

Can too much HDL be harmful to women with type 1 diabetes?

ORLANDO, Fla., June 26 - Elevated blood levels of high-density lipoprotein (HDL) or "good" cholesterol, typically thought to protect against heart disease, may do the opposite in women with type 1 diabetes, according to a University of Pittsburgh Graduate School of Public Health study being presented at the 70th Scientific Sessions of the American Diabetes Association.

The study, abstract number 0098-OR, included 658 men and women enrolled in the Pittsburgh Epidemiology of Diabetes Complications Study, a long-term prospective examination of childhood onset type 1 diabetes that began in 1986. Participants were diagnosed with type 1 diabetes between 1950 and 1980.

HDL cholesterol is known as "good" cholesterol because it helps prevent arteries from becoming clogged. High levels of HDL cholesterol, over 60 milligrams per deciliter (mg/dL), generally protect against heart disease, while low levels (less than 40 mg/dL for men and less than 50 mg/dL for women) increase risk.

Study researchers found the incidence of heart disease increased in both men and women with diabetes who had lower levels of HDL - below 47.5 mg/dL. For men, as levels of HDL increased, their incidence of heart disease decreased. The same was found for women, except in those with very high levels of HDL (over 80 mg/dL) whose incidence of heart disease increased substantially. Study authors were unable to draw a meaningful comparison to male participants since only a few had HDL over 80 mg/dL.

"Although high levels of HDL are typically associated with decreased risk for cardiovascular disease, this may not be the case for women who have type 1 diabetes and HDL in the upper ranges," said Tina Costacou, Ph.D., lead author of the study and assistant professor of epidemiology, University of Pittsburgh Graduate School of Public Health. "We need to examine this relationship further, but our study suggests that too much of a good thing may not always offer protection and may even be harmful for women with type 1 diabetes."

Study co-authors include Rhobert Evans, Ph.D., and Trevor Orchard, M.D., of the University of Pittsburgh. The study was funded by the National Institutes of Health.

Combination MMRV vaccine linked with 2-fold risk of seizures

Electronic health records study of 459,000 children sparked new CDC recommendations

Oakland, CA (June 28) - The combination vaccine for measles, mumps, rubella and chickenpox (MMRV) is associated with double the risk of febrile seizures for 1- to 2-year-old children compared with same-day administration of the separate vaccine for MMR (measles, mumps, rubella) and the varicella (V) vaccine for chicken pox, according to a Kaiser Permanente Division of Research study appearing online in the journal *Pediatrics*. A febrile seizure is a brief, fever-related convulsion but it does not lead to epilepsy or seizure disorders, researchers explained.

Funded by the U.S. Centers for Disease Control, the study analyzed 459,000 children 12 to 23 months old from numerous health systems across the United States receiving their first dose of measles-containing vaccine and found MMRV to be associated with a two-fold increased risk of fever and febrile seizures 7-10 days after vaccination compared with same-day administration of a separate shot for MMR and the varicella (chickenpox) vaccine. This study found that the risk for a febrile seizure after the first dose of MMRV vaccine is low, although it is higher than after MMR vaccine and varicella vaccine administered as separate injections.

The study found no evidence of an increased febrile seizure risk after any measles vaccine beyond 7-10 days post vaccination.

"Because the risk of febrile seizure is higher for the quadrivalent (combination) vaccine, providers recommending MMRV should communicate to parents that it increases the risk of fever and febrile seizure over that already associated with measles-containing vaccines," said the study's lead investigator Nicola Klein, MD, Ph.D., co-director of the Kaiser Permanente Vaccine Study Center. "But concerned parents should understand that the risk for febrile seizures after any measles-containing vaccine is low: less than 1 febrile seizure per 1,000 injections."

The CDC recently recommended that either vaccine may be used for first dose for 1-2 year olds, however families without a strong preference for MMRV should receive separate MMR +V vaccines, Klein said. The CDC reiterates that providers who consider using MMRV should discuss with families and caregivers the risk and benefits.

"While this study and the resulting CDC recommendations are very important and ones our pediatricians will follow, it is also important to emphasize that it is more common for a child to have a febrile seizure caused by a simple cold than by an immunization. And though febrile seizures are a very scary event for a family, they are not dangerous and do not lead to later epilepsy or seizure disorders," said Randy Bergen, MD, a Kaiser Permanente pediatrician and infectious disease specialist at Kaiser Permanente-Walnut Creek.

Kaiser Permanente researchers used its electronic health records and Vaccine Safety Datalink data from 2000 to 2008 to assess seizures and fever visits among children aged 12-23 months following MMRV and

separate MMR +V. They compared seizure risk following MMRV to MMR +V using regression analyses and by incorporating chart-reviewed febrile seizure cases.

The Vaccine Safety Datalink project is a collaborative effort between CDC's Immunization Safety Office and eight managed care organizations: Kaiser Permanente Northern California, Kaiser Permanente Southern California, Kaiser Permanente Colorado, Kaiser Permanente Northwest, Health Partners, Group Health Cooperative, Marshfield Clinic and Harvard Pilgrim Health Care. The VSD project was established in 1990 to monitor immunization safety and address the gaps in scientific knowledge about rare and serious events following immunization. The VSD shares electronic health records from the organizations' health systems.

MMRV was licensed by the FDA in 2005. MMRV was subsequently recommended by the Advisory Committee on Immunization Practices (ACIP) in 2006. Although prelicensure studies of MMRV among 1-2 year olds noted higher rates of fever and measles-like rash one to two weeks post vaccination when compared with separate MMR + V, it was unknown at the time of MMRV's licensure whether a higher rate of fevers was similarly associated with increased risk of febrile seizures. In February 2008, Kaiser Permanente researchers alerted the ACIP to preliminary evidence of an increased risk of febrile seizures following MMRV. This study represents additional data on twice as many vaccines.

"The Vaccine Safety Datalink, which we used to conduct this study, is a premiere example of how different managed care organizations can leverage their electronic medical records to improve vaccine safety and monitoring," Klein said.

This is the latest in a series of Kaiser Permanente studies undertaken to better understand the protective effects and risks of vaccines. Recent published studies found children of parents who refuse vaccines are nine times more likely to get chickenpox and 23 times more likely to get whooping cough compared to fully immunized children. A study published last year found that herpes zoster, also known as shingles, is very rare among children who have been vaccinated against chicken pox. A recent study in the Journal of the American Medical Association found that the pneumococcal vaccination is not associated with a reduced risk of heart attacks or strokes in middle-aged men.

Additional authors on this paper include: Bruce Fireman, MS, from the Kaiser Permanente Division of Research; Katherine Yih, MPH, PhD, from Harvard Pilgrim HealthCare Institute and Harvard Medical School, Boston, MA; Edwin Lewis, MPH, from the Kaiser Permanente Vaccine Study Center; Martin Kullendorff, PhD, from Harvard Pilgrim Healthcare Institute; Paula Ray, MPH, from the Kaiser Permanente Vaccine Study Center; Roger Baxter, MD, from the Kaiser Permanente Vaccine Study Center; Simon Hambridge, MD, PhD, from Kaiser Permanente, Denver, Co; James Nordin, MD, MPA, from Health Partners Research Foundation, Minneapolis, MN; Allison Naleway, PhD, Kaiser Permanente, Portland, OR; Edward A. Belongia, MD, from Marshfield Clinic Research Foundation; Tracy Lieu, MD, MPH, from Harvard Pilgrim Health Care Institute; James Baggs, PhD, from the Immunization Safety Office, CDC; Eric Weintraub, MPH, from the Vaccine Safety Datalink. Funding for the study was provided by the Vaccine Safety Datalink contract with America's Health Insurance Plans, funded by the Centers for Disease Control and Prevention.

Tooth Regeneration Gel Could Replace Painful Fillings

Could this new gel be the biggest dental breakthrough since the introduction of fluoride?

By Eric Bland

THE GIST

**** A new gel could soon eliminate painful fillings and root canals.***

**** The technology doesn't prevent cavities; it heals teeth by regenerating them.***

**** Although this is good news for teeth, the research could also be applied to heal bones and other tissues in the body.***

Dentists could soon hang up their drills. A new peptide, embedded in a soft gel or a thin, flexible film and placed next to a cavity, encourages cells inside teeth to regenerate in about a month, according to a new study in the journal ACS Nano. This technology is the first of its kind. The new gel or thin film could eliminate the need to fill painful cavities or drill deep into the root canal of an infected tooth.

"It's not like toothpaste," which prevent cavities, said Nadia Benkirane-Jessel, a scientist at the Institut National de la Sante et de la Recherche Medicale and a co-author of a recent paper. "Here we are really trying to control cavities (after they develop)."

Drilling teeth and filling them is safe and effective. Dentists fill millions of cavities each year across the United States. However, though dentists numb the tooth, many patients still rue the sound of that drill.

The new research could make a trip to the dentist's office more pleasant, said Berkirane-Jessel. Instead of a drill, a quick dab of gel or a thin film against an infected tooth could heal teeth from within.

Cavities are bacteria and pus-filled holes on or in teeth which can lead to discomfort, pain and even tooth loss. When people eat acidic foods, consume sugary snacks or simply don't maintain proper oral hygiene, bacteria begin to eat away at the protective enamel and other minerals inside teeth.

The causes of cavities are varied. But for most cavities, the treatment is the same: drilling into a tooth, removing the decay and filling in the hole to prevent further damage.

The gel or thin film contains a peptide known as MSH, or melanocyte-stimulating hormone. Previous experiments, reported in the Proceedings of the National Academy of Sciences, showed that MSH encourages bone regeneration. Bone and teeth are fairly similar, so the French scientists reasoned that if the MSH were applied to teeth, it should help healing as well.

To test their theory, the French scientists applied either a film or gel, both of which contained MSH, to cavity-filled mice teeth. After about one month, the cavities had disappeared, said Benkirane-Jessel.

Benkirane-Jessel cautions that the MSH-containing films or gels only treat cavities; they don't prevent them. People will still need to brush, floss and use mouthwash to help prevent cavities from forming in the first place.

Treating cavities without drilling "would have its advantages," said Hom-Lay Wang, a dentist at the University of Michigan. Cavities and drilling can destroy the nerves and blood vessels inside a tooth, making it more brittle and likely to fracture. Regenerating a tooth could help avoid crowns after a cavity has been filled.

That said, regenerating a tooth from within would only be useful in a relatively small number of cases. Most cavities would still need to be drilled and filled.

In the meantime, patients can't slacken their oral hygiene either. Numerous clinical trials over several years will have to be completed before the MSH-containing gels or films are available to treat cavities in humans.

Drone alone: how airliners may lose their pilots

*** 28 June 2010 by Paul Marks**

WOULD you fly in an airliner knowing there were no pilots in the cockpit? This is no mere hypothetical question. The US Federal Aviation Administration this month kicked off what could be the first step in a journey towards the full automation of the airliners we all travel on.

The FAA commissioned the Boeing subsidiary Insitu, based in Bingen, Washington, and the New Jersey Air National Guard to begin investigating ways for civil aircraft to share their airspace with remotely piloted uncrewed aerial vehicles (UAVs). In the UK, a research programme called Astraea 2, led by BAE Systems and Airbus owner EADS, is pressing ahead with similar aims.

The goal on both sides of the Atlantic is to allow UAVs to share civilian airspace, rather than clearing a section of airspace for every UAV flight, as happens now. While this segregation of the sky has prevented collisions, arranging clearance for every flight is time-consuming and curtails potential fly-at-a-moment's-notice applications for UAVs.

If they are to share civilian airspace, uncrewed planes will need to be able to sense the presence of other aircraft and take evasive action. Air traffic controllers would also need robust ways to manage flocks of UAVs - whose remote pilots may be hundreds of kilometres away.

Why contemplate opening up the sky to drones? For one thing, they could provide a relatively cheap boost to border-monitoring efforts, says Lambert Dopping-Hepenstal, an Astraea 2 project chief at BAE. At the moment, even in a country the size of the US, he says, "there is not enough segregated airspace" to support such schemes. Other mooted applications include surveillance, search-and-rescue and crop monitoring.

It won't stop there. Once UAVs can avoid passenger jets, remotely piloted cargo planes are likely to take to the skies, pushed by some compelling economics. "The cargo airlines want very much to lose their pilots. The money that would be saved in salary and benefits, including retirement and healthcare costs, is pretty staggering," says Mary Cummings, a former US navy fighter pilot who now researches ways to automate aviation systems at the Massachusetts Institute of Technology.

Indeed, some UAVs are already big, cargo-capable beasts: the largest variant of the Northrop Grumman Global Hawk has a 38-metre wingspan, similar to that of the aviation industry's veteran workhorse, the Boeing 737.

The FAA's project will initially focus on air traffic control procedures, whereas Astraea 2 researchers are focusing on a sense-and-avoid system for UAVs that is comprised of "cooperative" and "non-cooperative" elements.

Today's airliners use a cooperative system called the Traffic Alert and Collision Avoidance System (TCAS), whereby radio transmitters on each plane announce its position, height and heading. The system constructs a picture of what's in a plane's airspace and calculates collision risks. If a risk is detected, a loud, synthesised voice tells the crew to climb or dive to avoid the danger.

"UAVs will have to respond to these TCAS alerts," says Dopping-Hepenstal. But when planes without TCAS venture close, things get tricky. Some of these "may be radio silent or have low electromagnetic signatures, making them difficult to detect", he says. This is where the non-cooperative elements kick in. Astraea is developing a battery of sensors, including infrared heat sensors, millimetre-wave radars and optical cameras, to ensure UAVs know if a plane is nearby.

While infrared sensors and cameras should spot a plane in open air, they may lose it in cloud. That's when millimetre-wave radar, which easily pierces fog, takes over.

"Using multiple collision-sensing methods is clearly the safest approach," says Noel Sharkey, an autonomous-systems engineer at the University of Sheffield, UK. "But what happens in unpredictable circumstances? Human creativity can avert serious problems that have never arisen before." And while UAVs will have a remote pilot, "what happens if the wireless link to the pilot gets lost?" he asks.

Even trusted technology like TCAS fails on occasion, which worries Peter Ladkin, a safety-critical systems engineer at Bielefeld University in Germany. "Flying UAVs in civilian airspace, and mandating safety devices for them and their airspace co-users, has large, maybe even overwhelming, political, legal and social dimensions. It is not just a technology issue," he says. The repercussions from fatalities caused by the failure of a UAV's sensing technology would be profound, Ladkin adds.

Cummings is convinced that the cost-saving potential will prove compelling. Autopilots and auto-landing systems - by which aircraft automatically follow a radio beacon to the runway - already do so much of the actual flying that pilots will eventually be seen as an unnecessary expense, even in passenger planes. "You just don't need someone with a million dollars' worth of pilot training any more," she says.

Carolyn Evans of the British Airline Pilots Association says UAVs will "still need a remote pilot trained to the same level of expertise. But they might not need a co-pilot - so pilots, as you might expect, are not overly keen on the idea."

Would Evans fly on a remotely piloted plane? "It's like the spartan offerings of some budget airlines: it's not a product I like the sound of. So no, you won't find me catching one."

Cummings is unperturbed. "If round trips from Boston to Los Angeles on the first new unmanned airliner cost only \$50, people would stampede to get on board," she says.

Japanese gourmet mushroom found in Sweden

In Japan, the hon-shimeji mushroom is a delicacy costing up to SEK 8,000 a kilo (800 Euro). Now a student at the University of Gothenburg, Sweden, has discovered that this tasty fungus also grows wild in Sweden.

"There will undoubtedly be a lot of interest in Sweden, and definitely in Japan once these discoveries become known there," says Henrik Sundberg, who conducted the study.

Lyophyllum is a family of many different species of fungi. One of them is Lyophyllum shimeji, previously believed to grow only in the Far East. In Japan, the hon-shimeji - or "true shimeji" - is a delicacy, and so rare that a kilo of Japanese mushrooms of perfect quality can fetch as much as SEK 8,000 (800 Euro). Then, two years ago, came indications that the species also grows in Sweden.

"We were visited by a Japanese mycologist who found a fungus on a pine heath outside Skellefteå which she thought was similar to hon-shimeji," says Henrik Sundberg, a student at the Department of Plant and Environmental Sciences at the University of Gothenburg. "Using molecular techniques, we've now been able to show that this northern Swedish fungus is identical to the Japanese one."

Not the first fungal discovery

This is not the first time that a Japanese gourmet mushroom has been found in northern Scandinavia. Just over a decade ago, researchers were able to show that the Swedish mushroom *Tricholoma nauseosum* was identical to the Japanese species *Tricholoma matsutake*. Interest in the Swedish matsutake has been huge, and Japanese mycologists and traders have made their way to the country's northern forests to study the fungus.

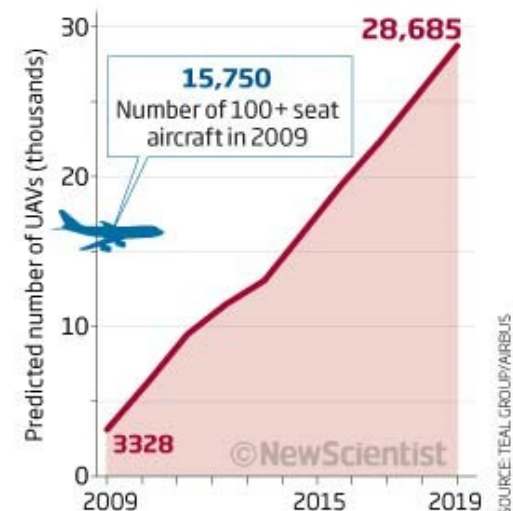
Molecular examination gave the answer

It was also the Swedish matsutake that led Japanese mycologist Etsuko Harada to the forest outside Skellefteå where she found the Swedish hon-shimeji in August 2008.

"After getting a positive response from Japanese mycologists, we became more and more convinced that we were on the trail of a Japanese delicacy," says Sundberg. "When we found more the following year, we started up a project to examine the fungus using molecular techniques. We were soon able to show that the Swedish and Japanese fungi are, without a doubt, identical."

Drone-filled skies

With the number of uncrewed aircraft set to soar, civil airspace could get crowded



Thrive on pine heaths

So far the Japanese fungus has been found on sparse pine heaths and flat-rock forests from Umeå to Gällivare in northern Sweden, as well as in Dalarna in the middle of the country. The reason why it did not previously attract attention is partly that it was lumped together with related species, and partly that nobody made the link with hon-shimeji. Finds in Norway and Finland suggest that the fungus is probably found throughout the taiga belt of boreal forest from Scandinavia to China and Japan, and maybe even in other areas with a temperate climate and pine forests, such as Scotland, Canada, the USA and Central Europe.

Season in August

The Swedish hon-shimeji probably forms fruiting bodies from August through to the first frosts. It is similar in appearance to its closest relatives, *Lyophyllum fumosum* and *Lyophyllum decastes*, but does not grow in such big clusters and often has a thicker stem which swells towards the base and sparser gills.

Its discovery in Sweden is reported in Sundberg's thesis on systematics and biodiversity at the Department of Plant and Environmental Sciences at the University of Gothenburg, and will be featured in a future issue of Swedish journal *Svensk Mykologisk Tidskrift*.

Shimeji

Shimeji is an umbrella name for more than 20 different fungi and translates roughly as "mushrooms that grow in deep forest during the rainy season". These include species from several different genera, including *Tricholoma*, *Lyophyllum*, *Hypsizygus* and *Clitocybe*.

Next to the matsutake, the hon-shimeji is the most sought-after and expensive culinary mushroom in the Japanese market. Both of these gourmet mushrooms have been in rapid decline since the mid-20th century, probably due to pests attacking host trees and changes in forestry. Its scarcity means that wild hon-shimeji is currently sold only by a few specialist dealers and served at exclusive restaurants.

The *Lyophyllum* family has not been widely studied in northern Europe and is notorious for its lush flora of synonyms and poorly defined species. It is therefore unknown how many *Lyophyllum* species there are worldwide. The mushrooms examined in the study were collected by Henrik Sundberg and Niclas Bergius along with Swedish amateur mycologists, and have since been supplemented with herbarium material.

Studies of women's attitudes to 'social egg freezing' find reasons differ with age

Young professionals put career ahead of motherhood, while older women are still waiting for Mr. Right

Rome, Italy: Women of different ages differ in their reasons for wishing to undergo egg freezing, show two studies presented to the 26th annual meeting of the European Society of Human Reproduction and Embryology today (Monday). A large number of female university students would be prepared to undertake egg freezing in an attempt to combine career success and motherhood, said Dr. Srilatha Gorthi, a research fellow at the Leeds Centre for Reproductive Medicine, Leeds, UK, adding that her team's research emphasised the importance of educating young women about their biological clocks in order that they could take informed decisions about future reproduction.

