, he'll hold them on his lap. While he's swinging through the trees, the twins will cling to the comforting thermal pads between his shoulder blades. If he hears the babies crying, he can't help himself - he must fetch them and pick them up.

In a study that appeared in the American Journal of Primatology, Sofia Refetoff Zahed and her colleagues at the University of Wisconsin compared the responses of experienced fathers and inexperienced males when confronted with the sound of a fussy infant monkey coming from a distant cage.

Without exception, the experienced fathers would quickly cross a bridge to reach the source of the distress cry, arriving within 45 seconds. Inexperienced males, by contrast, took their time. A minute, five minutes, wah wah wah! Oh well, guess I'd better see what the problem is. Or not. In half the cases, the inexperienced males never made it to the stimulus cage before the experiment was up.

Marmosets and tamarins become dream daddies because their partners are queen bees of fecundity. A mother monkey can't possibly handle the energetics of lugging around a pair of growing twins. Not when she is expected both to produce a double dose of milk and to become pregnant again roughly two weeks after giving birth.

"When I first started watching the monkeys, I thought the females were so mean," said Ms. Zahed, who is working on her doctorate. "The infants would try to get food, to get whatever the mother had, and the mom would grab it back and go away. The dad, on the other hand, would give up his food and let the infants get away with anything. "Then I got pregnant with my second child while I was still nursing the first," she added. "Then I understood. You do get grouchy."

In contrast to the obvious link between paternal care and offspring welfare seen in tamarins and marmosets, a male Barbary macaque's fascination with infants can look less than kid-friendly. Once abundant throughout North Africa, but now limited to forest patches in Algeria and Morocco, these monkeys live in troops of some 30 animals, a mix of related adult females and unrelated adult males. Females give birth in the spring, and Dr. Fischer said, spring "is high season for infant dealing."

Within days of being born, every infant is fair game for male pawings. "A male will approach a mother slowly," Dr. Fischer said, "seize the moment, and take the infant." He will carry the infant under his belly, or in his arms, and he'll advance toward one or two other males and start to make nice.

"If they don't have an infant, they can't interact," Dr. Fischer said. "There would be too much tension between them." A male may hold on to an infant for hours at a stretch. If the baby starts to cry, he may take it back to the mother for a feeding, all the while hanging on to the ankle of his precious networking tool.

The researchers initially assumed that baby handling might have a tranquilizing effect on the males, but on measuring the macaques' hormone levels, they found the opposite: carrying an infant caused a male's stress hormones to spike. The scientists now propose that the males use the infants as "battle symbols," as Dr. Fischer put it, "to show other males that they can bear the stress."

What better proof of a worthy ally, who will not wilt come breeding season - when males must form coalitions to monopolize fertile females and help spawn the next generation of fuzzy handheld devices?

Nature may never have invented the wheel, but she's the original wheeler-dealer and hedger of bets. The pouch of a male pipefish was long thought to be a passive incubator in which embryos could develop safely

while feasting on yolky nutrients the mother had supplied. Recent research suggests that the male also infuses the pouch with plenty of food, not to mention regulating osmotic pressure, salinity and oxygen flow.

Paternal generosity does have its limits. In a report published in the March 18 issue of Nature, Kimberly A. Paczolt and Adam G. Jones of Texas A&M University showed that the pouch of a gulf pipefish is a staging ground for sexual barters and the occasional war.

Male pipefish like big females, and if they mate with a meaty one, they will lavish her eggs with abundant nutrients of their own. But if a male ends up mating with a lightweight because she was the best he could find, and midway through gestation a fatter female swims by, the male's pouch knows what to do: abort or reabsorb a few existing embryos to use as food for the new.

Yes, fathers love to take charge, beat the odds, expand the nest. Reporting in the journal Science , David J. Varricchio of Montana State University and his colleagues offered evidence that for at least some species of birdlike carnivorous dinosaurs, fathers may have been the ones who cared for their young.

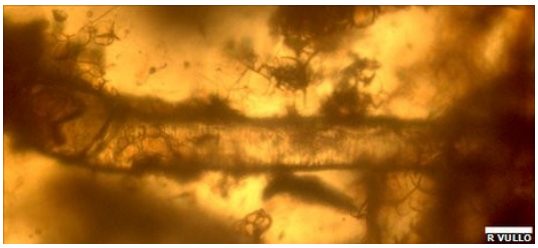
The researchers argued that to begin with, the repeated discovery of adult dinosaurs in close proximity to egg clutches indicated that dinosaurs didn't just dump and dash, turtle style, but instead stuck around to protect the nest. What's more, the total volume of each clutch was impressively large, suggesting input from more than one female.

Finally, the bones of the adults associated with the nests suggested that their owner might well have been male. A male that invited many females to mate with him and lay their heavy treasures in his nest. He was a good father. They had done their part. Now he would do the rest.

Prehistoric hair found in amber

By Matt Walker Editor, Earth News

Palaeontologists have discovered two mammal hairs encased in 100 million-year-old amber.



100 million-year-old hair

While older 2D fossilised hairs are known, those preserved in the amber are the oldest 3D specimens known.

The hairs, found alongside a fly pupa in amber uncovered in southwest France, are remarkably similar to hair found on modern mammals.

That implies that the shape and structure of mammal hair has remained unchanged over a vast period of time.

"We have 2D hair imprints as early as the Middle Jurassic," says Dr Romain Vullo of the University of Rennes, France, who discovered the hair.

The Jurassic Period lasted from 200 to 145 millions of years ago, followed by the Cretaceous Period which lasted to 65 million years ago.

"However, carbonised hair provides much less information about the structure than a 3D hair preserved in amber," says Dr Vullo. "Our specimens are the oldest known hair specimens in which we can observe the cuticular structure."

Dr Vullo and Professor Didier Neraudeau identified the hairs, which were initially found by colleague Dr Vincent Girard in amber he was examining for microorganisms.

Details are published in the journal Naturwissenschaften. The piece of amber, which is fossilised tree resin, was found in the Font-de-Benon quarry at Archingeay-Les Nouillers in Charente-Maritime, southwest France.

Dead or hungry?

The first hair fragment is 2.4mm long and 32 to 48 micrometres wide, while the second is just 0.6mm long and 49 to 78 micrometres wide. A close analysis of the hairs showed they have a very similar cuticular structure to those of hair or fur carried by modern mammals. The identity of the animal that shed the hair is not known.

Four teeth of a primitive marsupial called Arcantiodelphys have been found in the quarry, above the layer in which the amber was found.

"The more parsimonious hypothesis is to consider that the hair from the amber belong to this animal, or a closely related form," Dr Vullo told the BBC.

As to how the hair became encased in amber, the researchers say there are three possibilities. Either amber swamped part of an animal's corpse, an idea that is supported by the fly pupa found alongside the mammal hairs, as a fly may have laid its eggs into the carcass of the dead animal.

Or the hair was lost by a living animal which brushed past the resin, perhaps by a tree-living (arboreal) species.

Or the hair was lost in a similar manner by a mammal that came to feed on insects trapped in the resin, which later fossilised into amber.

Crayfish Brain May Offer Rare Insight into Human Decision Making

COLLEGE PARK, Md. - Crayfish make surprisingly complex, cost-benefit calculations, finds a University of Maryland study - opening the door to a new line of research that may help unravel the cellular brain activity involved in human decisions.

The Maryland psychologists conclude that crayfish make an excellent, practical model for identifying the specific neural circuitry and neurochemistry of decision making.

They believe their study is the first to isolate individual crayfish neurons involved in value-based decisions. Currently, there's no direct way to do this with a human brain.

The study will be published in the Proceedings of the Royal Society B, and is being released online by the journal today.

"Matching individual neurons to the decision making processes in the human brain is simply impractical for now," explains University of Maryland psychologist Jens Herberholz, the study's senior author.

"History has shown that findings made in the invertebrate nervous systems often translate to more complex organisms. It's unlikely to be exactly the same, but it can inform our understanding of the human brain, nonetheless. The basic organization of neurons and the underlying neurochemistry are similar, involving serotonin and dopamine, for example."

Herberholz adds that his lab's work may inform ongoing studies in rodents and primates. "Combining the findings from different animal models is the only practical approach to work out the complexities of human decision making at the cellular level."

Specific Findings And Conclusions

The experiments offered the crayfish stark decisions - a choice between finding their next meal and becoming a meal for an apparent predator. In deciding on a course of action, they carefully weighed the risk of attack against the expected reward, Herberholz says.

Using a non-invasive method that allowed the crustaceans to freely move, the researchers offered juvenile Louisiana Red Swamp crayfish a simultaneous threat and reward: ahead lay the scent of food, but also the apparent approach of a predator.

In some cases, the "predator" (actually a shadow) appeared to be moving swiftly, in others slowly. To up the ante, the researchers also varied the intensity of the odor of food.

How would the animals react? Did the risk of being eaten outweigh their desire to feed? Should they "freeze" - in effect, play dead, hoping the predator would pass by, while the crayfish remained close to its meal - or move away from both the predator and food?

To make a quick escape, the crayfish flip their tails and swim backwards, an action preceded by a strong, measurable electric neural impulse. The specially designed tanks could non-invasively pick up and record these electrical signals. This allowed the researchers to identify the activation patterns of specific neurons during the decision-making process.

