

Fish provide missing piece in the marine sediment jigsaw

Research published today reveals the previously unidentified role that fish play in the production of sediments in the world's oceans, and specifically of the carbonate sediments that contain critical records of changes in ocean chemistry and climate shifts in the geological past.

The discovery, made by a team of scientists from the UK and US, helps explain the origins of a key component of marine sediments – the fine-grained carbonates, the origins of which are often problematic to resolve.

Published today (21 Feb 2011) in The Proceedings of the National Academy of Science (PNAS), the study describes the discovery of an entirely new source of marine carbonate and one that has major implications for understanding the origins of the sediments that form ancient limestone and chalk deposits.

Until now it was believed that the fine-grained carbonates that constitute a major component of marine carbonate sediments were derived primarily from either direct precipitation out of seawater or from the breakdown of the skeletons of marine invertebrates and algae.

This study, funded by the UK's Natural Environment Research Council (NERC), shows that large volumes of carbonate crystals are precipitated inside the intestines of marine fish and are then excreted at very high rates, releasing this lesser-known, non-skeletal carbonate into the marine environment. Although this material comes from the guts of marine fish, it is derived from calcium in the seawater they drink rather than any undigested product of their food.

However, the form and fate of these crystals after excretion by the fish was unknown. The researchers therefore conducted a "needle in a haystack" search, to look for microscopic crystals that are unique to fish within areas that are already rich in carbonate crystals from other organisms.

The study was undertaken in The Bahamas, famous for its white carbonate sands and muds, where the preservation of such crystals in shallow sediments was predicted to be good. Measurements made on fish that were local to The Bahamas yielded conservative estimates that they produce in excess of 6 million kg of carbonate each year across the region, equivalent to an estimated 14% of its total carbonate mud production.

To reach these findings, the team combined data on regional fish biomass in different marine habitats across The Bahamas with laboratory measurements of the production rates for a range of fish species from this region. These production estimates for fish were then compared against published rates of mud production.

The study reveals that fish guts are a direct source of the most fine-grained carbonate with individual crystals generally less than 30 micrometres (or 0.03 mm) in diameter.

These crystals are also produced in an incredibly diverse array of shapes similar to rugby balls, broccoli florets and dumbbells. Despite their small size, the volumes of carbonate produced by individual fish are so immense that this carbonate has direct relevance to understanding marine carbonate budgets.

Lead author Professor Chris Perry, a marine geoscientist at Manchester Metropolitan University, said: "The recognition that fish can act as major producers of carbonate in the marine environments will be completely unexpected to a large section of the marine science community. Given how much carbonate these fish can produce, the findings also clearly have major implications for our understanding of different sources and sinks of carbonate sediment in the oceans and some exciting implications for understanding where much of the mud in limestones and chinks may derive from".

One of the most interesting issues arising from the study is what it means for our understanding of how marine carbonate sediments accumulate in the first place. The study clearly shows fish to be a unique and novel source of the carbonate sediment in modern marine environments, but the work has equally exciting implications for understanding these processes in the geological record.

Joint corresponding author, Dr. Rod Wilson, a fish biologist at the University of Exeter, said: "An obvious area of future study in this field relates to the geological record and in particular to the role of this process in periods of the Earth's history when ocean chemistry was very different and temperatures considerably warmer.

For example, a preliminary study has estimated fish carbonate production under Cretaceous seawater conditions, the time (146-65 million years ago) when large masses of chalk were deposited (famously including the White Cliffs of Dover).

These studies, although in their early stages, suggest massive increases in production of this carbonate by fish during this ancient time. Perhaps fish have been a major contributor to these iconic carbonate deposits, in addition to the better known micro-fossils of shelled organisms? However, we are yet to look for direct evidence of this unusual contribution of fish, and we are currently seeking research funds to help answer this intriguing question." And what about the future? The study finds clear evidence that at present such carbonates can accumulate within the marine environment, at least in warm shallow seas, but the fate of this carbonate under changing oceanographic conditions (especially marine chemistry change) is unclear.

On the one hand, rising sea-surface temperatures should result in higher rates of carbonate production by fish since production increases markedly with temperature. On the other hand, increasing ocean acidity may mean more of this carbonate is dissolved, with potential knock-on effects for ocean carbon cycling and absorption of CO₂ from the atmosphere.

http://www.eurekalert.org/pub_releases/2011-02/osu-pkt021611.php

Plankton key to origin of Earth's first breathable atmosphere

COLUMBUS, Ohio – Researchers studying the origin of Earth's first breathable atmosphere have zeroed in on the major role played by some very unassuming creatures: plankton.

In a paper to appear in the online Early Edition of the Proceedings of the National Academy of Sciences (PNAS), Ohio State University researcher Matthew Saltzman and his colleagues show how plankton provided a critical link between the atmosphere and chemical isotopes stored in rocks 500 million years ago.

This work builds on the team's earlier discovery that upheavals in the earth's crust initiated a kind of reverse-greenhouse effect 500 million years ago that cooled the world's oceans, spawned giant plankton blooms, and sent a burst of oxygen into the atmosphere. The new study has revealed details as to how oxygen came to vanish from Earth's ancient atmosphere during the Cambrian Period, only to return at higher levels than ever before. It also hints at how, after mass extinctions, the returning oxygen allowed enormous amounts of new life to flourish.

Saltzman and his team were able to quantify how much oxygen was released into the atmosphere at the time, and directly link the amount of sulfur in the ancient oceans with atmospheric oxygen and carbon dioxide.

The result is a clearer picture of life on Earth in a time of extreme turmoil. "We know that oxygen levels in the ocean dropped dramatically [a condition called anoxia] during the Cambrian, and that coincides with the time of a global extinction," said Saltzman, associate professor of earth sciences at Ohio State.

In a paper in the journal *Nature* just last month, the same researchers presented the first geochemical evidence that the anoxia spread even to the world's shallow waters.

"We still don't know why the anoxia spread all over the world. We may never know," Saltzman said. "But there have been many other extinction events in Earth's history, and with the exception of those caused by meteor impacts, others likely share elements of this one – changes in the balance of oxygen and carbon dioxide in the atmosphere and oceans. By getting a handle on what was happening back then, we may improve our understanding of what's happening to the atmosphere now."

Something enabled oxygen to re-enter the oceans and the atmosphere 500 million years ago, and the study suggests that the tiny plant and animal life forms known as plankton were key.

Plankton may be at the bottom our food chain today, but back then, they ruled the planet. There was no life on land at all. And aside from an abundance of trilobites, life in the oceans was not very diverse.

Not diverse, that is, until a geologic event that scientists call the Steptoean Positive Carbon Isotope Excursion (SPICE) occurred. In previous work, Saltzman and his collaborators showed that the SPICE event was caused by the burial of huge quantities of organic matter in ocean sediments, which pulled carbon dioxide from the atmosphere and released oxygen. The more oxygen plankton encounter in their cells, the more selective they become for the light isotope of carbon in carbon dioxide, and absorb it into their bodies.

By studying isotopes in fossilized plankton contained in rocks found in the central United States, the Australian outback, and China, the researchers determined that the SPICE event happened around the same time as an explosion of plankton diversity known as the "plankton revolution."

"The amount of oxygen rebounded, and so did the diversity of life," Saltzman explained.

Other researchers have tried to gauge how much oxygen was in the air during the Cambrian, but their estimates have varied widely, from a few percent to as much as 15-20 percent. If the higher estimates were correct, then the SPICE event would have boosted oxygen content to greater than 30 percent – or almost 50 percent richer than today's standard of 21 percent. This study has provided a new perspective on the matter.

"We were able to bring together independent lines of evidence that showed that if the total oxygen content was around 5-10 percent before the SPICE, then it rose to just above modern levels for the first time after the SPICE," Saltzman said.

The study has some relevance to modern geoengineering. Scientists have begun to investigate what we can do to forestall climate change, and altering the chemistry of the oceans could help remove carbon dioxide and restore balance to the atmosphere. The ancient and humble plankton would be a necessary part of that equation, he added. "When it comes to ancient life, they don't sound as exciting as dinosaurs, but the plankton are critical to this story."

Saltzman's coauthors on the PNAS paper include Seth Young of Indiana University; Lee Kump of Pennsylvania State University; Benjamin Gill of the University of California, Riverside, and Harvard University; Timothy Lyons, also of the

University of California, Riverside; and Bruce Runnegar of the University of California, Los Angeles. Additional coauthors on the Nature paper included Andrew Knoll of Harvard University.

The National Science Foundation's Geobiology and Low-Temperature Geochemistry Program funded this research.

http://www.eurekalert.org/pub_releases/2011-02/jhmi-fnc021811.php

Famed neurosurgeon's century-old notes reveal 'modern' style admission of medical error

Harvey Cushing's records show copious acknowledgement of medical errors that helped fuel advancements

The current focus on medical errors isn't quite as new as it seems. A Johns Hopkins review of groundbreaking neurosurgeon Harvey Cushing's notes, made at the turn of the last century, has turned up copious documentation of his own surgical mishaps as well as his suggestions for preventing those mistakes in the future.

Authors of the article, published in the Feb. Archives of Surgery, suggest that such open documentation may have played an important role in spurring groundbreaking medical treatment advances in Cushing's era — and could have the same effect today. "Acknowledging medical errors is evidently something that doctors identified early on as critical to advancement a very long time ago," says principal author Katherine Latimer, B.S., a medical student at the Johns Hopkins University School of Medicine.

Latimer and her colleagues scoured Johns Hopkins' archives to locate operative notes covering 878 of Cushing's patients. The notes, transferred decades ago to microfilm, covered the early years of Cushing's career, from 1896 to 1912, at The Johns Hopkins Hospital. After deciphering the notes—a monumental task, the authors say, owing to Cushing's poor handwriting, abbreviations, and pages crowded with notes of other physicians, too—the researchers selected 30 cases in which errors were clearly delineated.

The cases fell into categories of errors similar to those that plague doctors today, the authors said, classifying 11 of the cases as errors of judgment in which Cushing made the wrong choice during a surgery. One example: operating on the wrong side of a patient's brain. Seventeen cases were identified as "human error," mistakes in which Cushing revealed clumsy or careless behavior, such as dropping an instrument into a surgical wound.

Three of the errors were considered equipment or tool oversights, such as the case in which a woman's heavy bleeding left Cushing and his colleagues without enough wax, a substance used at the time to seal blood vessels.

Latimer and her colleagues say they were surprised by Cushing's frank and copious documentation of his own shortcomings. His notes acknowledged mistakes that may have resulted in patients' deaths, as well as those that didn't seem to harm patients' outcomes. They said the documentation took place in an era in which malpractice litigation was becoming a growing concern for doctors. Though malpractice penalties were substantially smaller in Cushing's day, lawsuits presented a serious risk for physicians' reputations, the authors noted.

The authors also emphasized that Cushing practiced in a time of enormous surgical innovation. For example, patient mortality from surgical treatment of brain tumors fell from 50 percent to 13 percent during his career. While some of this jump ahead was due to improving technology, the authors propose that part of the reason was open documentation of errors, which helped Cushing and other surgeons develop fixes to avoid them.

"People are human and will make medical mistakes," says Latimer, "but being vigilant about your own shortcomings is critical to improving. To keep medical innovation flowing, we need to strive to maintain this same vigilance today."

Alfredo Quinones, M.D., associate professor of neurosurgery at the Johns Hopkins University School of Medicine and senior author of the study, adds that today's medical errors continue to have a tremendous impact on patients and their families. "Recognizing errors and reporting them can help us greatly improve medicine," he says. "After all, we are all working towards the same goal: better patient care."

<http://www.physorg.com/news/2011-02-dissoluble-fishing-line-eco-friendly-success.html>

Dissoluble fishing line an eco-friendly success

At first glance, it's just looks like plain old fishing line - but the strong filament is actually a technological innovation made of special plastic that dissolves into carbon dioxide and water through the work of microorganisms in water.

"The time it takes depends on water temperature and other conditions, but it usually dissolves completely in five years," said Tokuo Ichikawa, the person in charge of developing the product at Globeride Inc., a fishing-gear company based in Higashi-Kurume, Tokyo.

The impetus for developing an environment-friendly fishing line came five years ago when Ichikawa, 53, and his colleagues took part in recovering discarded fishing line and sinkers underwater at Lake Kawaguchi in Yamanashi Prefecture. A small truck full of garbage, including fishing gear, is collected at the lake every day.

"Garbage you find on the ground should be removed out of common decency, but garbage left underwater should be taken away by companies," Ichikawa said.

Making stout fishing line from a fragile, naturally dissoluble material was challenging. Ichikawa solved the problem by using a stretchable material that was about 80 percent as strong as a regular nylon fishing line.