Dr. Gorthi surveyed 98 medical students (group A) and 97 students of education and sports studies (group B) from the University of Leeds. Information regarding egg freezing was provided, including the fact that they would have to finance their own egg freezing. The average age was 21 with age range from 18-30 years in both the groups; 63.3% of the medical students were not in a relationship, as opposed to 25.8% in group B, probably reflecting the level of commitment and time needed for their courses.

While 85.7% in group A said that they would be prepared to delay starting a family, only 49.5% in group B said they would consider this. Eight out of ten from group A said they would undergo egg collection and freezing, compared with only half as many (four out of ten) from group B. In group A, 85.3% were prepared to undergo up to three cycles of egg collection to bank enough eggs to give them a realistic chance of pregnancy. In contrast, the majority (79%) of those who would bank their eggs from group B said they would be prepared to undergo only one cycle of egg collection.

"Career considerations were given as the commonest reason to delay starting a family in group A, followed by financial stability and marriage or a stable relationship," said Dr. Gorthi. "However, in group B, financial stability came first, followed by a stable relationship and then career reasons. We think that this is the first time that young women's attitudes to egg freezing have been studied in this way."

Egg freezing is still a relatively new technology; a woman has to go through an IVF treatment cycle, which takes two to four weeks and carries certain risks: ovarian hyperstimulation, haemorrhage, infection and a possible, albeit small, effect on future natural fertility.

Until a few years ago, egg freezing was largely restricted to women undergoing chemotherapy for cancer because the chances of an egg surviving the slow freezing and thawing process was as low as two percent.

Now, thanks to new techniques such as vitrification, where water from the eggs is removed and they are flash-frozen, frozen eggs are as good as the fresh ones. Women seem to have a realistic prospect of delaying motherhood if they wish to do so, similar to men. The average cost of egg freezing is around £3000 per attempt and some women may have to undergo up to three cycles in order to cryopreserve a good number of eggs.

At a time when women are increasingly delaying having children until their late 30s and even 40s, clinics offering egg freezing are in need of information on the attitudes and expectations of young women in order to enable them to tailor counselling more appropriately. "There has been a vogue for offering freezing for social reasons to women, especially those embarking on their careers, or those who haven't found their Prince Charming, as a kind of insurance policy for later life. Research has proven that young eggs have a better genetic competency than older ones, and the chance of egg freezing working also declines with age. While the best results are likely to be in those under 30 years old, in reality it is predominantly women in their late thirties who are requesting egg freezing," said Dr. Gorthi.

"There is still a lot of misinformation about the age at which the women could start their families, the likelihood of success of treatment and the number of oocytes that need to be retrieved and frozen in order to give a realistic prospect for future success. Women thinking about undergoing this procedure must be provided with accurate information and have counselling to both the benefits and limitations of oocyte freezing compared with other options. This will enable them to take the decision which is right for their circumstances," she said.

"In addition, support from society is warranted for young women who choose to have a family when they are ready without compromising their careers. Experience from clinics who offer egg freezing for social reasons has shown that the use of frozen eggs is considered the last resort when women fail to conceive naturally," Dr. Gorthi said.

In a second study, Dr. Julie Nekkebroeck*, a senior psychologist at the Centre for Reproductive Medicine, UZ Brussel, Brussels, Belgium, found that a group of highly educated and financially secure women with an average age of just over 38 years had applied to have their eggs frozen because they had not yet found the right partner with whom to have children. Dr. Nekkebroeck and colleagues interviewed the 15 egg-freezing candidates in order to ascertain their reasons for wishing to undergo the procedure.

"We found that they had all had partners in the past, and one was currently in a relationship, but they had not fulfilled their desire to have a child because they thought that they had not found the right man," she said. The women found out about the possibility of egg freezing via the internet; before that, 46.7% had thought about becoming a single mother through the use of donor sperm, and 26.7% of them had considered adoption or staying childless.

The main reasons for opting for oocyte freezing were taking the pressure off the search for the right partner (53.3%), and giving a future relationship more time to blossom before bringing up the subject of their desire for a child (26.7%), whereas for 33.3% it was an insurance against future infertility. All 15 candidates had shared their intentions with their family and close friends and none of them felt discouraged by their entourage.

Out of the 15 women, 53.3% felt that the financial cost was a disadvantage of undergoing treatment, and 26.7% considered that the use of hormones was a deterrent. However, all of them accepted that they needed to undergo treatment while they were still healthy and fertile and they were also willing to repeat the treatment at least twice.

"The average age that the women thought they would use their frozen oocytes was 43.4 years, an age at which, for most women, there is considerable difficulty in achieving a spontaneous conception. But if they found a suitable partner, most of them would prefer to try to become pregnant spontaneously, rather than perform IVF with fresh material or, in the last instance, use their frozen oocytes," said Dr. Nekkebroeck.

If the women did not need their oocytes, 46.7% said that they would donate them for scientific research, 13.3% would donate them to another woman, and 26.7% were unsure about what to do with them.

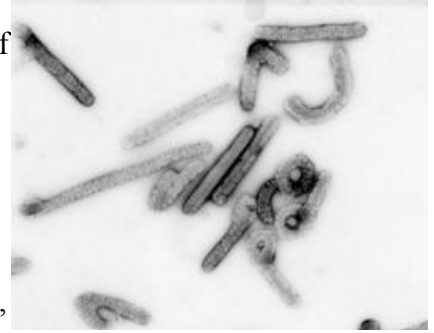
"We intend to continue interviewing these women in order to confirm our preliminary results and will also arrange follow-up interviews after their egg collection and freezing, and when they return to the hospital to collect and use their vitrified eggs. Because women have only just gained access to this efficient method of preserving their fertility, we believe that our results will add to the continuing debate about egg freezing for social reasons. Such research seems to indicate that social freezing might be added to the list of preventive measures to be taken against future age-related subfertility in women, besides fertility awareness campaigns, but only on the understanding that these women are properly counselled and educated about success rates, fees, treatment procedure etc.," Dr. Nekkebroeck concluded.

Ebola and Marburg viruses may be much older than thought

June 28, 2010 by Lin Edwards

(PhysOrg.com) -- New research on the DNA of wallabies, rodents, a number of mammals and bats has found it is likely the ancestors of the Ebola and lesser-known Marburg viruses were in existence tens of millions of years ago, which is much earlier than previously thought.

The Ebola and Marburg viruses are known as "filoviruses," and result in life-threatening hemorrhaging in humans and other primates. Outbreaks occur in remote locations in Africa, and while rare they cause high fatality rates, and seem to appear out of nowhere. There are no effective treatments, and no vaccines.



Negative stain image of an isolate of Marburg virus, showing filamentous particles as well as the characteristic "Shepherd's Crook". Magnification approximately 100,000 times. Image courtesy of Russell Regnery, Ph.D., DVRD, NCID, CDC.

It was previously thought that filoviruses were probably about 10,000 years old, with this figure based on the estimated mutation rate. The new research, by evolutionary biologist Derek Taylor and a team from the State University of New York in Buffalo, has used a different method to estimate their age.

The method is one used by paleovirologists, using remnants of virus genes found scattered within the genomes of animals. Viruses are either DNA or RNA based, and many insert their own genes into the DNA of host cells, and it had been thought that RNA-based viruses needed a gene for reverse transcriptase, an enzyme that converts their RNA to DNA in order to do this. Viruses with the gene are called retroviruses, and include the AIDS virus, HIV. Remnant viral genes from ancient retroviruses can be found in virtually every animal's genome.

Filoviruses are RNA viruses that do not have the gene for reverse transcriptase. Taylor and co-worker Jeremy Bruenn discovered non-retrovirus genes in fungi last year, and dubbed them non-retroviral integrated RNA viruses (NIRVs). In January this year a group of researchers in Boston also reported finding RNA viruses (bornavirus) able to integrate their genes into mammalian DNA without the help of reverse transcriptase.

Taylor and his team have found "fossil" remnants of filovirus genes inside the genomes of a dozen species, but have not found any in primate species. They used genome databases to find the fossil remnants in mammals, and also confirmed their presence in a dead bat and a wallaby from a local zoo.

The team then compared the filovirus remnants in different species and found they were almost identical, which suggests the virus infected animals early in evolution, and the viral remnants were inherited by succeeding generations as the groups diverged to form separate species. For example, the house mouse and Norway rat have the same remnants in the same places in the same chromosomes, even though these diverged from each other over 12 million years ago.

Taylor said the odds of a gene inserting itself in the same place among billions of nucleotides are extremely unlikely, which means the filoviruses are much more ancient than previously thought, with the age at least in the tens of millions rather than tens of thousands.

There have been numerous studies looking for species that could harbor filoviruses without contracting the disease (known as reservoir species), and bats have been considered good candidates. The presence of NIRVs, which Taylor calls "battle scars of an infection," could indicate the species with gene remnants could be reservoir candidates. Finding fossil remnants in New World marsupials could indicate the deaths in South America that sometimes occur after unexplained hemorrhagic fevers may be due to unidentified filoviruses.

The paper is published online in BMC Evolutionary Biology.

More information: Filoviruses are ancient and integrated into mammalian genomes, BMC Evolutionary Biology 2010, 10:193. doi:10.1186/1471-2148-10-193

Agent Orange Exposure Linked to Graves' Disease in Vietnam Veterans, UB Study Finds

Lois Baker

BUFFALO, N.Y. -- Vietnam War-era veterans exposed to Agent Orange appear to have significantly more Graves' disease, a thyroid disorder, than veterans with no exposure, a new study by endocrinologists at the University at Buffalo has shown.

Ajay Varanasi, MD, an endocrinology fellow in the UB Department of Medicine and first author on the study, garnered first prize in the oral presentation category for this research at the American Association of Clinical Endocrinologists annual meeting held in Boston in April.

"Our findings show that Vietnam veterans who came in contact with Agent Orange are more likely to develop Graves' disease than those who avoided exposure," says Varanasi.

"The autoimmune disorder was three times more prevalent among veterans who encountered the dioxin-containing chemical. We also looked at other thyroid diagnoses, but we didn't find any significant differences in thyroid cancer or nodules."

Agent Orange is a defoliant that was used in Vietnam to destroy crops and reduce jungle foliage that could shelter enemy combatants. The herbicide contains dioxin, which has chemical properties similar to the thyroid hormones.

Graves' disease is an autoimmune disease associated with overactivity of the thyroid gland. This gland releases the hormones thyroxine (T4) and triiodothyronine (T3), which control body metabolism and are critical for regulating mood, weight, and mental and physical energy levels.

Varanasi and colleagues assessed the prevalence of major thyroid diagnoses in the Veterans Administration electronic medical record database for upstate New York veterans born between 1925 and 1953, the age group that would have been eligible for military service during the Vietnam era. They conducted the research at the Buffalo VA Medical Center.

They compared the frequency of diagnoses of thyroid cancer, nodules, hypothyroidism and Graves' disease in veterans who identified themselves as being exposed to Agent Orange (23,939) or not exposed to Agent Orange (200,109).

"Analyzing data on thyroid conditions, we found no difference in the prevalence of thyroid nodules or cancers between the exposed and non-exposed groups," says Varanasi. "Graves' disease, however, was three times more prevalent in the exposed group."

"Interestingly, hypothyroidism [lower than normal thyroid] was less common in the exposed group."

Varanasi says that in view of the known effects of dioxin on the immune system, further research should be conducted on the increased prevalence of Graves' disease in Vietnam veterans. His research group is planning to continue this investigation either in vitro or in animal models.

Additional authors on the study are Toufic Abdo, MD, David Kasinski, Amy O'Donnell, MD, and Stephen Spaulding, MD, all associated with UB.

New theory for magnetic stripes on Mars

June 28, 2010 by Lin Edwards

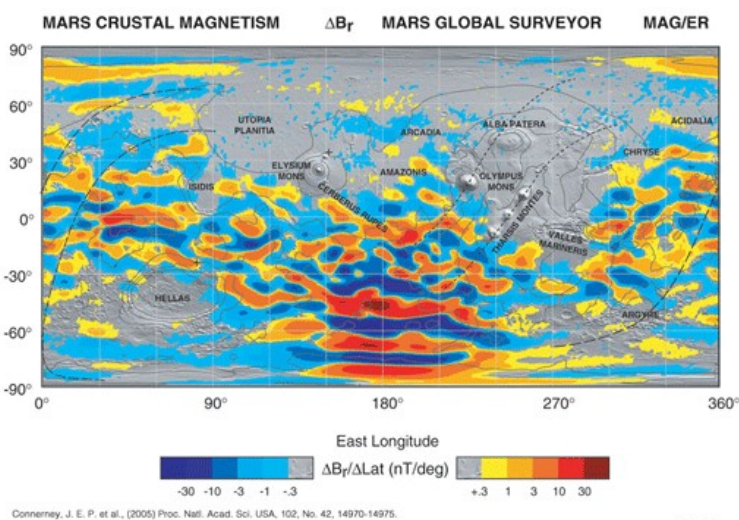
(PhysOrg.com) -- A controversial new theory has been proposed to explain a series of stripes of permanently magnetized minerals containing iron in the Martian crust. The magnetized stripes, which have alternating orientations, have intrigued scientists since their discovery in 1997.

The Mars Global Surveyor (MGS) began orbiting almost 400 km above the surface of Mars in 1997, and its magnetometer began sending signals back to Earth, which revealed the presence of the magnetized stripes. The latest research, led by Ken Sprenke and Daisuke Kobayashi of the University of Idaho in Moscow, Idaho, theorizes the stripes were created as a result of ancient hotspots beneath the planet's crust.

This global map uses colors to represent the strength and direction of the magnetic field caused by crustal magnetization. Credit: NASA

The theory, published in *Icarus*, is that sub-surface hotspots caused material to rise to the surface from the interior, and the mineral was then magnetized with the field present at the time. Sprenke noted that on Earth the Hawaiian Islands were probably created by hotspots moving slowly below the hard crust, leaving parallel magnetized tracks. He said there could have been dozens of hotspots in the first few hundred million years of Mars's existence, when the molten iron in the planet's core was probably acting as a dynamo.

The stripes form parallel arcs and are of two different types with distinctive pairs of poles, and Sprenke believes these magnetic poles, with "polar wandering" between them, represent the axis of the planet's spin at the time. In order to explain how the crust was dragged over the hotspots, Sprenke suggests Mars may have captured some satellites early in its history, and these could have exerted a gravitational tide that would have reduced the speed of the crust relative to the hotspots beneath. As evidence for this hypothesis, Sprenke pointed out that seven of the 15 impact basins on the planet were found unexpectedly to fall along equators of the two poles fixed by the magnetic stripes.



One problem with the new theory is that there is no surface topography corresponding to the proposed hotspots. Planetary scientist John Connerney at the NASA Goddard Space Flight Center in Greenbelt, Maryland, pointed out that on Earth hotspots are associated with chains of islands or mountains, but the same thing is not seen on Mars. Sprenke suggests this may be because later volcanic activity on Mars could have eliminated the surface topography after the dynamo activity had stopped.

Connerney worked on the MGS project and has his own theory for the stripes - that the stripes were a result of ancient spreading of the sea floor - but his theory has also been criticized by planetary scientists. Detection in the 1960s of alternating magnetic stripes of rock at the bottom of the Atlantic led to theories of sea floor spreading on Earth, which in turn led to the theories of plate tectonics.

The stripes on Earth were detected by ships and were not noticed from satellites, which suggests the mystery might only be resolved when higher resolution data becomes available. This may be in 2013 when the Mars Atmosphere and Volatile EvolutionN (MAVEN) reaches Mars, carrying two magnetometers. MAVEN will gather data for several years and may fly at only 150 km above the surface for at least some of the time. If it does, the quality of data on the magnetized surface would be much improved.

More information: Lithospheric Drift on Early Mars: Evidence in the Magnetic Field, Daisuke Kobayashi et al., Icarus, Article in Press, doi:10.1016/j.icarus.2010.06.015

Africa 'witnessing birth of a new ocean'

By Matt McGrath BBC News Science reporter

Africa is witnessing the birth of a new ocean, according to scientists at the Royal Society.

Geologists working in the remote Afar region of Ethiopia say the ocean will eventually split the African continent in two, though it will take about 10 million years.

Lead researcher Tim Wright who is presenting the research at the Royal Society's Summer Exhibition, described the events as "truly incredible".

Used to understanding changes in the planet on timescales of millions of years, the international team of scientists including Dr Wright have seen amazing changes in Afar in the past five years, where the continent is cracking open, quite literally underneath their feet.



Volcanic vent in Afar region, Ethiopia A 60km crack opened in Ethiopia in 2005 and has been expanding ever since (Photo: Julie Rowland, University of Auckland)

In 2005, a 60km long stretch of the earth opened up to a width of eight metres over a period of just ten days. Hot, molten rock from deep within the Earth is trickling to the surface and creating the split.

Underground eruptions are still continuing and, ultimately, the horn of Africa will fall away and a new ocean will form.

'A smaller Africa'

Dr James Hammond, a seismologist from the University of Bristol - who has been working in Afar - says that parts of the region are below sea level and the ocean is only cut off by about a 20-metre block of land in Eritrea.

"Eventually this will drift apart," he told the BBC World Service. "The sea will flood in and will start to create this new ocean. "It will pull apart, sink down deeper and deeper and eventually... parts of southern Ethiopia, Somalia will drift off, create a new island, and we'll have a smaller Africa and a very big island that floats out into the Indian Ocean."

The researchers say that they are extremely lucky to be able to witness the birth of this ocean as the process is normally hidden beneath the seas.

The team hope to conduct experiments in the area that will help understand how the surface of the Earth is shaped. They believe that the information they glean from observing the shaping of the Earth will help scientists better understand natural hazards such as earthquakes and volcanic eruptions.

Older adults watch more TV than younger people, enjoy it less

We usually scold our children and teenagers for watching too much TV. It turns out that their grandmas and grandpas spend even more of their time watching TV, and it is not good for them either, according to researchers at the Stein Institute for Research on Aging and Rady School of Management at the University of California, San Diego School of Medicine.

In a study published online in advance of publication in the August issue of the American Journal of Preventive Medicine, UCSD researchers examined television use in a large, nationally representative sample that was collected by the Center for Health and Well Being at Princeton University. Using an innovative, diary-

like assessment strategy called the Day Reconstruction Method, study participants were asked to measure how they spent their time and describe their experience of everyday activities.

"We found that older people spent a great deal more time watching TV than younger people did, yet they enjoyed the experience less," said first author Colin A. Depp, PhD, assistant professor of psychiatry with UCSD's Stein Institute for Research on Aging. "What the study underscored is that alternatives to television as entertainment are needed, especially in older adults."

The study looked at 3,092 Americans, aged 15 to 98, in survey data collected in 2006. Adults over 65 reported spending three times more of their waking hours watching TV than did younger adults. Older adults did not seem to experience the same "stress buffering" effects that younger adults did from watching TV, and TV use among older adults - unlike time spent on other leisure activities, such as socializing or physical exercise - was related to lower life satisfaction.

Data from other studies indicate that the average American household spends 4.5 hours watching TV per day and, in those over age 65, about 25% percent of their time is spent watching TV. Recent work suggests that sedentary activity, such as TV watching, is associated with negative changes in many aspects of health including cardiovascular, bone health and cellular function. Television use in particular has been linked with greater risk for obesity and Type2 diabetes, lower life satisfaction, less frequent engagement in social and physical interaction, and increased risk for dementia.

The authors were surprised to find that older adults experienced TV watching as less enjoyable than younger people. "It is reasonable to expect that older adults may enjoy TV more than younger ones do, because they have fewer demands on their time. Prior studies also suggest they may use TV to regulate negative emotions," said co-author Dilip V. Jeste, MD, Distinguished Professor of psychiatry and neurosciences at UCSD School of Medicine, Estelle and Edgar Levi Chair in Aging, and director of the Stein Institute for Research on Aging. "Yet, our study indicates that older adults report lower levels of positive emotion while watching TV when compared to other activities - which is not the case in younger adults."

The researchers concluded that increasing public awareness of alternatives to TV watching and reducing barriers to alternative activities that are more socially and physically engaging could reduce TV use in older people and diminish the potential for associated negative health effects.

Additional contributors include David A. Schkade, PhD, of UCSD's Rady School of Management and Wesley K. Thompson, PhD, of UCSD Department of Psychiatry and Stein Institute for Research on Aging. The study was funded in part by the National Institutes of Health.

First Accurate Peak Heart Rate for Women

Equation offers different exercise heart rate for women and better predicts heart risk

By Marla Paul

CHICAGO --- Women who measure their peak heart rates for exercise will need to do some new math as will physicians giving stress tests to patients.

A new formula based on a large study from Northwestern Medicine provides a more accurate estimate of the peak heart rate a healthy woman should attain during exercise. It also will more accurately predict the risk of heart-related death during a stress test.

