

Protein adaptation shows that life on early earth lived in a hot, acidic environment

A new study reveals that a group of ancient enzymes adapted to substantial changes in ocean temperature and acidity during the last four billion years, providing evidence that life on Early Earth evolved from a much hotter, more acidic environment to the cooler, less acidic global environment that exists today.

The study found that a group of ancient enzymes known as thioredoxin were chemically stable at temperatures up to 32 degrees Celsius (58 degrees Fahrenheit) higher than their modern counterparts. The enzymes, which were several billion years old, also showed increased activity at lower pH levels -- which correspond to greater acidity.

"This study shows that a group of ubiquitous proteins operated in a hot, acidic environment during early life, which supports the view that the environment progressively cooled and became more alkaline between four billion and 500 million years ago," said Eric Gaucher, an associate professor in the School of Biology at the Georgia Institute of Technology. The study, which was published April 3 in the advance online edition of the journal *Nature Structural & Molecular Biology*, was conducted by an international team of researchers from Georgia Tech, Columbia University and the Universidad de Granada in Spain.

Major funding for this study was provided by two grants from the National Aeronautics and Space Administration to Georgia Tech, a grant from the National Institutes of Health to Columbia University, and a grant from the Spanish Ministry of Science and Innovation to the Universidad de Granada.

Using a technique called ancestral sequence reconstruction, Gaucher and Georgia Tech biology graduate student Zi-Ming Zhao reconstructed seven ancient thioredoxin enzymes from the three domains of life -- archaea, bacteria and eukaryote -- that date back between one and four billion years old.

To resurrect these enzymes, which are found in nearly all known modern organisms and are essential for life in mammals, the researchers first constructed a family tree of the more than 200 thioredoxin sequences available from the three domains of life. Then they reconstructed the sequences of the ancestral thioredoxin enzymes using statistical methods based on maximum likelihood. Finally, they synthesized the genes that encoded these sequences, expressed the ancient proteins in the cells of modern *Escherichia coli* bacteria and then purified the proteins.

"By resurrecting proteins, we are able to gather valuable information about the adaptation of extinct forms of life to climatic, ecological and physiological alterations that cannot be uncovered through fossil record examinations," said Gaucher.

The reconstructed enzymes from the Precambrian period -- which ended about 542 million years ago -- were used to examine how environmental conditions, including pH and temperature, affected the evolution of the enzymes and their chemical mechanisms.

"Given the ancient origin of the reconstructed thioredoxin enzymes, with some of them predating the buildup of atmospheric oxygen, we thought their catalytic chemistry would be simple, but we found that thioredoxin enzymes use a complex mixture of chemical mechanisms that increases their efficiency over the simpler compounds that were available in early geochemistry," said Julio Fernández, a professor in the Department of Biological Sciences professor at Columbia University.

Fernández led a team that included Columbia University postdoctoral researchers Raul Perez-Jimenez, Jorge Alegre-Cebollada and Sergi Garcia-Manyes, and graduate student Pallav Kosuri in using an assay based on single molecule force spectroscopy to measure the activity level of the thioredoxin enzymes under different pH levels.

For their experiments, the researchers used an atomic force microscope to pick up and stretch an engineered protein in a solution containing thioredoxin. They first applied a constant force to the protein, causing it to rapidly unfold and expose its disulfide bonds to the thioredoxin enzymes. The rate at which a thioredoxin enzyme snipped the disulfide bonds determined the enzyme's level of efficiency.

The study results showed that the three oldest thioredoxin enzymes - those thought to have inhabited Earth 4.2 to 3.5 billion years ago - were able to operate in lower pH environments than the modern thioredoxin enzymes.

"Our analysis indicates that ancient thioredoxin enzymes were well adapted to function under acidic conditions and that they maintained their high level of activity as they evolved in more alkaline environments," said Fernández.

To measure the temperature range in which the enzymes operated, professor Jose Sanchez-Ruiz and graduate student Alvaro Inglés-Prieto from the Departamento de Química-Física at the Universidad de Granada in Spain used a technique called differential scanning calorimetry. This method measures the stability of enzymes by heating the enzymes at a constant rate and measuring the heat change associated with their unfolding.

The researchers found that the ancient proteins were stable at temperatures up to 32 degrees Celsius higher than the modern thioredoxins. The experiments showed that the enzymes exhibited higher temperature stability the older they were. The results provide evidence that ancestral thioredoxins adapted to the cooling trend of ancient oceans, as inferred from geological records.

"Our results confirm that life has the remarkable ability to adapt to a wide range of historical environmental conditions; and by extension, life will undoubtedly adapt to future environmental changes, albeit at some cost to many species," said Gaucher.

This study also showed that the experimental resurrection of ancient proteins together with the sensitivity of single-molecule techniques can be a powerful tool for understanding the origin and evolution of life on Earth.

The researchers are currently using this strategy to assess other enzymes to get a clearer picture of what life was like on Early Earth. They are also applying these tools to the field of biotechnology, where enzymes play important roles in many industrial processes.

"The functions and characteristics we observed in the ancestral enzymes show that our techniques can be implemented to generate improved enzymes for a wide range of applications," added Perez-Jimenez.

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http://www.eurekalert.org/pub_releases/2011-04/bu-rlh040411.php

Researchers link herpes to Alzheimer's disease **'Cold sores' connected to cognitive decline**

ALBUQUERQUE, NM – Laboratories at the University of New Mexico (UNM), Brown University, and House Ear Institute (HEI) have developed a new technique to observe herpes simplex virus type 1 (HSV1) infections growing inside cells. HSV1, the cause of the common cold sore, persists in a latent form inside nerve cells. Re-activation and growth of HSV1 infections contribute to cognitive decline associated with Alzheimer's disease. Details are published in the March 31 issue of PLoS ONE magazine from the Public Library of Science.

"Herpes infects mucous membranes, such as the lip or eye, and generates viral particles," submits study Principal Investigator Elaine Bearer, M.D., Ph.D., Harvey Family Professor and Vice Chair for Research, Department of Pathology, UNM School of Medicine. "These viral particles burst out of the cells of the mucous membrane and enter sensory nerve cells where they travel inside the nerve toward the brain. We now can see this cellular transportation system and watch how the newly formed virus engages cellular APP on its journey out of the cell."

Tagging herpes virus inside cells with green fluorescent protein, scientists used live confocal imaging to watch HSV1 particles emerge from infected cells. Newly produced viral particles exit the cell nucleus and then bud into cellular membranes containing amyloid precursor protein (APP). Electron microscopy at HEI detailed the ultrastructural relationship between HSV1 particles and APP.

This dance between viral particles and cellular APP results in changes in cellular architecture and the distribution of APP, the major component of senile plaques found in the brains of Alzheimer's disease patients. Results from this study indicate that most intracellular HSV1 particles undergo frequent, dynamic interplay with APP, which facilitates viral transport while interfering with normal APP transport and distribution. This dynamic interaction reveals a mechanism by which HSV1 infection leads to Alzheimer's disease.

In developed countries such as the U.S., approximately 20 percent of children are infected with HSV1 prior to the age of five. By the second and third decades of life, as much as 60 percent of the population is infected, and late-in-life infection rate reaches 85 percent.

Symptoms of primary HSV1 infection include painful blisters of the mouth, lips or eyes. After infection, HSV1 persists in nerve cells by becoming latent. Upon re-awakening, new viral particles are made in the neuron and then travel back out its pathways to re-infect the mucous membrane. Many infected people experience sporadic episodes of viral outbreaks as the well-known recurrent cold sore.

"Clinicians have seen a link between HSV1 infection and Alzheimer's disease in patients, so we wanted to investigate what might be going on in the body that would account for this," adds Dr. Shi-Bin Cheng, post-doctoral associate, Department of Pathology and Laboratory Medicine, Alpert Medical School, Brown University. "What we were able to see in the lab strongly suggests a causal link between HSV1 and Alzheimer's Disease."

"It's no longer a matter of determining whether HSV1 is involved in cognitive decline, but rather how significant this involvement is," Bearer asserts. "We'll need to investigate anti-viral drugs used for acute herpes treatment to determine their ability to slow or prevent cognitive decline."

Researchers recommend people treat a cold sore as quickly as possible to minimize the amount of time the virus is actively traveling through a person's nervous system. The faster a cold sore is treated, the faster the HSV1 returns to a dormant stage.

Additional Authors include: Paulette Ferland, senior research assistant, UNM; Paul Webster, House Ear Institute, Los Angeles, CA; participation of Kathleen Kilpatrick, UNM; and many undergraduate students at Brown who contributed to this project are acknowledged.

<http://www.bbc.co.uk/news/health-12937009>

Autistic brains "organised differently" say scientists

By Jane Hughes Health correspondent, BBC News

People with autism use their brains differently from other people, which may explain why some have extraordinary abilities to remember and draw objects in detail, according to new research.

University of Montreal scientists say in autistic people, the brain areas that deal with visual information are highly developed. Other brain areas are less active. The National Autistic Society says the findings significantly increase understanding of the condition. The research, published in the journal *Human Brain Mapping*, pulls together 15 years of data on the way the autistic brain works.

Better at visual tasks

It suggests that the brains of autistic people are organised differently from those of other people; the area at the back of the brain, which processes visual information, is more highly developed. That leaves less brain capacity in areas which deal with decision-making and planning. That may be why people with autism can be better than others at carrying out some types of visual tasks. For example, some are able to draw highly accurate and detailed images from memory. However, they can find it difficult to interpret things like facial expressions.

The condition varies in severity, with some people functioning well, but others completely unable to take part in normal society.

The researchers believe their findings may lead towards new ways of helping people to live with the condition. "For example, this may show a means to help people to literacy in a much more natural way than the usual methods of helping autistic people," said Dr Laurent Mottron from the University of Montreal.

"The natural tendency is to think that autism is a form of disorganisation. Here, what we see is that it is a reorganisation of the brain," he said.

Understanding autism

Autism experts regard the research findings as significant. "This review highlights that autism should not only be seen as a condition with behavioural difficulties, but should also be associated with particular skill," said Dr Christine Ecker from the Institute of Psychiatry at Kings College, London. "It offers us unique insights into the way people with autism perceive their environment and helps us to understand some of their behaviour."

She said it added to the understanding of autism. "Knowing the strengths and difficulties of someone with autism may help to better understand their needs and help them maximize their potential."

Carol Povey of the National Autistic Society said: "This study is interesting as it begins to demonstrate why people with autism often show a strong single channel for focus and attention. "Some adults with autism develop their own ways of coping with this experience, some seek out calm and quiet places, whilst others find creative outlets, like art, can help them both process the information as well as give others an insight into how they see the world. "The more insight we have into the way autism affects sensory processing, the more people with autism, their families and professionals can develop strategies to make daily life easier."

http://www.eurekalert.org/pub_releases/2011-04/iu-atl040411.php

Algae that live inside the cells of salamanders are the first known vertebrate endosymbionts

BLOOMINGTON, Ind. -- A species of algae long known to associate with spotted salamanders has been discovered to live inside the cells of developing embryos, say scientists from the U.S. and Canada, who report their findings in this week's Proceedings of the National Academy of Sciences.

This is the first known example of a eukaryotic algae living stably inside the cells of any vertebrate.

"It raises the possibility that more animal/algae symbioses exist that we are not aware of," said Indiana University Bloomington biologist Roger Hangarter, the PNAS report's sole American coauthor. "Since other salamanders and some frog species have similar algae/egg symbioses, it is possible that some of those will also have the type of endosymbioses we have seen in the spotted salamander."

