

Genome reveals panda's carnivorous side ***Bamboo-eater seemingly has no genes for cellulose-digesting enzymes.***

Jane Qiu

The complete genetic sequence of the giant panda has revealed that the iconic Chinese bear has all the genes required to digest meat - but not its staple food, bamboo.

The international team sequenced a three-year-old female panda called Jingjing, who was also a mascot of the 2008 Beijing Olympics, and found that she lacks any recognizable genes for cellulases - enzymes that break down the plant material cellulose. "The panda's bamboo diet may be dictated by its gut bacteria rather than by its own genetic composition," says Wang Jun, deputy director of the Beijing Genomics Institute in Shenzhen, Guangdong province, who led the sequencing project.



Jingjing, the three-year-old female panda whose genome has been sequenced. Zhihe Zhang

The researchers also discovered that the T1R1 gene, which encodes a key receptor for the savoury or 'umami' flavour of meat, has become an inactive 'pseudogene' due to two mutations. "This may explain why the panda diet is primarily herbivorous even though it is classified as a carnivore," says Wang.

The research, published in *Nature*, shows that pandas have about 21,000 genes packed into 21 pairs of chromosomes, including one pair of sex chromosomes. Of all the mammals that have been sequenced, pandas are most similar to dogs - with 80% similarity - and are only 68% similar to humans.

But the bear's genome has undergone fewer genetic changes over time than those of dogs and humans, suggesting that it evolved more slowly. The panda is often regarded as a 'living fossil' because its ancestors are thought to have lived in China more than eight million years ago.

The study also shows pandas have a high degree of genetic diversity - about twice as much as humans. "This shows that the panda has a good chance of survival despite its small population size," says Wang.

"The study has laid the biological foundation to better understand pandas, and has the potential for improving conservation by controlling diseases and boosting reproduction of the species," says Jianguo Liu, a conservation biologist at Michigan State University in East Lansing, Missouri, who was not involved in the study.

Habitat threat

But critics stress that protecting the panda's increasingly fragmented and shrinking habitat is a more pressing issue in their conservation. China is thought to be home to around 1,600 wild pandas - though the actual number is hotly debated. Another 300 or so live in captivity.

Some conservationists, such as Fan Zhiyong, director of the conservation group WWF's China species programme, believe that the panda genome will have little impact on conservation efforts. "Protecting pandas in the wild remains the top priority, but their habitats are becoming smaller and smaller," says Fan. "If we don't have any wild pandas one day, what can we do with their genes?"

Nature Methods

Although China has set up several panda sanctuaries since the 1960s, economic development often takes precedence over conservation. Consequently, pandas' habitats are often invaded by construction projects such as dams and highways. Tourism is also a big threat because pandas are reclusive creatures. For example, Jiuzhaigou, a panda sanctuary in Sichuan, is visited by millions of tourists every year. "You don't see any pandas there anymore," says Fan. "This is hardly surprising."

There is "no doubt" that information from the genome and habitat protection are both crucial for conservation efforts, says Wang. The panda genome, the first in a string of sequencing efforts by the Shenzhen institute, will be a test of how such genetic information can help in the conservation of endangered species, he adds. The team has got a draft genome map of the polar bear, and has started sequencing the genome of the Tibetan antelope.

I think step to the left, you think step to the east

Even the way people remember dance moves depends on the culture they come from, according to a report in the December 14th issue of *Current Biology*, a Cell Press publication. Whereas a German or other Westerner might think in terms of "step to the right, step to the left," a nomadic hunter-gatherer from Namibia might think something more like "step to the east, step to the west."

Those differences aren't just a matter of language; rather, they reflect differences in the way our minds encode and remember spatial relationships.

"The human mind varies more across cultures than we generally assume," said Daniel Haun of the Max Planck Research Group for Comparative Cognitive Anthropology. "Even everyday tasks that we would never think of doing any other way, like remembering body movements, are done differently in other places."

Researchers knew that cultures differ in the way that they represent the locations of objects in space. But, Haun and Christian Rapold explain, knowing where our own hands and feet are has a strongly "egocentric" organization in the brain. Therefore, you might expect all people to remember body movements in essentially the same manner.

Not so, the new study shows. The researchers conducted experiments in which they asked groups of German children and Haillom (sometimes referred to as Haikom) children from Namibia to learn a dance. The dance instructor (experimenter) stood by their side and demonstrated a simple move, shaking clasped hands from side to side in a right-left-right-right sequence. He then asked them to turn around to face the opposite direction and "dance again."

German children who successfully learned the dance almost always moved their hands to their right-left-right-right regardless of which direction they were facing. In contrast, the Haillom children switched the direction of their movements, from right-left-right-right to left-right-left-left, depending on which way they were facing at the time.

The new findings highlight the extraordinary diversity and flexibility of the human mind, the researchers say.

"It's becoming more and more clear that we cannot simply extrapolate from investigations within our own population to others," Haun said. "To understand the human mind, we need to widen our perspective and assume diversity rather than universality of cognition until proven otherwise."

The researchers include Daniel B.M. Haun, at Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands; Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany; and University of Portsmouth, Portsmouth, UK; and Christian J. Rapold, at Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands.

Octopuses use coconut shells as portable shelters

* 17:49 14 December 2009 by **Andy Coghlan**

Octopuses have been observed carrying coconut shells in what researchers claim is the first recorded example of tool use in invertebrates.

There is a growing record of tool use in animals and birds, from musical "instruments" made by orang-utans to sponges used by dolphins to dislodge prey from sand.