"Now we know for the first time what is normal for women, and it's a lower peak heart rate than for men," said Martha Gulati, M.D., assistant professor of medicine and preventive medicine and a cardiologist at Northwestern Medicine. "Using the standard formula, we were more likely to tell women they had a worse prognosis than they actually did."

Gulati is the lead author of a study published June 28 in the journal *Circulation*.

"Women are not small men," Gulati added. "There is a gender difference in exercise capacity a woman can achieve. Different physiologic responses can occur." Gulati was the first to define the normal exercise capacity or fitness level for women in a 2005 study.

The old formula -- 220 minus age -- used for almost four decades, is based on studies of men. The new formula for women, based on the new research, is 206 minus 88 percent of age.

At age 50, the original formula gives a peak rate of 170 beats per minute for men and women. The new women's formula gives a maximum heart rate of 162 beats for women. Many men and women use their peak heart rate multiplied by 65 to 85 percent to determine their upper heart rate when exercising.

"Before, many women couldn't meet their target heart rate," Gulati said. "Now, with the new formula, they are actually meeting their age-defined heart rate."

The new formula is trickier to calculate, Gulati acknowledged, but is easily determined with a calculator. She currently is working on an iPhone application for a quick calculation.

The new formula is based on a study of 5,437 healthy women ages 35 and older who participated in the St. James Women Take Heart Project, which began in the Chicago area in 1992.

With the new formula, physicians will more accurately determine if women are having a normal or abnormal response to exercise. "If it's abnormal, that's a marker for a higher risk of death," Gulati said. "Maybe we need to talk about whether you exercise enough and what we need to do to get it into the normal range."

"We need to keep studying women to get data applicable to women," Gulati said. "It's important to not get complacent that we have data on men and assume women must be the same. They're not."

Gulati's senior author on the study was Morton Arnsdorf, M.D., professor emeritus and associate vice chairman of medicine and former section chief of cardiology at the University of Chicago. Arnsdorf died in a motor vehicle accident in June.

"I feel fortunate to have been his student, have him take me under his wing and be my mentor," Gulati said. "He was an amazing mentor." The Women Take Heart Project study had been sitting dormant, and Arnsdorf encouraged her to open it to do more research, Gulati said.

(Northwestern Medicine is comprised of Northwestern University Feinberg School of Medicine and Northwestern Memorial Hospital.)

Surprising find may yield new avenue of treatment for painful herniated discs

DURHAM, N.C. -- An immune cell known to cause chronic inflammation in autoimmune disorders has been identified as a possible culprit in low back pain associated with herniated discs, according to doctors at Duke University Medical Center.

The finding implicates the cytokine molecule interleukin-17, and supports the burgeoning theory that an immune response plays a significant role in disc disease, says William J. Richardson, MD, an orthopedic surgeon at Duke. It may also open the door for new, therapeutic approaches that target a specific immune response in hopes of halting disc destruction, and possibly reversing the disease process.

"By identifying the specific subpopulation of lymphocytes (immune cells that are excited into action by the cytokine), it may soon be possible to arrest the body's inflammatory response to disc cells," says Richardson, senior author of the research published online this week in the July issue of *Arthritis and Rheumatism*. Doing so could reduce the painful inflammation associated with degenerative disc disease, and halt the evolution of arthritis. It may also reduce the need for back surgery.

"Mechanical forces may initiate the degenerative process, but biochemical inflammatory changes certainly play a role in disc pathology," says the study's first author, Mohammed Shamji, MD, PhD, senior neurosurgery resident at The Ottawa Hospital, Ontario, Canada, who participated in the research while at Duke. Decreasing the inflammation may arrest or reverse the patient's disease process and perhaps reduce the need for surgery. "Now we are learning which pathways we have to block."

Low back pain is one of the most common reasons people seek medical care, and both degenerative and herniated discs -- also referred to as slipped discs or ruptured discs -- are common causes of that pain. The economic impact of medical care for herniated discs in the U.S. is estimated to be as high as \$200 billion per year.

Herniated discs occur when the tough outer layer of cartilage cracks, allowing pieces of the softer inner material to protrude into the spinal canal. Until recently, it was thought that pain occurs when the material touches a nerve. Now doctors believe the pain is the result of an immune response caused by the presence of inflammatory cells.

"The center of the disc is immune-privileged since it has never been exposed to the immune system," says Shamji. When a disc is injured or degenerates, the body reacts against the invading inner material as it would against any virus or foreign body, and launches a response targeted at destruction. The nerve root, which is present near the protruding disc material, becomes painfully inflamed, swollen and damaged during that cascade of events.

In recent years, several anti-immune therapies, including steroids, have been injected into the space between the disc and the nerve, but with limited success, doctors say, because they don't target a specific immune response, and because low doses are used to minimize potentially serious side effects that include a higher predisposition to infection, activation of tuberculosis and a six-fold increase in lymphoma incidence.

The identification of IL-17 in the cascade of events is significant, Shamji says. "It's a product of a specific subgroup of immune cells that are involved in auto immune phenomena like rheumatoid arthritis and asthma, but not in the body's response against infection or tumor. If you target this specific lymphocyte, you may avoid compromising the body's ability to protect itself against infection or tumor."

Researchers say they're still several steps away from human studies of IL-17 blockers currently in development.

From M.S. Patients, Outcry for Unproved Treatment

By DENISE GRADY

For her first appointment with Dr. Daniel Simon, Neelima Raval showed up with a rolling file cabinet full of documents. She had downloaded every word written by or about Dr. Paolo Zamboni, a vascular surgeon from Italy with a most unorthodox theory about multiple sclerosis.

Dr. Zamboni believes that the disease, which damages the nervous system, may be caused by narrowed veins in the neck and chest that block the drainage of blood from the brain. He has reported in medical journals that opening those veins with the kind of balloons used to treat blocked heart arteries - an experimental treatment he calls the "liberation procedure" - can relieve symptoms.

The idea is a radical departure from the conventional belief that multiple sclerosis is caused by a malfunctioning immune system and inflammation.

The new theory has taken off on the Internet, inspiring hope among patients, interest from some researchers and scorn from others. Supporters consider it an outside-the-box idea that could transform the treatment of the disease. Critics call it an outlandish notion that will probably waste time and money, and may harm patients.

These critics warn that multiple sclerosis has unpredictable attacks and remissions that make it devilishly hard to know whether treatments are working - leaving patients vulnerable to purported "cures" that do not work.

The controversy has exposed the deep frustration of many people with this incurable, disabling disease, who feel that research has let them down. It is a case study in the power of the Internet to inform and unite angry patients - which may be a double-edged sword. Pressure from activists helped persuade the Multiple Sclerosis Society to pay for studies of Dr. Zamboni's theory, but the Internet buzz has also created an avid market for a therapy that is still unproved.

"It's eye-opening the way this group of patients has grabbed hold of the social-networking technology," said Dr. Simon, an interventional radiologist at JFK Medical Center in Edison, N.J. "They've taken this to a level I've not seen in other patients. Patients used to read an article or two. Now, they're actually seeing procedures on YouTube. Is this the future of medicine?"

Scientifically, the jury is out: Dr. Zamboni's hypothesis is being studied. It is not known whether narrowed veins are more common in people with multiple sclerosis than in others, and even if they are, whether the narrowings are a cause, or an effect, of the disease. There is no solid proof that opening the veins can help. There have been no studies with control groups - the only way to find out whether a treatment works.

"In my view the evidence is quite scanty and the biological plausibility is low," said Dr. Stephen L. Hauser, the chairman of neurology at the University of California, San Francisco. Many neurologists agree. Dr. Hauser said there was much stronger evidence that the disease arose from genetic variations affecting the immune system.

But Dr. Adnan H. Siddiqui, part of a team at the University at Buffalo that has been studying Dr. Zamboni's theory, said that it made sense and that the data from Italy was encouraging. Still, he emphasized that more study was needed, and that patients should not be treated until the research was done.

In Demand

Despite the lack of proof, many patients are captivated by the idea that multiple sclerosis might turn out to be a vascular disease. They want to believe it can be fixed with a relatively simple procedure, and they want to be tested and treated. Now.

These patients say they cannot afford to wait for research results because they will wind up in wheelchairs before the studies are done. Their only option so far has been a lifelong course of drugs with limited benefits and harsh side effects. To some, balloon treatment seems no riskier than those drugs.

Dr. Zamboni himself has said that the procedure should not yet be done outside of studies. He said in an interview that he was conducting research only and had turned down thousands of requests from people wanting to go to his clinic at the University of Ferrara.

But other doctors have set up shop. A clinic in India with a toll-free American phone number has an online advertisement for a "liberation package." Patients are posting testimonial videos and trading tips on clinics in Bulgaria, Poland and Jordan.

In the United States, where many hospitals forbid experimental treatments outside of studies, a "back alley" network of doctors willing to perform the procedure has begun to develop, said Dr. Salvatore J. A. Sclafani, chairman of radiology at Downstate Medical Center in Brooklyn. He said he knew of about a dozen. The doctors try to stay under the radar, and patients quietly pass their names to one another.

"It reminds me of abortion in 1968," Dr. Sclafani said.

He said he had treated about 20 patients at Kings County Hospital before the hospital ordered him to stop in early April. He said he had a waiting list of 300 to 400 patients..

Meanwhile, researchers are trying to answer basic questions. On June 29, the team in Buffalo is to begin the first treatment study to include a control group. The controls will be given a sham procedure, and compared with others who get the real thing. Initially, 30 patients - only those with an early form of the disease - will be enrolled. Thousands of people applied.

The Multiple Sclerosis Societies in the United States and Canada will spend \$2.4 million over the next two years on studies at seven centers. Researchers will study veins in patients with different stages of multiple sclerosis, in healthy people and in those with other neurological diseases. The studies will not test the balloon treatment, but are meant only to find out if the narrowings really exist, if they are related to the disease and if they are a cause or an effect.

Some patients complain that the society has been too slow to consider the new idea. A splinter group - the Reformed Multiple Sclerosis Society - has formed to increase the availability of the vein treatment.

Joyce Nelson, the president of the Multiple Sclerosis Society in the United States, said, "I wasn't aware how thin the veneer was and how close to the surface the frustration was."

"'We can't wait' has resounded," Ms. Nelson said. But she added, "There isn't a way to rush the work that needs to be done."

As the procedure has caught on in some places, few serious complications have been reported. But at Stanford University, a woman, 50, treated with stents (wire-mesh tubes used to hold blood vessels open) and blood-thinning drugs, died of a brain hemorrhage after returning home, and another patient needed heart surgery after a stent placed in a neck vein came loose and was swept into the heart. The procedures were stopped.

Dr. Michael Dake, who treated the patients, declined several requests for an interview, but said by e-mail that he hoped to discuss "a number of exciting developments" about the procedure "in the near future."

Dr. Philip Pizzo, the dean of Stanford's medical school, said the vein theory "deserves to be explored" - but only in studies. A study with a control group is being planned.

About 400,000 people in the United States have multiple sclerosis; worldwide, there are 2.1 million. (The disease is more common in temperate zones than in the tropics, and affects more women than men and more Caucasians than members of other groups.) It usually begins in young adults, with fatigue, vision problems, numbness, bladder trouble and difficulty with walking, balance and coordination. The disease eats away a fatty substance, myelin, that coats nerves, and gradually scars the nerves. The damage is thought to occur because the immune system, for unknown reasons, mistakenly attacks myelin.

Most patients, 85 percent, start out with a form called relapsing-remitting. In about half of those the disease becomes progressive, harder to treat and more disabling. Ms. Raval, who is 38 and has had multiple sclerosis for 13 years, implored Dr. Simon to test her for narrowed veins and, if he found any, to open them.

Dr. Simon regularly uses balloons and stents to open bile ducts and blood vessels. He was impressed with Ms. Raval's determination, her trove of information and her background. She has a degree in toxicology and works for a drug company. But he was also familiar with Dr. Zamboni's work - and deeply skeptical of it.

"My initial take was, it doesn't make any sense," Dr. Simon said.

But Ms. Raval had high hopes. She said she believed that the balloon treatment would be "the next best thing to a cure." The usual drugs have not worked for her. Her 5-year-old son is eagerly awaiting the day when she can run with him, but she is finding it harder and harder even to walk. *Theory Born of Experience*

Dr. Zamboni, 53, (no relation to the inventor of the ice-rink machine) began studying the medical literature on multiple sclerosis in 1995 when his wife learned she had the disease.

"What I found was like a detective story," he said.

He discovered reports of vein abnormalities and of brain lesions forming around veins. But the research had been abandoned. Vein disorders are his specialty; he has been studying them for 25 years. He began using ultrasound and other imaging techniques to examine veins, and found narrowings in the neck and chest veins in people with the disease, but not in healthy ones. He suspected that abnormal blood flow and pressure in the veins - not just narrowing alone - might cause minute amounts of bleeding in the brain, leading to an immune reaction and inflammation that damaged myelin and nerves. Iron deposits could also form, and add to the damage. He wondered if opening the narrowed areas might help.

In 2006 he began using balloons to treat patients, including his wife, whose symptoms went away and, he says, have not come back. Other patients who, like his wife, had relapsing-remitting disease, also recovered fully, he said; but some did not respond at all. In those with progressive disease, fatigue improved, but not mobility problems, according to a pilot study he published in December in *The Journal of Vascular Surgery*.

And in half the treated patients, the neck veins closed up again. The study did not have a control group, and the patients were also taking drugs to treat multiple sclerosis. More rigorous trials will start in Italy this summer, Dr. Zamboni said.

Another doctor, Marian Simka, who has been performing the procedure in Pszczyna, Poland, has reported that it has made symptoms worse in some patients..

Researchers in Buffalo have confirmed (but not yet published) that narrowed veins and abnormal blood flow are more common in people with multiple sclerosis. But, while Dr. Zamboni found them in all patients and no healthy people, the Buffalo team found them in about 60 percent of patients and 15 percent of healthy controls.

Granting a Patient's Wish

Dr. Simon sensed that Ms. Raval would have no peace unless she could learn whether she had narrowed veins, and he wanted to help her.

So he offered to perform a test to find out, a venogram. It involves passing a tube into a vein in the groin and up to the neck and chest, and then injecting dye to take X-rays of the veins. He felt sure there would be no blockages.

“And then she would be able to stop obsessing over this and move on with her life and get some kind of conventional treatment,” he said.

But he was stunned to find narrowings, right where Dr. Zamboni's theory predicted: in the jugular vein in the neck, and the azygous, a vein in the right side of the chest.

Ms. Raval was elated. She felt certain that opening up those veins would solve her problems. Dr. Simon agreed to try.

Although it was, technically, an experimental procedure, Dr. Simon said he did not have to ask his hospital for permission to perform it. The details were similar to other procedures that interventional radiologists do every day. It is not uncommon for them to take a device approved for one purpose and use it for another, like putting a bile-duct stent into a blood vessel - a practice called “off-label” use, which the Food and Drug Administration allows. Interventional radiology, Dr. Simon said, is an “off-label specialty” that depends on innovation and adaptability.

On March 24, as Ms. Raval lay on a padded table in a treatment room, Dr. Simon passed balloons to the pinched spots in her right jugular and azygous, and dilated them.

The procedure took less than an hour. In the recovery room, Ms. Raval said she felt better already.

Over the next days and weeks, she noticed remarkable improvements. Her fatigue went away. She walked and climbed stairs more easily, and the color in her face brightened. Her husband and co-workers saw the changes, too, she said.

Was it real, or just one giant, communal placebo effect? Ms. Raval posted exuberant Facebook messages naming her “most amazing doctor.” Other patients began calling Dr. Simon.

Within a month, Ms. Raval again had trouble walking. She felt sure her veins had closed again. Another venogram showed they had. Dr. Simon reopened them.

Ms. Raval felt better - and then deteriorated again. On June 18, another venogram, her fourth invasive procedure in three months, suggested that the narrowings had recurred. She struggled over what to do. She could not keep having balloon procedures again and again. Dr. Simon consulted Dr. Dake, his former mentor, who recommended stents.

Initially, Ms. Raval and Dr. Simon had thought stents too risky. Unlike balloons, which are inserted briefly and removed, stents are permanent. They can migrate to somewhere they do not belong, like the heart, as occurred in Dr. Dake's patient. Or tissue growth can clog them.

But Dr. Simon and Ms. Raval could see no other option. On June 23, he implanted a stent in her two jugular veins.

“I really have a good feeling on this one,” Ms. Raval said a few hours after the procedure. “I think this is the resolution, long-term. Let's wait and see.”

In the meantime, Dr. Simon had conducted venograms on about 20 other patients with multiple sclerosis. He found narrowed veins in all but one. He said he was going to ask the hospital's ethics panel for permission to perform balloon procedures in those patients. But the hospital would have to figure out how to get paid: insurance might cover venograms, but not an experimental treatment. The total charge for the procedure, including both hospital and doctor fees, would be about \$10,000, Dr. Simon said.

He and his partner, Dr. Noam Eshkar, said they knew many researchers thought patients should not be given unproven treatments outside of clinical trials. They said they did not disagree. But they also sympathized with patients who had progressive diseases and who felt they did not have the time to wait. “In the real world,” Dr. Eshkar said, “things happen at the edge of scientific proof.”

Ovarian transplantation restores fertility to old mice and also lengthens their lives

Rome, Italy: Scientists have discovered that when they transplant ovaries from young mice into aging female mice, not only does the procedure make the mice fertile again, but also it rejuvenates their behaviour and increases their lifespan. The question now is: could ovarian transplants in women have the same effect?

Dr Noriko Kagawa will tell the 26th annual meeting of the European Society of Human Reproduction and Embryology in Rome today (Tuesday) that successful ovarian transplants increased the lifespan of the mice by more than 40%. "At present ovarian transplants are performed with the aim of preserving a woman's fertility after cancer treatment for instance, or of extending her reproductive lifespan. However, the completely unexpected extra benefit of fertility-preserving procedures in our mouse studies indicates that there is a possibility that carrying out similar procedures in women could lengthen their lifespans in general," she said.

A very small number of women in the world have had ovarian transplants, and some have been more successful than others. Dr Kagawa stressed that there was still a lot of research to be carried out before it would be known whether ovarian transplants had similar, rejuvenating effects in women, particularly as it would involve waiting for many years until the patients became older.

Dr Kagawa, Associate Director for Research at the Kato Ladies' Clinic in Tokyo (Japan), told the conference that she and her colleagues had conducted two mouse experiments. In the first, both ovaries were removed from young female mice (about 140 days old), and transplanted in to six older mice (aged over 525 days) that were too old to be fertile any more. In the second experiment, only one ovary was removed from the young mice (about 170 days old) and transplanted into eight aged mice (over 540 days old). The average normal lifespan for this particular breed of mice (C57BL/6J) is 548 days, and they normally reach a mouse "menopause" at about 525 days old.

All the mice that received transplants in both experiments became fertile again, while control mice that had not received transplants did not. In the first experiment the mice resumed normal reproductive cycles that lasted for more than 80 days, and in the second experiment, they lasted for more than 130 days.

Dr Kagawa said: "All the mice in both experiments that had received transplants resumed the normal reproductive behaviour of young mice. They showed interest in male mice, mated and some had pups. Normally, old mice stay in the corner of the cage and don't move much, but the activity of mice that had had ovarian transplants was transformed into that of younger mice and they resumed quick movements.

Furthermore, the lifespan of the mice who received young ovaries was much longer than that of the control mice: the mice that had received two ovaries lived for an average of 915 days, and the mice that had received one ovary, for an average of 877 days. The newest of our data show the life span of mice that received transplants of young ovaries was increased by more than 40%.

"The results show that transplanted normal ovaries from young mice can function in old, infertile mice, making them fertile again, but, in addition, extending their lifespan. Women who have ovarian tissue frozen at young ages, perhaps because they are about to embark on cancer treatment, can have their young ovarian tissue transplanted back when they are older.

Normally we would be doing this simply to preserve their fertility or to expand their reproductive lifespan. However, our mice experiment suggests that this might also improve overall longevity. Further research has to be conducted before we can know whether or not this is the case."

Dr Kagawa said it was not known why the ovarian transplant increased the lifespan of the mice, but it might be because the transplants were prompting the continuation of normal hormonal functions.

She and her colleagues have been collaborating for the past six years with Dr Sherman Silber, from St Luke's Hospital, in St Louis, Missouri (USA), who has performed a number of successful ovarian transplants in women, either because they were about to be treated for cancer or because they had not yet found the right partner in life.

Their future collaborative research will include investigating whether it is possible for a woman to have a transplant using an ovary that is not her own and with minimal drugs to suppress the body's natural immune response to what it perceives as a "foreign" body. They are also looking at culturing follicles in ovarian tissue in the laboratory in order to obtain mature eggs that can be used for IVF.