Biologists Ryan Kerney, Eunsoo Kim, Aaron Heiss, and Brian Hall of Dalhousie University in Halifax, Nova Scotia, and Cory Bishop of St. Frances Xavier University in Antigonish, Nova Scotia, are the other members of the research team. Kerney was the report's lead author.

"We were particularly excited to discover this association in spotted salamander embryos, because this species was a model organism for early experimental embryology research and is a locally common salamander in eastern North America," Kerney said. "We hope that this study will highlight biodiversity research on common North American species, which can easily be overlooked or even considered over-studied."

Vertebrates are backboned animals. The group includes amphibians like the spotted salamander, as well as mammals, birds and reptiles. The rarity of vertebrate endosymbiosis, as the cell-within-a-cell association is called, has been thought to be the result of the animals' stringently xenophobic immune systems. Any foreign cell that manages to get as far as breaching a cell membrane normally triggers a number of slay-now-and-ask-questions-later gene systems.

Naturalists first noticed an association between spotted salamander eggs and green algae more than 100 years ago. This relationship was formalized by name in 1927 by Lambert Printz, who named the algal species *Oophilia amblystoma*. The genus name means "egg loving." The nature of that symbiosis was not known until the 1980s, when experimentation revealed the salamander embryos do not develop as quickly or as fully in the absence of the green algae. Likewise, algae grown separately from the embryos but in the presence of water exposed to the embryos also grew more robustly.



Spotted salamanders are the first known vertebrate to have an endosymbiont. The salamanders are found throughout eastern North America. Courtesy of Roger Hangarter

Despite decades of study, the revelation of an endosymbiosis between the amphibian and alga took many by surprise when Kerney presented preliminary information at a scientific meeting last year. The reason, Hangarter said, is that the algae cells were not easy to see by conventional light microscopy. Because the chlorophyll in the algae is highly fluorescent, the scientists were able to use modern fluorescent microscopy to probe to the salamanders.

They also used a short string of nucleic acids that targets and binds to a ribosomal RNA molecule unique to *Oophilia* (18S rRNA) and by a visualization technique called fluorescence in situ hybridization, they found that the algae RNA is pervasive within spotted salamander embryo cells.

"With the ability to use gene-specific probes, it is now possible to determine the presence of organisms that may not be easily visible by standard light microscopy," Hangarter said. "In the past, researchers looking with simpler light microscopy techniques than are available today failed to see any algae in the salamanders."

The symbiotic relationship between spotted salamanders and *Oophilia* is mutualistic because both creatures benefit. Symbiosis is a general category of species-species interaction in which the organisms share space for extended periods of time. Symbioses can benefit one organism and harm the other (parasitism), benefit both (mutualism), or benefit one creature and leave the other unaffected (commensalism).

Endosymbiosis is a special type of symbiosis, requiring one organism to live inside the cells of another. It is not yet known how the endosymbiotic infiltration of salamander embryo cells affects either the salamander or the alga. Anything is possible, despite the fact that the overall relationship between the two species is established as mutualistically beneficial.

Endosymbiosis also has special evolutionary significance, as it is presumed by biologists to have preceded the full integration of certain cell organelles, such as mitochondria and chloroplasts, special structures that perform unique functions within cells -- and possess their own chromosomes.

Kerney and Hangarter say they hope their ongoing work will inspire interest in local biology and respect for environmental protection. "We would like this work to draw attention to a fascinating yet common backyard salamander, and hope that it will both raise awareness of the species and promote the preservation of their fragile breeding habitat," Kerney said.

Hangarter agreed, adding, "I think it is important for people to realize that you do not need to go to exotic locations to make interesting scientific discoveries. The vernal ponds that the salamanders mate in are also essential for many other amphibians and other organisms, but such ponds are often among the first things destroyed when humans develop in wooded areas. One 500 square-foot pond might service several thousand mating salamanders and frogs that might inhabit an area of a few acres of woodland."

This research was supported by grants from the National Science Foundation, Tula Foundation (Canada), the Natural Sciences and Engineering Research Council of Canada, and the American Association of Anatomists.

Facial structure of men and women has become more similar over time

Research from North Carolina State University shows that they really don't make women like they used to, at least in Spain.

The study, which examined hundreds of Spanish and Portuguese skulls spanning four centuries, shows that differences in the craniofacial features of men and women have become less pronounced.

"Improving our understanding of the craniofacial features of regional groups can help us learn more from skeletal remains, or even help us identify an individual based on his or her remains," says Dr. Ann Ross, an associate professor of anthropology at NC State and principal investigator of the study. The researchers looked at more than 200 skulls dating to 20th and 16th century Spain, as well as approximately 50 skulls from 20th century Portugal.

Researchers found that craniofacial differences between contemporary men and women are less pronounced than they were in the 16th century. The researchers also found that, while craniofacial features for both sexes in Spain have changed over time, the changes have been particularly significant in females. For example, the facial structure of modern Spanish females is much larger than the structure of 16th century females. This difference may stem from improved nutrition or other environmental factors.

The researchers paid particular attention to structural differences between male and female skulls because "this can help us establish the sex of the remains based on their craniofacial features," Ross says – which is particularly important when an incomplete skeleton is found. "Being able to tell if a skull belonged to a man or woman is useful in both criminal investigation and academic research."

Assessing the 16th century skulls was important to the researchers because it allowed them to determine how the different features of male and female skulls have changed over time. "This has applications for characterizing older remains," Ross says. "Applying 20th century standards to historical remains could be misleading, since sex differences can change over time – as we showed in this study."

The study also found that the craniofacial sexual differences were very similar between Spanish and Portuguese populations, implying that standards developed for identifying sex in Spanish skulls could also be applied regionally.

A paper describing the research, "Implications of dimorphism, population variation, and secular change in estimating population affinity in the Iberian Peninsula," is forthcoming from the journal Forensic Science International. The paper was co-authored by Ross; Dr. D.H. Ubelaker of the Smithsonian Institution's National Museum of Natural History; and Dr. E.H. Kimmerle of the University of South Florida. The work was funded, in part, by the National Institute of Justice.

http://www.eurekalert.org/pub_releases/2011-04/f-sf-spb040511.php

Starting periods before the age of 10 increases risk of lung complaints in future

Women who suffer from asthma or poor lung function as adults generally started their periods at the age of 10 or before.

This is the conclusion of a European research study with Spanish participation, which shows that this trend is more common in southern Europe, and particularly affects women from large families.

"Adult women who had their first menstruation at the age of 10 or earlier have significantly lower lung capacity than women who had their first period at 13", Ferenc Macsali, lead author of the study and a researcher at the Haukeland Hospital in Bergen (Norway), tells SINC.

The experts discovered that women who underwent early menarche (first menstruation) suffer more frequently from asthma, suggesting that metabolic and hormonal factors have an impact on the respiratory system. In addition, these girls tend to be smaller in stature and have higher levels of body fat than other girls their age.

The study, carried out on 3,354 women aged between 27 and 55, is part of a multi-centre study called the European Community Respiratory Health Survey (ECRHS). The countries that took part were Spain, France, Italy, the United Kingdom, the United States, Belgium, Switzerland, Norway, Sweden, Denmark, Iceland and Estonia.

According to the study, published in the American Journal of Respiratory and Critical Care Medicine, early menstruation is more common in southern Europe and primarily affects women from large families. Smoking is also related to the onset of menstruation, since women who smoke tended to have their first period at the age of 10 or before. As a preventive measure, the researchers recommend monitoring the symptoms of asthma in these girls more carefully and setting up a smoking-prevention programme that would also include early menstruation as a risk indicator.

Low birth weight

"The link between lower lung function, asthma and early menarche goes back to birth", the expert explains. Other studies have shown that many women who experienced early menstruation had a low birth weight. "This

unfavourable intrauterine environment is possibly related to poor foetal lung development, which will affect this person over their whole life", he adds.

Despite their low initial weight, many women become overweight as adults due to a faster increase in body mass during early adolescence. Various studies over recent years have also shown that improved living conditions in western countries have led to children weighing more and maturing earlier. This trend also has an impact on girls having their first period at ever earlier ages.

Reference: Ferenc Macsali, Francisco Gómez Real, Estel Plana, Jordi Sunyer, Josep Anto, Julia Dratva, Christer Janson, Deborah Jarvis, Ernst Reidar Omenaas, Elisabeth Zemp, Matthias Wjst, Benedicte Leynaert, y Cecilie Svanes. "Early Age at Menarche, Lung Function, and Adult Asthma". American Journal of Respiratory and Critical Care Medicine. 183, enero de 2011. Doi: 10.1164/rccm.200912-1886OC.

http://www.eurekalert.org/pub_releases/2011-04/uowo-sit040111.php

Substance in tangerines fights obesity and protects against heart disease

New research from The University of Western Ontario has discovered a substance in tangerines not only prevents obesity, but also offers protection against type 2 diabetes, and even atherosclerosis, the underlying disease responsible for most heart attacks and strokes.

Murray Huff, a vascular biology scientist at the Schulich School of Medicine & Dentistry, along with Erin Mulvihill, a PhD student, studied the effects of a flavonoid in tangerines called Nobiletin. Their research is published in the journal Diabetes.

In a model of metabolic syndrome developed by the Huff laboratory at the Robarts Research Institute, mice were fed a "western" diet high in fats and simple sugars. One group became obese and showed all the signs associated with metabolic syndrome: elevated cholesterol and triglycerides, high blood levels of insulin and glucose, and a fatty liver. These metabolic abnormalities greatly increase the risk of cardiovascular disease and type 2 diabetes.

The second group of mice, fed the exact same diet but with Nobiletin added, experienced no elevation in their levels of cholesterol, triglycerides, insulin or glucose, and gained weight normally. Mice became much more sensitive to the effects of insulin. Nobiletin was shown to prevent the buildup of fat in the liver by stimulating the expression of genes involved in burning excess fat, and inhibiting the genes responsible for manufacturing fat.

"The Nobiletin-treated mice were basically protected from obesity," says Huff, the Director of the Vascular Biology Research Group at Robarts. "And in longer-term studies, Nobiletin also protected these animals from atherosclerosis, the buildup of plaque in arteries, which can lead to a heart attack or stroke. This study really paves the way for future studies to see if this is a suitable treatment for metabolic syndrome and related conditions in people."

Huff's research has focused on the pharmacological properties of naturally-occurring bioactive molecules. Two years ago, his research drew international attention when he discovered a flavonoid in grapefruit called Naringenin offered similar protection against obesity and other signs of metabolic syndrome. Huff says "What's really interesting to us is that Nobiletin is ten times more potent in its protective effects compared to Naringenin, and this time, we've also shown that Nobiletin has the ability to protect against atherosclerosis." *The research was funded primarily by the Heart and Stroke Foundation of Ontario, with additional grant support from the Pfizer Canada Cardiovascular Research Program.*

http://www.eurekalert.org/pub_releases/2011-04/esoc-sdd040511.php

Some diabetes drugs are better than others, according to new study

New research suggests that several commonly prescribed drugs for type 2 diabetes may not be as effective at preventing death and cardiovascular diseases, such as heart attacks and stroke, as the oral anti-diabetic drug, metformin.