In July, Globberide started selling a hook rig using the textile. Even though it was 10 percent more expensive, the product sold out quickly and they had to scramble to produce enough to meet the demand.

In 2002, the firm developed a sinker made of tungsten instead of lead, which is toxic. A tungsten sinker has less of an adverse impact on the environment, but products made of this rare metal cost 10 times more than off-the-shelf sinkers.

Globberide's president deemed it too expensive to sell, but employees noticed the relatively small but high-density tungsten product could be cast further than the lead sinker. The tungsten sinker was released under the advertising slogan, "Only you can hit the unreachable spot" and was named "Top Gun." Sales took off.

"Products won't sell just because they're 'environmentally friendly.' We have to sell things without lowering their quality. If we can do that, an awareness of biodegradable material will spread," Ichikawa said.

Ichikawa said he and his colleagues will develop fishing line using natural materials such as rice and corn in the future. (c) 2011, The Yomiuri Shimbun. Distributed by McClatchy-Tribune Information Services.

<http://www.nytimes.com/2011/02/22/health/22really.html>

The Claim: A Fake Smile Can be Bad for Your Health

By ANAHAD O'CONNOR

THE FACTS When was the last time you flashed a fake smile at the office?

For some, it may be just another mundane aspect of work life - putting on a game face to hide your inner unhappiness. But new research suggests that it may have unexpected consequences: worsening your mood and causing you to withdraw from the tasks at hand. In a study published this month in the *Academy of Management Journal*, scientists tracked a group of bus drivers for two weeks, focusing on them because their jobs require frequent, and generally courteous, interactions with many people.

The scientists examined what happened when the drivers engaged in fake smiling, known as "surface acting," and its opposite, "deep acting," where they generated authentic smiles through positive thoughts, said an author of the study, Brent Scott, an assistant professor of management at Michigan State University.

After following the drivers closely, the researchers found that on days when the smiles were forced, the subjects' moods deteriorated and they tended to withdraw from work. Trying to suppress negative thoughts, it turns out, may have made those thoughts even more persistent.

But on days when the subjects tried to display smiles through deeper efforts - by actually cultivating pleasant thoughts and memories - their overall moods improved and their productivity increased.

Women were affected more than men. Dr. Scott suspected cultural norms might be at play: women are socialized to be more emotionally expressive, he said, so hiding emotions may create more strain.

THE BOTTOM LINE Research suggests that an inauthentic smile to hide unhappiness can further worsen your mood.

http://www.eurekalert.org/pub_releases/2011-02/uoc-rua022211.php

Research uncovers a secret society connecting through the Internet

It can be a helpless and heartbreaking situation for families as they try to confront a family member with an eating disorder.

What they may not know is that there's a society on the Internet that is dedicated to thwarting any recovery from this dangerous and possibly fatal behavior.

University of Cincinnati communication researchers are reporting on a new type of social support group as social networks grow on the Web. This emerging Online Negative Enabling Support Group (ONESG) surrounding the pro-anorexia movement is reported in the current issue of the journal, *New Media & Society*.

Members of this society embrace anorexia as a choice rather than acknowledging it as an illness. The ONESG pro-anorexia movement reflects four themes and uses several communication strategies to encourage anorexics to embrace their harmful and dangerous impulses, writes lead author Stephen M. Haas, a UC associate professor of communication. The themes are:

- * Staying "true" to the anorexia movement – Forums and blogs invite members to discuss eating, bingeing and exercising, an "online confessional" of sorts where members can confess their guilt if they feel they have eaten too much or have not exercised enough to stay inline with the movement.
- * Promoting self-loathing strategies – Websites encourage communications that not only involving loathing of the physical body, but also of one's inner being in confessing feelings of worthlessness and weakness. These negative rants are embraced by other visitors – a communication technique the authors say is unique to this

community. Messages are accepted and not contradicted, building a shared identity in acknowledging each others' failures.

* Pro-anorexia advising – The two most common forms of advice involve dieting and dealing with confrontations from non-anorexics, such as family members who try to encourage healthy eating.

* Pro-anorexia encouragement – The fourth communication theme uncovered in these social networks involves encouragement. This can involve affectionate messages that foster group intimacy, offer tips and techniques to encourage anorexic behavior, and form a barrier against the disapproval of non-anorexic "outsiders."

In ONESG communications, there was a common ambivalence between self-loathing and self-encouragement. "Embracing the ambivalence of self-loathing and self-encouragement is an important strategy because it illustrates the inner turmoil that resides within pro-anorexia participants," the authors write. "They cling relentlessly to the idea that achieving a certain level of thinness will somehow remedy their feelings of worthlessness and undesirability; however, the means by which they attain this sense of value and belonging is stigmatized and deemed undesirable."

The researchers say this secret social network is strengthened by the anonymity of the Internet, which allows the exchange of extreme views. Interactions co-construct potentially dangerous, negative behaviors in a positive way that allows new, positive identities to be created. Affectionate messages create a bonding experience. The authors write that as new social media emerges, it will be even more important to understand their role and impact on ONESGs. They add that understanding these communication strategies may also serve as a useful tool to break down obstacles to life-saving therapy. "By gaining deeper insight, we can potentially increase our efforts to help those whose online interactions revolve around 'communicating thin,'" the authors write.

The researchers gathered their data by exploring general social networking sites and pro-anorexia specific websites that allowed public access. The websites and blogs were researched over a period dating from October 2006 to May 2007. The collected data was believed to be primarily from Caucasian women between the ages of 13 and 26.

Other authors who contributed to the study are Meghan E. Irr, University of Pittsburgh Medical Center; Nancy A. Jennings, UC associate professor of communication; and Lisa M. Wagner, a UC adjunct assistant professor of communication.

http://www.eurekalert.org/pub_releases/2011-02/w-ofr022211.php

Old folk remedy revived: How tansy may be a treatment for herpes

For centuries tansy has been used as a folk remedy, but now scientists from Britain and Spain believe the plant may have medical benefits after all, as a treatment for herpes.

The team's findings, published in *Phytotherapy Research*, are the result of joint work between two teams to established scientific evidence for traditional medicines.

Tansy, *Tanacetum vulgare*, is a flowering plant found across mainland Europe and Asia. From the Middle Ages onwards the plant, whose folk names include Golden Buttons and Mugwort, has been used as a remedy for various conditions, from fevers to rheumatism. However, it's supposed medical benefits have always been questioned.

"Our research focused on the anti-viral properties of tansy, especially the potential treatment it may represent for herpes," said lead author Professor Francisco Parra from the Universidad de Oviedo. "We currently lack an effective vaccine for either HSV-1 or HSV-2 stands of the disease, which can cause long term infections."

Professor Parra's team which specialises in investigating new antiviral compounds, both through design or by screening natural plant extracts, began joint work on the properties of tansy with the research group led by Dr Solomon Habtemariam from the University of Greenwich, which studies European medicinal plants to establish the scientific evidence for traditional medicines.

Through a mechanistic-based antiherpetic activity study, the teams revealed which constituents of the plant are responsible for antiviral activity.

"Our study revealed that parthenolide is not one of the major anti HSV-1 principles of tansy, as has been suggested. However we found that tansy does contains known antiviral agents including 3,5-dicaffeoylquinic acid (3,5-DCQA) as well as axillarin, which contributes to its antiherpetic effect," said Parra. "This shows that multiple properties of the plant are responsible for the supposed antiviral activity of tansy."

The joint study used an established anti-HSV study model on both crude extracts of the aerial parts and roots of tansy, as well as some purified compounds to analyse the plants anti-viral activity.

"Although the precise molecular targets for tansy extract require further research this study reveals the clear potential of tansy to treat the dermatological lesions caused by HSV, concluded Parra. "This shows that systematic pharmacological and phytochemical studies such as this can play pivotal roles in the modernisation of European traditional herbal medicines."

Cannabis ingredient can help cancer patients regain their appetites and sense of taste
The active ingredient in cannabis can improve the appetites and sense of taste in cancer patients, according to a new study published online in the cancer journal, Annals of Oncology [1] today.

Loss of appetite is common among cancer patients [2], either because the cancer itself or its treatment affects the sense of taste and smell, leading to decreased enjoyment of food. This, in turn, can lead to weight loss, anorexia, a worse quality of life and decreased survival; therefore, finding effective ways of helping patients to maintain a good diet and consume enough calories is an important aspect of their treatment.

Researchers in Canada ran a small pilot study from May 2006 to December 2008 in 21 adult patients with any advanced cancer (except brain cancer) who had been eating less as a result of their illness for two weeks or more. All were either being treated with chemotherapy or had been in the past. The patients were randomly assigned to receive medication from a pharmacist in a double-blind manner, which meant that neither the patients nor the doctors knew which treatment they were receiving. Eleven patients received oral capsules containing delta-9-tetrahydrocannabinol (THC) – the main psychoactive ingredient in cannabis – and eight patients were assigned to the control group to receive placebo capsules. The active capsules contained 2.5mg of THC and the patients took them once a day for the first three days, twice a day thereafter, and they had the option to increase their dose up to a maximum of 20mg a day if they wished; however, most followed the dosing protocol, with three patients in both groups increasing their dose to three times a day. The treatment ran for 18 days.

From patient answers to questionnaires conducted before, during and at the end of the trial, the researchers found that the majority (73%) of THC-treated patients reported an increased overall appreciation of food compared with patients receiving placebo (30%) and more often stated that study medication "made food taste better" (55%) compared with placebo (10%).

The majority of THC-treated patients (64%) had increased appetite, three patients (27%) showed no change, and one patient's data was incomplete. No THC-treated patients showed a decrease in appetite. By contrast, the majority of patients receiving placebo had either decreased appetite (50%) or showed no change (20%).

Although there was no difference in the total number of calories consumed by both groups, the THC-treated patients tended to increase the proportion of protein that they ate, and 55% reported that savoury foods tasted better, whereas no patients in the placebo group reported an increased liking for these foods. (Cancer patients often find that meat smells and tastes unpleasant and, therefore, they eat less of it).

In addition, THC-treated patients reported better quality of sleep and relaxation than in the placebo group.

Dr Wendy Wismer (PhD), associate professor at the University of Alberta (Edmonton, Canada), who led the study, said: "This is the first randomised controlled trial to show that THC makes food taste better and improves appetites for patients with advanced cancer, as well as helping them to sleep and to relax better. Our findings are important, as there is no accepted treatment for chemosensory alterations experienced by cancer patients. We are excited about the possibilities that THC could be used to improve patients' enjoyment of food.

"Decreased appetite and chemosensory alterations can be caused by both cancer and its treatment; untreated tumours cause loss of appetite, and by itself, chemotherapy also causes loss of appetite. In any individual patient, some part of both of these effects is usually present.

"It's very important to address these problems as both appetite loss and alterations to taste and smell lead to involuntary weight loss and reduce an individual's ability to tolerate treatment and to stay healthy in general. Additionally, the social enjoyment of eating is greatly reduced and quality of life is affected. For a long time everyone has thought that nothing could be done about this. Indeed, cancer patients are often told to 'cope' with chemosensory problems by eating bland, cold and odourless food. This may well have the result of reducing food intake and food enjoyment."

The researchers say that larger, phase II trials should test their findings further, but, in the meantime Dr Wismer thinks that doctors could consider THC treatment for cancer patients. "It could be investigated for any stage of cancer where taste and smell dysfunction and appetite loss has been indicated by the patient," she said. In addition, treatment would not necessarily have to be limited to the 18 days of the study. "Long term therapy with cannabinoids is possible, however, in each case this would be up to the patient's physician to determine."

Although the study was unable to show that THC treatment could increase total calorie intake, Dr Wismer said this was unsurprising. "In the healthy adult population, we know from personal experience that we usually eat more of something if it tastes better. However, in this advanced cancer population, there is a real struggle with appetite; normal appetitive pathways do not seem to be functioning. We know from our earlier work that individuals with advanced cancer have diminished appetite and have to make a big conscious effort to eat; they

are motivated to eat simply to survive. So, although THC did not significantly increase total calorie intake, the fact that it improved appetite and protein intake is important."

- Notes:
- [1] "Delta-9-tetrahydrocannabinol may palliate altered chemosensory perception in cancer patients: results of a randomized, double-blind, placebo-controlled pilot trial". *Annals of Oncology*. doi:10.1093/annonc/mdq727
 - [2] The prevalence of alterations in taste and smell is difficult to determine, but Dr Wismer and her colleagues found that in one study 86% of patients reported chemosensory alterations.
 - [3] This work was supported by the Canadian Institutes of Health Research, the Alberta Cancer Board, Alberta Heritage Foundation for Medical Research, and the Natural Sciences and Engineering Research Council of Canada.
- <http://www.nytimes.com/2011/02/22/science/22qna.html>

Of Heart and Guts

By C. CLAIBORNE RAY

Q. Is it better for digestion to sleep on the left side and better for the heart to sleep on the right?

A. There is some evidence that sleeping position may be related to heart function, though it may be more a matter of an existing heart problem's resulting in avoidance of sleeping on the left. As for digestion, at least one study found that gastroesophageal reflux can be somewhat increased when sleeping on the right side.