In the meantime, the researchers believe it is very important for doctors and patients to know that women have options when faced with cancer treatment that could destroy their fertility. "We have been successful in getting frozen ovaries to function completely normally after thawing and transplantation," said Dr Kagawa. "So this should no longer be considered an 'experimental' procedure. Ovarian transplantation is the proper and necessary accompaniment to otherwise sterilising treatment for young cancer patients. We must not neglect to freeze and save at least one of their ovaries before cancer treatment."

Why Fish Came Ashore

By SINDYA N. BHANOO

About 365 million years ago, the fins of some fish evolved into limbs, creating a class of animals known as tetrapods that left the water to dwell on land, giving rise to amphibians, reptiles, birds and mammals.

But just how fins turned to limbs has been a subject of great interest in evolutionary biology.

A new study in the journal Nature reports that a genetic defect in certain fish may have stunted fin growth and led to the development of limbs and the emergence of land dwelling creatures.

Using zebrafish, researchers inhibited the activity of a set of genes in developing embryos. Fin growth was greatly reduced, leaving room for limbs to develop.

"If this kind of gene expression happened in an ancestral fish that may have led to limb development," said Marie-Andree Akimenko, a biologist at the University of Ottawa in Canada and one of the study's authors.

The set of genes seem to code for the proteins that lead to the development of actinotrichia, fibers that provide structural support for the formation of fin rays, the rigid bones that make up a fin. The absence of these genes, found in other fish but not in any land-dwelling animals, may have allowed for limb development.

Next, Dr. Akimenko hopes to introduce this set of genes into mice embryos to see what happens.

Fossils of some early land dwellers show eight digits at the ends of each limb, rather than the five that most tetrapods have today. Further research may shed more light on how and why this occurred, she said.

This article has been revised to reflect the following correction:

Correction: June 30, 2010

A report in the Observatory column on Tuesday about the evolution of some fish into a class of four-limbed animals (known as tetrapods) referred incorrectly to appendages of early land-dwelling creatures and modern animals. The early creatures typically had eight digits per limb, compared with five on modern tetrapods - not eight limbs versus five limbs.

Closest delay means shuttles set to fly on into 2011

* 29 June 2010 by David Shiga

NASA's venerable packhorses will not be put out to pasture just yet. The space shuttles will almost certainly keep flying into 2011, now that delays on the ground are likely to postpone the last two flights.

This year was supposed to be the last for the shuttle service. The order to retire came in the wake of the fatal 2003 Columbia accident, and the last flight had been scheduled for November. Delays will probably push back the launch until early 2011.

NASA says it needs more time to finish readying Leonardo, a "walk-in closet" for the space station. NASA workers are busy reinforcing its shielding against space debris. Discovery will carry Leonardo on the second but last flight when astronauts will fix it to the space station. The delay will postpone the final mission, to be flown by Endeavour.

The two flights will also carry up spare parts to keep the station going after the shuttles are grounded. "These last couple of flights are all about leaving the ISS in the best possible position it can be in without the shuttle," which has an unparalleled ability to loft "huge amounts of cargo", says Allard Beutel, a spokesman for NASA's Kennedy Space Center in Cape Canaveral, Florida.

Discovering the Virtues of a Wandering Mind

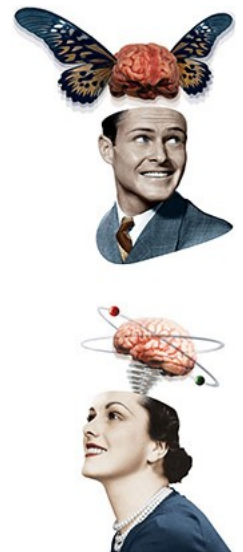
By JOHN TIERNEY

At long last, the doodling daydreamer is getting some respect.

In the past, daydreaming was often considered a failure of mental discipline, or worse. Freud labeled it infantile and neurotic. Psychology textbooks warned it could lead to psychosis. Neuroscientists complained that the rogue bursts of activity on brain scans kept interfering with their studies of more important mental functions.

But now that researchers have been analyzing those stray thoughts, they've found daydreaming to be remarkably common - and often quite useful. A wandering mind can protect you from immediate perils and keep you on course toward long-term goals. Sometimes daydreaming is counterproductive, but sometimes it fosters creativity and helps you solve problems.

Consider, for instance, these three words: eye, gown, basket. Can you think of another word that relates to all three? If not, don't worry for now. By the time we get back to discussing the scientific significance of this puzzle, the answer might occur to you through the "incubation effect" as your mind wanders from the text of this article - and, yes, your mind is probably going to wander, no matter how brilliant the rest of this column is.



Viktor Koen

Mind wandering, as psychologists define it, is a subcategory of daydreaming, which is the broad term for all stray thoughts and fantasies, including those moments you deliberately set aside to imagine yourself winning

the lottery or accepting the Nobel. But when you're trying to accomplish one thing and lapse into "task-unrelated thoughts," that's mind wandering.

During waking hours, people's minds seem to wander about 30 percent of the time, according to estimates by psychologists who have interrupted people throughout the day to ask what they're thinking. If you're driving down a straight, empty highway, your mind might be wandering three-quarters of the time, according to two of the leading researchers, Jonathan Schooler and Jonathan Smallwood of the University of California, Santa Barbara.

"People assume mind wandering is a bad thing, but if we couldn't do it during a boring task, life would be horrible," Dr. Smallwood says. "Imagine if you couldn't escape mentally from a traffic jam."

You'd be stuck contemplating the mass of idling cars, a mental exercise that is much less pleasant than dreaming about a beach and much less useful than mulling what to do once you get off the road. There's an evolutionary advantage to the brain's system of mind wandering, says Eric Klinger, a psychologist at the University of Minnesota and one of the pioneers of the field.

"While a person is occupied with one task, this system keeps the individual's larger agenda fresher in mind," Dr. Klinger writes in the "Handbook of Imagination and Mental Simulation". "It thus serves as a kind of reminder mechanism, thereby increasing the likelihood that the other goal pursuits will remain intact and not get lost in the shuffle of pursuing many goals."

Of course, it's often hard to know which agenda is most evolutionarily adaptive at any moment. If, during a professor's lecture, students start checking out peers of the opposite sex sitting nearby, are their brains missing out on vital knowledge or working on the more important agenda of finding a mate? Depends on the lecture.

But mind wandering clearly seems to be a dubious strategy, if, for example, you're tailgating a driver who suddenly brakes. Or, to cite activities that have actually been studied in the laboratory, when you're sitting by yourself reading "War and Peace" or "Sense and Sensibility."

If your mind is elsewhere while your eyes are scanning Tolstoy's or Austen's words, you're wasting your own time. You'd be better off putting down the book and doing something more enjoyable or productive than "mindless reading," as researchers call it.

Yet when people sit down in a laboratory with nothing on the agenda except to read a novel and report whenever their mind wanders, in the course of a half hour they typically report one to three episodes. And those are just the lapses they themselves notice, thanks to their wandering brains being in a state of "meta-awareness," as it's called by Dr. Schooler,

He, and other researchers have also studied the many other occasions when readers aren't aware of their own wandering minds, a condition known in the psychological literature as "zoning out." (For once, a good bit of technical jargon.) When experimenters sporadically interrupted people reading to ask if their minds were on the text at that moment, about 10 percent of the time people replied that their thoughts were elsewhere - but they hadn't been aware of the wandering until being asked about it.

"It's daunting to think that we're slipping in and out so frequently and we never notice that we were gone," Dr. Schooler says. "We have this intuition that the one thing we should know is what's going on in our minds: I think, therefore I am. It's the last bastion of what we know, and yet we don't even know that so well."

The frequency of zoning out more than doubled in reading experiments involving smokers who craved a cigarette and in people who were given a vodka cocktail before taking on "War and Peace." Besides increasing the amount of mind wandering, the people made alcohol less likely to notice when their minds wandered from Tolstoy's text.

In another reading experiment, researchers mangled a series of consecutive sentences by switching the position of two nouns in each one - the way that "alcohol" and "people" were switched in the last sentence of the previous paragraph. In the laboratory experiment, even though the readers were told to look for sections of gibberish somewhere in the story, only half of them spotted it right away. The rest typically read right through the first mangled sentence and kept going through several more before noticing anything amiss.

To measure mind wandering more directly, Dr. Schooler and two psychologists at the University of Pittsburgh, Erik D. Reichle and Andrew Reineberg, used a machine that tracked the movements of people's eyes while reading "Sense and Sensibility" on a computer screen. It's probably just as well that Jane Austen is not around to see the experiment's results, which are to appear in a forthcoming issue of *Psychological Science*.

By comparing the eye movements with the prose on the screen, the experimenters could tell if someone was slowing to understand complex phrases or simply scanning without comprehension. They found that when people's mind wandered, the episode could last as long as two minutes.

Where exactly does the mind go during those moments? By observing people at rest during brain scans, neuroscientists have identified a "default network" that is active when people's minds are especially free to

wander. When people do take up a task, the brain's executive network lights up to issue commands, and the default network is often suppressed.

But during some episodes of mind wandering, both networks are firing simultaneously, according to a study led by Kalina Christoff of the University of British Columbia. Why both networks are active is up for debate. One school theorizes that the executive network is working to control the stray thoughts and put the mind back on task.

Another school of psychologists, which includes the Santa Barbara researchers, theorizes that both networks are working on agendas beyond the immediate task. That theory could help explain why studies have found that people prone to mind wandering also score higher on tests of creativity, like the word-association puzzle mentioned earlier. Perhaps, by putting both of the brain networks to work simultaneously, these people are more likely to realize that the word that relates to eye, gown and basket is ball, as in eyeball, ball gown and basketball.

To encourage this creative process, Dr. Schooler says, it may help if you go jogging, take a walk, do some knitting or just sit around doodling, because relatively undemanding tasks seem to free your mind to wander productively. But you also want to be able to catch yourself at the Eureka moment.

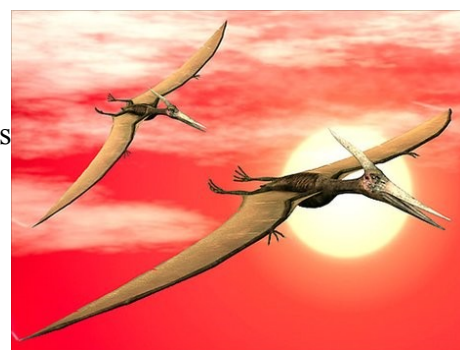
"For creativity you need your mind to wander," Dr. Schooler says, "but you also need to be able to notice that you're mind wandering and catch the idea when you have it. If Archimedes had come up with a solution in the bathtub but didn't notice he'd had the idea, what good would it have done him?"

'Sex' drove fossil animal traits

Several prehistoric creatures developed elaborate body traits in order to attract members of the opposite sex, according to new research. The purpose of the exaggerated crests and sails found in many fossil animals has long been controversial.

Some scientists said sails helped to regulate body temperature and that head crests helped flying reptiles steer during flight. Now a study says these traits became so big because of sexual competition.

The findings, by an international team of researchers, is published in the journal *American Naturalist*.



Pterosaurs sported elaborate crests on their heads

One of the prehistoric animals looked at by the researchers were pterosaurs - flying reptiles which became extinct at the time of the dinosaurs.

The study suggests the relative size of the head crest compared to the body of the pterosaur was too large for it to have been dedicated to controlling the animal's body temperature or its flight.

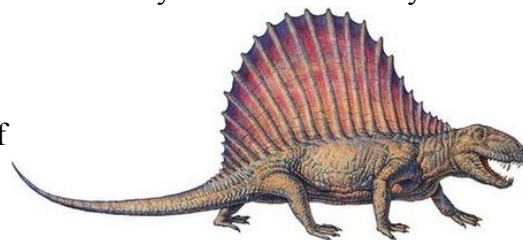
They also looked at mammal-like creatures called Eupelycosaur, which lived before the time of the dinosaurs. This group, which included the animals Dimetrodon and Edaphosaurus, carried large elaborate "sails" along their backs.

By using known relationships between body size and metabolic activity - the process behind heat generation - in living organisms, the scientists concluded that the features were "too exaggerated" to have played a role in the control of body temperature.

Co-author Dr Stuart Humphries, from the University of Hull said: "One of the few things that haven't changed over the last 300 million years are the laws of physics. "So it has been good to use those laws to understand what might really be driving the evolution of these big crests and sails."

His colleague, Dr Joseph Tompkins, from the University of Western Australia, commented: "The sails of the Eupelycosaur are among the earliest known examples of exaggerated secondary sexual traits in the history of vertebrate evolution. "Indeed, the sail of Dimetrodon is one of the largest secondary sexual traits of any animal."

Co-author Dr Dave Martill from the University of Portsmouth said: "Pterosaurs put even more effort into attracting a mate than peacocks whose large feathers are considered the most elaborate development of sexual selection in the modern day. "Peacocks shed their fantastic plumage each year, so it's only a burden some of the time, but pterosaurs had to carry their crest around all the time."



Dimetrodon's elaborate sail was designed to attract mates, says the team

Dr Tompkins added: "Our analysis suggests that male Pteranodon competed with each other in battles for dominance using their crests - in a similar way to animals with horns or antlers.

"Or alternatively, that females assessed males on the size of their crests, in a similar way to peahens choosing among a group of displaying males."

Dr Humphries said that collecting or dumping heat may well have been important in these animals.

But he said: "We have been able to show that these animals were likely to have been using their crests and sails mainly to attract mates or deter sexual competitors."

Bars, Restaurants See No Significant Employment Change Under Smoking Bans In 2 Cities

COLUMBUS, Ohio - The passage of smoking bans in two large Minnesota cities was not associated with job losses at bars and may in fact have contributed to higher employment in restaurants, according to new research.

The study is the first to examine the economic effects of clean indoor air policies on bars and restaurants as independent types of businesses, the researchers said. Consistent with previous published studies of the economic impact of smoking bans, this analysis did not find significant economic effects on the hospitality industry as a whole.

In both Minneapolis and St. Paul, the policies were associated with an increase of at least 3 percent in employment at restaurants over a 2 ½-year span following adoption of a local clean indoor air policy. Employment in Minneapolis bars increased more than 5 percent after passage of that city's smoking ban, while in St. Paul, bar employment had a nonsignificant decrease of 1 percent - a decrease that cannot be statistically distinguished from zero, or no change in employment.

The researchers noted that the broad look at total bar and restaurant employment at the city level over time means that this study is not able to describe potential changes at the neighborhood or individual business level. Opponents to smoking bans have argued against enactment of these policies with predictions of large revenue losses, worker layoffs and business closures in the hospitality industry, and at bars in particular because of known correlations between drinking and tobacco use.

Proponents of such policies say smoking bans promote a healthful workplace atmosphere for workers and patrons. According to the U.S. Department of Health and Human Services, exposure to secondhand smoke increases nonsmokers' risks of developing lung cancer, heart disease, respiratory conditions and other diseases.

"These clean indoor air policies are designed to protect workers from exposure to secondhand smoke," said Elizabeth Klein, assistant professor of health behavior and health promotion at Ohio State University and lead author of the study. "We are evaluating business employment because employment is an objective measure of the overall economic health of these businesses. What we have found is that there isn't a significant economic effect for bars, and in fact for restaurants, there is some positive change in employment. These findings underscore that nothing economically catastrophic happened for bars or restaurants in the Twin Cities as a result of banning smoking in these environments."

The research is published in the July/August issue of the *Journal of Public Health Management Practice*.

All of this research examines employment trends before Minnesota adopted a comprehensive statewide clean indoor air policy in late 2007. A comprehensive citywide smoking ban - covering virtually all workplaces - took effect on March 31, 2005 in Minneapolis and on March 31, 2006 in St. Paul. For a year before that, St. Paul operated under a partial smoking ban that exempted bars.

Klein and colleagues used what is called an interrupted time series analysis to evaluate short- and long-term effects of these new policies. They examined a five-year period between January 2003 and December 2007 to monitor employment levels in bars and restaurants before and after enactment of the smoking bans in these two cities. "It is difficult to find an appropriate comparison between one city with a clean indoor air policy and another city without a policy, so we used this model to look at what was going on in each community before adoption of the policies and what happened after that. This design allows for each city to serve as its own comparison group," Klein said.

The researchers also accounted for employment in the rest of the hospitality industry - minus restaurants and bars - over the same time period as a way to account for general economic conditions that might have been an additional influence on bar and restaurant employment.

The researchers obtained employment figures from the Minnesota Department of Employment and Economic Development, to which businesses are required by law to report the total number of individuals they employ each month. In Minneapolis, the comprehensive smoking ban was associated with a 3 percent gradual permanent increase in employment at restaurants and an increase of between 5 percent and 6 percent employment in bars. The estimated change in the rest of the hospitality industry, when compared with either bars or restaurants, was a 1 percent or smaller increase in employment.

In St. Paul, the clean indoor air policy was associated with a 4 percent increase in restaurant employment. Bars, which were not subject to the smoking ban until a year later than restaurants in that city, saw a 1 percent

or smaller decrease in employment after the smoking ban took effect in bars. When subject to statistical analysis, that decrease was no different from no effect at all.

For the rest of the hospitality industry in St. Paul, the partial smoking ban was associated with an almost 12 percent increase in employment. The comprehensive clean indoor air policy adopted a year later was associated with a reduction in hospitality employment of 13 percent, but this decrease was not significant by statistical standards. Klein said no clear explanation exists for this decrease, but an ongoing investigation into the economic effects of the statewide Minnesota smoking ban adopted in late 2007 can evaluate if other regions of the state experienced similar trends.

As part of monitoring other economic conditions, Klein accounted for the potential influence of a National Hockey League 2004-05 season-long strike on employment at bars and restaurants in St. Paul, home to the Minnesota Wild. The strike was associated with a nonsignificant drop in bar and restaurant employment of less than 1 percent.

The researchers did note that the employment figures act as a headcount of the total number of people employed but do not differentiate between part-time and full-time jobs held. And while revenues are another strong indicator of the economic health of businesses, reliable revenue data would not be available frequently enough to allow for a monthly analysis.

Klein said that these findings are consistent with previous research that has examined the economic effects of smoking bans on bars and restaurants in California and in cities in Canada and Australia. It also reinforces her own findings published in 2009 that suggested that exempting bars from community smoking bans made no economic difference in terms of preserving bar employment. That study examined employment trends over three years in eight Minnesota cities with different types of clean indoor air policies and two cities with no laws restricting smoking.

While the Midwestern United States has been slower to adopt clean indoor air policies than have coastal states, Klein said this first detailed look at the economic effects of smoking bans on bars in the Midwest might encourage more communities and states in the region to consider adopting the policies.

"These results show there is a null or a slightly positive effect on employment with these policies," Klein said. "In this case, it appears that the unintended consequences of local clean indoor air policies may have had a positive, albeit small, economic benefit for hospitality businesses."

This work was supported by a grant from ClearWay Minnesota, an independent, nonprofit organization seeking to reduce Minnesota residents' tobacco use and exposure to secondhand smoke through research, action and collaboration. The study findings do not necessarily represent the official views of the organization.

Co-authors on the paper were Jean Forster, Darin Erickson and Leslie Lytle of the University of Minnesota School of Public Health, and Barbara Schillo of ClearWay Minnesota.

Is Your Left Hand More Motivated Than Your Right Hand?

Motivation doesn't have to be conscious; your brain can decide how much it wants something without input from your conscious mind. Now a new study shows that both halves of your brain don't even have to agree. Motivation can happen in one side of the brain at a time.

Psychologists used to think that motivation was a conscious process. You know you want something, so you try to get it. But a few years ago, Mathias Pessiglione, of the Brain & Spine Institute in Paris, and his colleagues showed that motivation could be subconscious; when people saw subliminal pictures of a reward, even if they didn't know what they'd seen, they would try harder for a bigger reward. In the earlier study, volunteers were shown pictures of either a one-euro coin or a one-cent coin for a tiny fraction of a second. Then they were told to squeeze a pressure-sensing handgrip; the harder they squeezed it, the more of the coin they would get. The image was subliminal, so volunteers didn't know how big a coin they were squeezing for, but they would still squeeze harder for one euro than one cent. That result showed that motivation didn't have to be conscious.

For the new study, in *Psychological Science*, a journal of the Association for Psychological Science, Pessiglione and his colleagues Liane Schmidt, Stefano Palminteri, and Gilles Lafargue wanted to know if they could dig even farther down and show that one side of the brain could be motivated at a time. The test started with having the subject focus on a cross in the middle of the computer screen. Then the motivational coin - one euro or one cent - was shown on one side of the visual field. People were only subliminally motivated when the coin appeared on the same side of the visual field as the squeezing hand. For example, if the coin was on the right and they were squeezing with the right hand, they would squeeze harder for a euro than for a cent. But if the subliminal coin appeared on the left and they were squeezing on the right, they wouldn't squeeze any harder for a euro.