Insulin secretagogues (ISs), such as glimepiride, glibenclamide (known as glyburide in the USA and Canada), gliclazide and tolbutamide, have been used to treat type 2 diabetes since the 1950-1970s, Nevertheless, the long-term risk associated with these drugs has largely been unknown. Metformin is the first drug of choice in type 2 diabetes, but, until now, there have not been studies investigating the long-term risk of individual ISs compared with metformin.

A study published online today in the European Heart Journal [1] followed a large, unselected group of everyone living in Denmark, aged over 20, who had been treated with either an IS or metformin (monotherapy) between 1997 and 2006 – a total of 107,806 people. It found that, compared to metformin treatment, monotherapy with most ISs, including glimepiride, glibenclamide, glipizide and tolbutamide, was associated with a greater risk of death from any cause, and a greater risk of heart attacks, stroke or death from cardiovascular diseases. This was the case both for patients who had already suffered a heart attack and for

patients who had not. Two other ISs, gliclazide and repaglinide, showed no significant difference to metformin in their effectiveness in patients with and without a history of heart attacks.

Compared to metformin, patients who had not suffered a heart attack had approximately a fifth to a third higher risk of death from any cause if they were taking glimepiride, glibenclamide, glipizide or tolbutamide. In patients with a history of heart attacks, the risk was approximately a third to a half higher.

The researchers, led by Dr Tina Ken Schramm, a senior resident doctor at the Heart Centre at the Rigshospitalet Copenhagen University Hospital (Copenhagen, Denmark), stress that the findings may not mean that these ISs actually cause harm, but only that they appear to be less effective than metformin.

"Previous studies have shown that ISs, in particular sulphonylureas, are associated with a reduction in long-term risk. Therefore, the increased risk from ISs shown in our study presumably has more to do with the beneficial effects of metformin, gliclazide and repaglinide, than the detrimental effect of the other ISs," explained Dr Schramm. "This is the first study to compare all ISs with metformin despite a wide debate on the possible cardiovascular risk associated with ISs for about three decades. Our findings emphasise how important it is to conduct long-term follow up studies of glucose-lowering medications."

In an accompanying editorial [2], Drs Odette Gore and Darren McGuire of the University of Texas Southwestern Medical Center (Dallas, Texas, USA), write that the study's findings are "among the most robust published", and continue: "It is of key importance to note that the observation of less benefit with most sulphonylureas [ISs] in the study compared with metformin should not be interpreted as causing harm."

Dr McGuire explained: "Patients taking metformin had the best outcomes, supporting prior evidence of metformin benefit and making it the first-line drug recommended for almost all patients with type 2 diabetes. Compared against this beneficial drug, most of the ISs were associated with worse outcomes, but they would almost certainly be similar to, or better, had the comparison been made against placebo treatment, with the added benefit on kidney, eye, and nerve disease of the glucose control they yield. So patients should not stop their medications based on this study, but certainly should discuss any concerns with their doctor."

He added: "It's important to remember that these are observational analyses and not randomised comparisons, so it is impossible to tease out what if any of the difference in outcomes is due to the drugs compared versus differences in the patients – those taking ISs might have an increased risk to begin with."

Dr Schramm and her colleagues say that the mechanisms underlying the effects of different ISs and metformin are not fully understood and require further research.

She concluded: "Our study supports previous studies demonstrating that metformin may be less hazardous or more beneficial than most ISs. This suggests that metformin should be the first drug of choice in type 2 diabetes in most patients. The study shows there are important differences in the risk associated with different ISs, suggesting that gliclazide and maybe repaglinide are preferable, although in patients who have had a previous heart attack the most beneficial agents are metformin and gliclazide. As a result of our findings it is important now that there should be randomised studies focusing on patients at low and high cardiovascular risk."

[1] "Mortality and cardiovascular risk associated with different insulin secretagogues compared with metformin in type 2 diabetes, with or without a previous myocardial infarction: a nationwide study". *European Heart Journal*. doi:10.1093/eurheartj/ehr077

[2] "Resolving drug effects from class effects among drugs for type 2 diabetes mellitus: more support for cardiovascular outcome assessments". *European Heart Journal*. doi:10.1093/eurheartj/ehr019

[3] ISs act by causing insulin to be released, thereby dealing with the problem of insufficient insulin production seen in type 2 diabetes. Metformin combats insulin resistance – one of the characteristics of diabetes – by increasing the action of insulin on insulin receptors, thereby reducing blood glucose in the liver, muscles and fat. During the period of the study, about 50-60% of those receiving glucose-lowering medications received monotherapy with metformin or ISs in Denmark. The initial treatment for diabetes patients is usually monotherapy with either metformin or ISs, and then later, when the diabetes becomes more advanced, insulin treatment or a combination of treatments becomes an option.

http://www.eurekalert.org/pub_releases/2011-04/bmj-rrt040611.php

Regular retail therapy prolongs life

Frequent shopping by men and women increases survival in the older Taiwanese population

A spot of regular retail therapy really does seem to help people live longer, suggests research published online in the *Journal of Epidemiology and Community Health*. And it seems to benefit older men the most, the findings show. The authors base their findings on almost 1,850 elderly (65+) Taiwanese people who were living independently at home, and included in the nationally representative Elderly Nutrition and Health Survey in Taiwan (NAHSIT Elderly), carried out in 1999-2000. Participants were asked how often they went shopping, with options ranging from "never" to "every day."

Intellectual and physical capacities were measured using validated questionnaires, and age, gender, education, ethnicity, financial and employment status, lifestyle factors and the prevalence of long term

conditions were also factored in. The researchers then tracked how long each of the participants lived by linking individuals to national death registration data between 1999 and 2008.

Nearly half (48%) of the participants never or infrequently shopped during the week, and around one in four (22%) shopped between two and four times a week. A further 17% shopped every day, and the remainder shopped just once a week. Almost two thirds of respondents were under the age of 75. Just over half (54%) were men. Most had a healthy lifestyle and three out of four were financially self sufficient. Almost two thirds (60%) had up to two long term conditions.

Those who went shopping more than once a week tended to be at the younger end of the age spectrum, and male. They also tended to be smokers and drinkers, have better physical and mental health, take regular exercise and have a network of dinner companions.

The researchers used different approaches to take account of physical limitations and cognitive impairment, but even so, those who shopped daily lived longer than those who shopped less frequently. Those who shopped daily were 27% less likely to die, with male daily shoppers 28% less likely to die, compared with female shoppers who were 23% less likely to die.

The authors acknowledge that shopping could be a surrogate for good health to begin with, but suggest that shopping itself may improve health, by ensuring a good supply of food, to maintain a healthy diet, for example.

Frequent shopping among the elderly may not always be about buying things, but about seeking companionship or taking exercise, which is easier to do than more formal exercise that usually requires motivation, they say.

The conventional view of health promotion focuses on physical activity, but engaging in social and economic activities in later life may also contribute to better health, they add. "Shopping captures several dimensions of personal wellbeing, health, and security as well as contributing to the community's cohesiveness and economy, and may represent or actually confer increased longevity," they conclude.

http://www.eurekalert.org/pub_releases/2011-04/osu-bcp040611.php

Breast cancer patients' persistent fatigue is real, may actually speed up aging

COLUMBUS, Ohio – *The persistent fatigue that plagues one out of every three breast cancer survivors may be caused by one part of the autonomic nervous system running in overdrive, while the other part fails to slow it down.*

That imbalance of a natural system in the body appears linked to the tiredness and exhaustion that can burden cancer patients as much as a decade after their successful treatment.

The effect is so great, researchers say, that it may be a sign of accelerated aging in fatigued patients, causing them to seem as much as 20 years older compared with patients who aren't fatigued.

Those new research findings, just reported in the journal Psychoneuroendocrinology, are the latest from a three-decade-long study of the impact that stress can have on the human body.

Christopher Fagundes, a postdoctoral fellow at Ohio State University's Institute of Behavioral Medicine Research (IBMR), and Janice Kiecolt-Glaser, a professor of psychiatry and psychology and a member of the IBMR, drew early data from a larger ongoing study testing whether yoga can combat continuing fatigue in breast cancer patients.

They were looking for a new biomarker, a signal that could point to the initial cause of this fatigue. Their target was the autonomic nervous system, that part of the body that controls unconscious activities like breathing, heartbeat, digestion and such, which earlier research had indicated might play a role.

The autonomic nervous system has two main parts – the sympathetic and the parasympathetic. The former is responsible for what has become known as the fight-or-flight response, a triggering of short-term, energized activity. The latter deals with opposite situations. It is the resting phase, best recognized by the sleepiness that may follow eating a big meal.

While the sympathetic system is an energy hog, the parasympathetic conserves energy, and the two should remain in balance in healthy individuals. The researchers were looking for differences between fatigued and non-fatigued cancer survivors.

"We started looking for biomarkers for cancer-related fatigue," Fagundes said. "Other research has indicated that a systemic inflammation through the body might be a reliable biomarker for this. "Sick people with inflammation become tired and lethargic, which makes sense since their bodies are using energy to fight off infections. You can imagine that a long-term, systemic inflammation, year-in and year-out, might produce this fatigue."

For the study, 109 women participated and were placed in one of two groups – those who reported long-term fatigue and those who didn't. The women varied from being two months to two years after being treated for their disease.

Fatigue is a normal response to breast cancer treatments like chemotherapy and radiation therapy, but one-third or more of breast cancer survivors report continued debilitating fatigue long after treatment has ended.

After a short relaxation period, each woman had blood drawn to establish a baseline level for norepinephrine, a stress hormone that served as an indicator of activity by the sympathetic nervous system. Each participant had to give a five-minute speech before a two-person panel and then do a series of verbal arithmetic problems aimed at increasing stress levels. Additional blood samples were taken immediately after the stressor and then a half-hour later.

The norepinephrine levels rose as expected from the baseline in both groups after the stressful episode but the researchers were surprised to see something different. Regardless of the stressor, women who had persistent fatigue showed higher levels of norepinephrine than those who weren't fatigued.

"They had higher sympathetic activity and lower parasympathetic activity," Fagundes said, an indication that other researchers have suggested is a signal for inflammation.

The researchers also gauged another measure in the study, the natural variability in heart rate which decreases as a person ages. A lessened heart rate variability (HRV) is also an indicator of activity in the parasympathetic, or "resting," system.

"People who were fatigued had weaker parasympathetic activity than those who weren't," he said.

"One of the things we know best is that exercise can enhance a person's HRV," Kiecolt-Glaser said.

"Exercise is also the best documented treatment for fatigue, so this all begins to make sense.

"Fatigue isn't a symptom that should be ignored. It's a marker for other things that might be going on," she said. Higher norepinephrine levels and lower HRV have been linked to high blood pressure, myocardial infarctions, strokes and diabetes. "When a cancer patient reports persistent fatigue following treatment, it is something that deserves attention. It may be a symptom of other things that matter."

Working with Fagundes and Kiecolt-Glaser on the work were William Malarkey, Charles Shapiro, David Murray, Beom Seuk Hwang, Jean Philippe Gouin and Julian Thayer, all from Ohio State; and John Sollers from the University of Auckland. The work was supported in part by the National Institutes of Health and the American Cancer Society.

http://www.eurekalert.org/pub_releases/2011-04/qu-cnf040611.php

Common nanoparticles found to be highly toxic to Arctic ecosystem

Queen's researchers have discovered that nanoparticles, which are now present in everything from socks to salad dressing and suntan lotion, may have irreparably damaging effects on soil systems and the environment.

"Millions of tonnes of nanoparticles are now manufactured every year, including silver nanoparticles which are popular as antibacterial agents," says Virginia Walker, a professor in the Department of Biology. "We started to wonder what the impact of all these nanoparticles might be on the environment, particularly on soil."