In a 2003 study published in *The Journal of the American College of Cardiology*, subjects with congestive heart failure had a "highly significant tendency to avoid sleeping on the left side," while subjects without the condition did not. The study's authors also found that avoidance of sleeping on the left was related to the degree of heart enlargement and dysfunction.

The findings were in keeping with the concept that a left-hand position "may exert deleterious effects" on heart pressure, cardiac output or the functioning of cardiac nerves and thus "may be a protective strategy," researchers said, adding that the position choice might arise from discomfort from perceiving a stronger heartbeat.

A study of digestive reflux published in 1994 in *The Journal of Clinical Gastroenterology* found that the total amount of reflux time was significantly greater when sleeping on the right, though the number of episodes was not significantly greater.

<http://www.nytimes.com/2011/02/22/science/22origins.html>

A Romp Into Theories of the Cradle of Life

By DENNIS OVERBYE

TEMPE, Ariz. — *We're not in the Garden of Eden anymore.*

Darwin speculated that life began in a warm pond on the primordial Earth. Lately other scientists have suggested that the magic joining of molecules that could go on replicating might have happened in an undersea hot spring, on another planet or inside an asteroid. Some astronomers wonder if it could be happening right now underneath the ice of Europa or in the methane seas of Titan.

Two dozen chemists, geologists, biologists, planetary scientists and physicists gathered here recently to ponder where and what Eden might have been.

Over a long weekend they plastered the screen in their conference room with intricate chemical diagrams through which electrons bounced in a series of interactions like marbles rattling up and down and over bridges through one of those child's toys, transferring energy, taking care of the business of nascent life. The names of elements and molecules tripped off chemists' tongues as if they were the eccentric relatives who show up at Thanksgiving every year.

They charted the fall of meteorites and the rise of oxygen on the early Earth and evidence in old rocks that life was here as long as 3.5 billion years ago. The planet is only a billion years older, but estimates vary on when it became habitable.

In front of a 2,400-member audience one night they debated the definition of life - "anything highly statistically improbable, but in a particular direction," in the words of Richard Dawkins, the evolutionary biologist at Oxford. Or, they wondered if it could be defined at all in the absence of a second example to the Earth's biosphere - a web of interdependence all based on DNA.

Hence the quest for extraterrestrial examples is more than a sentimental use of NASA's dollars. "Let's go look for it," said Chris McKay, a planetary scientist at NASA's Ames Research Laboratory in Mountain View, Calif., who is involved with the Mars Science Laboratory, which will be launched in November.

The rapid appearance of complex life in some accounts - "like Athena springing from the head of Zeus," in the words of Dr. McKay - has rekindled interest recently in a theory fancied by Francis Crick, one of the discoverers of the double helix, that life originated elsewhere and floated here through space. These days the favorite candidate for such an extraterrestrial cradle is Mars, which was once a water world. Perhaps, some

think, its microbes hitched a ride to Earth on asteroids - unless, of course, the microbes went the other way and what's to be found on Mars are the dead remains of long-lost cousins of Earth.

"We've crashed more space probes on Mars than anywhere else — it's that interesting," Dr. McKay said. The conference was sponsored by the Origins Project at Arizona State University in an effort to get people together who don't normally talk to each other, said Lawrence Krauss, a physicist who helped organize the meeting.

Talk is indeed hard across disciplines and geological ages. John Sutherland, a biochemist at Cambridge University in England, said geologists and astronomers were more interested in talking and speculating about the origin of life than chemists were, even though it is basically a problem of "nitty-gritty chemistry."

The reason, he explained, is that "chemists know how hard it is."

The modern version of the Garden of Eden goes by the name of RNA world, after the molecule ribonucleic acid, which plays Robin to DNA's Batman today, but is now thought have preceded it on the biological scene. RNA is more versatile, being able not only to store information, like DNA, but also to use that information to catalyze reactions, a job now performed by proteins. That solved a sort of chicken-and-egg problem about which ability came first into the world. The answer is that RNA could be both.

"If you want to think of it that way, life is a very simple process," said Sidney Altman, who shared a Nobel Prize in 1989 for showing that RNA had these dual abilities. "It uses energy, it sustains itself and it replicates."

One lesson of the meeting was how finicky are the chemical reactions needed for carrying out these simple-sounding functions. "There might be a reason why amino acids and nucleotides are the way they are," Dr. Krauss said.

What looks complicated to us might not look so complicated to a piece of a carbon molecule awaiting integration into life's dance. "Complexity is in the eye of the beholder," said Dr. Sutherland, who after 10 years of trying different recipes succeeded in synthesizing one of the four nucleotides that make up RNA in a jar in his lab. With the right mixture and conditions, complicated-looking molecules can assemble themselves without help. "When everything is in the pot," he said, "the chemistry to make RNA is easier."

Dr. Sutherland's results were hailed as a triumph for the RNA world idea, but there is much work to be done, said Steve Benner, who constructs artificial DNA at the Foundation for Applied Molecular Evolution, in Florida. Nobody knows whether Dr. Sutherland's recipe would work on the early Earth, he said. Moreover, even if RNA did appear naturally, the odds that it would happen in the right sequence to drive Darwinian evolution seem small. "Other than that," Dr. Benner said, "the RNA world is a great idea for origin of life."

Some others, including astronomers and geologists, have another view of biological inevitability. Life is a natural consequence of geology, said Everett Shock, a geophysicist at Arizona State. "Most of what life is doing is using chemical energy," Dr. Shock said, and that energy is available in places like undersea volcanic vents where life, he calculated, acts as a catalyst to dissipate heat from the Earth. In what he called "a sweet deal," life releases energy rather than consuming it, making it easy from a thermodynamic standpoint.

"Biosynthesis is profitable - it has to be; they live there," said Dr. Shock, referring to microbes in undersea vents.

Some scientists say we won't really understand life until we can make it ourselves.

On the last day of the conference, J. Craig Venter, the genome decoding entrepreneur and president of the J. Craig Venter Institute, described his adventures trying to create an organism with a computer for a parent.

Using mail-order snippets of DNA, Dr. Venter and his colleagues stitched together the million-letter genetic code of a bacterium of a goat parasite last year and inserted it into another bacterium's cell, where it took over, churning out blue-stained copies of itself. Dr. Venter advertised his genome as the wave of future migration to the stars. Send a kit of chemicals and a digitized genome across space.

"We'll create panspermia if it didn't already exist," he said.

The new genome included what Dr. Venter called a watermark. Along with the names of the researchers were three quotations, from the author James Joyce; Robert Oppenheimer, who directed the building of the atomic bomb; and the Caltech physicist Richard Feynman: "What I cannot build, I do not understand."

When the news came out, last year, Dr. Venter said, the James Joyce estate called up and threatened to sue, claiming that Joyce's copyright had been violated. To date there has been no lawsuit.

Then Caltech called up and complained that Dr. Venter's genome was misquoting Feynman.

The institute sent a photograph of an old blackboard on which Feynman had written, "What I cannot create, I do not understand." And so his genome is now in the process of acquiring its first, non-Darwinian mutation.

The Threatening Scent of Fertile Women

By JOHN TIERNEY

The 21-year-old woman was carefully trained not to flirt with anyone who came into the laboratory over the course of several months.

She kept eye contact and conversation to a minimum. She never used makeup or perfume, kept her hair in a simple ponytail, and always wore jeans and a plain T-shirt.

Each of the young men thought she was simply a fellow student at Florida State University participating in the experiment, which ostensibly consisted of her and the man assembling a puzzle of Lego blocks. But the real experiment came later, when each man rated her attractiveness. Previous research had shown that a woman at the fertile stage of her menstrual cycle seems more attractive, and that same effect was observed here — but only when this woman was rated by a man who wasn't already involved with someone else.

The other guys, the ones in romantic relationships, rated her as significantly less attractive when she was at the peak stage of fertility, presumably because at some level they sensed she then posed the greatest threat to their long-term relationships. To avoid being enticed to stray, they apparently told themselves she wasn't all that hot anyway.

This experiment was part of a new trend in evolutionary psychology to study “relationship maintenance.” Earlier research emphasized how evolution primed us to meet and mate: how men and women choose partners by looking for cues like facial symmetry, body shape, social status and resources.

But the evolutionary mating game wasn't just about finding a symmetrical face in the savanna's equivalent of a singles bar. Natural selection favored those who stayed together long enough to raise children: the men and women who could sustain a relationship by keeping their partners happy. They would have benefited from the virtue to remain faithful, or at least the willingness to appear faithful while cheating discreetly.

It's possible that some of the men in Florida were just trying to look virtuous by downgrading the woman's attractiveness, the way a husband will instantly dismiss any woman pointed out by his wife. (That Victoria's Secret model? Ugh! A skeleton with silicone.) But Jon Maner, a co-author of the study, says that's unlikely because the men filled out their answers in private and didn't expect the ratings to be seen by anyone except the researchers.

“It seems the men were truly trying to ward off any temptation they felt toward the ovulating woman,” said Dr. Maner, who did the work with Saul Miller, a fellow psychologist at Florida State. “They were trying to convince themselves that she was undesirable. I suspect some men really came to believe what they said. Others might still have felt the undercurrent of their forbidden desire, but I bet just voicing their lack of attraction helped them suppress it.”

It may seem hard to believe that men could distinguish a woman who's at peak fertility simply by sitting next to her for a few minutes. Scientists long assumed that ovulation in humans was concealed from both sexes.

But recent studies have found large changes in cues and behavior when a woman is at this stage of peak fertility. Lap dancers get much higher tips (unless they're taking birth-control pills that suppress ovulation, in which case their tips remain lower). The pitch of a woman's voice rises. Men rate her body odor as more attractive and respond with higher levels of testosterone.

“The fascinating thing about this time is that it flies under the radar of consciousness,” says Martie Haselton, a psychologist at U.C.L.A. “Women and men are affected by ovulation, but we don't have any idea that it is what is driving these substantial changes in our behavior. It makes it clear that we're much more like other mammals than we thought.”

At this peak-fertility stage, women are more interested in going to parties and dance clubs, and they dress more attractively (as judged by both men and women). Some women's attitudes toward their own partners also change, according to research by Dr. Haselton along with a U.C.L.A. colleague, Christina Larson, and Steven Gangestad of the University of New Mexico.

“Women who are in steady relationships with men who are not very sexually attractive — those who lack the human equivalent of the peacock's tail — suddenly start to notice other men and flirt,” Dr. Haselton said. “They are also more critical of their steady partners and feel less ‘one’ with them on those few days before ovulation.” But that doesn't mean they're planning to walk out.

“These women don't show any shifts in feelings of commitment,” Dr. Haselton said. “They don't want to leave their steady partners. They just want to look around at other men and consider them as alternative sex partners.”

This fits the “good genes” evolutionary explanation for adultery: a quick fling with a good-looking guy can produce a child with better genes, who will therefore have a better chance of passing along the mother's genes.

But this sort of infidelity is risky if the woman's unsexy long-term partner finds out and leaves her alone to raise the child. So it makes sense for her to limit her risks by being unfaithful only at those times she's fertile.

By that same evolutionary logic, it makes sense for her partner to be most worried when she's fertile, and that's just what occurred in the relationships tracked by Dr. Haselton and Dr. Gangestad. The unsexy men became especially jealous and engaged in more "mate-guarding" during the stage of high fertility — perhaps because they sense the subtle physical cues, or maybe just because they could see the overt flirting.

One safe way for both men and women to stay in a relationship is to avoid even looking at tempting alternatives, and there seem to be subtle mental mechanisms to stop the wandering eye, as Dr. Maner and colleagues at Florida State found in an experiment testing people's "attentional adhesion."

The men and women in the experiment, after being primed with quick flashes of words like "lust" and "kiss," were shown a series of photographs and other images. The single men and women in the study couldn't help staring at photographs of good-looking people of the opposite sex — their gaze would linger on these hot prospects even when they were supposed to be looking at a new image popping up elsewhere on the screen.

But the people who were already in relationships reacted differently. They looked away more quickly from the attractive faces. The subliminal priming with words related to sex apparently activated some unconscious protective mechanism: Tempt me not! I see nothing! I see nothing!