Although tail-flipping is a very effective escape strategy against natural predators, it adds critical distance between a foraging animal and its next meal.

The crayfish took decisive action in a matter of milliseconds. When faced with very fast shadows, they were significantly more likely to freeze than tail-flip away.

The researchers conclude that there is little incentive for retreat when the predator appears to be moving too rapidly for escape, and the crayfish would lose its own opportunity to eat.

This was also true when the food odor was the strongest, raising the benefit of staying close to the expected reward. A strong predator stimulus, however, was able to override an attractive food signal, and crayfish decided to flip away under these conditions.

"Our results indicate that when the respective values of tail-flipping and freezing change, the crayfish adjust their choices accordingly, thus preserving adaptive action selection," the researchers write.

"We have now shown that crayfish, similar to organisms of higher complexity, integrate different sensory stimuli that are present in their environment, and they select a behavioural output according to the current values for each choice."

The next step is to identify the specific cellular and neurochemical mechanisms involved in crayfish decisions, which is more feasible in an animal with fewer and accessible neurons, Herberholz says. That research is now underway.

Herberholz's research is funded by grants from the National Science Foundation and University of Maryland's Division of Research.

Skulls show New World was settled twice: study

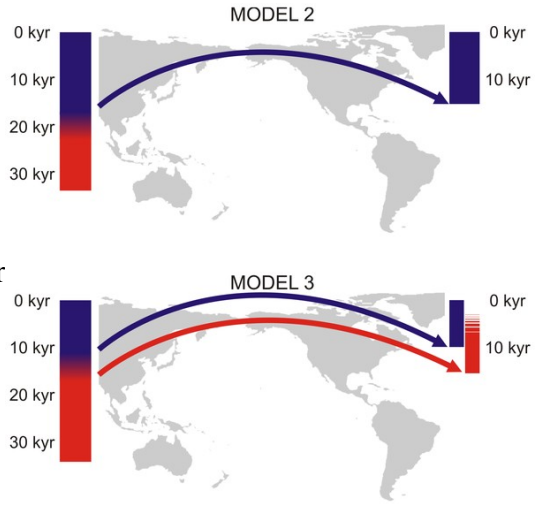
AFP

WASHINGTON (AFP) – Two distinct groups from Asia settled in the New World and not one single migration as suggested by previous genetic studies, experts said Monday after comparing the skulls of early Americans.

Paleoanthropologists from Brazil, Chile and Germany compared the skulls of several dozen Paleoamericans, dating back to the early days of migration 11,000 years ago, with the more recent remains of more than 300 Amerindians.

"We found that the differences between Early and Late Native American groups match the predictions of a two-migration scenario far better than they do those of any other hypothesis," they said.

"In other words, these differences are so large that it is highly improbable that the earliest inhabitants of the New World were the direct ancestors of recent Native American populations."



Their landmark research found differences in the cranial morphology that could only be explained by the fact that the last common ancestor of the Early and Late Native American groups came from outside the continent.

The experts agreed the differences were best explained by a scenario in which a first wave of settlers came across the Bering Strait from Northeast Asia followed by a second group from East Asia much later via the same route.

"We conclude that the morphological diversity documented through time in the New World is best accounted for by a model postulating two waves of human expansion into the continent originating in East Asia and entering through Beringia," they said. "This disparity between our results and those of most genetic studies points to a large gap in our understanding of the peopling of the New World."

Sperm whale faeces 'helps oceans absorb CO2'

By Richard Black Environment correspondent, BBC News

Sperm whale faeces may help oceans absorb carbon dioxide from the air, scientists say.

Australian researchers calculate that Southern Ocean sperm whales release about 50 tonnes of iron every year.

This stimulates the growth of tiny marine plants - phytoplankton - which absorb CO2 during photosynthesis.

The process results in the absorption of about 400,000 tonnes of carbon - more than twice as much as the whales release by breathing, the study says. The researchers note in the Royal Society journal Proceedings B that the process also provides more food for the whales, estimated to number about 12,000.

Phytoplankton are the basis of the marine food web in this part of the world, and the growth of these tiny plants is limited by the amount of nutrients available, including iron.

Faecal attraction

Over the last decade or so, many groups of scientists have experimented with putting iron into the oceans deliberately as a "fix" for climate change.

Not all of these experiments have proved successful; the biggest, the German Lohafex expedition, put six tonnes of iron into the Southern Ocean in 2008, but saw no sustained increase in carbon uptake.

The Polarstern The Lohafex expedition was the latest to probe iron fertilisation

Although 400,000 tonnes of carbon is less than one-ten-thousandth of the annual emissions from burning fossil fuels, the researchers note that the global total could be more substantial.

There are estimated to be several hundred thousand sperm whales in the oceans, though they are notoriously difficult to count; and lack of iron limits phytoplankton growth in many regions besides the Southern Ocean.

So it could be that whale faeces are fertilising plants in several parts of the world.

Crucial to the idea is that sperm whales are not eating and defecating in the same place - if they were, they could just be absorbing and releasing the same amounts of iron.

Instead, they eat their diet - mainly squid - in the deep ocean, and defecate in the upper waters where phytoplankton can grow, having access to sunlight.

Releasing the iron here is ultimately good for the whales as well, say the researchers - led by Trish Lavery from Flinders University in Adelaide. Phytoplankton are eaten by tiny marine animals - zooplankton - which in turn are consumed by larger creatures that the whales might then eat.

The scientists suggest a similar mechanism could underpin the "krill paradox" - the finding that the abundance of krill in Antarctic waters apparently diminished during the era when baleen whales that eat krill were being hunted to the tune of tens of thousands per year.

Mass Transits: Kepler Mission Releases Data on Hundreds of Possible Exoplanets

NASA's planet hunter has identified more than 700 candidate extrasolar worlds that have yet to be confirmed, including some that may be Earth-size

By John Matson

The Kepler spacecraft, launched in 2009 to scour distant stellar systems for Earth-like planets, has yet to attain that lofty goal, but it is now returning a flood of data about all manner of planets outside the solar system. On June 15, the Kepler team released information on possible planets identified in the first month or so of the spacecraft's three-plus-year mission—a massive set of more than 300 candidates that promises to significantly augment the known catalogue of extrasolar planets. The data were published online at the preprint repository arXiv.org and will be submitted to The Astrophysical Journal.

On top of that bountiful, publicly released haul, the Kepler team is holding onto a list of 400 of the most intriguing potential host stars for further observation. With these two sets of objects, Kepler is poised to rewrite the catalogue of known exoplanets, which currently contains about 450 objects, including five confirmed exoplanets that the Kepler team announced in January.

At least a dozen of the candidates are of comparable size to COROT 7 b, the smallest exoplanet known at just 1.6 times the diameter of Earth, and some are estimated to be slightly smaller. And those are just the smallest contestants from the set the Kepler team has not retained for follow-up observation. The withheld set of 400 possible stellar systems contains objects that appear even smaller, perhaps as small as Earth. "The cat is out of the bag," says Natalie Batalha, a professor of physics and astronomy at San Jose State University and a co-investigator on the Kepler team. "Kepler has seen Earth-size planet candidates."

But before COROT 7 b loses its crown as the smallest known exoplanet, Kepler's candidates must be verified with more data to rule out planetary decoys. "We fully expect half of the candidates to be false positives," Batalha says. One common false positive is an eclipsing binary star behind one of Kepler's target stars; the background light blocked by such an eclipse can mimic the periodic dimming that Kepler uses to identify planets passing in front of its target stars. The spacecraft, trained on a patch of more than 150,000 stars near the constellation Cygnus, trails Earth as both orbit the sun.

Without follow-up observations, fine details on the 312 publicly released candidates remain scarce—Kepler can determine a planet's diameter but not its mass, for instance. But even the rough outlines of the Kepler sample are intriguing.

For instance, more than half of Kepler's newly announced candidates are smaller than Neptune. That stands in stark contrast to the current catalogue of exoplanets, which because of observational biases is loaded with gas giant–size worlds; of the nearly 100 catalogued exoplanets whose diameters are known, all but two are Neptune-size or larger.

Kepler may also have spotted the first planetary system in which more than one planet can be seen passing in front of its star. One star in the public data set bears the signature of three distinct planets causing periodic dimming effects, and four more stars show the possible presence of two planets apiece. Such multiple-planet systems have been difficult to spot by Kepler's chosen search method—the monitoring of stars for planet-induced shading events known as transits—because the planets' orbits must be almost perfectly planar so both are aligned with the space telescope's line of sight.

But the ultimate prize of Kepler's hunt, a potentially habitable terrestrial world in an Earth-like orbit around a sunlike star, remains years away. The Kepler team's protocols require that three transits must be recorded, along with other observations, before a candidate can be confirmed as a true planet, and an Earth-like orbit will carry a planet into Kepler's view just once a year. (The planetary transits that Kepler looks for only occur once per planetary orbit, when the three objects—the planet, the host star and Kepler—fall into alignment. For a planet that takes around one Earth year to circle its star the transit would occur once annually.) With that requirement, plus time for data processing and confirmation, a true Earth–sun analogue will not be announced until after the end of the three- and-a-half-year mission, Batalha says.

In the meantime, the public data release should spur a rash of independent involvement as astronomers work to confirm the candidates Kepler has identified. "We're calling it an embarrassment of riches—so many candidates," Batalha says. "It's become abundantly clear that we're not going to be able to follow up all of these candidates ourselves."