The team acquired a sample of soil from the Arctic as part of their involvement in the International Polar Year initiative. The soil was sourced from a remote Arctic site as they felt that this soil stood the greatest chance of being uncontaminated by any nanoparticles.

"We hadn't thought we would see much of an impact, but instead our results indicate that silver nanoparticles can be classified as highly toxic to microbial communities. This is particularly concerning when you consider the vulnerability of the arctic ecosystem."

Dr. Walker further noted that although technological progress is important, the world has a history of welcoming innovations prior to reflecting on their impact on the environment. Such examples include the discovery of the insecticide DDT, the use of the drug thalidomide during pregnancy and the widespread use of synthetic fertilizers.

The researchers first examined the indigenous microbe communities living in the uncontaminated soil samples before adding three different kinds of nanoparticles, including silver. The soil samples were then left for six months to see how the addition of the nanoparticles affected the microbe communities. What the researchers found was both remarkable and concerning.

The original analysis of the uncontaminated soil had identified a beneficial microbe that helps fix nitrogen to plants. As plants are unable to fix nitrogen themselves and nitrogen fixation is essential for plant nutrition, the presence of these particular microbes in soil is vital for plant growth. The analysis of the soil sample six months after the addition of the silver nanoparticles showed negligible quantities of the important nitrogen-fixing species remaining and laboratory experiments showed that they were more than a million times susceptible to silver nanoparticles than other species.

These pioneering findings by Queen's researchers Niraj Kumar and Virginia Walker and Dowling College's Vishal Shah have been published today in the Journal of Hazardous Materials, the highest ranking journal in Civil Engineering.

New prostate cancer test gives more accurate diagnosis

New screening test better detects aggressive cancer, reduces false positives

CHICAGO - In a large multi-center clinical trial, a new PSA test to screen for prostate cancer more accurately identified men with prostate cancer -- particularly the aggressive form of the disease -- and substantially reduced false positives compared to the two currently available commercial PSA tests, according to newly published research from Northwestern Medicine.

The only currently available Food and Drug Administration-approved screening tests for prostate cancer result in a high number of false positives and lead to unnecessary biopsies and possible over-detection and over-treatment of indolent cancer which never would have caused suffering or death.

PSA stands for prostate-specific antigen, a substance whose elevated levels can indicate prostate cancer but can also be caused by prostate inflammation or enlargement or other conditions. Its lack of specificity can result in unnecessary biopsies.

"This new test is more specific and accurate than the currently available blood tests for early prostate cancer detection," said lead investigator William Catalona, M.D., director of the clinical prostate cancer program at the Robert H. Lurie Comprehensive Cancer Center of Northwestern University. "This will focus on the detection of more life-threatening prostate cancers and reduce unnecessary biopsies in men 50 years of age and older."

Catalona, known as the father of the PSA screening, was the first to show in 1991 that a simple blood test measuring PSA levels could be used to detect prostate cancer. He is a professor of urology at Northwestern's Feinberg School of Medicine and a urologist at Northwestern Memorial Hospital.

The study, which will be published in the May issue of the Journal of Urology, followed 900 patients from 10 sites, including Northwestern. The results showed the new screening test, a simple blood test called the Pro-PSA test, is particularly useful for patients with a normal prostate exam whose PSA is 2 to 10, a range considered the diagnostic gray zone because most men with higher levels have prostate cancer and most men with lower levels do not.

The Pro-PSA test measures a more specific PSA subform called (-2) Pro-PSA. The test becomes even more accurate when its results are analyzed with a mathematical formula that provides an overall Prostate Health Index. (The formula divides the Pro-PSA number by the free-PSA. Then the quotient of the two is multiplied by the square root of the total PSA.)

"The logic behind the formula is that the higher the Pro-PSA and the total PSA and the lower the free-PSA, the more likely the patient has aggressive prostate cancer," Catalona said. The new Pro-PSA test was recently approved for commercial use in Europe, Catalona noted. "The FDA is currently reviewing our data from the study, and I'm hopeful that it will be approved in the United States as well," he said.

Catalona conducted the study in collaboration with Beckman Coulter, Inc., a biomedical test developer and manufacturer, for which he serves as a paid consultant.

The trial was supported by Beckman Coulter. Catalona's research also is supported by the National Cancer Institute and the Urological Research Foundation.

<http://www.nytimes.com/2011/04/06/science/06particle.html>

At Particle Lab, a Tantalizing Glimpse Has Physicists Holding Their Breaths

By DENNIS OVERBYE

Physicists at the Fermi National Accelerator Laboratory are planning to announce Wednesday that they have found a suspicious bump in their data that could be evidence of a new elementary particle or even, some say, a new force of nature.

The results, if they hold up, could be a spectacular last hurrah for Fermilab's Tevatron, once the world's most powerful particle accelerator and now slated to go dark forever in September or earlier, whenever Fermilab runs out of money to operate it. "Nobody knows what this is," said Christopher Hill, a theorist at Fermilab who was not part of the team. "If it is real, it would be the most significant discovery in physics in half a century."

One possible explanation for this mysterious bump, scientists say, is that it is evidence of a new and unexpected version of the long-sought Higgs boson. This is a hypothetical elementary particle that, according to the reigning theory known as the Standard Model, is responsible for endowing other elementary particles with mass.

Another explanation might be that it is evidence of a new force of nature - in addition to gravity, electromagnetism, and the strong and weak nuclear forces we already know and are baffled by - that would manifest itself only at very short distances like those that rule inside the atomic nucleus.

Either could shake what has passed for conventional wisdom in physics for the last few decades. Or it could be there is something they do not understand about so-called regular physics.

Giovanni Punzi, the Fermilab physicist who is spokesman for the international team that did the work, said by e-mail that he and his colleagues were “strongly thrilled at the possibility, and cautious at the same time, because this would be so important that almost scares us - so we think of all possible alternative explanations.”

Physicists outside the Fermilab circle said they regarded the results, which have been widely discussed in physics circles for several months, with a mixture of awe and skepticism.

“If it holds up, it’s very big,” said Neal Weiner, a theoretical physicist at New York University. Lisa Randall, a theorist at Harvard, said the same thing: “It is definitely interesting, if real.”

But Nima Arkani-Hamed of the Institute for Advanced Study in Princeton, N.J., said he did not find the bump convincing, saying it could be an artifact of how the data was sliced and diced.

The important thing, he said, was that if this and other anomalies recently reported at the Tevatron are real, then the Large Hadron Collider, a rival machine run by CERN, “will see dramatic evidence in not too long - that’s certainly what I’m waiting for.”

The key phrase, everyone agrees, is “if it holds up.” The experimenters estimate that there is a less than a quarter of 1 percent chance their bump is a statistical fluctuation, making it what physicists call a three-sigma result, enough to attract attention but not enough to claim an actual discovery. Three-sigma bumps, as every physicist knows, can come and go.

The Tevatron has been colliding beams of protons and their opposites, antiprotons, that have been accelerated to energies of one trillion electron volts, for more than two decades looking for new forces and particles. The bump showed up in an analysis of some 10,000 of those collisions collected by the Collider Detector at Fermilab, one of two mammoth detectors at the facility, which is outside Chicago.

They found that in about 250 more cases than they expected, what came out of the collision were two jets of lightweight particles, like electrons, and a heavy-force-carrying particle called the W boson were produced. The team found that in about 250 times more cases than expected, the total energy of the jets clustered around a value of about 144 billion electron volts, as if they were the decay products of a hitherto unsuspected particle with that mass-energy. For comparison, a proton weighs about one billion electron volts.

This could not be the Standard Model Higgs, Dr. Punzi and his colleagues concluded, because the Higgs is predicted to decay into much heavier particles, namely quarks. Moreover, the rate at which these mystery particles were being produced was 300 times greater than Higgs bosons would be produced.

If real, it was something totally new, Dr. Punzi said. The result had recently been strengthened, he said, by new calculations of interactions between quarks, which are notoriously difficult to compute. “It is so new, so astonishing, we ourselves can barely believe it,” he said. “We decided we had to let the whole world know.”

Dr. Punzi and his colleagues have submitted a paper that was to be posted on a physics Web site Tuesday night and has been submitted to Physical Review Letters.

Joe Lykken, a Fermilab particle theorist, said Dr. Punzi’s group would have four times as much data in an analysis later this year. “This would be enough to claim a definitive major discovery,” he wrote in an e-mail, “just as the Tevatron - and perhaps Fermilab itself - is being shut down for budget savings.”

<http://www.newscientist.com/article/dn20340-tree-of-lice-suggests-mammals-did-ok-under-dinos.html>

'Tree of lice' suggests mammals did OK under dinos

April 2011 by Michael Marshall

They may be irritating and harmful, but lice have their uses. A study of their evolution suggests that the parasitic lice that plague modern birds and mammals began diversifying while dinosaurs ruled the Earth.

That implies their hosts were also diversifying, challenging the popular idea that mammals hid in the shadows during the dinosaur era and only began evolving into new species – or radiating – after the great reptiles died out during the K-T extinction of 65 million years ago. Because the bird and mammalian fossil record only goes back to just before this extinction, it is tough to determine their family tree during the reign of the dinosaurs.

Vince Smith of London's Natural History Museum assembled a family tree showing how modern lice groups are related. See a picture of a 44 million year old louse, used in Smith's study of the louse family tree.

Many lice only parasitise one species. For instance, lice infesting pocket gophers have notches on their heads that are sized to grip the hair of one species, like a lock-and-key mechanism. If a host evolves into two separate species, the louse follows suit in a process called co-speciation.

Lice radiation

Comparing the mammalian and louse tree, the team found eight co-speciations. Smith had found few louse fossils that he could date, but the matches with the mammalian tree allowed him to calibrate dates on the lice tree. This revealed that lice radiated much earlier than we thought, around 115 million years ago, says Smith. That's 50 million years before dinosaurs went extinct.

Assuming the lice were living on mammals and birds, that fills in some of the void left by the paucity of host fossils from before the K-T boundary, and implies mammals and birds radiated during the age of dinosaurs.

The suggestion is "dramatic", says Mike Benton of the University of Bristol, UK. Others, such as Tanja Stadler of the Swiss Federal Institute of Technology in Zurich, have suggested that mammals steadily split into more and more species from 100 million years ago (Proceedings of the National Academy of Sciences, DOI: 10.1073/pnas.1016876108).



Megamenopon rasnitsyni (left) is a 44-million-year-old louse fossil, collected from the Eckfeld Maar crater near Manderscheid in Germany. It is a close relative of *Holomenopon brevithoracicum* (right), which parasitises the feathers of waterfowl

There may be another explanation for the new lice tree, though, says Smith – that feathered dinosaurs were subject to the bothersome parasites as well. In which case dinosaur speciation would account for the radiation of lice, not mammals. *Journal reference: (Biology Letters, DOI: 10.1098/rsbl.2011.0105)*

http://www.eurekalert.org/pub_releases/2011-04/wt-mpm040611.php

Monkeys provide malaria reservoir for human disease in Southeast Asia

Monkeys infected with an emerging malaria strain are providing a reservoir for human disease in Southeast Asia, according to research published today. The Wellcome Trust funded study confirms that the species has not yet adapted to humans and that monkeys are the main source of infection.

Malaria is a potentially deadly disease that kills over a million people each year. The disease is caused by malaria parasites, which are transmitted by infected mosquitoes and injected into the bloodstream.