This is good news for fans of fidelity, but there's one caveat from a subsequent study by Dr. Maner along with C. Nathan DeWall of the University of Kentucky and others. This time, the researchers subtly made it difficult to pay attention to the attractive faces. Both men and women responded by trying harder to look at the forbidden fruit. Afterward, they expressed less satisfaction with their partners and more interest in infidelity.

The lesson here seems to be that too much "mate-guarding" can get in the way of "relationship maintenance."

"We shouldn't want our partner to be looking at lots of other people, because that's bad for the relationship," Dr. Maner said. "At the same time, preventing them from looking doesn't help either, and can backfire." Left to their own devices, conscious or unconscious, they might just manage to restrain themselves.

http://www.eurekalert.org/pub_releases/2011-02/cshl-nfo022311.php

Neuroscientists find overlooked brain area is an important locus of depression

The lateral habenula is hyperactive in rat models of human depression

Cold Spring Harbor, NY -- A team of neuroscientists at Cold Spring Harbor Laboratory (CSHL), Brookhaven National Laboratory (BNL) and UC San Diego (UCSD) has collected evidence suggesting that a previously overlooked portion of the brain could be a prime locus of human depression.

In two rat models of human depression, the scientists have demonstrated that neurons in a tiny area in the central brain called the lateral habenula (LHb) are hyperactive. Specifically, as the team reports today online ahead of print in the journal *Nature*, excitatory synaptic inputs onto neurons in the LHb are enhanced in "depressed" animals, a finding they regard significant because this excitation in turn causes the inhibition of "downstream targets" -- including neurons in a part of the brain called the ventral tegmental area (VTA), important in the brain's reward system and heavily populated by dopamine neurons.

Furthermore, the team, which includes Professor Fritz Henn of CSHL and BNL and Assistant Professor Bo Li of CSHL, as well as Professor Roberto Malinow of UCSD, was able to use an analog of deep brain stimulation (DBS), a novel form of electrical stimulation involving the implantation of electrodes into a specific brain area, to reverse depression-like symptoms in the rats.

DBS is an important new experimental modality of treatment for refractory depression in people, as well as a potentially important approach to treat other neurophysiological disorders, most notably Parkinson's disease. The team's results point to the LHb as a potential therapeutic target for DBS. A series of ongoing experiments in depression at other laboratories, which have shown promise in a small number of human patients, have used DBS to target an area of the cingulate cortex called Brodman's Area 25. Henn and colleagues in Germany last year reported success in treating one case of intractable human depression with DBS, targeting the LHb.

The animal models used in the team's rat experiments displayed a behavior called learned helplessness. The rats were stressed in ways that were unpredictable and inescapable; over time, they developed depression-like symptoms, notably a lack of motivation to evade unpleasant stress. "It's not a perfect model of human depression by any means," says Li, "but it is very valuable, for it does enable us to study the neural mechanisms of certain aspects of depression in people."

The team's most important decision was to study the lateral habenula. "This is an area of the brain that has often been overlooked, perhaps because of its size." Li noted, "It covers an area only about 1-2 mm across." So far only two brain imaging studies have implicated the LHb in depression because of the difficulty in resolving it using existing technologies such as PET and fMRI.

Dr. Henn, a pioneer in using learned helplessness to study depression, persuaded the team to focus on the LHB, a structure whose potential role in depression intrigued him because the LHB has elevated metabolic activity in the congenital learned helplessness model developed in his lab. The team hypothesizes that the therapeutic effect of DBS on hyperactivity in the LHB is due to the silencing effect of the high-frequency electrical pulses delivered by the implanted electrodes.

Further study of this and more broadly the mechanism behind LHB-related dysfunction is the team's most immediate priority. The rodent medial prefrontal cortex, the counterpart of Brodman's Area 25 in humans, which has already been demonstrated to be implicated in at least a subset of human depression, is one of several brain areas that send axonal projections to the habenula, Li notes. "In theory, it could be the source of the 'driving force' that makes neurons in the LHB overexcited."

"Our next important goal is to define the source of the overactivity, which appears to be due to increased glutamatergic activity," Henn states. Another priority, he says, is to better understand the mechanism of DBS in the habenula. "By applying DBS in the habenula, you're affecting the entire structure, and its entire population of neurons. We want to know which elements are critical in mediating the behavioral effect -- the relief of "depressed" symptoms -- that we have observed," Henn says.

The habenula projects not only to the VTA, but to other areas such as the Raphe nuclei, which produce serotonin, another neurotransmitter implicated in depression and which may control noradrenaline output in the brain as well. The team wants to know how the lateral habenula coordinates the activity of all three -- dopamine, serotonin and noradrenaline -- to fully understand the LHB's role in depression. Li says he intends to use highly specific methods including optogenetics to dissect different pathways of interest in the model.

"Synaptic potentiation onto habenula neurons in the learned helplessness model of depression" was published online ahead of print in Nature February 24, 2011. The authors are: B. Li, J. Piriz, M. Mirrione, C. Chung, C. Prolux, D. Schulz, F. Henn, and R. Malinow. The paper can be found online at www.nature.org.

A unique iPhone app called the 3D Brain, developed by CSHL's DNA Learning Center, may be of interest to readers of this story. It can be downloaded at: <http://itunes.apple.com/us/app/3d-brain/id331399332?mt=8>

http://www.eurekalert.org/pub_releases/2011-02/vumc-nsc022311.php

New study confirms body weight influences risk of death among Asians

A study of more than 1 million Asians found that those who were a normal weight were far less likely to die from any cause than individuals whose body-mass index (BMI) was too high or low.

A similar association was seen between BMI and the risk of death from cancer, cardiovascular disease or other causes.

The study, led by Wei Zheng, M.D., Ph.D., M.P.H., Ingram Professor of Cancer Research at Vanderbilt-Ingram Cancer Center, Nashville, Tenn., Paolo Boffetta, M.D., M.P.H., professor, Mount Sinai School of Medicine, New York, N.Y., and John D. Potter, M.D., Ph.D., member and senior adviser, Public Health Sciences Division, Fred Hutchinson Cancer Research Center, Seattle, Wash., was published in this week's issue of The New England Journal of Medicine.

"Previous studies that evaluated the association between BMI and the risk of death have been conducted primarily in populations of European descent, and the current definition of overweight and obesity is based essentially on criteria derived from those studies," said Zheng, director of the Vanderbilt Epidemiology Center. "The validity of these criteria in Asian populations has yet to be determined. A large proportion of Asians are very thin and the impact of a severely low BMI on the risk of death has not been well evaluated until now."

The World Health Organization estimates that more than 1 billion adults worldwide are overweight and at least 300 million are obese. Fat tissue has been recognized as an active endocrine organ, capable of releasing a number of biologically active factors that may contribute to obesity-related diseases, including type 2 diabetes, hypertension, coronary artery disease, stroke and several types of cancer.

The research, conducted as part of the Asia Cohort Consortium, included health status and mortality information on more than 1.1 million individuals from East and South Asia. In the cohorts of East Asians, including Chinese, Japanese and Koreans, the lowest risk of death was seen among individuals with a BMI in the range of 22.6 to 27.5, which is considered normal to slightly overweight (BMI is defined as weight in kilograms divided by the square of height in meters).

Chinese, Japanese and Korean populations were much like groups in other parts of the world. These East Asians with a raised BMI of 35.0 or higher had a 50 percent higher risk of death. The same was not true for Indians and Bangladeshis, indicating that a high BMI did not affect all ethnic groups in a similar way.

Being severely underweight was even more dangerous among all of the Asian populations studied. The risk of death was increased by a factor of 2.8 among those whose BMI was very low, that is, 15.0 or less.

"The most unexpected finding was that obesity among sub-continent Indians was not associated with excess mortality," said Potter. "This may be because many obese people in sub-continent India have a higher socioeconomic status and so have better access to health care."

"Our findings capture two different aspects of a rapidly evolving pattern; severe underweight was highly prevalent in Asia in the past, and we can still observe its important impact on mortality," explained Boffetta. "Looking into the future, however, prevention of overweight and obesity deserves the highest priority."

The authors conclude that this study provides strong evidence supporting the biologic plausibility that excess weight contributes to a higher risk of death. "This confirms that most people are at a higher risk for dying early if they are obese and is a clear message not to gain weight as we age," said Potter.

Nearly 50 researchers from seven countries contributed to this study. Data analysis for the project was conducted by the Asia Cohort Consortium Coordinating Center, which is supported, in part, by Fred Hutchinson Cancer Research Center and the National Cancer Institute.

http://www.eurekalert.org/pub_releases/2011-02/chop-wfb022311.php

Whole fresh blood for transfusions may have a longer shelf life than now assumed CHOP research could improve survival of those injured in war, trauma

In a finding that may potentially improve survival from war injuries and disasters, laboratory researchers report that refrigerated whole blood may have a shelf life well beyond the current standard of 24 to 48 hours.

"We have found that whole blood retains its clotting properties at least 11 days under standard refrigeration," said the study leader, David Jobs, M.D., a cardiothoracic anesthesiologist in the Cardiac Center at The Children's Hospital of Philadelphia. "If this lab discovery can be confirmed in human subjects, it may lead to a change in clinical practice, and possibly to improved survival for massively transfused patients."

The study appears in the January 2011 issue of the journal *Transfusion*.

The majority of patients receiving blood transfusions only require specific components of whole blood, such as red blood cells, plasma and platelets. However, whole blood may be preferable in specific situations such as infant heart surgery and combat casualties.

The definition of freshness of whole blood with respect to its clotting properties has not been systematically studied. The current practice at The Children's Hospital of Philadelphia assumes a fresh whole blood shelf life of 48 hours when refrigerated. After that point, the red blood cells may be recovered from the whole blood, but the other components, such as plasma and platelets must be discarded. "In any case, postponed surgeries currently waste resources," said Jobs.

Based on reports from military clinicians and on the authors' own observations in pediatric cardiac surgery, Jobs and colleagues did a laboratory study to measure the duration of blood coagulation properties in refrigerated whole blood.

The researchers used 21 units of whole blood from healthy volunteer donors, performing the study in the hematology and coagulation laboratory led by Long Zheng, M.D., Ph.D., in the clinical laboratory at The Children's Hospital of Philadelphia. They found that thromboelastography (TEG) and platelet aggregation levels, which measure the efficiency of blood coagulation, remain normal at least 11 days under standard refrigerated conditions.

If these results hold up under follow-up studies in human subjects, a change in current practice could increase the availability and usefulness of whole blood, especially in military or disaster relief situations, and in remote locations. "Trauma patients could potentially benefit, as well as others needing a large volume of blood replacement, such as patients undergoing liver transplant or children who need craniofacial reconstruction," said Jobs.

Furthermore, Jobs added, more efficient use of donated whole blood, besides reducing wastage, could lower the number of donors needed, and thus increase safety by reducing the risks of inadvertently transmitting blood borne viruses. In all, said Jobs, "Our results strongly suggest that clinical trials should proceed to test the value of whole blood beyond a 48-hour period."

Grants from the Cardiac Center and the Departmental Fund of Pathology and Laboratory Medicine, both at The Children's Hospital of Philadelphia, supported this study.

Jobs's co-authors were Yanika Wolfe, Daniel O'Neill, Jennifer Calder, Lisa Jones, Deborah Sesok-Pizzini and X. Long Zheng, all from The Children's Hospital of Philadelphia.

*"Toward a Definition of 'Fresh' Whole Blood: An In Vitro Characterization of Coagulation Properties in Refrigerated Whole Blood for Transfusion," *Transfusion*, January 2011.*

http://www.eurekalert.org/pub_releases/2011-02/aaon-adm020811.php

Alzheimer's disease may be easily misdiagnosed

ST. PAUL, Minn. – New research shows that Alzheimer's disease and other dementing illnesses may be easily misdiagnosed in the elderly, according to early results of a study of people in Hawaii who had their brains autopsied after death.

The research is being released today and will be presented as part of a plenary session at the American Academy of Neurology's 63rd Annual Meeting in Honolulu April 9 to April 16, 2011.

"Diagnosing specific dementias in people who are very old is complex, but with the large increase in dementia cases expected within the next 10 years in the United States, it will be increasingly important to correctly recognize, diagnose, prevent and treat age-related cognitive decline," said study author Lon White, MD, MPH, with the Kuakini Medical System in Honolulu.

For the study, researchers autopsied the brains of 426 Japanese-American men who were residents of Hawaii, and who died at an average age of 87 years. Of those, 211 had been diagnosed with a dementia when they were alive, most commonly attributed to Alzheimer's disease.