The decision to allow Kepler scientists to keep some of their data private until February 2011 has drawn criticism from some fellow researchers. Jon Morse, director of the astrophysics division for NASA's Science Mission Directorate, addressed the issue in May during a town hall with astronomers at the semiannual meeting of the American Astronomical Society in Miami. Morse explained that launch delays had caused the Kepler team to miss much of its annual follow-up season, the months when the spacecraft's target stars are in view

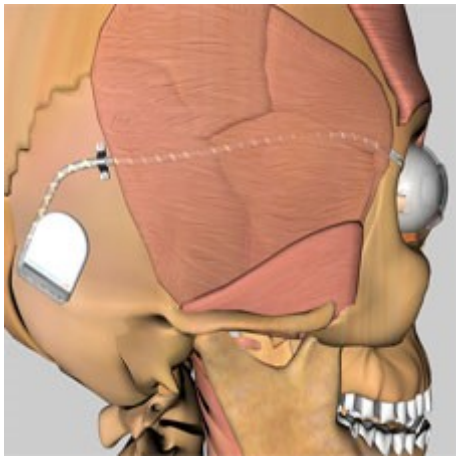
from telescopes on Earth. "Having the team be able to hold back 400 or so targets to do some follow-up from the ground to look for false positives was consistent" with the spirit of the original data release agreement, Morse said. "Folks in this room understand the concept of proprietary data rights."

Vision Quest: Retinal Implants Deliver the Promise of Sight to Damaged Eyes

Emerging technologies successfully stimulate retinas ravaged by retinitis pigmentosa, age-related macular degeneration and other diseases to give sufferers a new lease on light

By Larry Greenemeier

Scientists have been working for decades to create an optical prosthesis that restores at least partial vision to those suffering from retinitis pigmentosa, macular degeneration and other retina-damaging diseases. Some retinal implants have begun to deliver on that promise, but the challenge remains for researchers to develop a technology that, in addition to providing clear images, can be worn comfortably over the long term.



Germany's Retina Implant, AG, thinks it has made great strides in both areas, an assertion that will be put to the test later this year when the company launches its second clinical trial, placing subretinal (under retina) implants in about 50 patients over the next few years. Meanwhile, Sylmar, Calif.–based Second Sight Medical Products plans to make its epiretinal (over retina) implants commercially available in Europe later this year. Researchers at the Massachusetts Institute of Technology and other institutions and medical technology companies are likewise developing retinal implants—the retina lines the eye's inner surface and records images in patterns of light and color—but are not as far along as Retina Implant or Second Sight.

STIMULATING SIGHT: ***Retina Implant's subretinal device is a three- by three-millimeter micro-electronic chip (0.1 millimeter thick), containing about 1,500 light-sensitive photodiodes, amplifiers and electrodes. The chip is implanted directly under the retina to generate artificial vision by stimulating inner retina nerve cells.***

COURTESY OF RETINA IMPLANT AG

Retinal reawakening

Retina Implant's initial human clinical trial, started in 2005, improved the eyesight of 11 patients to the point where they were able to recognize objects as well as see shapes so clearly they could combine individual letters to form words or, essentially, read at a basic level at normal reading distance and in regular light conditions, says Eberhart Zrenner, the company's co-founder and director and chairman of the University of Tübingen's Institute for Ophthalmic Research in Germany. Zrenner presented the trial's results in May at the 2010 Association for Research in Vision and Ophthalmology's annual meeting in Fort Lauderdale, Fla.

Retina Implant's second clinical trial seeks to implant the latest version of the company's technology in a larger pool of patients. The new implant no longer has external parts—its power supply is positioned under the skin behind the ear, connected with a thin cable that leads to the eyeball so that the chip does not move once implanted. (This could damage the chip.)

Retinitis pigmentosa kills the retina's photoreceptors, which are the rod and cone cells that convert light into electrical signals for the brain, leading to vision loss. This disease, one of the most common forms of inherited retinal degeneration, affects about one in 4,000 people in the U.S. Age-related macular degeneration (AMD), a leading cause of vision loss in the U.S. among people 60 years and older, gradually destroys sharp, central vision. The macula (the light-sensitive retinal tissue at the back of the eye) degenerates in two ways: In "dry" AMD the macula's light-sensitive cells slowly break down; in the "wet" form abnormal blood vessels behind the retina start to grow under the macula, thereby displacing it.

Retina Implant's device is a three- by three-millimeter microelectronic chip (0.1 millimeter thick), containing about 1,500 light-sensitive photodiodes, amplifiers and electrodes that is implanted directly under the retina to generate artificial vision by stimulating inner retina nerve cells. The chip, which is placed in the retina's macular region, absorbs light entering the eye and converts it into electricity that stimulates any still-functioning retinal nerves. This stimulation is relayed to the brain through the optical nerve.

It takes the brain one or two days to adapt to chip-assisted vision, according to Zrenner. "Lines are typically all that can be expected to be seen initially by people with retinal implants," he says. "However, scientists are finding that the human brain can quickly retrain itself to interpret the lines and shapes of different gray levels into meaningful images." With the aid of a chip one Retina Implant patient reported seeing images and words slightly flickering as though they were viewed through small waves at the bottom of a pool, Zrenner adds.

Power (im)plant

"The major advance of the subretinal approach is that the implant itself is light sensitive," says Robert MacLaren, a consultant vitreoretinal surgeon and professor of ophthalmology at University of Oxford's Merton College. MacLaren, who specializes in treating patients with AMD, retinitis pigmentosa, choroideremia and Stargardt disease, is the lead surgeon for Retina Implant's second clinical trial in the U.K. The trials will also be conducted in Germany, Hungary and Italy.

MacLaren likes the idea of placing the implant beneath the retina, where it can stimulate the retina's bipolar cells, which transmit signals from photoreceptors to ganglion cells. "Another advantage is that the implant is placed in the preferred location for stimulating the eye's photoreceptors," he says. "The fact that it's light sensitive simplifies the arrangement, although the actual surgery is still very complicated."

One of the difficulties designing a subretinal implant has been powering the device. Some researchers were hoping to tap light coming into the retina but they found the amount of energy inadequate, according to MacLaren. "This idea of a subretinal implant has been around since the 1970s," he adds. "But it hasn't been proved functional in a trial until Retina Implant did it."

Light, camera, action

Whereas the subretinal approach places the implant under the surface of the retina to stimulate bipolar cells, an epiretinal implant directly stimulates ganglia using signals sent from a camera and power sent from an external transmitter, both mounted on a pair of glasses. In the case of Second Sight technology, a receiver is implanted under the eyeball's clear mucus membrane, called the conjunctiva. A small camera on a pair of sunglasses captures an image and sends the information to a video processor, worn on the belt along with a wireless microprocessor and battery pack.* After the video processor converts the images to an electronic signal, a transmitter on the glasses sends that information wirelessly to the receiver, which in turn conveys the signals through a tiny cable to an electrode array, stimulating it to emit electrical pulses. The pulses induce responses in the retina that travel via the optic nerve to the brain, which perceives patterns of light and dark spots corresponding to the electrodes stimulated. Patients learn to interpret the visual patterns produced into meaningful images.

With the epiretinal approach, "you could potentially stimulate more of the retina than with a subretinal implant, and it would be easier to adjust for contrast and light," MacLaren says. A drawback to epiretinal implants is that they require a camera mounted on a pair of glasses, which is cumbersome and requires the patient to move his entire head (rather than simply the eyeball) to take in his surroundings, he adds.

Epiretinal implants have met with some success: For example, last year a 73-year-old man receiving a Second Sight Argus II implant at Moorfields Eye Hospital in London was able to see again for the first time in 30 years. All together, 30 people are testing Argus II implants and some of these devices have been in place for more than three years, according to the company, which anticipates a commercial launch of the Argus II in Europe later this year. *Correction (6/16/10): This article originally stated that the video processor was mounted on the glasses.

Alcohol consumption lowers risk of developing several arthritic conditions

Impact of alcohol consumption on systemic inflammation unclear

Rome, Italy, Alcohol consumption is associated with a significantly reduced risk of developing several arthritic conditions including Rheumatoid Arthritis (RA), Osteoarthritis (OA), reactive arthritis, psoriatic arthritis and spondylarthropathy, according to results of a new study presented today at EULAR 2010, the Annual Congress of the European League Against Rheumatism in Rome, Italy. Regardless of the type of arthritis, all patients reported drinking less alcohol than controls, leading to questions around the inflammatory pathways behind the effects seen.

In this Dutch study, alcohol consumption was associated with a significantly lower risk of developing RA (Odds Ratio (OR) 0.27 (0.22-0.34), Osteoarthritis (OR 0.31, (0.16-0.62), spondylarthropathy (OR 0.34, 0.17-0.67), psoriatic arthritis (OR 0.38, 0.23-0.62), and reactive arthritis (OR 0.27, 0.14-0.52). A particularly protective effect was shown in the RA population with the presence of Anti-Citrullinated Protein Antibodies (ACPA, potentially important surrogate markers for diagnosis and prognosis in RA), (OR 0.59, 0.30-0.99).