The research shows that it's possible for only one side of the brain, and thus one side of the body, to be motivated at a time, says Pessiglione. "It changes the conception we have about motivation. It's a weird idea,

that your left hand, for instance, could be more motivated than your right hand." He says this basic research helps scientists understand how the two sides of the brain get along to drive our behavior.

For more information about this study, please contact: Mathias Pessiglione mathias.pessiglione@gmail.com

Doctors to treat septic patients with hypothermia

Mild hypothermia can reduce the effects of sepsis on oxygen transport around the body and could be used to treat patients in hospital

Inducing mild hypothermia is easy to implement in clinical practice and may be a valuable tool in the treatment of human sepsis patients, say researchers at the University of Brest, France. Sepsis is an inflammatory response to infection and will often result in septic shock, which is the biggest cause of death in intensive care units.

New research shows that the development of sepsis in rats living under hypothermic conditions was slower than in normal conditions and they survived much longer. The research is presented on Thursday 1st July at the Society for Experimental Biology Annual Meeting in Prague. The new research showed that rats with sepsis living under normal conditions (38 °C) showed a decreased ability to carry oxygen via the blood from the lungs to vital organs around the body, compared to those living under mildly hypothermic conditions (34 °C).

Hypothermia could have a beneficial effect in septic patients whose uptake of oxygen has been affected by the condition, by increasing the ability of the pigment in red-blood cells (haemoglobin, Hb) to carry oxygen, thus balancing the harmful effects of sepsis, say the researchers. Under normal conditions, sepsis can lead to septic shock, causing multiple organ dysfunction and death in 60% of cases.

Building on these results, the research team are carrying out a pilot clinical study into the efficiency, safety and practicality of using mild hypothermia as a treatment for septic shock in humans.

The pilot study is being carried out Professor Erwan L'Her from Brest hospital and colleagues from the ORPHY laboratory in the University of Brest. "The preliminary results suggest that mild hypothermia is safe and easily induced in septic shock patients and no serious adverse effects were observed", explained Karelle Leon, who is carrying out the research. Hypothermia is already frequently induced in human patients in hospital to protect the brain from further damage after an injury has been sustained.

Breakthrough in understanding cell development

How do plants and animals end up with right number of cells in all the right places?

For the first time, scientists have gained an insight into how this process is co-ordinated in plants. An international team, including Cardiff University's School of Biosciences and Duke University in the USA, have linked the process of cell division with the way cells acquire their different characteristics.

A protein called Short-root, already known to play a part in determining what cells will become, was also found to control cell division. The researchers report their findings on July 1 in the journal Nature. The discovery may have implications for animals and improve our understanding of what happens when organs are deformed.

The research team had already studied the molecular-level events that determine how particular cells in plants develop into different types. These events involve Short-root and another protein, Scarecrow.

Researchers also had a good understanding of the factors which allow cells to go through their cycle and divide into two daughter cells. "What was missing was a connection between the two," according to Dr Rosangela Sozzani, a postdoctoral researcher at the Duke Institute for Genome Sciences and Policy, North Carolina, who was lead author of the new study.

The research team combined a number of experimental techniques and technologies to produce a dynamic view of the genetic events that Short-root and its partner Scarecrow set into motion within a single type of cell in Arabidopsis plants. They found that at the very same time that cells divide, Short-root and Scarecrow switch on the gene cyclin D6. Cyclin D6 is one of a family of genes that govern cell growth and division.

Professor Jim Murray, who led the Cardiff University involvement in the discovery, said: "Not only does this finding have practical significance to our understanding of how plants develop, this may also be a fundamental process which is relevant to animals as well. For example, we already know that cyclin D6 is present in humans. We also know that disruption of this process can lead to tumours or badly-formed organs, so it is vital that we know more about it."

Penalty Kicks May Be Predictable

More than 80 percent of the time, even the best goalies guess wrong. This new study could improve those odds.

By Emily Sohn | Wed Jun 30, 2010 07:00 AM ET

In a World Cup-level soccer game, most penalty kicks become goals. Faced with a ball that rockets toward him from 36 feet away and that -- at 60-plus miles per hour - spends less than half a second in the air, a goalkeeper needs to decide which way he's going to dive before the kicker's foot even makes contact with the ball. More than 80 percent of the time, studies show, even the best goalies guess wrong.

Now, new research might give goalies the upper hand. Using motion-sensing technologies and computer analyses, a scientist has identified a few early signs that reliably predict which direction a penalty kick will go. The study also found that some people are much better at picking up on those signs than others.

"There's some interesting data suggesting that there's a big difference in performance among expert goalkeepers out there playing on national teams," said Gabriel Diaz, a cognitive scientist at Rensselaer Polytechnic Institute in Troy, N.Y. Some are adept at blocking penalty kicks, while others are no better than novices.

"In the future, I would like to create a perceptual training regime," he said. "Maybe we can train people's attention to focus on the most reliable information."

Penalty kicks can determine which team wins a soccer game, especially when shoot-outs are used to settle a draw. Although there is plenty of physical skill involved in placing the ball just out of the goalie's reach, a penalty shot is ultimately a mind game between player and goalkeeper. In a split second, each opponent tries to guess what the other will do.

Past studies have looked at how a goalie's emotions influence whether he dives or stands still, how his stance affects where the kicker places the ball, and how the kicker's anxiety affects his success rate. Taking a different approach, Diaz wanted to find out if any of the kicker's body movements before the kick might betray where the ball will go.

In a large room, Diaz created a scaled down penalty kick scenario that was one-third shorter than the official distance between ball and goal. The experimental setup also had a goal that was one-third smaller than normal.

With more than 40 motion sensors on 19 major joints, three college-level soccer players kicked more than 100 penalty kicks to both sides of the goal. Even the ball wore a motion sensor. Cameras tracked every move.

Out of 27 possible body movements, Diaz found five that turned out to be reliable predictors of where the ball would go, including the direction of the kicker's planted foot and the angle of his hips. If a kicker tried to do something unexpected, such as point his planted foot one way but kick the ball in the opposite direction, the rest of his body could also give him away, Diaz said. The player might, for example, have to move his arms in a certain way to keep his balance.

In a second experiment, Diaz showed animated video footage of penalty kicks from the first experiment to about 30 novice soccer players. They saw the kick just to the point where the kicker's foot touched the ball. Then, the screen went blank. They had half a second to decide which way the ball would go.

Results, which Diaz plans to submit to a scientific journal when he's done with follow-up studies, showed that half of the people were terrible at guessing where the ball went. The other half, however, excelled at it.

Those who did well may have zeroed in on a few specific body movements, the study suggested. They also tended to wait slightly longer to make a decision.

But that's time that goalies just don't have in real-game situations, said Richard Ginsburg, co-director of the Massachusetts General Hospital Sport Psychology Program in Boston. While the new findings might eventually give both kickers and goalies new ways to outsmart each other, he said, dissecting a sport into its scientific parts can never produce a perfect player.

With high-stake games, lots of emotion flowing, and tremendous amounts of pressure on the players, psychology starts to play a big role. That will always make results unpredictable.

"This kind of science can only take you so far," said Ginsburg, who has also played and coached soccer. "There are an enormous number of factors that go into this. There will always be these other variables that will be unknown."

Restore hearing thanks to new drug

Study uncovers potential drug treatment for noise-induced hearing loss

Researchers from the University of Auckland, New Zealand, have discovered that a potent new drug restores hearing after noise-induced hearing loss in rats. The landmark discovery found that injection of an agent called 'ADAC', activates adenosine receptors in cochlear tissues, resulting in recovery of hearing function. The finding paves the way for effective non-surgical therapies to restore hearing loss after noise-induced injury. Dr. Srdjan Vlajkovic and his team's work¹ is published in a special edition of Springer's journal *Purinergic Signalling*, focusing on the inner ear.

Hearing loss from noise exposure is a leading occupational disease with up to five percent of the population at risk worldwide. It is particularly common in the military and in industrial settings (construction workers, mining, forestry and airline industry). At the present time, the only treatment strategies for hearing loss are hearing aids and cochlear implants. Drug therapies for noise-induced hearing loss have only recently been proposed and, to date, there are virtually no treatments that can repair the damage to the inner ear and reduce the impact of hearing loss.

Vlajkovic and his team's study investigates the potential of adenosine amine congener (ADAC) – a selective A1 adenosine receptor agonist – in the treatment of noise-induced hearing loss. Wistar rats were exposed to narrow-band noise for 2 – 24 hours in an acoustic chamber to induce cochlear damage and permanent hearing loss. ADAC or placebo control was then administered by injection(s) in the abdomen, either as a single injection at six hours or multiple daily injections. The researchers measured the hearing in the rats before and after the treatments using a technique known as auditory brainstem response (ABR). They also used histological techniques to determine the number of missing cochlear sensory hair cells after noise exposure and the noise-induced production of free radicals.

Their results show that cochlear injury and hearing loss in rats exposed to narrow-band noise can be substantially restored by ADAC administration after noise exposure. Early treatment starting six hours after noise exposure was the most effective and provided greater recovery than late treatment starting 24 hours after noise exposure. The most sustainable treatment strategy was the one involving multiple injections of ADAC for five days after noise exposure. This therapy significantly attenuated noise-induced hearing loss and improved sensory hair cell survival.

The authors conclude: "This study underpins an important role of adenosine signaling in mitigation of cochlear injury caused by oxidative stress. ADAC in particular emerges as an attractive pharmacological agent for therapeutic interventions in noise-induced cochlear injury in instances of both acute and extended noise exposures."

References 1. Vlajkovic SM et al (2010). Adenosine amine congener mitigates noise-induced cochlear injury. *Purinergic Signalling*; 10.1007/s11302-010-9188-5 2. The study was supported by the RNID (UK), Deafness Research Foundation (NZ), and the Auckland Medical Research Foundation.

Cancer drug shows promise for treating a wide range of inflammatory diseases

New research published in the Journal of Leukocyte Biology suggests bortezomib induces cell death in activated and proliferating T cells, leaving resting T cells untouched, offering hope for reducing or eliminating dangerous inflammation

Those looking for a new treatment for a range of inflammatory diseases like arthritis, multiple sclerosis, inflammatory bowel disease, and lupus may need to look no further than a drug already available for treating cancer. In a research report published in the July 2010 print issue of the Journal of Leukocyte Biology (<http://www.jleukbio.org>), Japanese scientists use mice to show that bortezomib, currently used to treat cancers that affect white blood cells, induces cell death only in harmful (active and proliferating) T cells, leaving the rest unharmed. If the results prove true in humans, it offers hope that this drug or others similar to it might be used to treat inflammatory diseases without the side effects of current drugs that affect all T cells equally.

"Unfortunately, there are a lot of people who are suffering from autoimmune and inflammatory disease," said Koichi Yanaba, M.D., Ph.D., a scientist from the Department of Dermatology at Nagasaki University Graduate School of Biomedical Sciences who was involved in the research. "We believe that this new-type remedy for autoimmune and inflammatory disease could successfully treat them in the near future."

To make this discovery, scientists used two groups of mice - the first treated with bortezomib and the second with saline. Researchers induced contact hypersensitivity reaction with oxazolone, a chemical allergen used for immunological experiments and found that bortezomib significantly inhibited the contact hypersensitivity responses. Results strongly suggest that bortezomib treatment enhanced T cell death by inhibiting NF-kappa B activation, which plays a key role in regulating the immune response to infection. This in turn led to the suppression of inflammatory responses in immune cells by reducing interferon-gamma production.

"Any time you learn that a drug already on the market has the potential to be used for more illnesses than originally thought, it's a hopeful discovery," said Luis J. Montaner, D.V.M., M.Sc., D.Phil., Editor-in-Chief of the Journal of Leukocyte Biology, "Even if this drug is not quite as successful in humans, it raises the possibility that a similar compound could be created which would be more successful."

Details: Koichi Yanaba, Ayumi Yoshizaki, Eiji Muroi, Toshihide Hara, Fumihide Ogawa, Kazuhiro Shimizu, and Shinichi Sato. The proteasome inhibitor bortezomib inhibits T cell-dependent inflammatory responses. *J Leukoc Biol* 2010 88: 117-122. DOI: 10.1189/jlb.1009666 ; <http://www.jleukbio.org/cgi/content/abstract/88/1/117>

A butterfly effect in the brain

Next time your brain plays tricks on you, you have an excuse: according to new research by UCL scientists published today in the journal Nature, the brain is intrinsically unreliable.

This may not seem surprising to most of us, but it has puzzled neuroscientists for decades. Given that the brain is the most powerful computing device known, how can it perform so well even though the behaviour of its circuits is variable?

A long-standing hypothesis is that the brain's circuitry actually is reliable – and the apparently high variability is because your brain is engaged in many tasks simultaneously, which affect each other.

It is this hypothesis that the researchers at UCL tested directly. The team – a collaboration between experimentalists at the Wolfson Institute for Biomedical Research and a theorist, Peter Latham, at the Gatsby Computational Neuroscience Unit – took inspiration from the celebrated butterfly effect – from the fact that the flap of a butterfly's wings in Brazil could set off a tornado in Texas. Their idea was to introduce a small perturbation into the brain, the neural equivalent of butterfly wings, and ask what would happen to the activity in the circuit. Would the perturbation grow and have a knock-on effect, thus affecting the rest of the brain, or immediately die out?

It turned out to have a huge knock-on effect. The perturbation was a single extra 'spike', or nerve impulse, introduced to a single neuron in the brain of a rat. That single extra spike caused about thirty new extra spikes in nearby neurons in the brain, most of which caused another thirty extra spikes, and so on. This may not seem like much, given that the brain produces millions of spikes every second. However, the researchers estimated that eventually, that one extra spike affected millions of neurons in the brain.

"This result indicates that the variability we see in the brain may actually be due to noise, and represents a fundamental feature of normal brain function," said lead author Dr. Mickey London, of the Wolfson Institute for Biomedical Research, UCL.

This rapid amplification of spikes means that the brain is extremely 'noisy' – much, much noisier than computers. Nevertheless, the brain can perform very complicated tasks with enormous speed and accuracy, far faster and more accurately than the most powerful computer ever built (and likely to be built in the foreseeable future). The UCL researchers suggest that for the brain to perform so well in the face of high levels of noise, it must be using a strategy called a rate code. In a rate code, neurons consider the activity of an ensemble of many neurons, and ignore the individual variability, or noise, produced by each of them.

So now we know that the brain is truly noisy, but we still don't know why. The UCL researchers suggest that one possibility is that it's the price the brain pays for high connectivity among neurons (each neuron connects to about 10,000 others, resulting in over 8 million kilometres of wiring in the human brain). Presumably, that high connectivity is at least in part responsible for the brain's computational power. However, as the research shows, the higher the connectivity, the noisier the brain. Therefore, while noise may not be a useful feature, it is at least a by-product of a useful feature.

Notes to Editors

- 1.) For more information or to interview the researchers quoted, please contact Ruth Howells in the UCL Media Relations Office on tel: +44 (0)20 7679 9739, mobile: +07790 675 947, email: ruth.howells@ucl.ac.uk
- 2.) The paper 'Sensitivity to perturbations in vivo implies high noise and suggests rate coding in cortex' is published in Nature, embargoed until 6pm UK Time, Wednesday 30 June 2010. Journalists requiring advance copies of the paper should contact the Nature press office.

Dinosaurs Nestled Up to Geysers, Hot Springs to Incubate Eggs

By Michael Reilly | Wed Jun 30, 2010 03:54 PM ET

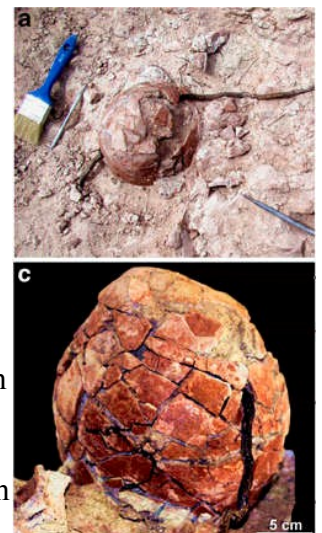
Everybody likes a good soak in a hot bath from time to time. But new research suggests that some dinosaurs took it to the extreme, laying their eggs in the steaming hot soils near hot springs and Old Faithful-like geysers in what is now northwestern Argentina.

In the Cretaceous period over a hundred million years ago, Argentina's Sanagasta Valley was alive with hydrothermal activity, much like Yellowstone National Park or Iceland are today. Tunnels of near-boiling, mineral-rich water crisscrossed the subsurface (figures below, from the paper), and explosive geysers pockmarked the landscape. Doesn't seem like a very inviting place to raise a family.

But researchers found some 80 clutches of fossilized eggs in the area, many of them containing a dozen or more eggs each. Even more strange, the nests were almost exclusively found within 10 feet of a geyser or hot spring. It seems that far from avoiding the hydrothermal features, dinosaurs were purposefully laying eggs near them as a way to keep them incubated during their 1-2 month long gestation.

Gerald Grellet-Tinner of the Field Museum in Chicago and Lucas Fiorelli of CRILAR in Argentina published their findings in the journal Nature Communications.

So far, the scientists are still uncertain what species of dinosaur laid the eggs; no bones have been found that can be linked directly to the eggs. But the eggs are enormous - over eight inches in diameter, bigger than an ostrich egg (figures at left, from the paper) - and bones found in the region belong to the Titanosaur family, 100-ton beasts that are among the largest animals to ever walk the planet.



Grellet-Tinner and Fiorelli think the nesting site was chosen because the consistent heat would be a good way to ensure such large eggs remained warm.

Interestingly, the eggshells also varied a lot in thickness, between 1.29 and 7.94 millimeters (.05 and .31 inches) thick. By contrast, chicken eggshells are around .311 millimeters thick. The researchers believe that all healthy eggs would have been on the thicker end of the spectrum at first, an evolutionary adaptation designed to prevent them from being destroyed while they spent weeks marinating in hydrothermal acids (which explains the thinner shell piece): *...we hypothesize that the 7-mm thick eggshells offered an adaptation to chemical dissolution in an extreme environment by buffering external erosion from acidic hydrothermal fluids, thus providing sufficient time for embryonic development.*

If so, that would mean these particular dinosaurs had a unique dependence on hydrothermal vents for survival. The heat and moisture from geyser activity were more than just convenient; they were crucial parts of the dinos' reproductive cycles, incorporated into their nesting instincts and the architecture of their eggs over generations.

It's unlikely that all - or even most - dinosaurs sought out such harsh conditions to lay their eggs. But the researchers note that though the discovery is the first of its kind, it may not be the last example we find that dinosaurs relied on Earth' primordial heat to survive and procreate.

UM School of Medicine scientists develop new strategy that may improve cognition Findings could lead to new drugs to enhance cognition in patients and healthy individuals

For the first time, scientists have linked a brain compound called kynurenic acid to cognition, possibly opening doors for new ways to enhance memory function and treat catastrophic brain diseases, according to a new study from the University of Maryland School of Medicine. When researchers decreased the levels of kynurenic acid in the brains of mice, their cognition was shown to improve markedly, according to the study, which was published in the July issue of the journal *Neuropsychopharmacology*. The study is the result of decades of pioneering research in the lab of Robert Schwarcz, Ph.D., a professor of psychiatry, pediatrics and pharmacology and experimental therapeutics at the University of Maryland School of Medicine.

"We believe that interventions aimed specifically at reducing the level of kynurenic acid in the brain are a promising strategy for cognitive improvement in both healthy patients and in those suffering from a variety of brain diseases ranging from schizophrenia to Alzheimer's disease," says Dr. Schwarcz.

Kynurenic acid is a substance with unique biological properties and is produced when the brain metabolizes the amino acid L-tryptophan. The compound is related to another breakdown product of tryptophan known as quinolinic acid. In 1983, Dr. Schwarcz published a paper in the journal *Science* identifying the critical role excessive quinolinic acid plays in the neurodegenerative disorder Huntington's disease. He has since designed a therapeutic strategy targeting quinolinic acid for the treatment of Huntington's disease. Dr. Schwarcz also is involved in a company called VistaGen, which pursues the development of neuroprotective drugs based on this concept.

In the study published this month, Dr. Schwarcz and his colleagues at the Maryland Psychiatric Research Center - a world-renowned clinical and basic science research center at the University of Maryland School of Medicine - examined mice that had been genetically engineered to have more than 70 percent lower kynurenic acid levels than ordinary mice. These mice were found to perform significantly better than their normal peers on several widely used tests that specifically measure function in the hippocampus. The hippocampus is a critical area of the brain for memory and spatial navigation. The mice were clearly superior in their ability to explore and recognize objects, to remember unpleasant experiences and to navigate a maze. The engineered animals also showed increased hippocampal plasticity, meaning they had a greatly improved ability to convert electrical stimuli into long-lasting memories.