The study found that about half of those diagnosed with Alzheimer's disease did not have sufficient numbers of the brain lesions characterizing that condition to support the diagnosis. Most of those in whom the diagnosis of Alzheimer's disease was not confirmed had one or a combination of other brain lesions sufficient to explain the dementia. These included microinfarcts, Lewy bodies, hippocampal sclerosis or generalized brain atrophy.

However, diagnoses of Lewy body dementia and vascular dementia were more accurate. Misdiagnoses increased with older age. They also reflected non-specific manifestations of dementia, a very high prevalence of mixed brain lesions, and the ambiguity of most neuroimaging measures.

"Larger studies are needed to confirm these findings and provide insight as to how we may more accurately diagnose and prevent Alzheimer's disease and other principal dementing disease processes in the elderly," said White.

The study was supported by the National Institute on Aging and the Department of Veterans Affairs.

This research will be presented as part of the Contemporary and Clinical Issues and Case Studies Plenary Session on Wednesday, April 13, 2011, at the 2011 American Academy of Neurology's Annual Meeting in Honolulu.

<http://www.physorg.com/news/2011-02-gas-rich-galaxies-gravity-theory.html>

Gas rich galaxies confirm prediction of modified gravity theory

PhysOrg.com -- Recent data for gas rich galaxies precisely match predictions of a modified theory of gravity known as MOND according to a new analysis by University of Maryland Astronomy Professor Stacy McGaugh.

This -- the latest of several successful MOND predictions -- raises new questions about accuracy of the reigning cosmological model of the universe, writes McGaugh in a paper to be published in March in Physical Review Letters.

Modern cosmology says that for the universe to behave as it does, the mass-energy of the universe must be dominated by dark matter and dark energy. However, direct evidence for the existence of these invisible components remains lacking. An alternate, though unpopular, possibility is that the current theory of gravity does not suffice to describe the dynamics of cosmic systems.

A few theories that would modify our understanding of gravity have been proposed. One of these is Modified Newtonian Dynamics (MOND), which was hypothesized in 1983 by Moti Milgrom a physicist at the Weizmann Institute of Science in Rehovot, Israel. One of MOND's predictions specifies the relative relationship between the mass of any galaxy and its flat rotation velocity. However, uncertainties in the estimates of masses of stars in star-dominated spiral galaxies (such as our own Milky Way) previously had precluded a definitive test.

To avoid this problem, McGaugh examined gas rich galaxies, which have relatively fewer stars and a preponderance of mass in the form of interstellar gas. "We understand the physics of the absorption and release of energy by atoms in the interstellar gas, such that counting photons is LIKE counting atoms. This gives us an accurate estimate of the mass of such galaxies," McGaugh said.

Using recently published work that he and other scientists had done to determine both the mass and flat rotation velocity of many gas rich galaxies, McGaugh compiled a sample of 47 of these and compared each galaxy's mass AND rotation velocity with the relationship expected by MOND. All 47 galaxies fell on or very close to the MOND prediction. No dark matter model performed as well.

"I find it remarkable that the prediction made by Milgrom over a quarter century ago performs so well in matching these findings for gas rich galaxies," McGaugh said. "

MOND vs. Dark Matter - Dark Energy

Almost everyone agrees that on scales of large galaxy clusters and up, the Universe is well described by dark matter - dark energy theory. However, according to McGaugh this cosmology does not account well for what happens at the scales of galaxies and smaller.

"MOND is just the opposite," he said. "It accounts well for the 'small' scale of individual galaxies, but MOND doesn't tell you much about the larger universe.

Of course, McGaugh said, one can start from the assumption of dark matter and adjust its models for smaller scales until it fits the current finding. "This is not as impressive as making a prediction ahead of [new findings], especially since we can't see dark matter. We can make any adjustment we need." This is rather like fitting planetary orbits with epicycles," he said. Epicycles were erroneously used by the ancient Greek scientist Ptolemy to explain observed planetary motions within the context of a theory for the universe that placed the earth in its center.

"If we're right about dark matter, why does MOND work at all?" asks McGaugh. "Ultimately, the correct theory - be it dark matter or a modification of gravity - needs to explain this."

More information: [Preprint of original paper on arXiv.org](#)

<http://www.physorg.com/news/2011-02-common-parasite-uncovers-key-crohn.html>

Common parasite uncovers key cause of Crohn's

PhysOrg.com -- Immune systems have their sinister side, especially when they have not learned how hard to fight.

Crohn's disease and other inflammatory bowel diseases inflict more than a million Americans with debilitating pain and digestive unrest because of uncontrolled immune responses in the gut.

How this happens remained a mystery until immunologists at Cornell's College of Veterinary Medicine caught a key culprit in Crohn's disease: a cell from our own immune forces. With unconventional help from a common parasite, Eric Denkers, professor of immunology, and research associate Charlotte Egan identified a renegade cell responsible for this largely arcane and increasingly prevalent illness.

"Auto-immune diseases are on the rise in this country but their causes have remained largely unknown," said Denkers. "It's possible that these diseases are more common in the West because we're too clean. Exposure to germs trains immune systems how to respond to threats. Early protection from germs may contribute to the increasing prevalence of immune system overreactions in our population, leading to auto-immune problems like allergies and inflammatory bowel disease."

Similar symptoms arise when some hosts first face the prevalent protozoan *Toxoplasma gondii*. Denkers' lab studies this parasite's arsenal of host-manipulating powers, but recently they have steered *Toxoplasma* research in an entirely new direction.

"We noticed that the initial intestinal inflammation these parasites can cause looks very similar to what happens during Crohn's disease," said Denkers, one of the first to study this connection. "Our lab has started using *Toxoplasma* to model Crohn's disease in humans and help us find the pivotal perpetrator, which has turned out to be a cell from our own immune forces."

Common parasite uncovers key cause of Crohn's

Specialized immune cells called intraepithelial lymphocytes patrol intestinal walls. Upon encountering invaders, they release messenger proteins that call more immune cells to the battleground.

"Too many messenger proteins recruit too many immune cells, causing inflammation that can devastate the host's own tissue," Denkers explained. "Bad balance between good bacteria, bad bacteria, and immune interactions like inflammation cause Crohn's disease."

"For the first time we've discovered how infection can turn these immune cells pathogenic, stimulating them to cause disease, inflammation and necrosis in the small intestine," said Denkers. "This marks a major leap toward understanding human Crohn's disease. Unveiling this kind of immunological interplay may lead to improved prevention and care in an array of auto-immune diseases."

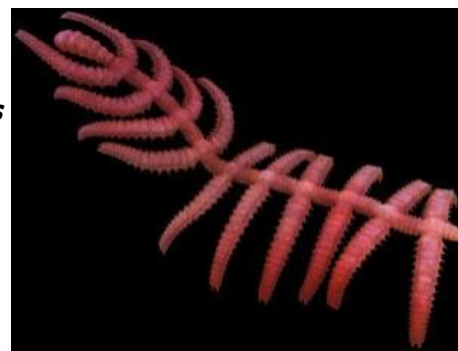
Denkers and colleagues published their discovery in *Mucosal Immunology*, followed by a review article discussing *Toxoplasma* infection as a model for Crohn's disease in the *Journal of Biomedicine and Biotechnology* in 2010. *Provided by Cornell University*

First animal to wear exoskeleton armour

* 23 February 2011 by Colin Barras

MEET *Diania cactiformis*, the "walking cactus", a 520-million-year-old fossil animal that is helping palaeontologists work out how some critters first strapped on armour to defend themselves against early predators.

The number of animals with tough shells and exoskeletons exploded around 540 million years ago in the early Cambrian, probably in response to a rise in predation at the time. It was then that arthropods evolved their exoskeleton - an innovation that has helped them become the most abundant animal group on the planet, with over a million species described to date.



Protection from predation (Image: Janni Liu)

The first arthropods are thought to have evolved from a strange group called the lobopods - essentially soft worms with legs - which look like arthropods minus the exoskeleton. But until now, the link between the two was missing. "We didn't have a single fossil you can point at and say: that's the first lobopod with a simple exoskeleton," says Janni Liu at the Free University of Berlin, Germany.

D. cactiformis (pictured) is that missing link. Liu found the fossil in Chengjiang, China. Its body was largely soft and squidgy like a typical lobopod, but its numerous legs were sheathed in protective armour with a decidedly arthropod-like appearance (Nature, DOI: 10.1038/nature09704).

The soft body of *D. cactiformis* suggests that arthropods grew armour on their legs first, rather than their bodies, contradicting the results of some developmental gene studies. "The fossil record is not just to provide the decorations you hang on the tree afterwards - it gives you useful information to constrain genetic models about evolution," says Graham Budd at the University of Uppsala, Sweden.

<http://www.scientificamerican.com/article.cfm?id=oil-droplets-mimic-early-life>

Oil droplets mimic early life

Lack of genetic material no hindrance to life-like behaviour.

By Jo Marchant

Oil droplets that creep purposefully through their watery environment, metabolize fuel, sense their surroundings and perhaps even replicate--could these be precursors to life? That's the claim of a chemist with a controversial approach to modeling how Earth's first organisms scraped themselves together.

Theories about how life started range from fortuitous chemistry around hydrothermal vents on the sea floor to the delivery of precursor molecules from outer space. But there is little hope of finding geological evidence for this momentous event: Earth's crust is continuously being recycled, with the oldest known rocks dating to only 3.8 billion years ago. By that point, life was flourishing and relatively complex.

So another way to investigate what happened is to try repeating it--to build basic life forms, called protocells, in the lab. Attempts to do this have generally involved using stripped-down versions of biological cells, and have assumed that certain building blocks, such as RNA, are already present. But Martin Hanczyc at the University of Southern Denmark in Odense is looking for life-like behaviors somewhere much simpler: in drops of oil. He described his work at a Royal Society discussion on the origins of life, held in London on February 21.

Oily character

Hanczyc's first round of experiments used nitrobenzene oil. To give the droplets a "metabolism," he put them into a highly alkaline solution (pH 12) and fuelled them with a chemical called oleic anhydride, which converts to oleic acid on contact with water. This reaction lowered the pH at the boundary of droplets, creating an uneven surface tension that caused them to move autonomously through the liquid (see video). Meanwhile, convection inside the droplets brought fresh supplies of oleic anhydride to the surface.

The droplets can "sense" their environment--moving through a pH gradient to seek out the highest possible pH (In this video, the blue dye indicates a higher pH). And by putting the fuel in the water, with a chemical catalyst in the oil, the droplets can absorb fuel from their surroundings. "You get immortal droplets," says Hanczyc. "As long as you feed them, they keep moving."

The system bears more than a passing resemblance to salad dressing. But Hanczyc insists that it has the potential for great things, with a self-contained body, embedded metabolism and the ability to avoid equilibrium. "If the avoidance of equilibrium by a structure is the most fundamental prerequisite for life, then this model could be considered as a type of primitive life that could have been possible on the early Earth," he says.

Other types of behavior are possible too. The drops tend to circle each other without touching, which Hanczyc sees as evidence for rudimentary chemical communication: "They share a chemical language." In so far unpublished work, Hanczyc and his colleagues have also shown that the droplets' past actions can influence their future ones, which could be interpreted as a primitive form of memory.

Creating watery compartments within oil droplets would allow for more complex structures. And the team is working on creating instabilities within the droplets that cause them to self-divide--with subsequent feeding or fusion, that might lead to a primitive replication cycle.

To demonstrate how all this might have happened on early Earth, Hanczyc is now recreating his droplets using ingredients that would have been around when life started, including mineral oil--a mix of simple hydrocarbons called alkanes--and the simple organic compound hydrogen cyanide (HCN), which reacts with water to form biological precursors such as amino acids and nucleobases. These droplets show many of the same behaviors, he told the meeting.

Software needed

Reaction among delegates was mixed. Geologist Norm Sleep from Stanford University in California says that he isn't aware of any examples of such autonomous structures forming in geological systems, but doesn't rule out that it could happen. The necessary organic molecules would have been around, he says, perhaps deep beneath the Earth's surface or on the seabed.

But biochemists argue that the lack of genetic information in the droplets means that they would never develop into anything more complex. "You need to put software into the hardware," says Philipp Holliger of the MRC Laboratory of Molecular Biology in Cambridge, UK, who recently suggested that before cells evolved, RNA could have replicated within liquid-filled microcompartments inside ice.

Hanczyc disagrees. "I think you will get quite complex structures," he says. "You don't have DNA or RNA, but the necessary information is embedded in the chemistry of the system." Characteristics would be passed to daughter droplets on division, though he concedes that without being formally encoded, these would be dependent on the environment, and could easily be lost.