Interestingly, researchers also found that the degree of systemic inflammation in patients was shown to increase as the amount of alcohol consumed decreased (p=0.001) and that there was no dose response relationship (low 0.12 (0.08-0.18), moderate 0.46 (0.36-0.59), high 0.17 (0.12-0.25)) between the amount of alcohol consumed and the risk of arthritis development. Researchers hypothesise that there could be two explanations for this inflammatory effect; either that patients with more severe disease activity consume less alcohol due to associated changes in their lifestyle, or that the presence of alcohol in the system could protect against the development of systemic inflammation.

"We know from previous research that alcohol consumption may confer a protective effect against developing RA, our data have shown that this effect may apply to other arthritic conditions too," said Dr Annekoos Leonoor Huidekoper, Leiden University Medical Centre, Netherlands and lead author of the study. "What intrigues us now is that the findings related to systemic inflammation, further research into the inflammatory pathways involved is needed to determine the exact nature of the association."

Patients with arthritic conditions (n=997; RA n=651, reactive arthritis, spondylaropathy or psoriatic arthritis n=273, osteoarthritis n=73) were enrolled from the Leiden Early Arthritis Cohort and healthy controls (n=6,874) recruited from the Multiple Environmental and Genetic Assessment of risk factors for venous thrombosis study. Alcohol consumption was recorded at baseline (units per week), and the effect of alcohol consumption on risk of disease development was analysed by univariate and multivariate logistic regression (statistical tests that predict the probability of an event occurring). Odds ratios and confidence intervals (95%) were adjusted for age, sex, Body Mass Index (BMI) and smoking.

Professor Paul Emery, President of EULAR and arc Professor of Rheumatology, Leeds Institute of Molecular Medicine, University of Leeds, UK said: "These are very interesting findings but we should assert the need for caution in the interpretation of these data. Alcohol should be consumed in moderation, with consideration for local public health recommendations. A number of social and medical problems are associated with increased consumption of alcohol; therefore any positive implications of its use must be understood within the wider health context." *Abstract Number: AB0179*

More than just the baby blues

How postpartum depression arises and how it could be prevented

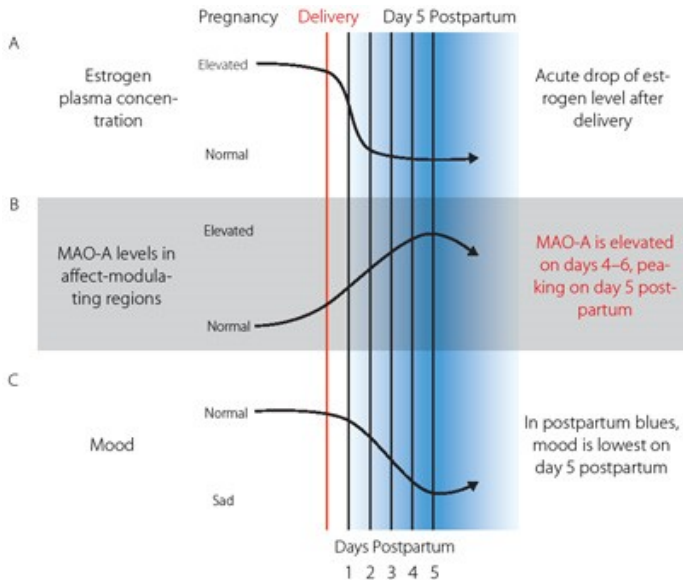
Within the first week after giving birth, up to 70 percent of all women experience symptoms of the baby blues. While most women recover quickly, up to 13 percent of all new mothers suffer from symptoms of a clinical-level postpartum depression. Postpartum depression is defined as a major depressive episode starting within 4 weeks after delivery and is a significant public health problem. Postpartum blues represents a major risk factor for developing postpartum depression and severe postpartum blues symptoms can be viewed as a prodromal stage for postpartum depression. Julia Sacher from the MPI for Human Cognitive and Brain Sciences in Leipzig and her colleague Jeffrey H. Meyer from the Centre for Addiction and Mental Health in Toronto, Canada, could now reveal an increase of the enzyme MAO-A throughout the female brain in the immediate postpartum period and propose a novel, neurobiological model for postpartum blues [Arch. Gen. Psychiatry, 26 May 2010].

Fig.: Monoamine model of postpartum blues. A: After delivery, estrogen levels drop 100- to 1000fold; the estrogen decline is greatest during the first 3 to 4 days postpartum, with a modest decline thereafter. B: Monoamine oxidase A (MAO-A) levels are significantly greater in the early postpartum period, with a peak on day 5 postpartum. C: In the early postpartum period, up to 70% of mothers experience sadness, mood lability, anxiety, insomnia, poor appetite, and irritability, with mood being lowest on day 5 postpartum.

Image: Max Planck Institute for Human Cognitive and Brain Sciences

For most women, the birth of their baby is one of the most strenuous but also happiest days in their lives. So it is very difficult to understand why almost three-quarters of all women feel down shortly after giving birth. They can suffer from extreme sadness, mood swings, anxiety, sleeplessness, loss of appetite, and irritability. For a long time, the reasons for this have been unclear. What has been known is that in the first three to four days after giving birth, estrogen levels drop 100 to 1000 fold.

In the current study researchers have discovered that proportional to this estrogen-loss, levels of the enzyme monoamine oxidase A (MAO-A) increase dramatically throughout the female brain. The enzyme can be found in higher concentrations in glial cells and monoamine-releasing neurons, where it breaks down the neurotransmitters serotonin, dopamine, and norepinephrine. As well as being responsible for transmitting signals between nerve cells, these neurotransmitters also influence our mood. If they are deficient, we initially feel sad, and later have a high risk of becoming depressed.



Using positron emission tomography (PET) - an imaging method that creates images of the distribution of a short-lived radioactive substance in an organism - the

researchers measured the distribution of a radioactively- marked ligand in the brain which binds specifically and with a high affinity to the enzyme monoamine oxidase A. They found that levels of MAO-A were, on average, 43 percent higher in women who had just had a baby than in a control group consisting of women who either had children a long time ago or had no children.
The MAO-A increase could be shown in all brain regions investigated, with MAO-A levels being highest on day five postpartum. This result fits neatly with the fact that the mood of mothers often hits a low precisely on this day.

Severe baby blues symptoms can be viewed as a prodromal stage for postpartum depression. From this perspective, preventing depressive symptoms in the immediate postpartum period may have powerful impact for prophylaxis of postpartum depression. Attempts can be made to either lower elevated levels of MAO-A with selected antagonist drugs, or to increase the concentration of monoamine neurotransmitters that can elevate mood. Both have the goal of keeping levels of monoamine neurotransmitters in the brain balanced after birth.
Given the need to develop treatments that are compatible with breastfeeding, the intake of dietary supplements of monoamine precursors in the early postpartum period would be a promising strategy to maintain a sufficient balance of monoamines during this time.
This includes the administration of precursor supplements such as the amino acids tryptophan and tyrosine, which the body can convert into the neurotransmitters serotonin, norepinephrine, and dopamine, respectively.

"Our results have the exciting potential for prevention for severe postpartum blues. This could have an impact on prevention and treatment of postpartum depression in the future", says Julia Sacher, first author of the study. *[Claudia Steinert/Rosie Wallis]*

Original work: *J. Sacher, A. A. Wilson, S. Houle, P. Rusjan, S. Hassan, P. M. Bloomfield, D. E. Stewart, J. H. Meyer* ***Elevated Brain Monoamine Oxidase A Binding in the Ear***

Anti-neutrino's odd behaviour points to new physics

* 13:33 16 June 2010 **by Anil Ananthaswamy**

Now you see it, now you don't: that's neutrinos for you. The astounding ability of these subatomic particles to morph from one type to another may have created another crack in our understanding of nature.

It may point the way to new physics that could tell us why the universe appears to be made only of matter and not antimatter too.

Physicists on the Main Injector Neutrino Oscillation Search (MINOS) experiment at Fermilab in Batavia, Illinois, were studying a phenomenon called neutrino oscillation when they found a discrepancy between neutrinos and anti-neutrinos that cannot be explained by standard model physics.

Neutrinos and their antimatter counterparts oscillate between three types: electron, tau and muon. In the MINOS experiment, muon neutrinos and muon anti-neutrinos are beamed at two detectors: a "near" detector at Fermilab itself, and a "far" detector inside a mine in Soudan, Minnesota. The particles have to pass through 700 kilometres of earth to get to the far detector.

Missing neutrinos

The particles are most likely changing into their tau counterparts. MINOS is not sensitive to taus, but infers them by measuring a deficit of muon neutrinos and anti-neutrinos.
According to our current understanding of neutrino physics, MINOS should see a similar deficit for neutrinos and anti-neutrinos, but on Monday the MINOS collaboration announced that this may not be what is happening.

When physicists measured a specific parameter related to neutrino oscillations, it was about 40 per cent greater for anti-neutrinos than for neutrinos. They say this is tentative evidence of a greater deficit in the anti-neutrino beam than in the neutrino beam.

Jenny Thomas of University College London, a spokeswoman for MINOS, stresses that the results are preliminary. "It could be an unlucky statistical fluctuation," she says. "Those things happen."

But if the effect proves solid, it could help us solve one of the biggest mysteries in physics: how an imbalance of matter and antimatter arose in the early universe.

The discrepancy could be due to a difference in the way neutrinos oscillate compared with anti-neutrinos. Or the anti-neutrinos may be interacting with the 700 kilometres of rock in a way that is not understood.