"These results are very exciting, because they open up an entirely new way of thinking about the formation and retrieval of memories," says Dr. Schwarcz. "Kynurenic acid has been known for more than 150 years, but only now do we recognize it as a major player in one of the fundamental functions of the brain. Our most recent work, still unpublished, shows that new chemicals that specifically influence the production of kynurenic acid in the brain predictably affect cognition. We are now in the process of developing such compounds for cognitive enhancement in humans."

"I feel confident Dr. Schwarcz's determined pursuit of answers for the desperate patients suffering from devastating neurodegenerative disorders such as Alzheimer's disease and Huntington's disease, and psychotic disorders such as schizophrenia, will pay off," says E. Albert Reece, M.D., Ph.D., M.B.A., vice president for medical affairs, University of Maryland, and John Z. and Akiko K. Bowers Distinguished Professor and dean, University of Maryland School of Medicine. "His work creates hope for these patients and their families, and his findings are making a significant impact on the field of neuroscience and psychiatric medicine."

Psychological research conducted in WEIRD nations may not apply to global populations

A new University of British Columbia study says that an overreliance on research subjects from the U.S. and other Western nations can produce false claims about human psychology and behavior because their psychological tendencies are highly unusual compared to the global population.

According to the study, the majority of psychological research is conducted on subjects from Western nations, primarily university students. Between 2003 and 2007, 96 per cent of psychological samples came from countries with only 12 per cent of the world's populations. The U.S. alone provided nearly 70 per cent of these subjects.

However, the study finds significant psychological and behavioral differences between what the researchers call Western, Educated, Industrialized, Rich and Democratic (WEIRD) societies and their non-WEIRD counterparts across a spectrum of key areas, including visual perception, fairness, spatial and moral reasoning, memory and conformity.

The findings, published in *Nature* tomorrow and *Behavioral Sciences* this week, raise questions about the practice of drawing universal claims about human psychology and behavior based on research samples from WEIRD societies.

"The foundations of human psychology and behavior have been built almost exclusively on research conducted on subjects from WEIRD societies," says UBC Psychology and Economics Prof. Joe Henrich, who led the study with UBC co-authors Prof. Steven Heine and Prof. Ara Norenzayan. "While students from Western nations are a convenient, low-cost data pool, our findings suggest that they are also among the least representative populations one could find for generalizing about humans."

The study, which reviews the comparative database of research from across the behavioural sciences, finds that subjects from WEIRD societies are more individualistic, analytic, concerned with fairness, existentially anxious and less conforming and attentive to context compared to those from non-WEIRD societies.

According to the study, significant psychological and behavioral differences also exist between population groups within WEIRD nations. For example, U.S. undergraduate students are typically more analytic and choosy and less conforming than U.S. adults without college educations.

"Researchers often implicitly assume that there is little variation across human populations or that these 'standard subjects' are as representative of the species as any other population," says Henrich. "Our study shows there is substantial variability in experimental results across populations. In fact, there is enough evidence that researchers cannot in good faith continue to make species-generalizing claims about *Homo sapiens* in the absence of comparative evidence."

The research team calls on universities, peer reviewers, funding agencies and journal editors to push researchers to explicitly support any generalizations to the species with evidence or potent inductive arguments. Additionally, they envision the creation of research partnerships with non-WEIRD institutions to further and expand and diversify the empirical base of the behavioral sciences.

View the study, "*The weirdest people in the world?*," and comprehensive commentary by the authors and colleagues in the research community at: <http://journals.cambridge.org/action/displayIssue?jid=BBS&volumeId=33&issueId=2-3&iid=7825832>

Anger drives support for wartime presidents

By Gerry Everding

It's no secret that Americans tend to throw their support behind a sitting U.S. president when the nation is thrust into a war or other potentially violent conflict with a foreign foe – a phenomenon known as the "rally 'round the flag effect."

But new experimental psychology research from Washington University in St. Louis is the first to offer compelling evidence that these wartime surges in presidential support represent a collective reaction to a specific human emotion.

"It's about anger, not anxiety," says Alan Lambert, PhD, professor of psychology in Arts & Sciences and lead author of the study published this month in the *Journal of Personality and Social Psychology*. "Anger is the engine that drives these sudden spikes in presidential approval ratings."

His findings, to be presented July 7 at the 33rd annual meeting of the International Society of Political Psychology in San Francisco, Calif., show that anger – not anxiety – is the dominant emotion that both triggers and feeds the rally effect.

While there are many competing theories about why rally effects occur, their existence is well documented. Rally effects contributed to dramatic and sustained spikes in popularity for John F. Kennedy after the Cuban Missile Crisis, for George Herbert Walker Bush during Operation Desert Storm and for George W. Bush after the 9/11 terror attacks on the World Trade Center. After 9/11, George W. Bush's popularity surged by almost

40 points, reaching as high as 90 percent and remaining much higher than normal for nearly a year, according to the Gallup Poll.

Contrary to popular opinion and previous speculations among psychologists, Lambert's study shows that the impulse to support the president in times of war has little to do with feelings of anxiety or uncertainty or needing a president to somehow make us feel safe. Nor do pre-existing political ideologies and values prevent us from being pushed at least a bit further down the militaristic path.

"Wherever you start on the ideological spectrum, your support for the president is pushed in an upward direction by feelings of anger," he says. "It's not a rational thought process. It's a very primitive, almost knee-jerk response."

Lambert's findings are based on a five-year study that began in 2003 with experiments measuring shifts in pro-military attitudes among college students who watched eight minutes of a CNN "America Remembers" documentary on the 9/11 terror attacks.

He and a team of Washington University psychology student co-investigators surveyed a group of 136 college students to establish a baseline score of the participants' attitudes toward George W. Bush, pro-war policies, patriotic symbols and conservative views.

In some of the earlier studies, half the students were randomly assigned to watch the CNN terror attack video, while the other half completed simple anagram word games. Participants' moods were then assessed to measure current levels of anger, unhappiness, anxiety and other emotions; each then rated their own favorableness toward a list of prominent political figures and controversial political issues, including iconic examples from both ends of the liberal and conservative spectrum.

As expected, those exposed to the CNN 9/11 video scored much higher on measures of anger than those completing the mundane word game, and regardless of their initial political leanings, most video viewers showed a marked increase in their support both for George W. Bush and his militaristic policies.

"Keep in mind," says Lambert, "that this was a group of typical college students, many of whom didn't like the war and for the most part, didn't like George Bush at the beginning of the study. But, if you make them angry and you remind them about the war, they still end up showing increased support for George Bush."

While existing theories tend to frame rally effects as part of a general shift to the right, Lambert's study found no evidence for an across-the-board increase in support for conservative social policies, such as restrictions on abortion and prayer in schools.

"Anger clearly increased support for the president, but that effect was very narrowly confined to the president's military policies," he says. "It didn't affect attitudes toward gays. It didn't affect attitudes toward abortion. It had absolutely no effect at all on any other political ideology apart from militaristic attitudes. It's absolutely a rifle shot, something that pushes just this one button."

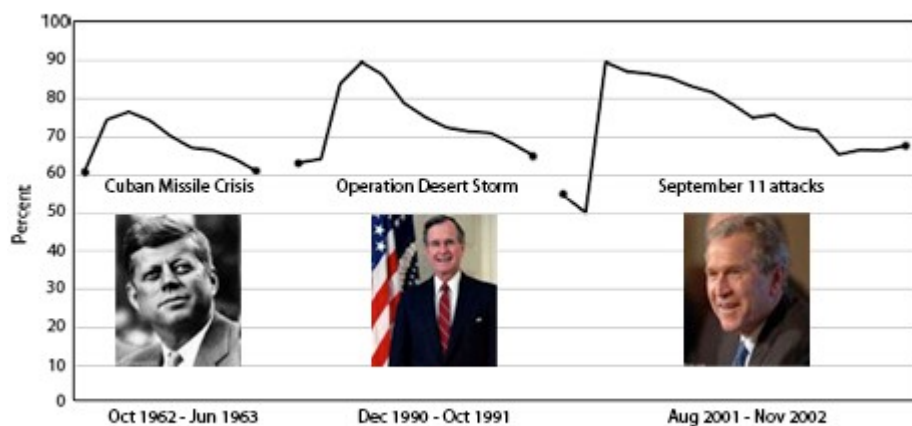
As part of the study, Lambert and his team conducted three more experiments designed to show that findings from the first experiment were not confined to scenarios involving George W. Bush and the 9/11 attacks. Nor were the findings skewed by some underlying patriotic bias embedded within the CNN documentary.

In one follow-up experiment, the CNN video was replaced with a session in which participants were asked to write about their own personal recollections of the 9/11 attack. In another, participants were asked to recall some event in their past about which they still felt angry, an exercise that prompted recollections ranging from broken romances, lost jobs and fights with sports coaches.

"Our last experiments showed that you can cause increased support for military action even when you make people angry for reasons that are completely unrelated to politics," Lambert says. "In our last experiment, we came up with this hypothetical Bush-like hawkish politician and we got the same effects."

As Lambert explains it, most types of threats -- especially outside threats -- tend to trigger off two types of emotion: anger and anxiety. His study used various experimental and statistical methods to tease apart and

The Rally Effect: Presidential approval ratings in times of crisis



WUSTL graphic

isolate the consequences of anxiety from anger, showing that feelings of anxiety may actually diminish support for a president's war plans.

"When you isolated the anger from anxiety, the anger led to more support for the president and the anxiety led to somewhat more negative reactions," he says. "Our data suggests that when people are anxious, they don't really like risky political policies. Going to war or continuing a war is a risky sort of activity, and when people are anxious, they tend to be risk averse."

Making people angry, on the other hand, sets into motion a much different cluster of behavioral tendencies.

"When people are angry," Lambert says, "they start preferring and liking things that they would not normally prefer. They start liking aggressive politicians more than they otherwise would, and they start disliking passive or dovish politicians. So, in a sense, once the emotion is activated, it has a life of its own, and starts directing your thoughts and attitudes, independent of how you might have felt before you became angry."

"If I kick you, you're going to look for some way to kick me back; but when something happens to the entire country, you need to look for someone more powerful than you to carry out that role, and in least in our culture, it's the president that does that."

Lambert suspects that the psychology behind the rally effect may explain why leaders in countries such as North Korea and Iran are so quick to rattle sabers in their dealings with adversaries around the globe – the threat of conflict abroad can shore up support for politicians at home.

These findings also have clear implications for America's support for Barack Obama. Presidential approval ratings for Obama, while still relatively good, are not nearly as high as they were at the beginning of his presidency. Lambert's research suggests that Obama's popularity would be most likely increased in the context of a military, as opposed to a non-military conflict. For example, even if Obama had managed to quickly resolve the problem with the oil spill in the gulf, this would have been unlikely to result in a sustained boost in approval.

While findings from this study may be limited to an American context, Lambert recently returned from a year as a Fulbright Scholar in the former Soviet republic of Georgia, where he conducted similar research and found much the same results.

"Essentially, a rally effect is a function of collective remembering and collective emotion," Lambert says. "There's a difference between one isolated person feeling something, or even just a couple thousand. Here, we're talking about millions of people all remembering and all feeling the same thing at more or less the same time. That doesn't happen very often, but when it does, it's an incredibly powerful thing."

Lambert's co-authors include current graduate students Laura Scherer and John Paul Schott along with former undergraduates Kristina Olson, Rick Andrews, Thomas Obrien and Alison Zisser, all then in the Department of Psychology in Arts & Sciences at Washington University. (Since this research has been conducted, Kristina Olson has gone on Yale University, where she is a member of the psychology faculty; the other co-authors (Rick Andrews, Thomas O'Brien, and Alison Zisser) are now enrolled in graduate programs in the social sciences.)

Ancient monster whale more fearsome than Moby Dick

*** 18:00 30 June 2010 by Jessica Hamzelou**

The fossilised skull of a colossal whale with a killer bite has been uncovered by a team who reckon the monster shared the Miocene oceans with a giant shark.

The bones, dated to 12 to 13 million years ago, were spotted by Klaas Post of the Natuurhistorisch Museum Rotterdam, the Netherlands, in Peru's Ica desert. In homage to Herman Melville's Moby Dick, the beast has been named *Leviathan melvillei*. The skull is a huge 3 metres long, says team member Olivier Lambert at the Royal Belgian Institute of Natural Sciences. The team estimates the whale would have been between 13 and 18 metres long, like a modern sperm whale.

What really surprised the researchers was the size of the whale's teeth. "Some of the biggest ones are 36 centimetres long and 12 centimetres wide, and are probably the biggest predatory teeth ever discovered," Lambert says.

The massive creature could have hunted baleen whales (Image: C. Letenneur (MNHN))

Teeth made for hunting

Unlike the modern-day sperm whale, which feeds by suction, the giant whale had these massive teeth on both its upper and lower jaw. "We think the whale used these teeth to catch its prey," says Lambert, suggesting the whale fed in a similar way to modern killer whales. Today's sperm whales have much smaller teeth on the lower jaw only.



"The whale would certainly have been able to catch very large prey, like baleen whales, of which there were plenty in the locality," Lambert says. "We think it was feeding on medium-sized baleen whales, which were about 8 or 9 metres long."

Leviathan melvillei is thought to have co-ruled the ocean with the giant shark *Carcharocles megalodon*, whose fossils have been found in the same locality in Peru. Lambert and colleagues estimate that the shark was about 15 metres long – more or less the same size as the giant sperm whale.

It's unlikely that the two giants would have battled each other, says Lambert. "At such sizes, I think it would have been very dangerous for adults of both species to fight," he says. "I could more easily imagine an adult of one species attacking a juvenile of the other."

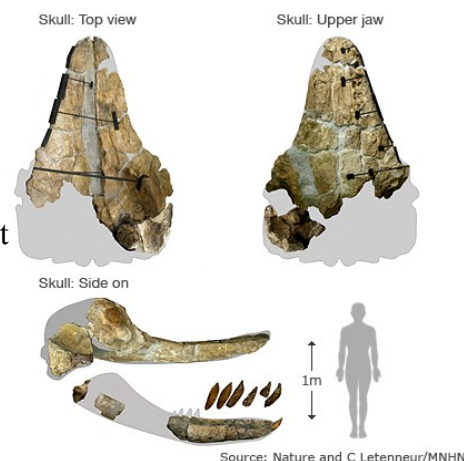
Spermaceti mystery

The skull may shed light on the function of the mysterious spermaceti organ. Consisting of two oil and wax reservoirs on top of the whale's snout, it is specific to sperm whales ancient and modern.

"For a long time it has been proposed that the spermaceti organ helps the whale dive deeper," Lambert says. The team's proposal that the ancient whale fed on baleen whales, which live near the water's surface, suggests this may not be the case.

"An alternative hypothesis is that spermaceti organs are used as battering rams to injure opponents during contests over females," says Dave Carrier at the University of Utah. "*Leviathan melvillei* may also have used forehead ramming to dispatch their suggested prey – baleen whales," Carrier says.

Modern killer whales lack spermaceti organs, but are well known to attack large prey by ramming with their snouts." *Journal reference: Nature DOI: 10.1038/nature09067*



Caltech Researchers Show How Active Immune Tolerance Makes Pregnancy Possible **Understanding of mouse immune-system response to specific fetal antigens also may provide insight into issues that arise during human pregnancies**

PASADENA, Calif. - The concept of pregnancy makes no sense - at least not from an immunological point of view. After all, a fetus, carrying half of its father's genome, is biologically distinct from its mother. The fetus is thus made of cells and tissues that are very much not "self" - and not-self is precisely what the immune system is meant to search out and destroy.

Women's bodies manage to ignore this contradiction in the vast majority of cases, making pregnancy possible. Similarly, scientists have generally paid little attention to this phenomenon - called "pregnancy tolerance" - and its biological details.

Now, a pair of scientists from the California Institute of Technology (Caltech) have shown that females actively produce a particular type of immune cell in response to specific fetal antigens - immune-stimulating proteins - and that this response allows pregnancy to continue without the fetus being rejected by the mother's body. Their findings were detailed in a recent issue of the Proceedings of the National Academy of Sciences (PNAS).

"Our finding that specific T regulatory cells protect the mother is a step to learning how the mother avoids rejection of her fetus. This central biological mechanism is important for the health of both the fetus and the mother," says David Baltimore, Caltech's Robert Andrews Millikan Professor of Biology, recipient of the 1975 Nobel Prize in Physiology or Medicine, and the principal investigator on the research.

Scientists had long been "hinting around at the idea that the mother's immune system makes tolerance possible," notes paper coauthor Daniel Kahn, a visiting associate in biology at Caltech, and an assistant professor of maternal-fetal medicine at the University of California, Los Angeles (UCLA). What they didn't have were the details of this tolerance - or proof that it was immune-related.

Now they do. To pin down those details, the two scientists began looking at the immune system's T regulatory cells (Tregs) in a strain of inbred mice that are all genetically identical - except for one seemingly tiny detail. Male mice - including male fetuses - carry on their cells' surfaces a protein known as a "minor transplantation antigen." Female mice lack this antigen.

Under normal circumstances, this antigen's existence isn't a problem for the male fetuses because the pregnancy tolerance phenomenon kicks in and protects them from any maternal immune repercussions.

To demonstrate the role of Tregs, Baltimore and Kahn used a drug to selectively target and destroy the cells. If the Tregs were indeed the source of pregnancy tolerance, they reasoned, their destruction would give the immune system free rein to go after the antigen-laden fetuses.

"In this case," says Kahn, "we knew the only possible immune response would be against the males - that the males would be at risk."

Indeed they were. When Baltimore and Kahn looked at the offspring of mice who'd been treated with the toxin, they found that fewer of the male fetuses survived to birth; those males that did survive were of significantly lower birthweight, presumably because of the inflammation caused by the mother's immune response to that single antigen.

"These T cells are functioning in an antigen-specific manner," Kahn notes. "In other words, their function requires the presence of the specific fetal antigens."

In their studies of these animals, the scientists also found that pregnancy tolerance "develops actively as a consequence of pregnancy," says Kahn. "The mice are not born with it." Indeed, virgin mice showed no signs of these pregnancy-specific Treg cells. Conversely, the cells were found in larger numbers in those individual mice that had given birth to more male babies, with the level of Treg cells increasing with the number of male births.

The next step, Kahn adds, is to look at Tregs and their role in pregnancy tolerance in humans - a line of research that may lead to new insights into such pregnancy-related conditions as preeclampsia, in which high blood pressure and other symptoms develop in the second half of pregnancy. Preeclampsia is a major cause of maternal mortality around the world.

"There's a lot to be learned," he says. "Pregnancy is often ignored in research because it's usually successful, and because - from an immunologic standpoint - it has such complexity. Until now, it's been difficult to grab a handle on how the immunology of pregnancy really works."

The work described in the PNAS article, "Pregnancy induces a fetal antigen-specific maternal T regulatory cell response that contributes to tolerance," was supported in part by a research grant from the Skirball Foundation. Kahn is supported by the National Institutes of Health's Building Interdisciplinary Research Careers in Women's Health Center at UCLA.

Gene regulating human brain development identified

MADISON - With more than 100 billion neurons and billions of other specialized cells, the human brain is a marvel of nature. It is the organ that makes people unique. Now, writing in the journal *Cell Stem Cell* (July 1, 2010), a team of scientists from the University of Wisconsin-Madison has identified a single gene that seems to be a master regulator of human brain development, guiding undifferentiated stem cells down tightly defined pathways to becoming all of the many types of cells that make up the brain.

The new finding is important because it reveals the main genetic factor responsible for instructing cells at the earliest stages of embryonic development to become the cells of the brain and spinal cord. Identifying the gene - known as Pax6 - is a first critical step toward routinely forging customized brain cells in the lab.

What's more, the work contrasts with findings from animal models such as the mouse and zebrafish, pillars of developmental biology, and thus helps cement the importance of the models being developed from human embryonic stem cells.

The new work, conducted in the Waisman Center laboratory of UW-Madison neuroscientist Su-Chun Zhang, reveals the pervasive influence of Pax6 on the neuroectoderm, a structure that arises early in embryonic development and that churns out the two primary forms of brain cells - neurons and glial cells - and the hundreds of cell subtypes that make up the human brain. "This is a well-known gene," says Zhang, a professor of anatomy in the UW School of Medicine and Public Health. "It's been known for a long time from work in mice and other animals, but what Pax6 does in human development isn't very well known."