There are five species of malaria parasite that are known to cause disease in humans, of which *Plasmodium knowlesi* is the most recently identified. Previously thought to only infect monkeys, researchers have shown that human *P. knowlesi* infections are widely distributed in Southeast Asia and that it is a significant cause of malaria in Malaysian Borneo. Until now, it was not clear whether the infection is transmitted from person to person, or is passed over from infected monkeys.

Researchers led by Professor Balbir Singh at the Malaria Research Centre, Universiti Malaysia Sarawak, collaborating with Sarawak State Health Department, St George's University of London and the London School of Hygiene and Tropical Medicine, examined blood samples from 108 wild macaques from different locations around the Sarawak division in Malaysian Borneo. Their results reveal that 78% were infected with the *P. knowlesi* species of malaria parasite, and many were infected with one or more of four other species of monkey malaria parasites that have not yet been found in humans

By comparing the molecular identity of the parasites from monkeys and those isolated from patients with *knowlesi* malaria, the team were able to build a picture of the evolutionary history of the parasite and its preferred host. Their analysis reveals that transmission of the *knowlesi* species is more common amongst wild monkeys, than from monkeys to humans, and that monkeys remain the dominant host.

"Our findings strongly indicate that *P. knowlesi* is a zoonosis in this area, that is to say it is passed by mosquitoes from infected monkeys to humans, with monkeys acting as a reservoir host," explains Professor Singh. "However, with deforestation threatening the monkeys' habitat and increases in the human population, it's easy to see how this species of malaria could switch to humans as the preferred host. This would also hamper current efforts aimed at eliminating malaria."

Based on the molecular data, the researchers estimate that the *knowlesi* malaria species evolved from its ancestral species between 98 000 and 478 000 years ago. This predates human settlement in the area, meaning that monkeys are mostly likely to have been the initial host for the parasite when the species first emerged. This estimate also indicates that the species is as old as, or older than, the two most common human malaria parasites, *P. falciparum* and *P. vivax*. The study is published today in the journal PLoS Pathogens.

Political views are reflected in brain structure

We all know that people at opposite ends of the political spectrum often really can't see eye to eye. Now, a new report published online on April 7th in Current Biology, a Cell Press publication, reveals that those differences in political orientation are tied to differences in the very structures of our brains.

Individuals who call themselves liberal tend to have larger anterior cingulate cortexes, while those who call themselves conservative have larger amygdalas. Based on what is known about the functions of those two brain regions, the structural differences are consistent with reports showing a greater ability of liberals to cope with conflicting information and a greater ability of conservatives to recognize a threat, the researchers say.

"Previously, some psychological traits were known to be predictive of an individual's political orientation," said Ryota Kanai of the University College London. "Our study now links such personality traits with specific brain structure." Kanai said his study was prompted by reports from others showing greater anterior cingulate cortex response to conflicting information among liberals. "That was the first neuroscientific evidence for biological differences between liberals and conservatives," he explained.

There had also been many prior psychological reports showing that conservatives are more sensitive to threat or anxiety in the face of uncertainty, while liberals tend to be more open to new experiences. Kanai's team suspected that such fundamental differences in personality might show up in the brain.

And, indeed, that's exactly what they found. Kanai says they can't yet say for sure which came first. It's possible that brain structure isn't set in early life, but rather can be shaped over time by our experiences. And, of course, some people have been known to change their views over the course of a lifetime.

It's also true that our political persuasions can fall into many more categories than liberal and conservative. "In principle, our research method can be applied to find brain structure differences in political dimensions other than the simplistic left- versus right-wingers," Kanai said. Perhaps differences in the brain explain why some people really have no interest in politics at all or why some people line up for Macs while others stick with their PCs. All of these tendencies may be related in interesting ways to the peculiarities of our personalities and in turn to the way our brains are put together.

Still, Kanai cautioned against taking the findings too far, citing many uncertainties about how the correlations they see come about. "It's very unlikely that actual political orientation is directly encoded in these brain regions," he said. "More work is needed to determine how these brain structures mediate the formation of political attitude."

Male victims of 'intimate terrorism' can experience damaging psychological effects

First study of post-traumatic stress examines impact on men who sustain partner abuse

WASHINGTON – Men who are abused by their female partners can suffer significant psychological trauma, such as post-traumatic stress disorder, depression and suicidal thoughts, according to two new papers published by the American Psychological Association.

Although most reported domestic abuse is committed by men against women, a growing body of research has picked up on the prevalence and significance of domestic violence perpetrated against men, says research published in the April issue of *Psychology of Men & Masculinity*. "Given the stigma surrounding this issue and the increased vulnerability of men in these abusive relationships, we as mental health experts should not ignore the need for more services for these men," said British researcher Anna Randle, PsyD, lead author of a paper summarizing two decades of research into domestic violence effects on men.

Approximately 8 percent of men and 25 percent of women reported being sexually or physically assaulted by a current or former partner, according to the National Violence against Women Survey, which polled 8,000 men and 8,000 women and was published by the National Institute of Justice in 1998. While this survey did not indicate the sex of the perpetrator, it provided the most up-to-date comprehensive interpersonal violence statistics at the time of the study, according to the researchers. One analysis of the survey's results showed that male victims were just as likely to suffer from PTSD as female victims of domestic abuse. In addition, psychological abuse was just as strongly associated with PTSD as was physical violence in these male victims. "This raises questions and concerns for male victims of domestic violence, given findings that women are more likely to perpetrate psychological than physical aggression toward male partners," wrote Randle.

Randle noted one study showing that abuse rates among same-sex couples are similar to those of heterosexual couples. However, the depth of research on male same-sex couples is limited when compared to studies of heterosexual couples, she said.

In the second study, led by Denise Hines, PhD, from Clark University, researchers looked at two independent sample groups totaling 822 men between the ages of 18 and 59. The first sample was composed of 302 men who had sought professional help after being violently abused by their female partners. The authors called this "intimate terrorism," characterized by much violence and controlling behavior.

The second sample was composed of 520 men randomly recruited to participate in a national phone survey in which they were asked questions about their relationship. Of this general community, 16 percent said they had sustained minor acts of violent and psychological abuse during arguments with their female partners. This type of abuse was referred to in the research as "common couple violence," in which both partners lashed out physically at each other.

The researchers found that in both groups of men, there were associations between abuse and post-traumatic stress symptoms. However, the "intimate terror victims" who had sought professional help were at a much greater risk of developing PTSD than the men from the general community group who said they had engaged in more minor acts of violence with their partners, according to the researchers. "This is the first study to show that PTSD is a major concern among men who sustain partner violence and seek help," said Hines.

Research has shown severe underreporting of spousal or partner abuse of men, according to Randle. For example, men are not as likely to report serious injuries due to abuse, and psychological or less violent abuse is more likely to go unreported to authorities. In addition, police are less likely to arrest female suspects accused of violence than male suspects, according to another study cited by Randle.

The lack of reliable data has led to some confusion in the literature on domestic violence effects on men, the researchers said. They suggest more rigorous research focusing specifically on male victims.

Article: "A Review of the Evidence on the Effects of Intimate Partner Violence on Men." Anna A. Randle, PsyD, Multidimensional Treatment Foster Care, England; Cynthia A. Graham, PhD, Brunel University, England; Psychology of Men & Masculinity, Vol. 12, No.2. <http://www.apa.org/pubs/journals/releases/men-12-2-97.pdf>

Article: "Symptoms of Posttraumatic Stress Disorder in Men Who Sustain Intimate Partner Violence: A Study of Help seeking and Community Samples." Denise A. Hines, PhD, Clark University; Emily M. Douglas, PhD, Bridgewater State College; Psychology of Men & Masculinity, Vol. 12, No. 2. <http://www.apa.org/pubs/journals/releases/men-12-2-112.pdf>

http://www.eurekalert.org/pub_releases/2011-04/mali-cad040711.php

Caffeine and diabetes -- helpful or harmful?

Latest findings presented in the premier issue of Journal of Caffeine Research

New Rochelle, NY -A growing body of research suggests that caffeine disrupts glucose metabolism and may contribute to the development and poor control of type 2 diabetes, a major public health problem. A review article in the inaugural issue of Journal of Caffeine Research: The International Multidisciplinary Journal of Caffeine Science, a quarterly peer-reviewed journal from Mary Ann Liebert, Inc. publishers, examines the latest evidence, contradicting earlier studies suggesting a protective effect of caffeine. The entire issue is available free online.

James Lane, PhD, Duke University, describes numerous studies that have demonstrated caffeine's potential for increasing insulin resistance (impaired glucose tolerance) in adults that do not have diabetes, an effect that could make susceptible individuals more likely to develop the disease. In adults with type 2 diabetes, studies have shown that the increase in blood glucose levels that occurs after they eat carbohydrates is exaggerated if they also consume a caffeinated beverage such as coffee. This effect could contribute to higher glucose levels in people with diabetes and could compromise treatment aimed at controlling their blood glucose.

"More than 220 million people worldwide have diabetes, says Editor-in-Chief Jack E. James, PhD, School of Psychology, National University of Ireland, Galway, Ireland. "The links that have been revealed between diabetes and the consumption of caffeine beverages (especially coffee) are of monumental importance when it is acknowledged that more than 80% of the world's population consumes caffeine daily. Dr. Lane's review of the topic gives the clearest account to date of what we know, what we don't know, and what needs to be done – urgently!"

Journal of Caffeine Research provides a much-needed authoritative source and central forum to advance knowledge of caffeine science and caffeine's effects on human health. It strives to be inclusive with respect to the diversity of research methodologies used to investigate caffeine, and the diversity of views and opinions regarding its mechanisms and effects, and will combine scientific research and clinical studies on caffeine, with an impact across many fields.

The inaugural issue of the Journal captures the broad scope of debate and research in this emerging clinical and scientific arena. Included are an interview on "Caffeine Consumption and Combat Stress amongst Military Personnel," a provocative roundtable discussion on "Caffeine, Alcohol, and Youth: A Toxic Mix," and articles on "Effects of Caffeine Consumption by Women and Men on the Outcome of In Vitro Fertilization," "The

'Buzz' on Caffeine: Patterns of Caffeine Use in a Convenience Sample of College Students," "Gender Differences in Subjective and Physiological Responses to Caffeine and the Role of Steroid Hormones," "Loss of Coronary Dilation to N6-2-(4-Aminophenyl) Ethyladenosine in Isolated Hearts from Chronic Caffeine- and Nifedipine-Treated Rats," "Energy Drink Use and Substance Use among Musicians," and more.

<http://news.discovery.com/history/mona-lisa-grave-bones-110407.html>

Dig for Mona Lisa's Bones to Begin

Historians are resorting to grave-digging in an effort to learn the true identity of the woman in the iconic painting.

By Rossella Lorenzi

The woman believed to have inspired Leonardo da Vinci's Mona Lisa may be exhumed in a bid to recreate her face, Italian researchers announced this week.

Most scholars believe that the Mona Lisa, known as La Gioconda in Italian or La Joconde in French, is the portrait of Lisa Gherardini, a member of a minor noble family of rural origins who married the wealthy merchant Francesco del Giocondo. "Her life is no longer a mystery," said Giuseppe Pallanti, who carried out extensive research on the Renaissance woman.

Pallanti, who is not involved in the project, traced back Lisa's life from her birth on June 15, 1479 to her death at the age of 63. He discovered that Lisa died in the convent of Sant'Orsola, a now derelict building in the heart of Florence. The hunt for her bones will start there later this month.