Jack Szostak, a biologist at Harvard Medical School in Boston, Mass., is generally thought to be closest to building an artificial life form in the lab. He and his colleagues work with fatty-acid molecules that, in water, spontaneously form vesicles with membranes similar to those of biological cells, and support the replication of an added-in DNA template. Szostak told the Royal Society meeting that his protocells can grow and divide, and even compete with each other. For example, vesicles with phospholipids in their membranes--a key component of actual cell membranes--grow faster than those without.

He seems bemused by Hanczyc's oil-based approach. "It's an interesting, simple system," he says. "I don't see any relevance to the origin of life. But you never know."

Hanczyc, however, argues that oil-based life is worth taking seriously, if only as a reminder about the weird variety of forms that life might take. If not involved in our own life history, he argues, oil organisms could be alive alongside us, either buried deep on Earth, or elsewhere in the Solar System--for example on Titan, Saturn's largest moon, where HCN and other hydrocarbons are abundant.

"This behavior is very easy to find, just by throwing things into a pot," he says, pointing out that many biological reactions happen more easily in oil than in water. "We shouldn't be biased by the fact that we are all water-based organisms."

http://www.eurekalert.org/pub_releases/2011-02/fhcr-mcl022411.php

Multiple childbirth linked to increased risk of rare, aggressive 'triple-negative' breast cancer

Conversely, never giving birth significantly lowers the risk of such cancer, study finds

SEATTLE – Full-term pregnancy has long been associated with a reduced risk of breast cancer, but a new study finds that the more times a woman gives birth, the higher her risk of "triple-negative" breast cancer, a relatively uncommon but particularly aggressive subtype of the disease. Conversely, women who never give birth have a 40 percent lower risk of such breast cancer, which has a poorer prognosis than other types of breast cancer and doesn't respond to hormone-blocking therapies such as tamoxifen.

These findings, from a study led by Amanda Phipps, Ph.D., a postdoctoral research associate in the Public Health Sciences Division of Fred Hutchinson Cancer Research Center, are published online ahead of the March 16 issue of the Journal of the National Cancer Institute.

"Unlike most breast cancers, triple-negative tumors don't depend on hormonal exposures to grow and spread, so our assumption going into the study was that reproductive factors would not be associated with a woman's risk of this cancer subtype," Phipps said. "We were surprised by these findings because researchers have known

for quite some time that women who have children, especially those who have them at an early age and have multiple full-term pregnancies, have a lower risk of breast cancer overall."

While never giving birth appears to be protective against triple-negative breast cancer, the researchers found that women who remain childless have about a 40 percent higher risk of estrogen-receptor-positive breast cancer – the most common form of the disease, which can be treated with estrogen-blocking drugs – as compared to those who have one or more offspring. This higher risk of estrogen-receptor-positive breast cancer among women who have not had children is well established, and it is thought to be related to the fact that such women do not undergo pregnancy-related changes in the breast that confer a lifelong protective effect.

"The mechanisms by which full-term pregnancy contributes to an increased risk of triple-negative breast cancer and a decreased risk of other forms of the disease are not clear," Phipps said. "We do know that the hormones of pregnancy induce certain changes in the cellular structure of the breast. Overall, those changes seem to make the breast less susceptible to cancer. It is possible, however, that the increased risk of triple-negative breast cancer we found in women who had given birth may be due to some abnormal response of their breast tissue to the hormones of pregnancy. Another possibility is that pregnancy somehow makes the breast more susceptible to certain carcinogens even while reducing breast cancer risk overall," she said.

For the study, which was based on data from the Women's Health Initiative, Phipps and colleagues analyzed the detailed reproductive histories of some 150,000 postmenopausal women, more than 300 of whom went on to develop triple-negative breast cancer. "This particular study is significant because it is one of the largest studies ever conducted on the impact of reproductive history on triple-negative breast cancer," Phipps said.

Triple-negative breast cancer, which refers to any breast cancer that does not express the genes for estrogen receptor (ER), progesterone receptor (PR) or Her2/neu, accounts for only 10 percent to 20 percent of all breast cancers, and only in the past decade have researchers become aware that this cancer subtype exists. "This research reinforces the notion that breast cancer is not just one disease," Phipps said.

"The mechanisms that lead to triple-negative breast cancer are likely different from those that lead to other forms of the disease. We still have a lot to learn about what causes this more aggressive form of breast cancer, but we hope that research like this will help us develop better tools to identify those women at greatest risk."

It is known that this cancer subtype is more predominant in African American women and it tends to be diagnosed at an earlier age. Researchers also know there is a strong link between genetic mutations in the so-called "breast cancer gene," BRCA1, and triple-negative breast cancer.

"More research is needed to better understand the causes of the most aggressive and lethal forms of breast cancer. While this study adds to our knowledge base, it should not change women's approaches to breast cancer screening," Phipps said.

The National Heart, Lung and Blood Institute of the National Institutes of Health funded the study, which also involved researchers from Albert Einstein College of Medicine, Georgetown University, Harbor-UCLA Medical Center, Stanford University, State University of New York at Stony Brook, the University of Buffalo, the University of Pittsburgh and Wake Forest University.

http://www.eurekalert.org/pub_releases/2011-02/nmh-mhf022311.php

Menopausal hot flashes may be a good sign for heart

Study finds women who suffer from hot flashes when they begin menopause are at lower risk for cardiovascular events

CHICAGO – You are enjoying a night out with friends when it starts; first you feel flush, then a sensation of warmth crawls down your body. Soon you begin perspiring and you feel as if everyone around you can tell what is happening – another hot flash. An estimated three out of four women experience hot flashes associated with menopause and nearly all would agree they are a nuisance, but experts say there could be an upside to having hot flashes. New research released today in the online edition of the journal *Menopause* suggests that women who suffer from hot flashes and night sweats may be at lower risk for cardiovascular disease, stroke and death.

"While they are certainly bothersome, hot flashes may not be all bad," said Northwestern Medicine endocrinologist Emily Szmuiłowicz, MD, who is lead author of the study. "Our research found that despite previous reports suggesting that menopause symptoms were associated with increased levels of risk markers for heart disease, such as blood pressure and cholesterol, the actual outcomes tell a different story."

Szmuiłowicz, who co-chaired the study along with JoAnn Manson, MD, DrPH, and Ellen Seely, MD from Harvard Medical School, reviewed medical information from 60,000 women who were enrolled in the Women's Health Initiative Observational Study and followed for ten years, to determine the relationship between menopause symptoms and cardiovascular events. Subjects were grouped into four categories – women

who experienced hot flashes and night sweats at the onset of menopause, later in menopause, during both time periods, and not at all.

"We found that women who experienced symptoms when they began menopause had fewer cardiovascular events than those who experienced hot flashes late in menopause or not at all," said Szmuiłowicz.

The results are significant since there has been concern that menopausal symptoms, which result from instability in the blood vessels in the skin, may put women at risk for other types of vascular problems as well.

"It is reassuring that these symptoms, which are experienced by so many women, do not seem to correlate with increased risk of cardiovascular disease," said Szmuiłowicz.

Szmuiłowicz and team say more research needs to be done in order to understand the mechanisms behind the association, but say it's good news for the millions of women who experience these troublesome symptoms at the time of menopause.

"Hot flashes will never be enjoyable, but perhaps these findings will make them more tolerable," said Szmuiłowicz.

The paper titled "Vasomotor symptoms and cardiovascular events in postmenopausal women" is now available online and will be printed in the June issue of Menopause. For more information, visit

<http://journals.lww.com/menopausejournal/pages/default.aspx>.

http://www.eurekalert.org/pub_releases/2011-02/mscc-cip022311.php

Change in PSA level does not predict prostate cancer

Screening for PSA velocity leads to many unnecessary biopsies and should be removed from screening guidelines

NEW YORK, February 24, 2011 — Researchers at Memorial Sloan-Kettering Cancer Center have found that change in PSA levels over time — known as PSA velocity — is a poor predictor of prostate cancer and may lead to many unnecessary biopsies. The new study of more than 5,000 men was published online February 24 in the Journal of the National Cancer Institute. Andrew Vickers, PhD, Associate Attending Research Methodologist in the Department of Epidemiology and Biostatistics and lead author said, "We have found no evidence to support the recommendation that men with a high PSA velocity should be biopsied in the absence of other indications. In other words, if a man's PSA has risen rapidly in recent years, there is no cause for concern if his total PSA level is still low and his clinical exam is normal."

Prostate cancer is the most common cancer among American men and the second leading cause of cancer deaths in men, according to the American Cancer Society. While PSA screening is widely used for the early detection of prostate cancer, it is also associated with a high rate of overdiagnosis, which can lead to unnecessary treatment and anxiety. Currently, early detection guidelines of several organizations (the National Cancer Center Network and the American Urological Association) recommend that men with a rapid rise in PSA — or a high PSA velocity — have a surgical biopsy for prostate cancer, even if there are no other indicators that cancer may exist. Those indicators could be an elevated baseline PSA or a positive digital rectal exam (DRE).

This study's population came from the Prostate Cancer Prevention Trial. Five thousand five hundred and nineteen men aged 55 years and older with no previous prostate cancer diagnosis, normal DRE, and a baseline PSA of 3.0 ng/mL or less were randomly assigned to finasteride — a drug commonly used to treat enlargement of the prostate gland, more commonly referred to as BPH, or benign prostatic hypertrophy — or placebo for seven years. This particular study focused on the men in the placebo group. The men were followed with yearly PSA tests, with biopsy recommended for men with a PSA higher than 4.0 ng/mL. After seven years, all men who were not diagnosed with prostate cancer were asked to consent to an end-of-study biopsy.

Dr. Vickers and colleagues found no important association between PSA velocity and biopsy outcome after adjusting for risk factors such as age, race, and PSA levels. PSA alone was a much better predictor of biopsy outcome than PSA velocity.

According to Peter T. Scardino, MD, Chair of the Department of Surgery, "This study should change practice. We have previously published papers determining that PSA naturally varies from month to month and have urged men whose PSA suddenly rises to wait six weeks and repeat the test before agreeing to a needle biopsy. This new study in a large population of men provides even stronger evidence that using changes in PSA as a basis for recommendation for biopsy leads to many more unnecessary biopsies and does not help to find the more aggressive cancers that we want to find and treat." Dr. Scardino added that "men should be cautious before rushing into a biopsy for minor variations in their PSA level."

The work was funded by the Prostate Cancer Foundation, the Sidney Kimmel Center for Prostate and Urologic Cancers, and a P50-CA92629 SPORE grant from the National Cancer Institute to Dr. Scardino. Additional support was obtained from the National Institutes of Health.

http://www.eurekalert.org/pub_releases/2011-02/usmc-nhm022311.php

Newborn heart muscle can grow back by itself, UT Southwestern researchers have found
DALLAS – In a promising science-fiction-meets-real-world juxtaposition, researchers at UT Southwestern Medical Center have discovered that the mammalian newborn heart can heal itself completely.

Researchers, working with mice, found that a portion of the heart removed during the first week after birth grew back wholly and correctly – as if nothing had happened.

"This is an important step in our search for a cure for heart disease, the No. 1 killer in the developed world," said Dr. Hesham Sadek, assistant professor of internal medicine and senior author of the study available online in the Feb. 25 issue of *Science*. "We found that the heart of newborn mammals can fix itself; it just forgets how as it gets older. The challenge now is to find a way to remind the adult heart how to fix itself again."

Previous research has demonstrated that the lower organisms, like some fish and amphibians, that can regrow fins and tails, can also regrow portions of their hearts after injury.

"In contrast, the hearts of adult mammals lack the ability to regrow lost or damaged tissue, and as a result, when the heart is injured, for example after a heart attack, it gets weaker, which eventually leads to heart failure," Dr. Sadek said.

The researchers found that within three weeks of removing 15 percent of the newborn mouse heart, the heart was able to completely grow back the lost tissue, and as a result looked and functioned just like a normal heart. The researchers believe that uninjured beating heart cells, called cardiomyocytes, are a major source of the new cells. They stop beating long enough to divide and provide the heart with fresh cardiomyocytes.

Dr. Eric Olson, chairman of molecular biology and co-senior author of the study, said that this work is fascinating. "The inability of the adult heart to regenerate following injury represents a major barrier in cardiovascular medicine," said Dr. Olson, who directs the Nancy B. and Jake L. Hamon Center for Basic Research in Cancer and the Nearburg Family Center for Basic and Clinical Research in Pediatric Oncology.

"This work demonstrates that cardiac regeneration is possible in the mammalian heart during a window of time after birth, but this regenerative ability is then lost. Armed with this knowledge, we can next work to discover methods to reawaken cardiac regeneration in adulthood."

The next step, the researchers said, is to study this brief window when the heart is still capable of regeneration, and to find out how, and why, the heart "turns off" this remarkable ability to regenerate as it grows older.