In animals, the gene is known to play a role in the development of the eye and is seen in some neural cells. In the human cells used in the new Wisconsin study, Pax6 was observed in virtually all of the cells of the neuroectoderm. "The fact that Pax6 is uniformly expressed in all human neuroectoderm cells was a surprise," Zhang explains. "This is a phenomenon that is a departure from what we see in animals. It seems that in the earliest stages of development, human cells are regulated by different processes."

The finding may help explain why the human brain is larger and, in many respects, more advanced than what is observed in other species. In the laboratory dish, human brain stem cells are chock full of Pax6 and produce a large volume of cortical cells, notes Xiaoqing Zhang (no relation to Su-Chun Zhang), a UW-Madison neuroscientist and the lead author of the *Cell Stem Cell* paper.

"In human brain development, this plays a really important role," says Xiaoqing Zhang. "In humans, the cortex is a major part of the brain. In the mouse, the cortex is a much smaller part of the brain."

Adds Su-Chun Zhang, "In a way, it makes sense that the human brain is regulated in a different way. The brain distinguishes the human as a unique species."

In practical terms, the new finding will help scientists refine and improve techniques for making specific types of neural cells. Such cells will be critical for future research, developing new models for disease, and may one day be used in clinical settings to repair the damaged cells that cause such conditions as Parkinson's disease and amyotrophic lateral sclerosis or Lou Gehrig's disease.

"This gives us a precise and efficient way to guide stem cells to specific types of neural cells," says Xiaoqing Zhang. "We can activate this factor and convert stem cells to a particular fate."

The discovery of the new role of Pax6, says Su-Chun Zhang, is the first time researchers have discovered a single genetic factor in human cells that is responsible for shepherding blank slate stem cells to become a particular tissue stem cell type. "Until now, for any organ or tissues, we didn't know any determinant factors. This is the first," he says. There are certainly other genes at play in the cells of the developing brain, says Su-Chun Zhang: "You may need additional genes, but they're in a supporting role. Pax6 is the key."

The National Institutes of Neurological Diseases and Stoke, part of the National Institutes of Health, supported the new study.

Genetic Finding May Provide a Test for Longevity

By NICHOLAS WADE

If you were going to live to be 100, would you want to know it?

When it becomes affordable to have one's genome sequenced, perhaps in a few years, a longevity test, though not a foolproof one, may be feasible, if a new claim holds up. Scientists studying the genomes of centenarians in New England say they have identified a set of genetic variants that predicts extreme longevity with 77 percent accuracy.

The centenarians had just as many disease-associated variants as shorter-lived mortals, so their special inheritance must be genes that protect against disease, said the authors of the study, a team led by Paola Sebastiani and Thomas T. Perls of Boston University. Their report appears in Thursday's issue of *Science*.

The finding, if confirmed, would complicate proposals for predicting someone's liability to disease based on disease-causing variants in the person's genome, since much would depend on whether or not an individual possessed protective genes as well.

"I think it's a quite striking finding," said Nir Barzilai, an expert on longevity at the Albert Einstein College of Medicine. It shows that only a limited number of favorable genes are required to attain great age, he said. Identifying these genes would provide protection against all the diseases of old age, a more powerful strategy than tackling each disease one by one. "I feel there's an elephant in the room and no one realizes it's really important - this is the next step to make us all healthy," Dr. Barzilai said.

The Boston University team found the genetic variants with a statistical technique called a genome-wide association study. This is the technique that researchers had hoped would lay bare the genetic roots of common diseases like Alzheimer's or cancer, but it has largely failed to do so, raising the question of how the Boston University team was more successful while using a smaller sample size than usual. The team analyzed the genomes of 1,055 centenarians.

Dr. Sebastiani said the reason for their success was that living past 100 was such an extreme form of longevity that any genes involved would give very powerful signals of their presence, offsetting the reduced statistical power of the small sample. She found that 150 genetic variants were associated with extreme longevity. She then looked at a different sample of centenarians from those involved in her study and found that more than three-quarters possessed many of the 150 genetic variants she had already identified. The other centenarians had few or none of the protective variants, which means there are many more yet to find, Dr. Sebastiani said.

But Kari Stefansson, a geneticist who has looked for determinants of longevity among the Icelandic population, said of the current study that he was "amazed at how many loci of genome-wide significance have been found in a modest sample size."

Dr. Stefansson said he had been able to accumulate a larger collection of centenarians, despite Iceland's small population, because his company, Decode Genetics, has analyzed most of the genomes of living Icelanders and in addition can compute the genomes of Icelanders who lived long ago from the genomes of their descendants. None of the Boston University team's 150 genetic variants is present among Icelandic centenarians, he said.

Dr. Perls said at a press conference Wednesday that there were about 80,000 centenarians alive at any one time in the United States. Some 15 percent of his control group, and presumably of the population at large, have the potential to live to be 100, according to the test based on the 150 variants. But they fail to attain that age because of accidents or unhealthy living, he said.

Low vitamin D linked to the metabolic syndrome in elderly people

A new study adds to the mounting evidence that older adults commonly have low vitamin D levels and that vitamin D inadequacy may be a risk factor for the metabolic syndrome, a condition that affects one in four adults. The results were presented at The Endocrine Society's 92nd Annual Meeting in San Diego.

"Because the metabolic syndrome increases the risk of diabetes and cardiovascular disease, an adequate vitamin D level in the body might be important in the prevention of these diseases," said study co-author Marelise Eekhoff, MD, PhD, of VU University Medical Center, Amsterdam.

The researchers found a 48 percent prevalence of vitamin D deficiency. The study consisted of a representative sample of the older Dutch population: nearly 1,300 white men and women ages 65 and older.

Nearly 37 percent of the total sample had the metabolic syndrome, a clustering of high blood pressure, abdominal obesity, abnormal cholesterol profile and high blood sugar.

Subjects with blood levels of vitamin D (serum 25-hydroxyvitamin D) lower than 50 nanomoles per liter, considered vitamin D insufficiency, were likelier to have the metabolic syndrome than those whose vitamin D levels exceeded 50. That increased risk especially stemmed from the presence of two risk factors for the metabolic syndrome: low HDL, or "good" cholesterol, and a large waistline.

There was no difference in risk between men and women, the authors noted.

The study included subjects who were participating in the Longitudinal Aging Study Amsterdam. Although the data were from 1995 and 1996, Eekhoff said they expect that vitamin D inadequacy remains prevalent among whites in the Netherlands.

Using follow-up data from 2009, the researchers plan to study how many of the subjects with low vitamin D levels developed diabetes. "It is important to investigate the exact role of vitamin D in diabetes to find new and maybe easy ways to prevent it and cardiovascular disease," Eekhoff said.

The study's other authors were Mirjam Oosterwerff, MD, Paul Lips, MD, PhD, and Natasja Van Schoor, PhD, all from VU University Medical Center.

Killer whales and the mystery of human menopause

The evolutionary mystery of menopause is a step closer to being solved thanks to research on killer whales.

A study by the Universities of Exeter and Cambridge has found a link between killer whales, pilot whales and humans — the only three known species where females stop breeding relatively early in their lifespan.

Despite very different social structures between the three species, the research shows that in each case females become increasingly genetically related to those they live with as they get older. Because of this, there is a motivation for older females to do what is best for the survival of those around them. This creates a 'grandmother' role, where the success rate of breeding in the group can be helped by older females sharing parenting knowledge and stopping breeding to allow younger females easier access to resources.

The research, published in the Proceedings of the Royal Society B, is the first to provide a plausible explanation why these species in particular are the only ones in which females finish reproduction while they still have decades left to live.

Dr Michael Cant, from the University of Exeter's School of Biosciences (Cornwall Campus) and a Royal Society University Research Fellow, said: "It's always been puzzling as to why only humans and toothed whales have evolved menopause, while females in all other long-lived species continue breeding until late in life. "Although the social behaviours of the three menopausal species are very different, there is a common link: their social systems mean females become more related to those around them as they get older. This predisposes females of our species, and those of killer whales and pilot whales, to the evolution of menopause and late life helping".

Humans are thought to have evolved in groups in which young females left their group to find a mate. This would have meant they started their reproductive lives in families to whom they were genetically unrelated. Later in life, however, as their offspring start to breed, they become more genetically related to those around them and have the option to cease reproduction to help raise their 'grand-offspring'.

However, this argument doesn't seem to explain menopause in killer whales or pilot whales, in which both sexes remain in their natal family groups throughout their life, but occasionally come together with other groups to mate. The new research, however, shows this very different social system has the same overall effect on patterns of genetic similarity within groups: females become more closely related to infants in the group as they get older.

By contrast with humans and menopausal whales, in other long lived mammals it is typically males who leave the group to breed, and females who stay with their mother. According to the research, in this case older females will be selected to continue breeding rather than give up reproduction to help raise grandchildren.

Dr Rufus Johnstone, from the Department of Zoology at the University of Cambridge, and co-author of the study, said: "For the first time we can see a common link between menopausal species which provides a valid explanation as to why this trait might have evolved. This isn't likely to be the only factor relevant to the evolution of 'grandmothering' and menopause, but it does give us an idea why it is restricted to so few species in the animal kingdom."

Remains of oldest palace for emperor's accession ceremony found

KASHIHARA, Japan, July 1 (AP) - (Kyodo)—What appear to be the remains of the oldest building used for an emperor's accession ceremony have been excavated at the site of the Fujiwara palace in the ancient capital of Fujiwara-kyo in Kashihara, Nara Prefecture, the Nara National Institute for Cultural Properties said Thursday.

They were partial remnants of buildings and gates of the Fujiwara palace's "daijokyu," a set of buildings used for an imperial accession ceremony. Fujiwara palace was in Fujiwara-kyo, Japan's capital between 694 and 710 before it was moved to Heijo-kyo, located in what are now the cities of Nara and Yamatokoriyama.

Earlier, similar remains were found at the site of the Heijo palace in Heijo-kyo which was Japan's capital for most of the Nara Period (710- 794) before it was moved to Heian-kyo, now Kyoto.

Archaeologists say the latest discovery could provide a key to the origin and transition of the daijokyu. The state-run archaeological research institute said it will continue studies on the newly found remains, noting that the daijokyu at Fujiwara-kyo could have become a model for daijokyu buildings used in later periods.

Emperor Mommu, who reigned between 697 and 707, and Emperor Gemmei, whose reign lasted from 707 to 715, both ascended the throne at the Fujiwara palace. But the archaeologists have so far failed to identify which of the two emperors used Fujiwara-kyo's daijokyu, the institute said.

In Japan, an emperor performs a "niinamesai" rite in the fall every year, offering fruits of the year's new harvest to Shinto gods and goddesses. The first niinamesai ritual an emperor performs after accession to the throne is called "daijosai," which is one of the enthronement-linked ceremonies and is performed at the daijokyu.

Incumbent Emperor Akihito performed the daijosai and enthronement ceremonies in November 1990.

Tibetans adapted to high life at record-breaking rate

*** 19:00 01 July 2010 by Wendy Zukerman**

Mountain-dwelling Tibetans have genetically adapted to life at altitude in the past 3000 years – the fastest genetic change known to have occurred in humans.

Rasmus Nielsen at the University of California, Berkeley, and his colleagues looked at the DNA of people living in two villages at 4300 and 4600 metres above sea level in Tibet. At these heights, oxygen levels are about 40 per cent lower than at sea level and lowlanders experience hypoxia, which is associated with headaches, fatigue, smaller fetuses and more deaths in infancy.

Tibetans don't suffer from hypoxia, but it has been unclear why. Nielsen's team compared the DNA of 50 Tibetans with that of 40 Han Chinese people from Beijing and 200 people of European ancestry from Denmark, all of whom live at altitudes below 2000 metres.

By comparing the DNA of the three groups, the team identified the specific genetic differences between the Tibetan and Han populations, thought to have diverged around 2750 years ago.

Haemoglobin puzzle

The biggest difference was near a gene called EPAS1, which is known to respond to low levels of oxygen by increasing haemoglobin production. A modified version of the EPAS1 region was found in 87 per cent of the Tibetans, but only 9 per cent of Han Chinese.

Nielsen's team also measured the haemoglobin levels and counted red blood cells in both groups, and came up with surprising results. "Individuals with the 'adaptive' version of the gene have lower haemoglobin levels than individuals without," says Nielsen, though he doesn't know how this might benefit those living at high altitudes.

In theory higher levels of haemoglobin would be beneficial, because this would improve oxygen transport. But high levels could make the blood thicker and less efficient at carrying oxygen, says Jay Storz of the University of Nebraska-Lincoln. However, he thinks that the adaptation must lie in other genetic differences.

Recent split

Nielsen's team found that more than half of the top 30 genomic differences between the Tibetan and Han populations were in genes linked to oxygen transport in the blood. Some were associated with haemoglobin production and others with red blood cell production, for example.

The two populations diverged less than 3000 years ago, so the Tibetans' adaptation to high altitudes represents "the fastest genetic change ever observed in humans", says Nielsen.

Simon Ho, an evolutionary biologist at the University of Sydney, Australia, says the speed of the adaptation is "remarkable". *Journal reference: Science, DOI: 10.1126/science.1190371*

Discovery of a hepatitis C-related virus in bats may reduce outbreaks in humans

Viral hepatitis affects more than 500 million people worldwide and is a cause of liver failure and liver cancer. While vaccines are available for hepatitis A and B, this is not the case for hepatitis C, which affects as much as two percent of the population in the U.S. Scientists today are reporting discovery of a virus related to hepatitis C in Asian bats, which may provide insights into the origins of the hepatitis C virus and into the mechanisms by which infectious diseases move from other species to humans.

The full study findings are published online in the publication PLoS Pathogens.

Transmitted by blood transfusion or sexual intercourse, hepatitis C is a common cause of liver failure. Viruses related to hepatitis C, known as GB-viruses, have previously been found only in primates. Now, using cutting-edge molecular techniques, an international team of investigators has identified a GB-virus in *Pteropus giganteus* bats in Bangladesh. The work was completed at the Center for Infection and Immunity (CII) at Columbia University's Mailman School of Public Health, led by W. Ian Lipkin, MD; the International Centre for Diarrheal Disease Research in Bangladesh; 454 Life Sciences, a Connecticut-based division of Roche Corporation; and the Wildlife Trust in New York City. Using gene sequencing methods, the investigators confirmed the viral genetic material in the serum of five of 98 bats, and in the saliva of one, to be related to GBV-A and -C viruses. Further analysis of the two identified strains, tentatively named GBV-D, suggests that *P. giganteus* bats are a natural reservoir for this virus. According to the research team, the fact that bat saliva can contain GBV-D nucleic acids provides a biologically plausible mechanism for this agent to be transmitted from infected bats to other hosts, including humans.

Bats are often important hosts for emerging infectious disease agents with significant impact on human health including rabies, ebola, Marburg, hendra, nipah, and SARS viruses. Opportunities for transmission to humans are particularly prominent in countries like Bangladesh, where people live in close association with bats.

"This discovery underscores the importance of international programs focused on microbe hunting in hot spots of emerging infectious diseases," said Dr. Ian Lipkin, John Snow Professor of Epidemiology and director of the CII. "Finding this novel flavivirus in bats significantly broadens the host range of GB-like agents and may provide insights into the origins of hepatitis C," added Thomas Briese, PhD, lead molecular biologist on the team and Mailman School associate professor and associate director of CII.

"The Indian subcontinent and South Asia are areas where we are ardently working to identify the next possible pandemic disease," stated Peter Daszak, President of Wildlife Trust. "Identification of the natural reservoir of a virus, even if it may not directly infect people, is critical to surveillance and reducing the risk of outbreaks of infectious disease," noted Jonathan Epstein, associate vice president of Conservation Medicine Programs at Wildlife Trust.

First Experiment to Attempt Prevention of Homosexuality in Womb

July 1, 2010 By Marla Paul

(PhysOrg.com) -- "This is the first we know in the history of medicine that clinicians are actively trying to prevent homosexuality," says Alice Dreger, professor of clinical medical humanities and bioethics at Northwestern University Feinberg School of Medicine.

Dreger and collaborator Ellen Feder, associate professor and acting chair of philosophy and religion at American University, have brought to national attention the first systematic approach to prenatally preventing homosexuality and bisexuality. The "treatment" is targeted at one particular population of girls, but the researchers involved in the work say their findings may have implications beyond this population.

The girls and women in question have congenital adrenal hyperplasia (CAH), a serious endocrine disruption that sometimes results in ambiguous genitalia. Their endocrine problem will require medical management from birth onward. Research has shown that females born with CAH have increased rates of tomboyism and lesbianism.

The prenatal treatment at issue, however, does not treat or prevent the CAH. Most clinicians who use prenatal dexamethasone for CAH seek to prevent the development of ambiguous genitalia. But the New York-based group of clinical researchers whose work is traced by Dreger and Feder suggest that prenatal dexamethasone can also be used in this population to prevent the "abnormality" of homosexuality, as well as the "abnormal" interest these girls tend to have in traditionally masculine careers and hobbies.

Dreger and Feder's paper on the topic appears in the Bioethics Forum of the Hastings Center and can be read at <http://www.thehastingscenter.org/Bioethicsforum/Post.aspx?id=4754&blogid=140>.

A new consensus from seven major medical organizations (including the American Academy of Pediatrics) will be published in August indicating that this use of prenatal dexamethasone is experimental and not to be treated as standard of care. This comes in the wake of Dreger and Feder leading an investigation showing that the chief proponent of this off-label use, pediatric endocrinologist Maria New, treated hundreds of women with

this experimental drug without proper research ethics oversight. Time magazine related that aspect of the story: <http://www.time.com/time/health/article/0,8599,1996453,00.html> .

The FDA and the Office of Human Research Protections are now investigating these formal complaints.

USB coffee-cup warmer could be stealing your data

*** 02 July 2010 by Paul Marks**

ARE you sure that the keyboard or mouse you are using today is the one that was attached to your computer yesterday? It might have been swapped for a compromised device that could transmit data to a snooper.

The problem stems from a shortcoming in the way the Universal Serial Bus (USB) works. This allows almost all USB-connected devices, such as mice and printers, to be turned into tools for data theft, says a team that has exploited the flaw.

Welcome to the murky world of the "hardware trojan". Until now, hardware trojans were considered to be modified circuits. For example, if hackers manage to get hold of a microchip when it is still in the factory, they could introduce subtle changes allowing them to crash the device that the chip gets built into (New Scientist, 1 July 2009, p 18).

Computer engineers John Clark, Sylvain Leblanc and Scott Knight at the Royal Military College of Canada in Kingston, Ontario, wondered if a hardware trojan attack could be carried out by other means. They calculated that the easiest way to introduce a hardware trojan might be via a computer's USB ports.

The trio found they could exploit a weakness in USB's plug-and-play functionality. The USB protocol trusts any device being plugged in to report its identity correctly. But find out the make and model of a target user's keyboard, say, swap it with a compromised device that reports the same information - and that doesn't even have to be a keyboard - and the computer won't realise.

Swap a USB keyboard for a device that reports the same model number, and the computer won't know

The team designed a USB keyboard containing a circuit that successfully stole data from the hard drive and transmitted it in two ways: by flashing an LED, Morse-code style, and by encoding data as a subtle warbling output from the sound card (Future Generation Computer Systems, DOI: 10.1016/j.future.2010.04.008). They could have chosen more efficient methods to transmit the data, such as email, but Leblanc says their main goal was to see if they could steal data without anyone noticing.

"We've shown any USB device could contain a hardware trojan," he says. Security software, if it checks USB devices at all, tends to look only for malware on USB memory sticks.

"This work opens many cans of worms," says Vasilios Katos, a computer scientist at the Democritus University of Thrace in Greece. "A USB device cannot now be trusted - it may have hidden processing capabilities."

He's right, says Leblanc. "You could mount a hardware trojan attack with a USB coffee-cup warmer."

New animal experiment guidelines issued for UK

How should researchers design and write up their work to avoid needless and unethical waste of live animals? Guidelines published this week will make the task a lot easier.

The 20-point checklist is the handiwork of the UK's National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs). It follows a survey last year that highlighted the difficulties involved in judging the scientific worth of many animal studies because of missing details (PLoS ONE, DOI: 10.1371/journal.pone.0007824).

The survey of 271 UK and US studies found, for example, that only 59 per cent included the aim of the research and 4 per cent failed to report how many animals were used.

"Without this fundamental information, results have limited value for advancing science, and risk wasting money and using animals unnecessarily," says Vicky Robinson, chief executive of the NC3Rs (see editorial comment).

The ARRIVE guidelines (<http://www.plosbiology.org/article/info:doi/10.1371/journal.pbio.1000412>) include the need to specify the numbers of animals used and welfare details.

Supporters of animal research fear that the failure to design, conduct, report and review experiments correctly risks giving ammunition to those who oppose any use of laboratory animals.