"Ground-penetration radar used in an initial survey revealed the likely presence of a crypt in the grounds below the convent's church. We believe Lisa Gherardini is buried there," Silvano Vinceti, the president of an organization called the National Committee for the Promotion of Historic and Cultural Heritage, announced at a news conference in Florence this week.

The project aims to find Lisa's bones and possibly reconstruct her face using carbon dating, DNA analysis and forensic techniques. "We could compare the DNA that we find in the bones to that of Bartolomeo and Piero, Lisa's children who are buried in the church of Santissima Annunziata in Florence," Francesco Mallegni, an anthropologist at Pisa's university, said. If enough skull fragments are found, Mallegni will try to reconstruct Lisa's facial features, in order to see if her face matches that of the iconic painting hanging at the Louvre museum in Paris.

The comparison might solve the enigma around Mona Lisa's famous smile as well as her identity. Among the innumerable speculations, there were conjectures that she was the artist's mother, a noblewoman, a courtesan, a prostitute or even a man. Theories also abound that the sitter was happily pregnant, or affected by various diseases ranging from facial paralysis to compulsive gnashing of teeth.

Known for controversial claims such that letters and numbers are hidden inside the Mona Lisa painting, Vinceti has based his search in the convent on documents found by Pallanti some years ago.

One document is Francesco del Giocondo's will in which the merchant asks his younger daughter, Marietta, to take care of his "beloved wife," Lisa. At that time, Marietta, one of Lisa and Francesco's five children, had become a nun, thus she brought her mother to the nearby convent of Sant'Orsola. Lisa died four years after her husband's death, at the age of 63, according to a document known as a "Book of the Dead," found by Pallanti in a church archive. "Lisa di Francesco Del Giocondo died on July 15, 1542 and was buried in Sant'Orsola," the document states. The record notes that the whole parish turned out for her funeral, showing that she was rather famous among Florentine society.

"The project is indeed based on important documents," Alessandro Vezzosi, director of the Museo Ideale in the Tuscan town of Vinci, where the the master was born in 1452, told Discovery News.

"If successful, the research might help in answering several questions about Lisa Gherardini. For example, we don't know why she wasn't buried with her husband in the family tomb," Vezzosi said.

<http://news.sciencemag.org/sciencenow/2011/04/the-curse-of-the-mummies-arteries.html>

The Curse of the Mummies' Arteries

by Heather Pringle

In the ancient tomb paintings of the Nile Valley, Egypt's nobility often appears lithe, beautiful, and, above all, healthy. But researchers have long doubted that life at the top of the social pyramid in ancient Egypt was quite so rosy.

At least as early as 1500 B.C.E., Egyptian physicians observed symptoms of angina, heart attacks, and congestive heart failure in patients and recorded them in medical papyri. Yet they gave little indication of how often they saw such cases.

Now a team led by cardiologists Adel Allam of the Al Azhar Medical School in Cairo and Gregory Thomas of the University of California, Irvine, has conducted the broadest and most detailed study yet of atherosclerosis

- a hardening of the arteries that causes both strokes and heart attacks - among ancient Egypt's upper classes by building on earlier work and performing CT scans on 52 of their mummies. In a study presented at the scientific session of the American College of Cardiology today in New Orleans, the team found that 44 of the mummies still possessed identifiable cardiovascular tissue, and of these 45% exhibited definite or probable hardening of the arteries.

"We were a bit surprised by how just how much atherosclerosis we found on ancient Egyptians who were young," says team member James Sutherland, a radiologist at the South Coast Radiological Medical Group in Laguna Hills, California. "The average age of death was around 40."

Researchers have long known that factors as such as smoking, a genetic predisposition to early heart disease, a calorie-rich diet, and a lifestyle lacking in exercise all increase the risk of atherosclerosis today. But how prevalent were these factors in ancient Egypt? According to ancient hieroglyphic inscriptions, wealthy ancient Egyptians relished such calorie-rich fare as cakes sweetened with honey. But they did not smoke tobacco and, in an age before automobiles, they likely got more exercise than many of us do today. "So we think there must be other risk factors that we are missing," says Thomas.

One such risk might have been a high exposure to bacterial infection and infectious disease. Parasitic diseases such as malaria and schistosomiasis are endemic in the Nile Valley, and the ancient Egyptians had little means of treating them. "So all that infection might have really revved up the [ancient Egyptians'] inflammatory response," says team member Michael Miyamoto, a cardiologist at the Mission Internal Medical Group in Mission Viejo, California. Inflammation helps to remove the agents of infection and promote healing, but older individuals may have paid a steep price for it: high levels of inflammatory response can contribute to the development of atherosclerosis.

The team now plans to test this hypothesis. Since microscopic signs of inflammation might well be absent from ancient, desiccated tissue, the researchers intend to look for indirect evidence of inflammation by examining CT scans of the mummies for the extent of chronic infections, such as bone infections or periodontal disease.

Guido Lombardi, a mummy researcher and paleopathologist at Cayetano Heredia University in Lima, Peru, is impressed by the study. "The team found mummies that were intact, with arteries that were readily identifiable. ... I have no doubt that [their diagnoses] are right," he says.

Moreover, Frank Rühli, an anatomist at the Centre for Evolutionary Medicine at the University of Zurich and the co-director of the Swiss Mummy Project, which is examining mummies in Swiss collections by medical imaging, is intrigued by the team's hypothesis that high inflammation levels may have posed a major risk for vascular disease in ancient Egypt. "I think the whole issue now is to find out what the risk factors were and how they changed over time," he says.

<http://www.newscientist.com/article/mg21028073.400-neanderthals-bad-luck-and-its-part-in-their-downfall.html>

Neanderthals: Bad luck and its part in their downfall

07 April 2011 by Mark Buchanan

AS OUR ancestors moved north out of Africa and onto the doorstep to the rest of the world, they came across their long-lost cousins: the Neanderthals.

As the popular story goes, the brutish hominins were simply no match for cultured, intelligent Homo sapiens and quickly went extinct. Maybe, but it's also possible that Neanderthals were simply unlucky and disappeared by chance, mathematicians propose.

We know that humans and Neanderthals got pretty cosy during their time together in the Middle East, 45,000 years ago. Between 1 and 4 per cent of the DNA of modern non-Africans is of Neanderthal origin, implying their ancestors must have interbred before humans moved into Europe (New Scientist, 15 May 2010, p 8).

The popular theory has it that humans soon displaced Neanderthals thanks to their superior skills and adaptations. But mathematicians Armando Neves at the Federal University of Minas Gerais in Belo Horizonte, Brazil, and Maurizio Serva at the University of Aquila, Italy, now say that the extinction of Neanderthals may have been down to a genetic lottery.

When two populations interbreed, one of them can go extinct simply due to the random mixing of their genes through sexual reproduction. To find out if this could have wiped out Neanderthals, Neves and Serva modelled the populations that met in the Middle East. Using very few assumptions, they estimated the rate of interbreeding that would lead to the observed share of Neanderthal DNA.

Their results suggest that the 1 to 4 per cent genetic mix could have come about with one interbreeding every 10 to 80 generations. The time taken to reach this mix would depend on the size of the populations. But regardless of populations, Neves and Serva's model shows that low rates of interbreeding could theoretically have led to the extinction of Neanderthals through a genetic lottery (arxiv.org/abs/1103.4621).

"The observed low fraction of Neanderthal DNA could easily have arisen quite naturally even if Neanderthals weren't inferior," says Neves.

A strong point of the analysis, says anthropologist Luke Premo of the University of Washington in Pullman, is that it makes few assumptions about unknown factors, including the relative sizes of the African and Neanderthal populations at the time. Nevertheless, says Premo, the evidence for some kind of superiority of the African group is still strong. "Humans were expanding while Neanderthals were fairly restricted to a portion of Eurasia," he says. "Given their larger population and expansion, it appears that humans were bound to win out." http://www.eurekalert.org/pub_releases/2011-04/chdl-awf040711.php

A world first: The discovery of a common genetic cause of autism and epilepsy

Montreal, Canada Researchers from the CHUM Research Centre (CRCHUM) have identified a new gene that predisposes people to both autism and epilepsy.

Led by the neurologist Dr. Patrick Cossette, the research team found a severe mutation of the synapsin gene (SYN1) in all members of a large French-Canadian family suffering from epilepsy, including individuals also suffering from autism. This study also includes an analysis of two cohorts of individuals from Quebec, which made it possible to identify other mutations in the SYN1 gene among 1% and 3.5% of those suffering respectively from autism and epilepsy, while several carriers of the SYN1 mutation displayed symptoms of both disorders.

"The results show for the first time the role of the SYN1 gene in autism, in addition to epilepsy, and strengthen the hypothesis that a deregulation of the function of synapse because of this mutation is the cause of both diseases," notes Cossette, who is also a professor with the Faculty of Medicine at the Université de Montréal.

He adds that "until now, no other genetic study of humans has made this demonstration."

The different forms of autism are often genetic in origin and nearly a third of people with autism also suffer from epilepsy. The reason for this comorbidity is unknown. The synapsin gene plays a crucial role in the development of the membrane surrounding neurotransmitters, also referred to as synaptic vesicles. These neurotransmitters ensure communication between neurons. Although mutations in other genes involved in the development of synapses (the functional junction between two neurons) have previously been identified, this mechanism has never been proved in epilepsy in humans until the present study.

The results of the present study were published in the latest online edition of Human Molecular Genetics (www.hmg.oxfordjournals.org/search?submit=yes&fulltext=SYN1+loss). They provide the key to a common cause of epilepsy and autism and will make it possible to gain a better understanding of the pathophysiology of these devastating diseases that seriously perturb brain development. They will also contribute to the development of new treatment strategies.

Facts and figures relating to autism and epilepsy in Canada

Invasive development disorders, also called the autism spectrum, include five diagnoses: autism, the most well known; RETT syndrome; childhood disintegrative disorder; Asperger syndrome; and unspecified pervasive developmental disorder. It is estimated that 60 to 70 people (including 10 children) out of every 10,000 people are affected by pervasive development disorders in Canada.

Epilepsy affects around 85 out of 10,000 people in Canada. There are several kinds of epileptic seizures and syndromes.

About the study: SYN1 loss-of-function mutations in ASD and partial epilepsy cause impaired synaptic function. Anna Fassio, Lysanne Patry, Sonia Congia, Franco Onofi, Amélie Piton, Julie Gauthier, Davide Pozzi, Mirko Messa, Enrico Defranci, Manuela Fadda, Anna Corradi, Pietro Baldelli, Line Lapointe, Judith St-Onge, Caroline Meloche, Laurent Mottron, Flavia Valtorta, Dang Khoa Nguyen, Guy A. Rouleau, Fabio Benfenati. Human Molecular Genetics.

http://www.eurekalert.org/pub_releases/2011-04/jhmi-sd040711.php

Scientists develop 'universal' virus-free method to turn blood cells into 'beating' heart cells

Johns Hopkins scientists have developed a simplified, cheaper, all-purpose method they say can be used by scientists around the globe to more safely turn blood cells into heart cells.

The method is virus-free and produces heart cells that beat with nearly 100 percent efficiency, they claim.

"We took the recipe for this process from a complex minestrone to a simple miso soup," says Elias Zambidis, M.D., Ph.D., assistant professor of oncology and pediatrics at the Johns Hopkins Institute for Cell Engineering and the Kimmel Cancer Center.