"If the effect is real, then there is some physics that is not expected," says Thomas. "Then there is something new that we don't understand, and that's fantastic."

Antonio Ereditato at the University of Bern, Switzerland, a spokesman for the OPERA neutrino experiment in Italy says: "This is once more proof that neutrino physics is a privileged tool to assess new physics." But he adds that statistically robust results are needed.

Male desire to be strong and protect family key to preventing suicides: UBC study

Masculine ideals of strength coupled with strong family ties can help men combat depression and overcome thoughts of suicide, according to University of British Columbia research.

In a study to appear in a forthcoming issue of Social Science and Medicine, UBC researchers John Oliffe and John Ogrodniczuk looked at how men's ideas of masculinity served or hindered them during bouts of severe depression. Their findings shed light on risk factors and prevention strategies for suicide.

The authors analyzed qualitative data from interviews with 38 men between 24 and 50 years of age living in Vancouver and Prince George. The participants were self-identified or were formally diagnosed with depression.

The study suggests that men can best counter suicidal thoughts by connecting with others – namely intimate partners and family – to regain some stability and to secure emotional support from others.

"Support from friends and connecting to other things including spirituality is often the conduit to men seeking professional help to overcome the suicidal thoughts that can accompany severe depression" says lead author Oliffe, an associate professor in the School of Nursing.

Men die by suicide at least three times more than women although it is women who are diagnosed at twice the rate of men for depression. Men aged 20-29 have the highest rate of suicide. Statistics Canada reports that in 2003, the last year for which data is available, more than 2,900 men committed suicide.

The investigators found that most study participants expressed a strong commitment to their families and turned away from suicide for the hurt and trauma it would cause loved ones.

"Here, men's strong sense of masculine roles and responsibility as a provider and protector enables men to hold on while seeking support to regain some self-control," says Oliffe.

But Ogrodniczuk says the "stoic warrior" ideal also presents a downside that can lead men to shut down and look for escape. In these situations, study participants chose to mute their feelings or disconnect from others. They often overused alcohol and other drugs.

"Instead of finding respite from their emotional, mental and physical pain, self-harm emerged as the most common outcome of these actions," says Ogrodniczuk, an associate professor in the Dept. of Psychiatry

The study received support from the Canadian Institutes of Health Research (CIHR), which supports better health and healthcare for Canadians. As the Government of Canada's health research investment agency, CIHR enables the creation of evidence-based knowledge and its transformation into improved treatments, prevention and diagnoses, new products and services, and a stronger, patient-oriented healthcare system. Composed of 13 internationally-recognized institutes, CIHR supports more than 13,000 health researchers and trainees across Canada. www.cihr-irsc.gc.ca

Why do certain diseases go into remission during pregnancy?

University of Michigan and NIH scientists find a biological mechanism to explain the phenomenon

ANN ARBOR, Mich. -- During pregnancy, many women experience remission of autoimmune diseases like multiple sclerosis and uveitis. Now, scientists have described a biological mechanism responsible for changes in the immune system that helps to explain the remission.

The expression of an enzyme known as pyruvate kinase is reduced in immune cells in pregnant women compared to non-pregnant women, according to Howard R. Petty, Ph.D., biophysicist at the University of Michigan Kellogg Eye Center and Roberto Romero, M.D., of the National Institutes for Health.

The study, which appears online ahead of print in the August issue of the American Journal of Reproductive Immunology, also reports that expression of the enzyme is lower in pregnant women compared to those with pre-eclampsia, a condition with inflammatory components.

The study is significant because the newly discovered mechanism points to a pathway that could be targeted for treatment. “It may be possible to design drugs that mildly suppress pyruvate kinase activity as a means of replicating the immune status of normal pregnancy,” says Petty.

In addition to pre-eclampsia, he believes that rheumatoid arthritis, type 1 diabetes, and uveitis may eventually yield to similarly designed drugs.

In his search to explain the phenomenon, Petty knew to look for a metabolic pathway or mechanism with two characteristics. It had to “dial down” the intensity of the normal immune response, an action needed so that a pregnant woman does not reject the fetus, which has proteins from the father that are “foreign” to the mother. At the same time, such a mechanism must support cell growth needed by the developing fetus.

The activity of the enzyme pyruvate kinase—and and its product, pyruvate—fills both roles: promoting cell growth while modifying the immune response. Because pyruvate kinase activity is depressed during pregnancy, cell metabolism supports an increased production of lipids, carbohydrates, amino acids, and other substances that support cell growth.

Petty explains that our normal robust immune response depends upon pyruvate to promote calcium signaling, which, in turn, stimulates the production of messenger molecules called cytokines. When pyruvate is decreased during pregnancy, calcium signaling is also reduced, and the immune response is different than that in non-pregnant individuals. Says Petty, "Modification of signaling along this pathway allows the pregnant woman to maintain an immune response, but at a level that will not harm the fetus."

The study included 21 women in their third trimester of a normal pregnancy, 25 women with pre-eclampsia, and a control group of non-pregnant women. Petty and colleagues used a variety of methods to confirm their findings, including fluorescence microscopy and flow cytometry, which are used to study cell signaling.

The higher levels of the enzyme seen in women with pre-eclampsia bolster the study's findings, says Petty. "Pre-eclampsia has features of inflammatory disease. If you don't reduce these pyruvate levels, you heighten inflammatory disease," he adds. Petty wonders whether one day enzyme levels could be tested early in pregnancy to predict the likelihood of developing pre-eclampsia or other complications.

It is possible, says Petty, that the general mechanisms described in the current study may apply to more than one complication of pregnancy. This possibility—and that of designing drugs to suppress pyruvate kinase activity—is the focus of future research. "I have a long list of things I'd like to see developed for the clinic in the next five years," adds Petty.

Romero is chief of the Perinatology Research Branch (PRB) of the National Institute of Child Health and Human Development/National Institutes of Health (NICHD/NIH)

Reference: Leukocyte Pyruvate Kinase Expression Is Reduced in Normal Human Pregnancy but Not in Pre-eclampsia. Amer J Reprod Immunol, online 6.15.10 at http://www3.interscience.wiley.com/cgi-bin/fulltext/123525215/HTMLSTART

Gut-residing bacteria trigger arthritis in genetically susceptible individuals

Written by Mary Bates

BOSTON, Mass – A single species of bacteria that lives in the gut is able to trigger a cascade of immune responses that can ultimately result in the development of arthritis.

Our gut, like that of most mammals, is filled with thousands of species of bacteria, many of which are helpful and aid in the development of a normal, healthy immune system. Gut-residing bacteria can also play a role in disorders of the immune system, especially autoimmune disorders in which the body attacks its own cells.

It turns out that rheumatoid arthritis is one such disorder. Researchers in the laboratories of Christophe Benoist and Diane Mathis at Harvard Medical School and Dan Littman at New York University made this discovery while working in mice prone to arthritis.

"In the absence of all bacteria, these mice didn't develop arthritis, but the introduction of a single bacterium was enough to jump-start the immune process that leads to development of the disease," says Mathis, an HMS professor of pathology.

The findings appear in the June 25 issue of the journal Immunity.

The researchers began by raising arthritis-prone mice in a germ-free environment. The mice had much lower levels of arthritis-causing autoantibodies than mice raised in a non-germ-free facility. The germ-free mice also showed strong attenuation in the onset and severity of clinical arthritis.

At three weeks of age, some mice were transferred to a non-germ-free facility and the researchers introduced segmented filamentous bacteria into their systems. When they introduced this normally-occurring bacteria into the mice, the animals rapidly began producing autoantibodies and developed arthritis within four days.

First author Hsin-Jung Wu emphasizes that these bacteria do not cause the mice to "catch" arthritis. "It's more that they have the genetic susceptibility, and this bacterium creates an environment that allows this genetic susceptibility to play out," says Wu, a postdoctoral researcher at Harvard Medical School. "It's an interaction between genetics and the environment."

The team mapped out the complex chain of events leading to arthritis. The segmented filamentous bacteria cause the animals to produce more of a particular subset of T cells. The immune system reacts to the activity of the T cells as if to a foreign threat and produces autoantibodies that trigger the devastating disease.

One surprising finding was that bacteria in the gut could influence the development of an autoimmune disease affecting tissues distant from the gut. Diseases such as irritable bowel syndrome have been linked to gut-residing bacteria, but this study is unique in showing the mechanism by which a bacterium in the gut can influence the development of an autoimmune response that ends in inflammation and pain in the joints.

The team will continue to use this mouse model of arthritis to answer questions about the link between the disease and autoimmune response. Next, they plan on tackling the molecular explanation of how these bacteria promote the development of this particular subset of T cells and to explore connections with other autoimmune diseases, in particular type-1 diabetes. *This research was funded by the National Institutes of Health.*

New link identified for bipolar disorder

Possible mechanism identified for how lithium treats bipolar disorcer

Lithium has been established for more than 50 years as one of the most effective treatments for manic depression, clinically termed bipolar disorder.

However, scientists have never been entirely sure exactly why it is beneficial.

Now, new research from Cardiff University scientists suggests a possible mechanism for why Lithium works, opening the door for better understanding of the illness and potentially more effective treatments.