Animal welfare organisations have welcomed the guidelines, but cautioned that they should remind scientists to replace animals in experiments as well as reduce the number used. "They should not be seen as a means to perpetuate the use of animals in research," says Kailah Eglington, chief executive of the Dr Hadwen Trust, an organisation in the UK that develops alternatives to animal testing.

Malcolm Macleod of the University of Edinburgh, UK, said that although the guidelines address the validity of individual experiments, they will do nothing to prevent animals being wasted in experiments that are not published because the results are negative.

Wallabies and Bats Harbor "Fossil" Genes from the Most Deadly Family of Human Viruses

Research reveals potential reservoir species, new mechanism for how mammals acquire genes

BUFFALO, N.Y. -- Modern marsupials may be popular animals at the zoo and in children's books, but new findings by University at Buffalo biologists reveal that they harbor a "fossil" copy of a gene that codes for filoviruses, which cause Ebola and Marburg hemorrhagic fevers and are the most lethal viruses known to humans.

Published this week in the online journal BMC Evolutionary Biology, the paper ("Filoviruses are ancient and integrated into mammalian genomes") demonstrates for the first time that mammals have harbored filoviruses for at least tens of millions of years, in contrast to the existing estimate of a few thousand.

It suggests that these species, which maintain a filovirus infection without negative health consequences, could have selectively maintained these so-called "fossil" genes as a genetic defense.

The work has important implications for the development of potential human vaccines, as well as for the modeling of disease outbreaks and the discovery of emerging diseases, including new filoviruses.

"This paper identifies the first captured 'fossil' copies of filovirus-like genes in mammalian genomes," says Derek J. Taylor, PhD, associate professor of biological sciences in the UB College of Arts and Sciences and co-author. "Our results confirm for the first time that several groups of mammals, including groups such as marsupials that never colonized Africa, have had an association with filoviruses."

The UB co-authors say that if the rarely captured genes represent antiviral defenses or genomic scars from persistent infections, then the work opens up new possibilities for identifying reservoir species for filoviruses, which harbor the virus but remain asymptomatic. "The reservoir for filovirus has remained a huge mystery," says Jeremy A. Bruenn, PhD, UB professor of biological sciences and co-author. "We need to identify it because once a filovirus hits humans, it can be deadly."

When the UB researchers studied samples from the fur of a wallaby at the Buffalo Zoo and a brown bat caught on the UB campus, they found that the genomes of both animals as well as some other small mammals contain "fossil" copies of the gene for these deadly viruses, and thus could be candidate reservoir species for them.

"Who knew that the bats in the attic as well as modern marsupials harbored fossil gene copies of the group of viruses that is most lethal to humans," asks Taylor.

The research also demonstrates a new mechanism by which different species of mammals can acquire genes, through non-retroviral integrated RNA viruses, which the UB scientists had previously identified in eukaryotes but was unknown in mammals.

The UB scientists note that it is well-known that RNA retroviruses, like HIV-AIDS, can be integrated into mammal genomes. "But because filoviruses infect only the cytoplasm of cells and not the nucleus and because they have no means of making DNA copies that might be integrated into the genome -- as retroviruses do -- it was never thought gene transfer could occur between non-retroviral RNA viruses and hosts," says Bruenn. "This paper shows that it does and it may prove to be a far more general phenomenon than is currently known."

The research also reveals that existing estimates that filoviruses originated in mammals a few thousand years ago were way off the mark. "Our findings demonstrate that filoviruses are, at a minimum, between 10 million and 24 million years old, and probably much older," says Taylor. "Instead of having evolved during the rise of agriculture, they more likely evolved during the rise of mammals."

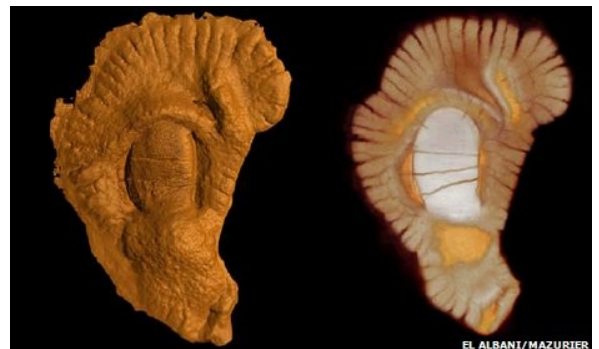
In addition to Bruenn and Taylor, Robert W. Leach, scientific programmer at the Center for Computational Research in UB's New York State Center of Excellence in Bioinformatics and Life Sciences, is a co-author on the paper. The authors are actively involved with the Molecular Recognition in Biological Systems and Bioinformatics strategic strength identified as part of the UB2020 strategic planning process.

'Cookie-shaped' fossils point to multicellular life

Page last updated at 10:07 GMT, Thursday, 1 July 2010 11:07 UK
Relics of some of the first stirrings of modern life may have been uncovered. Scientists report in the journal Nature the discovery of centimetre-sized fossils they suggest are the earliest known examples of multicellular life.

The specimens, from Gabon, are 2.1 billion years old - 200 million years older than for any previous claim.

Abderrazak El Albani and colleagues describe the fossils' distinctive appearance as resembling irregularly shaped "wrinkly cookies".



Fossil (©El Albani - Mazurier) A virtual reconstruction of the inner and outer form of one of the fossils

The step from single-celled to multicellular organisation was a key step in the evolution of life on Earth and set the scene for the eventual emergence of all complex organisms, including animals and plants.

The big question is whether the new West African specimens truly represent large organisms growing in a co-ordinated manner, or are merely a record of the remains of aggregations of unicellular bacteria.

The team tells Nature that its analysis of the fossils' three-dimensional structure using X-ray microtomography leans it towards the former explanation.

The fossils would have existed during a period in Earth history that came shortly after the so-called Great Oxidation Event, when free oxygen concentrations in the atmosphere rose rapidly.

Another oxygen surge that occurred about half a billion years ago co-incided with the Cambrian Explosion - the huge spurt in evolution that established all the major animal groupings.

"The evolution of the Gabon macrofossils, representing an early step toward large-sized multicellularity, may have become possible by the first boost in oxygen," Dr El Albani and colleagues said in a statement, "whereas the Cambrian Explosion could have been fuelled by the second.

"Why it took 1.5 billion years for the multicellular organisms to take over is currently one of the great unsolved mysteries in the history of the biosphere."



Gabonese fossils (El Albani) The Gabonese fossils were laid down in shales

Why men are attracted to women with small feet

*** 13:45 02 July 2010 by Bob Holmes**

Which face is more attractive? If you chose the face on the left, you share the tastes of most heterosexual men. It is a composite face, or "morph", made from the faces of eight women with unusually small feet. The face on the right is a morph of eight women with unusually large feet.

It's quite a difference, isn't it? Women with smaller feet have prettier faces, at least according to the men who took part in this study. So do women with longer thigh bones and narrower hips, as well as women who are taller overall. And the contest isn't even a close one. "These are the most strikingly different morphs I've ever seen," says Jeremy Atkinson, an evolutionary psychologist at the University at Albany, New York.

Atkinson and his colleague Michelle Rowe measured hand length, foot length, thigh length and hip width on 60 white female college students, then adjusted each measurement to account for individual differences in overall height. For each of 16 body-part measurements, they selected the eight women with the shortest lengths and the eight with the longest, and constructed morphs of their faces. These morphs were then rated for attractiveness by 77 heterosexual male students.

The men were three-and-a-half times as likely to pick the short-footed morph as more attractive, and almost 10 times as likely to say it was more feminine, Atkinson and Rowe found.

Similarly, they were more than 11 times as likely to pick the narrow-hipped morph as more attractive, and eight times as likely to choose the long-thighed morph, the researchers reported at a meeting of the Human Behavior and Evolution Society in Eugene, Oregon, last month.

Tough beginnings

Atkinson thinks men find these features attractive because they serve as markers of a healthy childhood. Biologists know that stress and poor nutrition during foetal development and puberty can affect sex hormone levels and cause earlier puberty. This can leave such women relatively short and stout, while those with a more benign childhood continue growing for longer, and attain a slenderer, more stereotypically feminine face and body, which most men find more attractive.

Atkinson's explanation makes sense, says David Perrett, a psychologist at the University of St. Andrews, UK, who studies facial attractiveness. Since faces and bodies are shaped by the same hormones, he says, you should be able to predict the attractiveness of one body part by looking at another.

Complicated men

The researchers also morphed 67 men and asked 82 heterosexual women to rate the attractiveness and masculinity of morphs of eight male faces, selected, as before, by the same 16 body part measurements. The results were less clear-cut than they had been for women: the female viewers chose morphs of men with long torsos as being more attractive, but they also thought men with small wrists were more attractive.

Women may lack a consistent preference because powerful, masculine men can be a mixed blessing, evolutionarily speaking, says Atkinson. "If they go for a big alpha male, they'll get good genes," he says. "But they may be left to raise the child themselves."

Indeed, the women who took part in the study were twice as likely to rate the large-wristed morph as more open to sex without love, and by the same margin opted for the small-wristed morph as a better candidate for a long-term relationship.

Supernovae don't make the biggest atoms

*** 02 July 2010 by Kate McAlpine**

THEY are the brightest of stars, but supernovae may not forge the heaviest elements. That's the suggestion arising from analysis of a new model of the particle winds that rush from the cores of supernovae.

The only two elements formed in abundance shortly after the big bang were hydrogen and helium. All the heavier ones must have been forged by fusing these smaller nuclei together. The high pressures and temperatures inside ordinary stars can account for elements up to a certain size, but making elements bigger than iron, which has a nucleus containing 26 protons, requires some other mechanism.

That's where supernovae come in. These exploding stars blast neutrinos from their cores to their surface at close to the speed of light, kicking protons and neutrons out of other atoms as they go. This creates a "wind" within which neutrons and protons fuse to form the nuclei of small atoms. Further protons, neutrons and atoms join in to make larger ones.

But atoms larger than nickel, with 28 protons, won't accept new protons as the mutual repulsion of so many positively charged particles becomes too strong. To make these atoms, neutrons must enter the nucleus and then transform into protons once inside, a process known as rapid neutron capture or r-process.

It was assumed that all the heavy elements could be made in this way. Now Thomas Janka of the Max Planck Institute for Astrophysics in Garching, Germany, and colleagues say the composition of the neutrino-driven wind means it won't work for the largest elements.

Janka's team used the latest data on the energies and interactions of protons, neutrons and neutrinos to produce a computer model of a smallish supernova. The ability to make the large elements depends on the number of neutrons that can enter nuclei, which in turn depends on the number of neutrons that are not attached to protons. Janka's model revealed that the wind contains more protons than neutrons, which means there are not enough unattached neutrons to create elements much larger than tin, which has 50 protons (Physical Review Letters, DOI: 10.1103/PhysRevLett.104.251101).

"It is a final dead end," says Janka. "It is the gravestone for r-process in this environment." Instead, Janka suggests that the neutron-rich explosions that occur when collapsed stars merge create the heaviest elements, including gold, lead and uranium.

The case isn't closed. Kohsuke Sumiyoshi of Numazu National College of Technology in Japan points out that large supernovae may explode differently, as their cores have a different make-up from the small one Janka modelled, and so will produce a different proportion of protons and neutrons. Janka expects larger supernovae to unfold in a similar way to the one he modelled.

In a Space Probe's Journey, a Test for Japan

By HIROKO TABUCHI

TOKYO - The Japanese are calling it a miracle. The Hayabusa space probe returned last month from a seven-year, 382-million-mile round trip to an asteroid, giving a much-needed confidence boost to a country worried that its technological prowess might be waning.

But Japan is still holding its breath. Did the mission accomplish one of its main objectives?

Preliminary tests on a capsule retrieved from the probe have shown no signs of the precious samples of the 4.6-billion-year-old asteroid that the Hayabusa was supposed to retrieve - samples that scientists around the globe had hoped would hold new clues about the formation of the solar system.

Last week, the Japan Aerospace Exploration Agency, known as JAXA, followed up with better news. Scientists had detected traces of vaporized material inside the container, some of it possibly from the asteroid, Itokawa, which goes around the sun on an elliptical orbit that crosses the paths of both Earth and Mars.

"Hayabusa capsule yields gas," declared one newspaper headline. "Vapor gives us hope," read another.

The June 13 return of the Hayabusa, which drew heavily on Japanese industrial expertise, has fanned hopes that this nation has not lost its edge in technology and manufacturing. The American journal Science has called Hayabusa - the Earth's first visit to an asteroid and the longest mission to outer space - a "trailblazer."

Japanese companies hope the mission can translate to sales in the steadily expanding market for space technology. According to the nonprofit Space Foundation, based in Colorado, the commercial and governmental global market for satellites and other space infrastructure grew to \$261 billion in 2009, up 7 percent from 2008 and 40 percent over the last five years. But Japanese companies so far have failed to gain much traction as prime contractors in the global satellite communications market.

NEC, which built the probe's advanced ion engines, wants to sell its technology in the United States, to NASA as well as to commercial customers through a joint venture with the American aerospace firm Aerojet-General. Ion engines use electric fields, instead of chemical reactions, to propel rockets and satellites. They are less powerful but more efficient than conventional chemical engines and can last for years before running out of fuel. The information technology behemoth Fujitsu, meanwhile, is aggressively marketing its communications systems, which are credited with guiding the Hayabusa spacecraft back to Earth. And IHI, which developed the probe's heat-resistance technology, says it hopes to build on the mission's publicity to double the revenue from its space-related business.

An expert panel was appointed earlier this year to advise the government on ways to help double Japanese companies' earnings from their space businesses to at least 14 trillion yen (\$158 billion).

"Achieving big goals is always accompanied with adversity, but where there's a strong will, there's a way," NEC's president, Nobuhiro Endo, said at a shareholders' meeting on June 22, showing off a scaled model of the Hayabusa.

Japan, the third country after the United States and the former Soviet Union to put a satellite into orbit, in 1977, has since launched a string of successful rockets and has been intent on being a space power. But its aspirations have more recently been usurped by China, which put a man in space - a feat Japan has not yet managed on its own - and it has also incurred a series of setbacks, including a Mars probe launched in 1998 that failed to reach orbit around that planet.

And the Japan Aerospace Exploration Agency - known as JAXA - with a budget of about 230 billion yen for 2010 (\$2.6 billion), is still relatively tiny compared with the United States' NASA and its \$18.7 billion budget.

Launched on a Japanese rocket in May 2003, the Hayabusa (translation: peregrine falcon) had a benighted journey. After the probe landed in 2005 on the Itokawa asteroid, which is about a third of a mile long and shaped like a potato, its sample-capture mechanism went awry. To the public's dismay, JAXA officials said they were not sure whether any samples had been collected. Next, the probe's robotic rover, meant to take photos and temperature readings on the asteroid, inexplicably floated off into space and was never heard from again.

Worse yet, after Hayabusa took off from the asteroid, all four of NEC's ion engines shut down. So did all 12 of the chemical-fueled rocket engines made by another space industry giant, Mitsubishi Heavy Industries. The probe was left drifting in space.

Then, for more than seven weeks, for reasons still not clear, there were no communication signals from the probe. Public dismay quickly turned to derision and, eventually, indifference.

On the 49th day of radio silence, the Hayabusa control room finally made contact with the probe, Junichiro Kawaguchi, the mission's leader, recalled in an interview. But scientists intent on remotely reviving the failed engines succeeded only in getting the undamaged half of one ion engine to work with the undamaged portion of a second engine.

With the Hayabusa limping along, JAXA had to drastically alter its original plan, which had called for the probe to approach Earth, eject its capsule of samples back into the atmosphere and then remain in orbit awaiting orders for a new mission.

But the equivalent of only one full engine made it impossible for the probe to muster the propulsion to escape Earth's gravitational pull. The probe itself would have to re-enter the atmosphere in a ball of fire, with only the heatproof sample capsule surviving. "I could see the sparks as the probe disintegrated," Mr. Kawaguchi said of the June 13 re-entry. "It was a miraculous return, yet I had very mixed emotions."

Still, the Hayabusa's fiery return, three years later than the originally scheduled capsule drop, has generally been hailed as a national triumph. Fans flocked to public viewings, some decked out in handmade costumes meant to resemble the probe. Now, though, as JAXA continues to slowly open and examine the capsule, officials say it will take months to determine whether it contains any asteroid samples.

Some Japanese space experts choose to see the glass as more than half full.

"What Hayabusa has shown is the reliability of Japan's technology," said Hiroaki Akiyama, a specialist in planet geology at Wakayama University in western Japan. "Traveling to the asteroid, making a landing and then returning to Earth is in itself a near miracle," he said. "The return of the probe has proven that Japan's space program might not be big, but it is one of the most advanced in the world." But the fear lingers that after its million-mile errand of retrieval, the Hayabusa falcon has returned with empty talons.

If there are no meaningful asteroid samples, space enthusiasts fear that public disappointment could lead the government to slash spending on basic space exploration programs. Most directly at stake, as Tokyo tries to rein in public spending, is a second Hayabusa mission planned for around 2014 to journey to another asteroid -

this time in a search for water or organic matter - looking for clues not just to the Earth's beginnings but to the origins of life itself.

The Democratic government, which took office in September and is now led by a new prime minister, Naoto Kan, is talking a fiscal hard line. The Democrats had threatened to scale back this year's approximately \$1.9 million budget for the Hayabusa 2 program to less than \$565,000, although Mr. Kan has recently said he will consider reviving financing for the next Hayabusa project.

And while initial polls after the Hayabusa's return showed renewed public support for increased space spending, doubts are already surfacing in the news media.

"Apart from making it back to Earth, there aren't any results to show," the influential Nikkei Industrial Journal said in an editorial on Monday. "With three out of four engines breaking down, there is no proof that the technology is reliable. And it's extremely suspect that any sand from the asteroid was collected - the goal of the mission."

But Mr. Kawaguchi, the Hayabusa project leader, and other space industry insiders say the real failure will come if Japan gives up so easily. "Yes, there were problems, but we learned how to overcome those - that's the whole point," he said. "We've sent a message out to the world that Japanese technology still leads."

Oil leak's spread predicted by simulation

Detailed simulations of the Gulf of Mexico oil leak show that crude is likely to start spreading into the Atlantic Ocean soon.

Once oil becomes caught in the Gulf of Mexico's fast moving Loop Current, it could be carried thousands of miles, around Florida, up the Atlantic coast of the US, and then out into the open ocean.

An animation by the US National Center for Atmospheric Research (NCAR) suggests that concentrations of oil in the water south of Florida will start to become detectable around 70 to 90 days after a leak starts. The Deepwater Horizon rig sank on the 22nd April.

The animation, given to the BBC World Service's Science in Action programme, is based on a computer model of ocean currents and eddies, and assumes that conditions will be similar to those found in a typical year.



Video courtesy of the National Center for Atmospheric Research

"In the Atlantic Ocean there is a Western Boundary Current System, and the Gulf of Mexico's Loop Current is part of this system," explains NCAR scientist Synte Peacock.

"So what happens is the current comes up through the Yucatan [Channel, the strait between Mexico and Cuba], and it does a clockwise loop within the gulf, and then shoots out and joins the Gulf Stream proper.

"So when something in the gulf gets caught up within that current, it can get out of there."

So with that definitely happen? Dr Peacock says: "At some time in the next six months it's highly highly likely that it will escape from the Gulf."

The Atlantic Ocean Gulf Stream carries water towards Europe, but the simulations show it is unlikely that oil will be detected that far away. "Even a year after the spill start date, in our simulations we don't see any detectable quantities of oil hitting Europe," says Dr Peacock. "It's very diluted within the Atlantic Ocean."

'Food colouring'

To create the dramatic video, the scientists modelled what would happen if they were to release a coloured tracer dye into the water at the site of the leak. The situation in the gulf is worse than that on which the simulation is based "It's like a food colouring. You inject it into the ocean and watch it disperse," explains Dr Peacock. The virtual dye then shows the path that the water - and therefore the oil - could take.

The researchers repeated the experiment several times, using slightly different scenarios, to arrive at a likely spread pattern for the oil.

There are still some aspects to the Gulf of Mexico leak, and the behaviour of oil released at great depth, which are not fully understood. The scientists say that could have an influence on the accuracy of the model.

"Oil is a little bit different, for several reasons; it undergoes a number of transformations," says Synte Peacock. "There is a lot of evaporation in the first few hours, so it changes form.

"People are also skimming it like crazy, and trying to contain it as it comes up from the flow head. So it's not a perfect analogy by any means, but it's the closest thing we have right now."

The model assumes an oil leak lasting just 60 days, so already the reality is worse than the model scenario.

The eventual outcome will be complicated, as the southern US heads further into hurricane season. The scientists are now trying to add simulations of storms' possible effects to the model.