Zambidis says, "many scientists previously thought that a nonviral method of inducing blood cells to turn into highly functioning cardiac cells was not within reach, but "we've found a way to do it very efficiently and we want other scientists to test the method in their own labs." However, he cautions that the cells are not yet ready for human testing.

To get stem cells taken from one source (such as blood) and develop them into a cell of another type (such as heart), scientists generally use viruses to deliver a package of genes into cells to, first, get them to turn into stem

cells. However, viruses can mutate genes and initiate cancers in newly transformed cells. To insert the genes without using a virus, Zambidis' team turned to plasmids, rings of DNA that replicate briefly inside cells and eventually degrade.

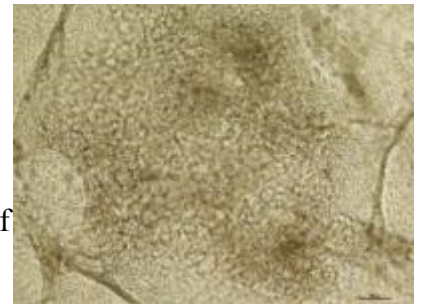
Adding to the complexity of coaxing stem cells into other cell types is the expensive and varied recipe of growth factors, nutrients and conditions that bathe stem cells during their transformation. The recipe of this "broth" differs from lab to lab and cell line to cell line.

Reporting in the April 8 issue of Public Library of Science ONE (PLoS ONE), Zambidis' team described what he called a "painstaking, two-year process" to simplify the recipe and environmental conditions that house cells undergoing transformation into heart cells. They found that their recipe worked consistently for at least 11 different stem cell lines tested and worked equally well for the more controversial embryonic stem cells, as well as stem cell lines generated from adult blood stem cells, their main focus.

The process began with Johns Hopkins postdoctoral scientist Paul Burrige, Ph.D., who studied some 30 papers on techniques to create cardiac cells. He drew charts of 48 different variables used to create heart cells, including buffers, enzymes, growth factors, timing, and the size of compartments in cell culture plates. After testing hundreds of combinations of these variables, Burrige narrowed the choices down to between four to nine essential ingredients at each of three stages of cardiac development.

Beyond simplification, an added benefit is reduced cost. Burrige used a cheaper growth media that is one-tenth the price of standard media for these cells at \$250 per bottle lasting about one week.

Zambidis says that he wants other scientists to test the method on their stem cell lines, but also notes that the growth "soup" is still a work in progress. "We have recently optimized the conditions for complete removal of the fetal bovine serum from one brief step of the procedure – it's made from an animal product and could introduce unwanted viruses," he says.



[This is a video of a "beating" cardiomyocyte.](#) Credit: Paul Burrige

In their experiments with the new growth medium, the Hopkins team began with cord blood stem cells and a plasmid to transfer seven genes into the stem cells. They delivered an electric pulse to the cells, making tiny holes in the surface through which plasmids can slip inside. Once inside, the plasmids trigger the cells to revert to a more primitive cell state that can be coaxing into various cell types. At this stage, the cells are called induced pluripotent stem cells (iPSC).

Burrige then bathed the newly formed iPSCs in the now simplified recipe of growth media, which they named "universal cardiac differentiation system." The growth media recipe is specific to creating cardiac cells from any iPSC line.

Finally, they incubated the cells in containers that removed oxygen down to a quarter of ordinary atmospheric levels. "The idea is to recreate conditions experienced by an embryo when these primitive cells are developing into different cell types," says Burrige. They also added a chemical called PVA, which works like glue to make cells stick together.

Nine days later, the nonviral iPSCs turned into functional, beating cardiac cells, each the size of a needlepoint.

Burrige manually counted how often iPSCs formed into cardiac cells in petri dishes by peering into a microscope and identifying each beating cluster of cells. In each of 11 cell lines tested, each plate of cells had an average of 94.5 percent beating heart cells. "Most scientists get 10 percent efficiency for iPSC lines if they're lucky," says Zambidis.

Zambidis and Burrige also worked with Johns Hopkins University bioengineering experts to apply a miniversion of an electrocardiograph to the cells, which tests how cardiac cells use calcium and transmit a voltage. The resulting rhythm showed characteristic pulses seen in a normal human heart.

Virus-free, iPSC-derived cardiac cells could be used in laboratories to test drugs that treat arrhythmia and other conditions. Eventually, bioengineers could develop grafts of the cells that are implanted into patients who suffered heart attacks.

Zambidis' team has recently developed similar techniques for turning these blood-derived iPSC lines into retinal, neural and vascular cells.

The research was funded by the Maryland Stem Cell Research Fund and the National Institutes of Health.

Research participants include Susan Thompson, Michal Millrod, Seth Weinberg, Xuan Yuan, Ann Peters, Vasiliki Mahairaki, Vassilis E. Koliatsos, and Leslie Tung at Johns Hopkins. On the Web: [Video of a "beating" cardiac cell is available](#)

From Safe Distance, U.S.-Japanese Team Draws Up Plan to Demolish Reactors

By KEN BELSON

TOKYO - Hydrogen explosions. High levels of radiation. Thousands of gallons of contaminated water dumped into the sea. With the drumbeat of bad news, including another powerful aftershock on Thursday, it will take months, if not years, to stabilize the reactors and spent fuel pools that were damaged in last month's earthquake and tsunami at the Fukushima Daiichi plant.

Yet it is not too soon for a team of engineers from Japan and the United States to begin working on the thorny task of how to dismantle the reactors, four of which are so badly damaged that the plant's operator has said they will be scrapped.

Already, dozens of engineers from Toshiba, which helped build four of the Fukushima Daiichi reactors, have been joined by experts from the United States to prepare for the decommissioning work, a job so big that the planning needs to start even now, in parallel with the efforts to contain the crisis.

The team includes experts from Westinghouse, whose majority owner is Toshiba; the Shaw Power Group, a civil engineering firm; and the Babcock & Wilcox Company, an energy technology and services company, one of whose specialties is the disposal of hazardous materials.

The plans to take apart the reactors are complicated not only by the volatility of the situation but also by the uncertainty about the reactors' condition once they finally cool. No one has ever decommissioned four damaged reactors at one power plant, let alone reactors rocked by a powerful earthquake and swamped by a tsunami.

In fact, no Japanese nuclear power plant has ever been entirely decommissioned, which is one reason Westinghouse and Babcock & Wilcox - companies that helped shut down the damaged reactor at Three Mile Island in Pennsylvania after the accident there in 1979 - have joined the effort. Among myriad problems, the engineers must find ways to dispose of the fuel, remove reactors, demolish buildings, and clean up nearby land and water.

"Each of these problems is solvable and have been solved before," said Hiroshi Sakamoto, a senior vice president at Toshiba America Nuclear Energy Corporation, who returned to Japan to lead the team. (It has dubbed itself "Mt. Fuji," short for Management Support for Fukushima U.S. and Japan Initiative.)

"The situation is really the complexity and combination of factors," he said.

While the team makes plans, 800 of Toshiba's engineers are helping the Tokyo Electric Power Company, which operates the Fukushima Daiichi plant, with the more pressing problem of cooling the reactors and reducing the radioactivity there. About 250 engineers are stationed in Fukushima, and an additional 500 are working at Toshiba's nuclear engineering center in Yokohama, Japan.

They are helping to re-establish electrical power to pumps and motors and to install power panels; draining contaminated water; and acquiring desalination equipment, underwater pumps and air purifiers to filter radioactive dust. Westinghouse has provided Tokyo Electric with boron, fuel, spare pumps and other supplies.

"We are taking a two-tier approach for Fukushima," said Kiyoshi Okamura, chief of Toshiba's nuclear business. "These efforts are mutually complementary."

Because of the emergency, Toshiba's engineers - those who are helping Tokyo Electric and those planning the decommissioning - are working without a formal contract. But the Japanese-American team submitted a proposal to Tokyo Electric on April 4 that lays out a long-term plan to remove and transfer spent fuel as part of a larger project. Toshiba has not been told when a decision will be made on the proposal, which might ultimately be worth billions of dollars.

Westinghouse, Shaw and Babcock & Wilcox were eager to help when it became apparent early on that the Fukushima reactors might have to be scrapped. But the crisis made it difficult for Tokyo Electric to respond. By joining hands with Toshiba, the American companies won instant credibility and found a conduit to reach the utility. "It was chaos at the beginning, so it helps to have Toshiba" as a partner, said Jack Allen, the president of Westinghouse in Asia.

Two weeks ago, engineers from the American companies started arriving in Japan, where they were briefed about the situation. They moved into a war room at Toshiba's headquarters that includes offices in a secure part of the building. The rooms are stuffed with desks, computers, whiteboards and dozens of engineers slumped over laptops.

One door is covered with business cards and a sheet that includes photographs of the engineers so that names can be more easily matched to faces. On the walls are aerial photographs and schematics of the Fukushima reactors, as well as charts and photographs from decommissioned reactors at Three Mile Island and the Maine Yankee nuclear power plant in Wiscasset, Me., which took eight years to shut down. Graphic illustrations of

cranes and other equipment are taped to the walls. A well-used coffee cart sits in the hallway. Soda cans and snacks share desk space with laptops. A mixture of Japanese and English fills the air.

Though it is still in its early days, the "Mt. Fuji" team has proposed installing devices around the Fukushima Daiichi plant to monitor radioactivity. It is weighing what machinery is needed, based on various scenarios, and will soon open an office in New York so that engineers there can take over when the team in Tokyo is asleep.

Most of all, the team is waiting for the engineers at Fukushima Daiichi to cool the reactors so it can begin work. "All things hinge," said David J. Richardson, a president at Babcock & Wilcox, "on having safe access."

<http://www.bbc.co.uk/news/health-12999000>

Drinking over recommended limit 'raises cancer risk'

Drinking more than a pint of beer a day can substantially increase the risk of some cancers, research suggests.

The Europe-wide study of 363,988 people reported in the British Medical Journal found one in 10 of all cancers in men and one in 33 in women were caused by past or current alcohol intake. More than 18% of alcohol-related cancers in men and about 4% in women were linked to excessive drinking. The Department of Health said it was taking action to reduce drinking. Cancer charities say people should limit their drinking to lower the risk.

The study calculated that in 2008 current and past drinking habits were responsible for about 13,000 cancer cases in the UK, out of a total of 304,000 cases. Previous research has shown a link between alcohol consumption and cancers of the oesophagus, liver, bowel and female breast. When alcohol is broken down by the body it produces a chemical which can damage DNA, increasing the chance of developing cancer.

Glass too far

The latest research found that individuals who drank more than two standard drinks a day for men and one drink a day for women were particularly at risk of alcohol-related cancers.

A standard drink contains about 12g of alcohol, which is equivalent to a 125ml glass of wine or a half pint of beer. Yet NHS guidelines are a little more relaxed, saying that men should drink no more than three to four units a day while women should not go above two to three units a day. Of the cancers known to be linked to alcohol, the researchers suggest that 40% to 98% occurred in people who drank more than the recommended maximum.

The results were gathered as part of a study following 363,988 men and women in eight European countries aged between 35 and 70. The European Prospective Investigation into Cancer study tracked their levels of drinking and how this affected their risk of cancer. Researchers then looked at figures on how much people drank in each country, including the UK, taken from the World Health Organization.

The study focused on France, Italy, Spain, the Netherlands, Greece, Germany, Denmark and the UK.