Other UT Southwestern researchers involved in the study were Dr. Enzo Porrello, postdoctoral research fellow in molecular biology and the paper's lead author; Ahmed Mahmoud, graduate research assistant in internal medicine; Emma Simpson, research assistant in pathology; Dr. Joseph Hill, chief of cardiology; and Dr. James Richardson, professor of pathology and molecular biology.

The study was funded by the National Health and Medical Research Council, the National Heart Foundation of Australia and the American Heart Association.

http://www.eurekalert.org/pub_releases/2011-02/qmuo-idc022211.php

Is dairy colostrum the key to Olympic success?

Scientists investigating natural ways to enhance athletic performance have found that bovine colostrum can massively reduce gut permeability – otherwise known as 'leaky gut syndrome.'

Their findings, published in the March issue of the *American Journal of Physiology-Gastrointestinal and Liver Physiology*, could have positive implications not just for athletes but also for sufferers of heatstroke.

A research group led by Ray Playford, Professor of Medicine at Barts and The London School of Medicine and Dentistry looked at athletes who were asked to run for 20 minutes at 80 per cent of their aerobic maximum. At the end of the exercise, changes in the subjects gut leakiness were measured using urine sample – also determined were changes in the athletes' core temperature. Under standard conditions, gut leakiness had increased by 250 per cent and temperature had risen by 2 degrees. However, when the group were given a drink of dairy colostrum for two weeks before the trial, the rise in gut leakiness was reduced by about 80 per cent, despite the same effort and temperature rise.

Gut disorders induced by exercise are common in runners – the body's response to increased permeability is to clear the gut contents, giving rise to symptoms such as diarrhoea to avoid toxins from gut organisms entering the bloodstream, as these lead to heatstroke which can result in damage to the internal organs.

Professor Playford's research identified changes in gut barrier function in laboratory studies: gut cells were cultured at normal 37 degrees body heat and at 39 degrees to replicate the temperature after exercise. The death rate of gut cells was much increased at the higher temperature yet when colostrum was added to the culture medium the rise in cell death rate was reduced by two thirds.

Professor Ray Playford said: "Athletes' performance can be seriously diminished due to gut symptoms during heavy exercise. We have been looking at natural approaches to reduce this problem as the range of products that athletes can legitimately take is very limited. Our findings suggest colostrum may have real value in helping our athletes perform. This is a research area we are especially interested in given our proximity to the 2012 Olympic site. In addition, extremes of temperature and exercise are often suffered by armed forces in desert war scenarios and can result in heat stroke which is life threatening. Based on our results to date, our research group is also exploring products that may be useful for protecting soldiers in life threatening situations such as these."

The nutraceutical, bovine colostrum, truncates the increase in gut permeability caused by heavy exercise in athletes, is published in the March issue of American Journal of Physiology-Gastrointestinal and Liver Physiology

(<http://ajpgi.physiology.org/>)

http://www.eurekalert.org/pub_releases/2011-02/uoth-spr022411.php

Serotonin plays role in many autism cases, studies confirm

Rise in substance's level in the brain improved social behaviors in mice

SAN ANTONIO - Mouse models are yielding important clues about the nature of autism spectrum disorders, which impact an estimated one in 110 children in the U.S.[1] In labs at the UT Health Science Center San Antonio, researchers are studying strains of mice that inherently mimic the repetitive and socially impaired behaviors present in these disorders.

Georgianna Gould, Ph.D., research assistant professor of physiology in the Graduate School of Biomedical Sciences, is eyeing the role that serotonin plays in autism spectrum disorders.

Serotonin is known for giving a sense of well-being and happiness. It is a neurotransmitter, a chemical that acts like a radio tower in the brain conveying signals among cells called neurons. Thirty percent of autism cases may have a serotonin component.[2]

In a recent paper in the Journal of Neurochemistry, Dr. Gould and colleagues showed that a medication called buspirone improved the social behaviors of mice. Buspirone is approved by the U.S. Food and Drug Administration for use in adults as an anti-anxiety and antidepressant adjuvant medication.

Some genetic variations result in diminished transmission of serotonin between neurons. Buspirone increased transmission by partially mimicking the effects of serotonin at cellular sites called receptors.

Reactions to newly encountered mouse

Social interaction behaviors of the mice were measured by placing them in a three-chamber social interaction test and positioning a "stranger" mouse in one of the chambers. Buspirone-treated mice spent more time in the chamber with the stranger mouse than untreated mice and more time sniffing the stranger.

"No animal model is completely characteristic of humans, and we're far from saying that buspirone is a treatment for behaviors of autistic people," Dr. Gould said. "But this does offer further proof that serotonin is involved in a significant proportion of autism cases."

2nd serotonin-related avenue

Dr. Gould now plans to study the impact of a diet rich in the amino acid, tryptophan, on the social behavior of the mice. Tryptophan is a biochemical precursor of serotonin, which means it is converted into serotonin during the metabolic process. Foods such as turkey are rich in tryptophan.

"We are going to supplement the diet of mice with tryptophan to see if behavior improves, and also reduce it to see if behavior worsens," Dr. Gould said. The future study of tryptophan is funded by the Morrison Trust, a San Antonio trust that lists nutrition as one of its topics of interest.

Support from the San Antonio Area Foundation made the project possible. Co-authors of the journal article are Julie Hensler, Ph.D., and Teri Frosto Burke, M.S., of the pharmacology department at the Health Science Center; Lynette Daws, Ph.D., of the university's physiology department in whose lab the work was conducted; and Robert Benno, Ph.D., and Emmanuel Onaivi, Ph.D., of the biology department at William Paterson University in Wayne, N.J.

[1] <http://www.cdc.gov/ncbddd/autism/data.html#prevalence> [2] <http://www.ncbi.nlm.nih.gov/pubmed/21254450>

<http://www.physorg.com/news/2011-02-3d-bio-printers-skin-body.html>

3D bio-printers to print skin and body parts

Cornell University researchers have engineered an ear made of silicone using a 3D bio-printer.

PhysOrg.com - The range of uses for three-dimensional printers is increasing all the time, but now scientists are developing 3D "bioprinters" that will be able to print out skin, cartilage, bone, and other body parts. 3D printers print by depositing material line by line and then vertically layer by layer. They have been used to make sculptures and repair sculptures, to make three-dimensional objects out of plastics and polymers, and even to print food.

Professor James Yoo, from the Institute of Regenerative Medicine at Wake Forest University in Winston-Salem, North Carolina told the annual meeting of the American Association for the Advancement of Science (AAAS) his group is developing a system that will allow them to print skin directly onto burn wounds.

Yoo's team were motivated to develop a portable bioprinting system by the injuries arising on battlefields in Iraq and Afghanistan, where around 30 percent of injuries involve the skin. Their research is funded by the US Department of Defense.

The bioprinter has a built-in laser scanner that scans the wound and determines its depth and area. The scan is converted into three-dimensional digital images that enable the device to calculate how many layers of skin cells need to be printed on the wound to restore it to its original configuration. The system has successfully printed skin patches 10 cm square on a pig.

Also at the AAAS meeting was the director of Cornell University's Computational Synthesis Laboratory, Professor Hod Lipson, who demonstrated a bioprinter by printing an ear, working from a scan of a human ear and a computer file containing the three-dimensional coordinates. The ear was printed using silicone gel instead of real human ear cells.

The Cornell team has already published results on their experiments to bioprint repairs to damaged animal bones, but Professor Lipson said there were a number of technical challenges still to overcome. He said the first use is likely to be repairs to cartilage, since it has a fairly simple internal structure with little vascularization.

Bioprinting cartilage has been tried "fairly successfully" in animal models, and the team have successfully printed cartilage cells directly into the meniscus of an injured knee to reconstruct it.

One of the major challenges to be faced in bioprinting is the connection between the bioprinted material and the rest of the body, especially with larger tissues, since any organ or body part that is printed will need to be connected to the body's blood vessels, and this can be very difficult. Regardless of the challenges, Professor Lipson believes bioprinting will become a standard technique within a couple of decades.

<http://news.discovery.com/animals/cats-humans-pets-relationships-110224.html>

Cats Adore, Manipulate Women

Cats attach to humans, and particularly women, as social partners, and it's not just for the sake of obtaining food.

By Jennifer Viegas | Thu Feb 24, 2011 10:15 AM ET

The bond between cats and their owners turns out to be far more intense than imagined, especially for cat aficionado women and their affection reciprocating felines, suggests a new study.

Cats attach to humans, and particularly women, as social partners, and it's not just for the sake of obtaining food, according to the new research, which has been accepted for publication in the journal Behavioural Processes.

The study is the first to show in detail that the dynamics underlying cat-human relationships are nearly identical to human-only bonds, with cats sometimes even becoming a furry "child" in nurturing homes.

"Food is often used as a token of affection, and the ways that cats and humans relate to food are similar in nature to the interactions seen between the human caregiver and the pre-verbal infant," co-author Jon Day, a Waltham Centre for Pet Nutrition researcher, told Discovery News. "Both cat and human infant are, at least in part, in control of when and what they are fed!"

For the study, led by Kurt Kotrschal of the Konrad Lorenz Research Station and the University of Vienna, the researchers videotaped and later analyzed interactions between 41 cats and their owners over lengthy four-part periods. Each and every behavior of both the cat and owner was noted. Owner and cat personalities were also assessed in a separate test. For the cat assessment, the authors placed a stuffed owl toy with large glass eyes on a floor so the feline would encounter it by surprise.

The researchers determined that cats and their owners strongly influenced each other, such that they were each often controlling the other's behaviors. Extroverted women with young, active cats enjoyed the greatest synchronicity, with cats in these relationships only having to use subtle cues, such as a single upright tail move, to signal desire for friendly contact.

While cats have plenty of male admirers, and vice versa, this study and others reveal that women tend to interact with their cats -- be they male or female felines -- more than men do.

"In response, the cats approach female owners more frequently, and initiate contact more frequently (such as jumping on laps) than they do with male owners," co-author Manuela Wedl of the University of Vienna told Discovery News, adding that "female owners have more intense relationships with their cats than do male owners."

Cats also seem to remember kindness and return the favors later. If owners comply with their feline's wishes to interact, then the cat will often comply with the owner's wishes at other times. The cat may also "have an edge in this negotiation," since owners are usually already motivated to establish social contact.

Although there are isolated instances of non-human animals, such as gorillas, bonding with other species, it seems to be mostly unique for humans to engage in social relationships with other animals. In this case with cats, it's for very good reason. Cats could very well be man's -- and woman's -- best friend.

"A relationship between a cat and a human can involve mutual attraction, personality compatibility, ease of interaction, play, affection and social support," co-author Dorothy Gracey of the University of Vienna explained. "A human and a cat can mutually develop complex ritualized interactions that show substantial mutual understanding of each other's inclinations and preferences."

Dennis Turner, a University of Zurich-Irchel animal behaviorist, told Discovery News the he's "very impressed with this study on human-cat interactions, in that it has taken our earlier findings a step higher, using more modern analytical techniques to get at the interplay between cat and human personalities."

Turner, who is also senior editor of *The Domestic Cat: The Biology of Its Behaviour* (Cambridge University Press), added that he and his colleagues "now have a new dimension to help us understand how these relationships function."

Kotrschal's team is presently involved in a long-term study of man's other well-known animal best friend: dogs.

<http://www.newscientist.com/article/dn20160-two-planets-found-sharing-one-orbit.html>

Two planets found sharing one orbit

*** Updated 18:01 24 February 2011 by Marcus Chown**

Buried in the flood of data from the Kepler telescope is a planetary system unlike any seen before.

Two of its apparent planets share the same orbit around their star. If the discovery is confirmed, it would bolster a theory that Earth once shared its orbit with a Mars-sized body that later crashed into it, resulting in the moon's formation.

The two planets are part of a four-planet system dubbed KOI-730. They circle their sun-like parent star every 9.8 days at exactly the same orbital distance, one permanently about 60 degrees ahead of the other. In the night sky of one planet, the other world must appear as a constant, blazing light, never fading or brightening.

Gravitational "sweet spots" make this possible. When one body (such as a planet) orbits a much more massive body (a star), there are two Lagrange points along the planet's orbit where a third body can orbit stably. These lie 60 degrees ahead of and 60 degrees behind the smaller object. For example, groups of asteroids called Trojans lie at these points along Jupiter's orbit.

In theory, matter in a disc of material around a newborn star could coalesce into so-called "co-orbiting" planets, but no one had spotted evidence of this before. "Systems like this are not common, as this is the only one we have seen," says Jack Lissauer of NASA's Ames Research Center in Mountain View, California. Lissauer and colleagues describe the KOI-730 system in a paper submitted to the *Astrophysical Journal* (arxiv.org/abs/1102.0543).