Laboratory studies with cells have shown that an enzyme known as prolyl oligopeptidase (PO) controls a set of genes that determine sensitivity to lithium. Among these genes is ImpA2, which like PO activity itself, has been associated with differences in some bipolar patients. These results reveal a new mechanistic link that could explain these changes in these patients.

Professor Adrian Harwood of Cardiff School of Biosciences, who led the research, said: "We still cannot say definitively how lithium can help stabilise bipolar disorder. However, our research has uncovered a new cell signalling process with links to bipolar disorder.

"This introduces a new mechanism and more candidate genes whose study could lead to greater understanding of the causes of bipolar disorder, better diagnostic tests and new types of drugs that are more effective and have fewer side effects than Lithium does at present."

The research, funded by the Wellcome Trust, is published in the international journal PLoS ONE.

Illegal bushmeat 'rife in Europe'

By Mark Kinver Science and environment reporter, BBC News

About 270 tonnes of illegal bushmeat could be passing through one of Europe's busiest airports each year, the first study of its kind estimates. A team of researchers says the illicit trade could pose a risk to human or animal health and increase the demand for meat from threatened species. The figure is based on seizures from searches carried out over 17 days at Charles de Gaulle airport in Paris. The findings appear in the journal Conservation Letters.

Two primate species were among the seizures of bushmeat by customs **(Image: Anne-Lise Chaber)**

A team of researchers from France, Cambodia and the UK said it was the "first systematic study of the scale and nature of this international trade". "We estimate that about five tonnes of bushmeat per week is smuggled in personal baggage through Paris Roissy-Charles de Gaulle airport," they wrote.

During the 17-day study, a total of 134 passengers arriving on 29 flights from 14 African nations were searched. Nine people were found to be carrying bushmeat, which had a combined mass of 188kg.

In total, 11 species were found - including two types of primates, two kinds of crocodiles and three rodent species - four of which were listed as protected species.

'Lucrative trade'

Co-author Marcus Rowcliffe from the Zoological Society of London (ZSL) explained why the international team of researchers decided to carry out the research. "As no study like this had been carried out before, we really had no idea as to the volume of bushmeat coming into airports," he told BBC News. "It was a surprise when we saw how much was arriving."

The products were not only imported for personal consumption, but were part of a lucrative organised trade with high prices indicating luxury status, Dr Rowcliffe added. "A 4kg monkey will cost around 100 euros (£84), compared with just five euros in Cameroon," he said.

Based on the data gathered from the 29 flights covered by the study, the researchers then calculated the weekly and annual inward flow of bushmeat. "Assuming that (the study's) rates are representative of the average weekly rate over the year, this equates to... 273 tonnes of bushmeat," they calculated.

The team suggested that there were likely to be a number of factors behind the large volume of bushmeat being imported. "First, detecting and seizing these products is not a priority," they explained. "Second, penalties for importing illegal meat or fish are low and rarely imposed. Third, the rewards for transporting bushmeat are potentially high."

The researchers acknowledged that the study had a short time scale and limited geographical coverage, and said that a longer and large scale survey was now required to build on the findings.

However, they added that their study did allow them to consider ways to control the trade.

They suggest offering incentives to customs officers, increasing the penalties for illegally importing the products and raising awareness among passengers that bringing such products into the EU was prohibited.

The team concluded: "The large scale of current imports makes it important to consider all options for reducing the flow of illegal meat and fish, and of bushmeat in particular."

Orphaned elderly serious casualty of African AIDS epidemic, Stanford study finds

STANFORD, Calif. — The rise in AIDS death rates in sub-Saharan Africa has led to a burgeoning new category of neglected individuals — nearly a million orphaned elderly, or older adults living alone without the benefit of any caregivers, Stanford University School of Medicine researchers have found.

The researchers used existing data to develop the first estimates on the number of elderly individuals left alone, without any adult support, as a result of the AIDS epidemic, said Grant Miller, PhD, MPP, assistant professor of medicine, who is affiliated with the Stanford Center for Health Policy.

"We find that AIDS has produced close to a million elderly people in sub-Saharan Africa who are living without the support of their sons, daughters or other younger adults. Many of them also live with young children under 10 years of age, creating households with a missing generation of adults," said Miller, senior author of the study. "I think this probably understates the magnitude of the problem. We were unable to closely examine material living conditions or elderly health."

The study appears in the June 16 online issue of the British Medical Journal. Miller's co-authors at the Stanford Center for Health Policy are Jay Bhattacharya, MD, PhD, associate professor of medicine, and Eran Bendavid, MD, instructor of medicine.

Miller said he and his colleagues were stunned to learn that no one had taken a systematic look at this potentially large group of needy individuals. "It just blew me away," he said. "We all know we have this problem with orphaned children. I wondered, do we have a similar problem with orphaned elderly? I searched a variety of publications and didn't find a clear answer."

Tim Kautz, the lead author of the study, said the idea for the project struck a chord with him, as he had spent a summer doing AIDS education in rural Tanzania. He lived there with a family that had taken in an unrelated, elderly villager who had no one else to look after him.

"I saw both the devastation caused by AIDS and the importance of the family in caring for the elderly. This project was a way to combine the two observations," said Kautz, a former Stanford undergraduate now pursuing a PhD in economics at the University of Chicago.

The researchers used data from the Demographic and Health Survey, a USAID-funded database that provides standardized information on maternal/child health, HIV and other health indicators in low- and middle-income countries. The survey covered 123,000 individuals over age 60 living in 22 African countries between 1991 and 2006.

The scientists found a very strong correlation between the rise in AIDS death rates in these countries and an increase in elderly individuals living alone. For every one-point increase in AIDS mortality rates, they found a 1.5 percent increase in elderly people left to manage on their own.

In the 22 countries, the estimates translated into 582,200 to 917,000 elderly people left unattended, the researchers found. About a third of them — or as many as 323,000 — were also caring for young children. These individuals were more likely to be women, uneducated, living in rural areas and poorer than their attended counterparts. The results suggest HIV/AIDS has had a disproportionate impact on elderly people of lower socioeconomic status, the researchers reported.

Kautz said he was surprised the figures weren't even higher. He said he believes there are many more older individuals who have been left alone as their children die of AIDS, but that these elders have moved in with relatives or neighbors. These individuals would not be accounted for in the study, he said.

Although HIV has generally reduced life expectancies in Africa, those who escape the epidemic are living much longer as a result of greater access to health technologies, the researchers said. So there is an increased need for elder care services, they noted.

Yet few African countries have public pension programs or formal systems for caring for elders; most rely on traditional family structures, now undercut by the strain of AIDS, to provide this service. The researchers said the study points to the importance of taking these needy elders into consideration in allocating resources and planning programs.

"This is another component of the social consequences of HIV. So people in agencies who make resource allocation decisions need to consider this cost of HIV, and it's a pretty important one," Miller said. "Those working on the ground dealing with late-stage AIDS patients also need to think about the dependents of these patients."

Policies that help reduce AIDS mortality also will be of help to this group, he said.

"Future work is needed to more closely examine the health and overall welfare of this population, but our work suggests that reducing AIDS deaths in Africa may provide substantial benefits to this under-recognized population," the researchers concluded.

The researchers said the study is just a first step in understanding the problem. They speculate that elderly individuals who are alone suffer greater health problems, though they didn't specifically address the issue in the study. Similarly, they did not look at quality-of-life issues, though they suspect that these elders suffer physical and financial burdens as a result of being primary caregivers for young children. More research is needed on the health, well-being and other issues associated with these neglected elders, they said.

The study was funded by the National Institutes of Health.

Teenagers want to finish their studies and leave home

Two researchers from the University of Santiago de Compostela (USC) have studied the relationship between teenagers' goals and antisocial behaviour. The results show that the principal goal of young people is to finish their studies and leave home. The most antisocial among them place greater importance on popularity with others.

"The goals that teenagers place most importance on are to do with leaving home, work and education, in other words they are related to finishing their studies and academic achievements", Laura López Romero, co-author of the study with Estrella Romero and a researcher at the USC, tells SINC.

"Antisocial goals are to deceive, steal or bypass rules and laws, but not as a means to an end, rather as an end in themselves. In other words, taking part in this kind of behaviour is a goal in itself for adolescents, because it allows them to achieve social recognition and to establish an identity and antisocial reputation, which gives them a certain level of popularity with others", says López Romero.

The objective of the study, which has been published recently in the Spanish Journal of Psychology, was to study how teenagers' goals were structured, and the relationship between these and antisocial behaviour. It was based on questionnaires handed out to a sample of 488 participants, aged between 12 and 18, at six public schools in Galicia.

The students had to state the importance they placed on each goal, using a scale of six options. "Then we analyzed the young people's involvement in antisocial behaviour", the expert points out. The study is based on these data. The researchers also studied the role of gender in the relationship between goals and antisocial behaviour.

The conditioning of gender roles

Out of the teenagers interviewed, 233 were boys (47.8 %) and 254 were girls (52.2%). "We observed very classic differences between the two groups. The girls placed more importance on goals related to education and interpersonal-family aspects, while the boys set targets that were more antisocial or related to sporting achievements", explains López Romero.

The only factor without any difference between the two was their goal of leaving home. "Both groups were the same in terms of their aspirations about gaining autonomy and freedom", says the expert.

Music and speech share a code for communicating sadness in the minor third

By Ferris Jabr

Here's a little experiment. You know "Greensleeves"-the famous English folk song? Go ahead and hum it to yourself. Now choose the emotion you think the song best conveys: (a) happiness, (b) sadness, (c) anger or (d) fear.