Madlen Schutze, lead researcher and study author, from the German Institute of Human Nutrition, said that many cancer cases could be avoided if alcohol consumption was limited. "And even more cancer cases would be prevented if people reduced their alcohol intake to below recommended guidelines or stopped drinking alcohol at all," she said.

'Best data'

Cancer Research UK director of health information Sara Hiom said that many people did not know that drinking alcohol could increase their cancer risk. "In the last 10 years, mouth cancer has become much more common and one reason for this could be because of higher levels of drinking - as this study reflects.

"Along with being a non-smoker and keeping a healthy bodyweight, cutting back on alcohol is one of the most important ways of lowering your cancer risk."

Cancer Partners UK medical director Prof Karol Sikora said the message had to be "drink occasionally, but not regularly". "This is the best data we've got and we're ever likely to get. "The take-home message is that the more alcohol you drink, some of the common cancers - the four cancers that have been identified - do increase, and that's worrying. So the message has to be 'look at drinking habits, and reduce.'"

The Department of Health is set to publish an alcohol strategy in the summer.

Professor Sir Ian Gilmore, former president of the Royal College of Physicians and chairman of the UK Alcohol Health Alliance, called for tougher regulation to curb alcohol consumption.

He told the BBC: "It is yet another piece of evidence that really leads us to conclude that sitting back and waiting for people to change their habits, perhaps with voluntary partnerships with the drinks industry included in policies, will not bring about results. "If we really want to see preventable deaths coming down in the next decade or so, I think there will have to be some form of tougher regulation by government."

It is expected to include plans to stop supermarkets selling cheap alcohol and tighten up licensing laws which were relaxed under the previous government.

Cold asteroids may have a soft heart

A new analysis of one of the most well-known meteorites on Earth provides strong evidence that the prevailing view of many asteroids is wrong.

Rather than randomly mixed blobs of rock and dust stuck together, it appears that the asteroid that was the source of the Allende meteorite was large enough to have had a molten core, even though its surface remained cold and solid. The new view also suggests that astronomers' view of how planets like the Earth formed may need revision.

The Allende meteorite fell in Mexico in 1969, shattering into thousands of fragments as it slammed into the Earth's atmosphere and strewing them across dozens of miles of desert. More than two tons of scattered pieces have been found, and it has become perhaps the best-studied meteorite ever.

When the solar system formed, planets built up through the slow accumulation of smaller objects that collided and stuck together. When these growing collections of rubble reached a certain size, radioactive elements within them heated up enough so that the rock melted, and heavier elements tended to sink toward their cores. This separating process (known as differentiation) ended up producing concentric layers of different composition, structured like the layers of an onion. In the metallic cores at the centers of these bodies, swirling eddies of molten metal would produce a magnetic field. Planetary scientists have long thought that asteroids that formed cores must have completely differentiated and melted throughout their interiors. Now, new findings by planetary scientists at MIT and other institutions suggest that may not be the case: that many asteroids with cores might be only partially differentiated, with their outer regions largely unmelted.

"It's a new paradigm for how people imagine the parent bodies of meteorites," says Benjamin Weiss, associate professor of planetary sciences and paleomagnetism in MIT's Department of Earth, Atmospheric and Planetary Sciences (EAPS). The shift in thinking comes from a combination of laboratory work and theoretical modeling. The lab studies, led by former MIT postdoctoral scholar Laurent Carporzen, found evidence for magnetization, apparently built up over a period of millions of years, in a piece of the Allende meteorite. A separate theoretical analysis, led by Linda Elkins-Tanton, the Mitsui Career Development Associate Professor of Geology in EAPS, showed exactly how such magnetization could have occurred - and why that changes not just our view of asteroids, but also of how all the planets formed and where the water that fills Earth's oceans came from.

The two lines of evidence were published this month in a two related papers, one appearing in the journal *Proceedings of the National Academy of Sciences*, the other in *Earth and Planetary Science Letters*. Weiss is a co-author of both papers.

The Allende meteorite is a type called a carbonaceous chondrite. Chondrites are conglomerates of tiny pieces (called chondrules and inclusions) stuck together, and the individual pieces are thought to be remnants of the primordial cloud of material that originally collapsed to form the solar system. "Many of these are the oldest solar system solids we know of," Weiss says.

The new analysis shows that while newly formed asteroids melted from the inside out because of their radioactive elements, their surfaces, exposed to the cold of space and continuing to accumulate layers of new, cold fragments, remained cold. Computer modeling of the cooling process by Elkins-Tanton clearly shows this disparity of a molten interior and cold, unmelted crust, she says.

The decisive new evidence came from studies of the way mineral grains within the meteorite are magnetized: the magnetic orientations of all the grains line up, showing that they became magnetized after the material had all become stuck together, rather than being a remnant of earlier magnetic fields in the swirling cloud of dust from which the object formed. In addition, using a form of radiometric dating involving isotopes of xenon, they could determine that the magnetization took place over a period of millions of years. That rules out an alternative theory that the grains could have become magnetized as a result of a brief pulse of magnetism in the cloud of dust itself.

The finding has implications far beyond the specific asteroid that was the source of this meteorite: "It says there's a whole spectrum of planetary bodies, from fully melted to unmelted," Weiss says.

Erik Asphaug, professor of earth and planetary sciences at the University of California at Santa Cruz and a specialist in asteroids and comets, finds the case compelling. "The magnetic data is difficult to argue with - that the Allende meteorite acquired magnetization late, and apparently from a stable field. I am convinced about that," he says. Weiss and Elkins-Tanton, he says, "have made a firm association, for the first time, between differentiated parent bodies and chondrule-rich objects."

Asphaug adds "I think their conclusion has very significant implications, in that many differentiated asteroids can be 'dressed' in chondrule clothing."

The new research also provides important information about the whole process of planet formation and how long it took, says Elkins-Tanton. The analysis shows that the parent body must have formed within just 1.5 million years, she says. "The question is, what fraction of planetesimals formed in that period of time? It turns out to be a lot."

Her calculations show that the planetesimals that stuck together to form the early Earth, even though the heating process would have made them drier than previously thought, would still have retained enough water within their unmelted outer regions to produce the oceans. That contradicts a widely held view of planet formation in which the vast majority of the water and other volatile materials on Earth arrived later, delivered by impacting comets and asteroids.

It also implies that this process must have been commonplace in planet formation, and greatly improves the odds that most of the planets around other stars will also have abundant water, she says, which is considered an essential prerequisite for life as we know it. As we study distant planets around other stars, "This increases the probability of finding life in a form that we would recognize it," she says.

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<http://www.physorg.com/news/2011-04-gut-instinct-criminals-sight.html>

Gut instinct: We can identify criminals on sight, study finds

(PhysOrg.com) -- A woman walking her dog encounters a man. She has an instant, visceral reaction to him and screams. The next day, she sees his picture in the newspaper; he has been charged with rape.

This anecdote prompted three Cornell researchers to reopen a "long and sordid" history of research and debate about whether we can determine who is a criminal by looking at his face. Their finding: We can.

"In two experiments, subjects were able to distinguish between criminals and noncriminals by rating each photo we presented to them," said human development doctoral student Jeffrey Valla '12, first author of the study, published in the *Journal of Social, Evolutionary and Cultural Psychology* (Vol. 5:1), with human development professors Stephen Ceci and Wendy Williams.

The researchers gathered head shots of Caucasian males, ages 20 to 29, put them all against a white background and controlled for attractiveness and display of facial emotion. Half were photos of convicts. The criminals were on their first conviction, had short hair and little to no facial hair. About half the criminals had been convicted of violent crimes (forcible rapes, murder, assault) and half for nonviolent crimes (forgery, theft, arson and drug dealing).

On a scale of one to seven, study participants rated how likely each man was to have committed a crime. If they thought a crime had been committed, they were asked to pick violent or nonviolent crimes and to specify which crime had taken place. "We found a small but reliable effect," Valla said. "Subjects rated the criminal photos as significantly more likely to have committed a crime than noncriminals."

But the participants could not distinguish between violent and nonviolent offenders, and women subjects had more trouble correctly identifying rapists than men.

"We speculate that part of the reason why rapists might be successful is that they may purposefully make themselves appear to be nonthreatening to gain access to their victims," Valla said.

The researchers also found that after the experiment, subjects who said they "knew" which photos were police mug shots were worse at picking criminals than those who said they didn't know the photos' origin.

"We wanted to explore this without any preconceptions whether people can distinguish criminals from noncriminals, if there is a difference in appearance between criminals and noncriminals, and whether it's inherent or whether it's gained through experience -- the so-called Dorian Gray effect, in which you come to wear your experiences on your face," Valla said. "I'm not saying that's what people are picking out in the criminal photos, but it's one possibility."

Valla said some people react with aversion when he describes the experiments, in part because it smacks of data abused by adherents of such discredited theories as Social Darwinism, eugenics, phrenology and the "born criminal" -- a "subhuman species" with drooping eyes, large ears, protruding jaw and flat nose -- which led to the sterilization of criminals. Should we trust our intuition about people?

"If you're walking down the street and see someone who looks sinister, and you don't have to engage with him, are you going to give him the benefit of the doubt? Ideally, yes. But our study participants were more likely to err on the side of thinking someone was a criminal than not. Perhaps our reptilian brain is a little less ready to take such a risk," he said. *Provided by Cornell University*

Exo-evolution: Aliens who hide, survive

* 17:39 08 April 2011 by Mark Buchanan

Has ET evolved to be discreet? An evolutionary tendency for inconspicuous aliens would solve a nagging paradox – and also suggest that we Earthlings should think twice before advertising our own existence.

As physicist Enrico Fermi argued in 1950, unless the evolution of life is unique to Earth, there must be many intelligent species out there. So why have they neither phoned home nor been detected by us?

"It's a real paradox," says Adrian Kent of the Perimeter Institute in Waterloo, Ontario, Canada. In order to explain the Fermi paradox, Kent turns to natural selection – and suggests that it may favour quiet aliens.

Violent universe

He argues that it's plausible that there is a competition for resources on a cosmic scale, driving an evolutionary process between alien species on different planets. Advanced species, for example, might want to exploit other planets for their own purposes.

If so, the universe would be a violent place, and evolutionary selection may favour the inconspicuous – those who lay low on purpose, or who simply lack the skill or ambition to venture forth or advertise their existence.

"This is an interesting idea," says alien hunter Seth Shostak of the SETI institute in Mountain View, California. "If I let the cosmos know I exist, then I might be subject to extermination."

However, he is wary of assuming a "straitjacket" on the activities of intelligent species, who might not be able to resist the intellectual pull to develop advanced technologies detectable by others.

"If interstellar violence is possible, the bad news is that all societies are required to constrain their endeavours to activities that could never be detected at a distance," says Shostak.

Voyager danger

The theory joins a long list of attempts to explain the Fermi paradox, from the suggestion that aliens' communications are indistinguishable from background noise, to calculations concluding that ET just hasn't had enough time to find us.

Kent acknowledges that his hypothesis is speculative. But he also warns that it could have real consequences for the near future: vehicles such as NASA's two Voyager probes, which are hurtling away from the solar system, may alert imperialist aliens to our existence and require retrieval, he says.

He adds that it may not take much for a truly advanced civilisation to wipe us out pretty quickly. "The hyper-advanced aliens might not have to send their interstellar battle fleet to conquer Earth," he notes. "It might only take three bored undergraduate aliens with borrowed lab equipment." *Reference: <http://arxiv.org/abs/1104.0624>*