Richard Gott and Edward Belbruno at Princeton University say we may even have evidence of the phenomenon in our own cosmic backyard. The moon is thought to have formed about 50 million years after the birth of the solar system, from the debris of a collision between a Mars-sized body and Earth. Simulations suggest the impactor, dubbed Theia, must have come in at a low speed. According to Gott and Belbruno, this could only have happened if Theia had originated in a leading or trailing Lagrange point along Earth's orbit. The new finds "show the kind of thing we imagined can happen", Gott says.

Will KOI-730's co-orbiting planets collide to form a moon someday? "That would be spectacular," says Gott. That may be so, but simulations by Bob Vanderbei at Princeton suggest the planets will continue to orbit in lockstep with each other for the next 2.22 million years at least.

<http://www.newscientist.com/article/dn20169-new-drug-is-champagne-moment-for-cystic-fibrosis.html>

New drug is 'champagne moment' for cystic fibrosis

*** Updated 11:19 25 February 2011 by Andy Coghlan**

A pioneering drug has drastically improved the lung function of people with a certain type of cystic fibrosis.

It is the first to target the cause, not the symptoms, of the world's most common hereditary lung disease, and could be combined with a second new drug to improve the lives of thousands around the world.

Peter Mueller, chief scientific officer for Vertex Pharmaceuticals in Cambridge, Massachusetts, and colleagues gave the drug, called VX-770, or a placebo to 161 people with cystic fibrosis for a year.

At the outset, most participants had just 60 per cent as much lung function as that of a healthy person. At the end of the trial, those who received VX-770 had an average improvement of almost 20 per cent in their lung function; the lung function of those who received the placebo did not change.

"These data exceeded our expectations," said Mueller, announcing the results yesterday.

Root of the problem

No other treatments for cystic fibrosis have caused such dramatic improvements, probably because they alleviate symptoms rather than attacking the main cause – a defective protein in lung cells called the Cystic Fibrosis Transmembrane Regulator, or CFTR, discovered in 1989. VX-770 is the first of a new generation of drugs that attack and correct the protein.

In healthy people, CFTR proteins form channels in the surface membrane of lung and other cells; these channels shuttle chloride ions in and out of the cell. When they fail, the lungs clog up with mucus, making it difficult for people to breathe and making them vulnerable to infections.

VX-770 corrects the channels in people with a certain form of cystic fibrosis who make a faulty form of the protein channel which reaches the cell surface but is always closed. The mechanism isn't yet fully understood, but the drug somehow makes the channels open so that they work normally, says Stuart Elborn at Queen's University, Belfast, UK, the principal investigator for the European arm of the trial. "It means you have normal regulation of the airway surface liquid, so instead of accumulating mucus, it gets cleared away," he says.

Additional results from the trial provide evidence that the drug is performing this role. One of the signs of the failing cell membrane channels is a huge accumulation of chloride in sweat, so sweat from people with cystic fibrosis usually has three times the usual concentration of chloride. Chloride concentrations halved in the sweat of participants receiving the drug, bringing them much closer to those seen in healthy people.

Other benefits included 55 per cent fewer "pulmonary exacerbations" – deteriorations in symptoms that require antibiotic treatment – compared with participants receiving the placebo. On average, people receiving the drug also gained around 3 kilograms, suggesting that the disease's usual effects on digestion had eased.

Big news

"This is a champagne moment for the cystic fibrosis community," says Elborn at Queen's University, Belfast, UK, the principal investigator for the European arm of the trial.

"It's pretty exciting," said a spokeswoman for the UK's Cystic Fibrosis Trust. "It's very big news."

Announcing the results yesterday, Vertex said it hoped to apply within two or three months to get the drug approved both in the US and Europe. The company developed the drug with support from the US Cystic Fibrosis Foundation.

Double game

One drawback is that only 5 per cent of people with cystic fibrosis have the specific mutation that the drug corrects, around 5000 patients worldwide.

But Elborn says there is hope for the rest in the shape of a second drug under development, called VX-809, which could potentially correct a mutation affecting 75 per cent of people with cystic fibrosis.

Those with this mutation make the CFTR protein but fail to deliver it to the cell surface. In experiments on lung cells in culture, Vertex has shown that the new drug successfully brings the protein to the surface.

The key could be to combine the two drugs, with one able to raise the protein to the surface if it's not already there, and the other able to prise it open if it remains closed. The company said yesterday that a small trial of the combination is already under way, and results are expected within months.

http://www.eurekalert.org/pub_releases/2011-02/afps-sc022511.php

Staring contests are automatic: People lock eyes to establish dominance

Imagine that you're in a bar and you accidentally knock over your neighbor's beer. He turns around and stares at you, looking for confrontation.

Do you buy him a new drink, or do you try to outstare him to make him back off? New research published in *Psychological Science*, a journal of the Association for Psychological Science, suggests that the dominance behavior exhibited by staring someone down can be reflexive.

Our primate relatives certainly get into dominance battles; they mostly resolve the dominance hierarchy not through fighting, but through staring contests. And humans are like that, too. David Terburg, Nicole Hooiveld, Henk Aarts, J. Leon Kenemans, and Jack van Honk of the University of Utrecht in the Netherlands wanted to examine something that's been assumed in a lot of research: that staring for dominance is automatic for humans.

For the study, participants watched a computer screen while a series of colored ovals appeared. Below each oval were blue, green, and red dots; they were supposed to look away from the oval to the dot with the same color. What they didn't know was that for a split-second before the colored oval appeared, a face of the same color appeared, with either an angry, happy, or neutral expression. So the researchers were testing how long it

took for people to look away from faces with different emotions. Participants also completed a questionnaire that reflected how dominant they were in social situations.

People who were more motivated to be dominant were also slower to look away from angry faces, while people who were motivated to seek rewards gazed at the happy faces longer. In other words, the assumptions were correct—for people who are dominant, engaging in gaze contests is a reflex.

"When people are dominant, they are dominant in a snap of a second," says Terburg. "From an evolutionary point of view, it's understandable—if you have a dominance motive, you can't have the reflex to look away from angry people; then you have already lost the gaze contest."

Your best bet in the bar, though, might just be to buy your neighbor a new beer.

http://www.eurekalert.org/pub_releases/2011-02/tum-bbo022511.php

Bamiyan Buddhas once glowed in red, white and blue

TUM conservators research the ruins of the statues and offer an outlook on the prospect of restoration

The world watched in horror as Taliban fanatics ten years ago blew up the two gigantic Buddha statues that had since the 6th century looked out over the Bamiyan Valley in what is now Afghanistan. Located on the Silk Road, until the 10th century the 55 and 38 meter tall works of art formed the centerpiece of one of the world's largest Buddhist monastic complexes. Thousands of monks tended countless shrines in the niches and caves that pierced a kilometer-long cliff face.

Since the suppression of the Taliban regime, European and Japanese experts, working on behalf of UNESCO and coordinated by the International Council on Monuments and Sites (ICOMOS), have been endeavoring to secure the remains and restore access to the statues. The fragments are being very carefully examined, as prior to the explosion the Buddha statues had barely been researched. For a year and a half now, scientists from the Chair of Restoration, Art Technology and Conservation Science have been studying several hundred fragments at the TUM. Their findings not only contribute to our understanding of this world cultural heritage site, they may also enable the parts recovered to be reassembled:

* **Coloration:** "The Buddhas once had an intensely colorful appearance," says Professor Erwin Emmerling. His team discovered that prior to the conversion of the region to Islam, the statues were overpainted several times, presumably because the colors had faded. The outer robes, or sangati, were painted dark blue on the inside and pink, and later bright orange, on top. In a further phase, the larger Buddha was painted red and the smaller white, while the interior of the robes was repainted in a paler blue. The graphic reconstruction undertaken by the TUM researchers confirms ancient traditions: sources as far back as the 11th century speak of one red Buddha and one moon-white. The other parts of the figures may possibly have had a white priming coat, but that can no longer be proven beyond doubt.



The illustration shows the colored appearance of the Bamiyan Buddhas' robes at the end of the 10th century. Parts damaged in later periods, which cannot be reconstructed, are made visible. Arnold Metzinger

* **Construction technique:** The statues themselves were hewn out of the cliff; however, the flowing garments were formed by craftsmen using clay, which was applied in two or three layers. The remains display an astonishing degree of artistic skill. "The surfaces are perfectly smooth – of a quality otherwise only found in fired materials such as porcelain," says Professor Emmerling. In the clay, the TUM conservators found straw and chaff which absorb moisture, animal hairs which stabilize the plaster like fine glass fibers, and quartz and other additives which prevent shrinkage. The bottom layer of plaster was held in place with ropes attached to small wooden pegs. This allowed the craftsmen of old to apply unusually thick layers of up to eight centimeters. "These have survived not only nearly 1500 years of history, but even the explosion in some parts," adds Professor Emmerling in amazement.

* **Dating:** Previous attempts to determine when the statues originated were estimates based on the style of the Buddha's robes or similar criteria. Now mass spectrometer tests at the ETH Zurich and the University of Kiel have determined the age of the organic material in the clay layers. The TUM scientists have, as a result, been able to date the construction of the smaller Buddha to between 544 and 595 and the larger Buddha between 591 and 644.

* **Conservation:** How can the fragments at this world heritage site be conserved for the future? The ICOMOS teams have in the meantime stacked the ruins in temporary warehouses in the Bamiyan Valley.

Larger pieces have been covered over in situ. "However, that will only last for a few years, because the sandstone is very porous," Professor Emmerling explains. Conventional methods of conservation are out of the question. "On this scale, under the climatic conditions in the Bamiyan Valley, the behavior of the synthetic resins usually used would vary too widely relative to the natural rock." Expert conservator Professor Emmerling has therefore joined forces with Consolidas, a company founded by a TUM graduate, to refine a process recently developed by the latter for possible use on the Buddha fragments: instead of synthetic resins, it might be possible to inject an organic silicon compound in the stone.

In addition, the TUM conservators are also working on a 3D model of the cliff face that shows all of the pieces in their former position. Professor Emmerling considers a reconstruction of the smaller Buddha to be fundamentally possible – he argues in favor of reassembling the recovered parts, rather than attempting to reconstruct the original condition in antiquity. As far as the larger Buddha is concerned, in view of its depth of around 12 meters, Professor Emmerling is more skeptical. The smaller figure with a depth of around two meters was more along the lines of a relief. However, even to restore this figure, there are political and practical obstacles to overcome. Conservation of the fragments would require the construction of a small factory in the Bamiyan Valley – alternatively some 1400 rocks weighing up to two tons each would have to be transported to Germany. A conference to be held in Paris next week will consider the continuing fate of the Buddhas.

<http://www.bbc.co.uk/news/health-12577352>

Doctors offered meningitis 'red flag' advice

Doctors should check for leg pain, confusion, stiff neck and sensitivity to light in children as the "red flags" for meningitis, a study says.

Headaches, pale colour and cold hands and feet are not reliable early signs of the disease, says the report in the British Journal of General Practice. The classic meningitis rash appears later during an infection, researchers said after following 1,200 cases. Charities said parents should still keep an eye out for all symptoms.

Approximately one in 10 patients infected with the condition will die. Meningitis is an inflammation of the membranes which cover the brain and spinal cord and can be caused by a viral or bacterial infection.

The researchers said half of children with the condition were initially misdiagnosed, perhaps because symptoms such as the classic rash, appear later in the infection.

The study looked at symptoms at the early stages of the disease by following 1,212 cases at 15 GP surgeries in Oxfordshire and Somerset. The authors said: "Only confusion, leg pain, photophobia, rash and neck pain/stiffness can be considered 'red flags' for this illness." They said headache and a pale colour were less common in children with meningococcal disease than in those with minor infections.

'Hung up on rash'

Sue Davie, chief executive of the Meningitis Trust, said: "Anything that helps early diagnosis is a good thing." However, she said this was advice for GPs and warned against parents ignoring other symptoms: "I'm always cautious about homing in on one or two symptoms as parents need to be vigilant against them all. "Everyone gets hung up on the rash, a third of people said they wouldn't take action without a rash and that can be deadly."

Chris Head, chief executive of the Meningitis Research Foundation, said: "This is a significant move forward to enable early recognition of these diseases. Not everyone with meningitis and septicaemia gets all the symptoms. "Children with septicaemia may not have a stiff neck or dislike of bright lights. Children with meningitis may not get a rash. "That's why it's important for parents to trust their instincts and not be deterred from seeking medical help again if their child gets worse after being seen by a doctor."