Almost everyone thinks "Greensleeves" is a sad song—but why? Apart from the melancholy lyrics, it's because the melody prominently features a musical construct called the minor third, which musicians have used to express sadness since at least the 17th century. The minor third's emotional sway is closely related to the popular idea that, at least for Western music, songs written in a major key (like "Happy Birthday") are generally upbeat, while those in a minor key (think of The Beatles' "Eleanor Rigby") tend towards the doleful.

The tangible relationship between music and emotion is no surprise to anyone, but a study in the June issue of Emotion suggests the minor third isn't a facet of musical communication alone—it's how we convey sadness in speech too. When it comes to sorrow, music and human speech might speak the same language.

In the study, Meagan Curtis of Tufts University's Music Cognition Lab recorded undergraduate actors reading two-syllable lines—like "let's go" and "come here"—with different emotional intonations: anger, happiness, pleasantness and sadness (listen to the recordings here). She then used a computer program to analyze the recorded speech and determine how the pitch changed between syllables. Since the minor third is defined as a specific measurable distance between pitches (a ratio of frequencies), Curtis was able to identify when the actors' speech relied on the minor third. What she found is that the actors consistently used the minor third to express sadness.

"Historically, people haven't thought of pitch patterns as conveying emotion in human speech like they do in music," Curtis said. "Yet for sad speech there is a consistent pitch pattern. The aspects of music that allow us to identify whether that music is sad are also present in speech."

Curtis also synthesized musical intervals from the recorded phrases spoken by actors, stripping away the words, but preserving the change in pitch. So a sad "let's go" would become a sequence of two tones. She then asked participants to rate the degree of perceived anger, happiness, pleasantness and sadness in the intervals. Again, the minor third consistently was judged to convey sadness.

A possible explanation for why music and speech might share the same code for expressing emotion is the idea that both emerged from a common evolutionary predecessor, dubbed "musilanguage" by Steven Brown, a cognitive neuroscientist at Simon Fraser University in Burnaby (Vancouver), British Columbia. But Curtis points out that right now there is no effective means of empirically testing this hypothesis or determining whether music or language evolved first.

What also remains unclear is whether the minor third's influence spans cultures and languages, which is one of the questions that Curtis would like to explore next. Previous studies have shown that people can accurately interpret the emotional content of music from cultures different than their own, based on tempo and rhythm alone. "I have only looked speakers of American English, so it's an open question whether it's a phenomenon that exists specifically in American English or across cultures," Curtis explained. "Who knows if they are using the same intervals in, say, Hindi?"

Love ballad leaves women more open to a date

If you're having trouble getting a date, French researchers suggest that picking the right soundtrack could improve the odds. Women were more prepared to give their number to an 'average' young man after listening to romantic background music, according to research that appears today in the journal Psychology of Music, published by SAGE.

There's plenty of research indicating that the media affects our behaviour. Violent video games or music with aggressive lyrics increase the likelihood of aggressive behaviour, thoughts and feelings – but do romantic songs have any effect? This question prompted researchers Nicolas Guéguen and Céline Jacob from the Université de Bretagne-Sud along with Lubomir Lamy from Université de Paris-Sud to test the power of romantic lyrics on 18-20 year old single females. And it turns out that at least one romantic love song did make a difference.

Guéguen and Jacob were part of a research team that had already shown how romantic music played in a flower shop led to male customers spending more money. This time the researchers used questionnaires to pinpoint agreed-upon neutral and romantic songs. They chose 'Je l'aime à mourir', a well-known love song by French songwriter Francis Cabrel, and the neutral song 'L'heure du thé', by Vincent Delerm. A group of young women separate from the main study rated 12 young male volunteers for attractiveness, and the researchers picked the one rated closest to 'average' to help with the experiment.

The researchers then set up a scenario where the 87 females each spent time in a waiting room with background music playing, before moving to a different room where the experimenter instructed her to discuss the difference between two food products with the young man. Once the experimenter returned, she asked them to wait for a few moments alone, and this gave the 'average' male a chance to use his standard chat up line: "My name is Antoine, as you know, I think you are very nice and I was wondering if you would give me your phone number. I'll phone you later and we can have a drink together somewhere next week.'

The love song in the waiting room almost doubled Antoine's chances of getting a woman's number – 52% of participants responded to his advances under the influence of Francis Cabrel, whereas only 28% of those who had heard the 'neutral' song by Vincent Delerm offered their details.

"Our results confirm that the effect of exposure to media content is not limited to violence and could have the potential to influence a high spectrum of behaviour," says Guéguen. "The results are interesting for scientists who work on the effect of background music on individuals' behaviour."

The results also add weight to a general learning model proposed by Buckley and Anderson in 2006 to explain the effect of media exposure. Their model states that media exposure in general, and not only aggressive or violent media, affects individuals' internal states, which explains why prosocial media fosters prosocial outcomes.

Why did the music have this effect? It may be that, as shown in earlier research, the music induced positive affect (in psychological terms, affect is the experience of feeling or emotion). Positive affect is associated with being more receptive to courtship requests. Alternatively, the romantic content of the song may have acted as a prime that then led to displays of behaviour associated with that prime. In either case, further research is needed before the researchers will commit to wider generalisations on the targeted use of love songs. But if you're a hopeful single, awareness of the background music certainly won't do any harm.

Nicolas Guéguen, Céline Jacob and Lubomir Lamy 'Love is in the air': Effects of songs with romantic lyrics on compliance with a courtship request Psychology of Music 38 (3) The article will be available free for a limited period: http://pom.sagepub.com/cgi/reprint/38/3/303

Panel Recommends Approval of After-Sex Pill to Prevent Pregnancy

By GARDINER HARRIS

GAITHERSBURG, Md. — A federal advisory panel voted unanimously Thursday that federal drug regulators should approve a medicine that could help prevent pregnancy if taken as late as five days after unprotected sex.

The pill, called ella, sprang from government labs and appears to be more effective than Plan B, a morning-after pill now available over the counter to women 18 and older that gradually loses efficacy after intercourse and can be taken at latest three days after sex. Ella, by contrast, works just as well on the fifth day as the first after sex.

Ella blocks the effects of progesterone, a female hormone that spurs ovulation. It is a chemical relative to RU-486, the abortion pill, and some mystery remains over exactly how it works. That mystery spurred a fierce debate outside the committee over whether it should be considered an abortion drug, a debate that prompted the posting of several uniformed police officers around the meeting room.

The F.D.A. usually follows the advice of its advisory panels but not always.

The dispute is whether the drug works by delaying ovulation (as the pill's manufacturer claims) or by preventing a fertilized egg from implanting itself in the uterus (as anti-abortion advocates say).

Dr. Jeffrey Bray, a pharmacologist at the Food and Drug Administration, said that ella may do both. And Dr. Scott Emerson, a committee member and professor of biostatistics at the University of Washington, said any drug that can prevent pregnancy if taken five days after unprotected sex must do more than simply delay ovulation.

Animal studies showed that ella had little effect on established pregnancies, suggesting it acts differently than RU-486. Dr. David Archer, a professor of obstetrics and gynecology at Eastern Virginia Medical School who spoke on behalf of ella's maker, said ella was not an abortion pill. "I just don't think there is any element here that would allow me to say that this has an abortifacient activity," Dr. Archer said.

Ella is manufactured by HRA Pharma, a tiny French drug maker. If approved, the medicine would be available by prescription only. Born in the United States, ella was approved for sale in Europe last fall. During the meeting, anti-abortion and abortion rights advocates traded salvos. Wendy Wright, president of Concerned Women for America, a conservative group, called ella an unsafe abortion pill that men might slip to unsuspecting women.

"With ella, women will be enticed to buy a poorly tested abortion pill in the guise of a morning-after pill," she said. Ms. Wright was followed to the microphone by Amy Allina, program director of the National Women's Health Network, who said abortion questions were distractions intended to prevent "medically safe contraceptive options from becoming available."

The committee spent the day in a cold discussion of the sobering realities that follow moments of passion, a discussion punctuated by the clacking of knitting needles from Dr. Paula Hilliard, a committee member and professor of gynecologic specialties at the Stanford University School of Medicine. It was a conversation mostly among women. Dr. Erin Gainer, HRA Pharma's chief executive, is a young woman, and nine of the committee's 11 members are women. Women's health advocates say that the need for better contraceptive options is clear.

James Trussell, director of the Office of Population Research at Princeton University, who spoke on behalf of the company, said that more than one million women who do not want to get pregnant are estimated to have unprotected sex every night in the United States, and more than 25,000 become pregnant every year after being sexually assaulted. Half of all pregnancies in the United States are unintended even though contraceptives are almost universally accepted by women.

Even though ella is somewhat more effective and can be taken later than Plan B, the new drug would, if approved, probably do little to solve this epidemic of unplanned pregnancies. Plan B has been available without a prescription since 2006 for women 18 and older, but abortion and unintended-pregnancy rates have remained largely unchanged.

Women who have unprotected sex have about one chance in 20 of becoming pregnant. Those who take Plan B within three days cut that risk to about one chance in 40, and if ella is approved, that risk would be cut further to about one chance in 50. Ella is less effective in obese women, studies show.

Dr. Valerie Montgomery Rice, a committee member and dean of Meharry Medical College in Nashville, pressed the company and F.D.A. to make the drug available over the counter, as is Plan B. "Why would we not move to O.T.C. status?" she asked. Dr. Gainer said the medicine was too new to consider such a step.

Ella was originally developed by the National Institute of Child Health and Human Development. The institute, now named after Eunice Kennedy Shriver, is part of the National Institutes of Health. It decided in 2002 during the avowedly anti-abortion Bush administration to finance a crucial study to assess the drug's efficacy as an emergency contraceptive.

Like fireflies, earthquakes may fire in synchrony

Small stresses might bring big results, says study

In nature, random signals often fall mysteriously in step. Fireflies flashing sporadically in early evening soon flash together, and the same harmonic behavior can be seen in chirping crickets, firing neurons, swinging clock pendulums and now, it turns out, rupturing earthquake faults.

Scientists have well established that big earthquakes can trigger other big quakes by transferring stress along a single fault, as successive earthquakes in Turkey and Indonesia have shown. But some powerful quakes can set off other big quakes on faults tens of kilometers away, with just a tiny nudge, says a new paper. Christopher Scholz, a seismologist at Columbia University's Lamont-Doherty Earth Observatory, explains how: the faults are already synchronized, he says.

Scholz argues in the most recent issue of the Bulletin of the Seismological Society of America that when a fault breaks, it may sometimes gently prod a neighboring fault also on the verge of fracturing. The paper finds evidence for synchronized, or "phase locked," faults in southern California's Mojave Desert, the mountains of central Nevada, and the south of Iceland. Drawing on earthquake patterns as far back as 15,000 years, the paper identifies strings of related earthquakes, and explains the physics of how faults separated by up to 50 kilometers, and rupturing every few thousand years, might align themselves to rupture almost simultaneously.

"All of a sudden bang, bang, bang, a whole bunch of faults break at the same time," says Scholz. "Now that we know that some faults may act in consort, our basic concept of seismic hazard changes. When a large earthquake happens, it may no longer mean that the immediate future risk is lower, but higher."

The idea of independent events synchronizing themselves goes back to the Age of Discovery and the pendulum clock, invented as scientists and navigators were searching for a device to measure longitude at sea. In 1665, Christiaan Huygens, the Dutch mathematician who invented the pendulum clock (a dead end, it turned out, in solving the longitude problem) first described how the pendulums of two clocks hanging from the same wall became synchronized. Known as entrainment, or coupled oscillation, this phenomenon is caused by the motion of the two pendulums communicating through the beam supporting the clocks.

Entrainment can also happen when faults lie relatively close, between 10 and 50 kilometers apart, and are moving at comparable speeds, Scholz says. As faults break successively over time, their cycles may eventually fall in sync, a process described in the paper by the mathematical "Kuramoto Model."

The paper provides real-world examples from places where geologists and seismologists have compiled a long record of past quakes. In the Mojave Desert, the Camp Rock fault, a secondary fault off the San Andreas, ruptured in 1992, causing a magnitude 7.3 quake in the town of Landers, killing one child. Seven years later, the Pisgah fault, 24 kilometers away, broke, causing a magnitude 7.1 quake at Hector Mine, inside the Twentynine Palms Marine Corps Base.

When a fault ruptures in a large earthquake, the movement releases stresses that may have built up over millennia. But the movement also transfers a small amount of that stress, usually a fraction of a percent, to nearby faults. In order for that tiny added stress to trigger a large earthquake on a nearby fault, that fault had to already be very near its breaking point, says Scholz. For the two faults to have been simultaneously near their breaking points requires them to be synchronized in their seismic cycles.

Paleoseismology—that is, studies of the physical signs left by past earthquakes-- show that the Mojave faults rupture every 5,000 years or so, so the relatively short seven-year lag between the Landers and Hector Mine quakes suggested to Scholz the timing could not be random. When he looked at the paleoseismological record, he saw that both faults had ruptured together before, at about 5,500 years ago and 10,000 years ago. He noticed a similar trend with the nearby Lenwood and Helendale faults, which had ruptured together 1,000 years ago and 9,000 years ago. And, the two fault pairs happened to be moving at virtually the same pace, 1 millimeter and .8 millimeter, respectively.

He noticed a similar trend in Nevada. In the summer of 1954, the Rainbow Mountain fault system was hit by five earthquakes ranging in magnitude from 5.5 to 6.8. The action culminated on Dec. 16 with a 7.1 quake on Fairview Peak and a 6.8 quake four minutes later on the Dixie Valley fault, 40 kilometers away. Again, the triggering stress was a small fraction of a percent. Paleoseismic evidence showed that similar groups of faults nearby had produced clusters of earthquakes every 3,000 years or so over the last 12,000 years.

The same pattern emerged in Iceland. In June 2000, two quakes--magnitudes 6.5 and 6.4-- struck within four days of each other on parallel faults 14 kilometers apart. In 1896, five large quakes struck on different neighboring faults within 11 days of each other, with similar clusters occurring in 1784, and from 1732 to 1734.

Scholz says his hypothesis of synchronized faults could make it easier to assess some earthquake hazards by showing that faults moving at similar speeds, and within roughly 50 kilometers of each other, may break at similar times, while faults moving at greatly different speeds, and located relatively far apart, will not.

However, seismologists have yet to come up with a reliable method for predicting imminent earthquakes; the best they can do so far is to identify dangerous areas, and roughly estimate how often quakes of certain sizes may strike.

Ross Stein, a geophysicist at the U.S. Geological Survey, who was not involved in the study, questioned the paper's wider significance. There is "good" evidence for historic earthquake sequences, and "possible" evidence for prehistoric sequences, he said, but those quakes make up a minority of earthquake events.

Probiotic Prophylactic: Bacteria May Protect Critically Ill Patients against Pneumonia

A solution of Lactobacillus administered to patients on mechanical ventilators cut the incidence of pneumonia nearly in half, suggesting that probiotics may be useful for the prevention of hospital-acquired infections

By Nicholette Zeliadt

GOOD GERM: Microscopic image of Lactobacillus **ISTOCKPHOTO**

How's this for preventative medicine?: Ingesting bacteria may help to prevent infections.

Researchers at Creighton University School of Medicine in Omaha, Neb., recently demonstrated that regular doses of probiotic bacteria given to hospital patients on mechanical ventilators resulted in fewer cases of pneumonia. The findings were published online June 3 in the American Journal of Respiratory and Critical Care Medicine.

Probiotics, live microorganisms thought to provide a health benefit when consumed in sufficient amounts, are frequently used to mitigate a variety of conditions, including digestive disorders such as antibiotic-associated diarrhea, lactose intolerance and irritable bowel syndrome. Scientific evidence to back many claims, however, is often preliminary at best or lacking entirely. The new study demonstrates that one strain of so-called beneficial bacteria can prevent pneumonia in some patients, and may be useful for the prevention of hospital-acquired infections.

Lee Morrow, an associate professor of medicine at Creighton and lead author of the study, along with his colleagues administered a solution containing the human intestinal probiotic bacteria, Lactobacillus rhamnosus GG or a placebo to 138 critically ill patients on ventilators. The study was designed so that neither patients nor care providers knew which group received probiotics. The patients received treatment twice daily and were monitored routinely for the presence of pneumonia-causing pathogens. The researchers observed that probiotic treatment reduced the number of cases of pneumonia by nearly half.

"We chose to study probiotics in this context because ventilator-associated pneumonia (VAP) is increasingly caused by pathogens associated with antimicrobial resistance, and the supply of novel antibiotics is essentially nonexistent for the foreseeable future," Morrow said in a prepared statement.

Pneumonia affects nearly 30 percent of patients on ventilators; it can result when microorganisms from the mouth or ventilator equipment are inhaled into the lungs. In addition to causing health complications for individuals who are already critically ill, VAP results in higher health care costs.

"This is an enormous accomplishment," says Donald Craven, a physician at the Lahey Clinic Medical Center in Burlington, Mass., who was not involved in the study. The results "hold promise for trying to prevent an infection that has serious morbidity, mortality and is a major factor for hospital costs that we're trying to contain," he adds.

Patients receiving probiotics were also less likely to develop diarrhea caused by Clostridium difficile, a common bacterium found in health care venues, and required less antibiotic treatment when C. difficile infections occurred. No side effects were associated with either the placebo or probiotic treatment.

In support of the current findings, a recent systematic review of previous studies of the use of various probiotic strains suggested that probiotics may reduce VAP by 39 percent. The mechanism by which probiotics prevent pneumonia, however, remains unresolved. Some evidence suggests that probiotics may modulate the immune system to help it to ward off pathogens. Future studies will be necessary to identify the precise mechanism as well as the optimal dose and strain of probiotics for specific conditions.

Under certain circumstances probiotics can actually be harmful and cause secondary infections. The authors cautioned that their preliminary findings apply only to the carefully monitored study population, and should not be generalized to all hospital patients. Furthermore, the results need to be replicated by research at other care facilities, ideally using a diversity of patient populations.

Nevertheless, Morrow and colleagues suggest that probiotic treatment could be a novel, inexpensive, nonantibiotic approach to preventing secondary infections. Using Lactobacillus rhamnosus GG to prevent pneumonia "appears safe and efficacious in a select population of patients," the authors concluded.