Now veined octopuses, *Amphioctopus marginatus*, have been filmed picking up coconut halves from the seabed to use as hiding places when they feel threatened.

"This octopus behaviour was totally unexpected," says Julian Finn, a marine biologist at Museum Victoria in Melbourne, Australia, who has filmed at least four individual veined octopuses performing the trick off the coast of Indonesia.



Making the most of what is lying around (Image: Roger Steene)

Discarded coconuts

People living in Indonesian coastal villages discard coconut shells into the sea after use. When the octopuses come across these on the seabed, they drape their bodies over and around the shells, hollow-side up, leaving their eight arms dangling over the edges.

The octopuses then lift the shells by making their arms rigid, before tiptoeing away in a manoeuvre Finn calls stilt-walking.

When the octopuses feel threatened, they flip the half shells over themselves and hide. Some even use two shells to create a more spacious shelter with an opening through which they can keep a lookout.

"It was a very comical sight," says Finn. He believes octopuses have known for millennia how to perform similar tricks with unoccupied bivalve shells, but have only recently discovered that coconut halves are a light and convenient alternative.

Tool use

Finn argues that the behaviour qualifies as tool use for a number of reasons. First, the shells are not permanent homes like those occupied by hermit crabs, but are carried around for future use.

It is also a costly behaviour, both in terms of energy use and in potentially making the octopuses more vulnerable to attack.

But there are uncertainties about whether the octopuses have learned this behaviour by observing others, or by working it out for themselves in each case.

"The finding is remarkable, particularly as the octopus transports the tool for future use," says Christopher Bird of Imperial College London, who studies tool use in rooks. "But simply observing tool use in the wild doesn't necessarily mean that the animal is cognitively sophisticated, as we don't know how the behaviour developed."

Cognitive demands

"The conventional definitions of tool use include the use of non-attached objects to act on other object(s), which may be food," says Alex Kacelnik of the University of Oxford, whose team recently studied whether crows plan their tool use in advance.

"The use of a coconut shell for protection does not fit this definition, but I sympathise with the authors in that this does not imply that the cognitive demands for such an action are lower," Kacelnik says. "The interesting issues are not whether this observation fits a pre-established definition, but what cognitive operations make the behaviour possible." *Journal reference: Current Biology, vol 19, R1069*

Regular coffee, decaf and tea all associated with reduced risk for diabetes

Individuals who drink more coffee (regular or decaffeinated) or tea appear to have a lower risk of developing type 2 diabetes, according to an analysis of previous studies reported in the December 14/28 issue of Archives of Internal Medicine.

By the year 2025, approximately 380 million individuals worldwide will be affected by type 2 diabetes, according to background information in the article. "Despite considerable research attention, the role of specific dietary and lifestyle factors remains uncertain, although obesity and physical inactivity have consistently been reported to raise the risk of diabetes mellitus," the authors write. A previously published meta-analysis suggested drinking more coffee may be linked with a reduced risk, but the amount of available information has more than doubled since.

Rachel Huxley, D.Phil, of The George Institute for International Health, University of Sydney, Australia, and colleagues identified 18 studies involving 457,922 participants and assessing the association between coffee consumption and diabetes risk published between 1966 and 2009. Six studies involving 225,516 individuals also included information about decaffeinated coffee, whereas seven studies with 286,701 participants reported on tea consumption.

When the authors combined and analyzed the data, they found that each additional cup of coffee consumed in a day was associated with a 7 percent reduction in the excess risk of diabetes. Individuals who drank three to four cups per day had an approximately 25 percent lower risk than those who drank between zero and two cups per day.

In addition, in the studies that assessed decaffeinated coffee consumption, those who drank more than three to four cups per day had about a one-third lower risk of diabetes than those who drank none. Those who drank more than three to four cups of tea had a one-fifth lower risk than those who drank no tea.

"That the apparent protective effect of tea and coffee consumption appears to be independent of a number of potential confounding variables raises the possibility of direct biological effects," the authors write. Because of the association between decaffeinated coffee and diabetes risk, the association is unlikely to be solely related to caffeine. Other compounds in coffee and tea - including magnesium, antioxidants known as lignans or chlorogenic acids - may be involved, the authors note.

"If such beneficial effects were observed in interventional trials to be real, the implications for the millions of individuals who have diabetes mellitus, or who are at future risk of developing it, would be substantial," they conclude. "For example, the identification of the active components of these beverages would open up new therapeutic pathways for the primary prevention of diabetes mellitus. It could also be envisaged that we will advise our patients most at risk for diabetes mellitus to increase their consumption of tea and coffee in addition to increasing their levels of physical activity and weight loss."

(Arch Intern Med. 2009;169[22]:2053-2063. Available pre-embargo to the media at www.jamamedia.org.)

Editor's Note: Dr. Huxley is supported by a Career Development Award from the National Heart Foundation of Australia. This work was additionally supported by a grant from the National Health and Medical Research Council of Australia; a Research Career Development Fellowship from the UK Wellcome Trust; and a research grant from Institut Servier, France and Assistance Publique-Hopitaux de Paris. Please see the article for additional information, including other authors, author contributions and affiliations, financial disclosures, funding and support, etc.

New planet discoveries suggest low-mass planets are common around nearby stars

SANTA CRUZ, CA--An international team of planet hunters has discovered as many as six low-mass planets around two nearby Sun-like stars, including two "super-Earths" with masses 5 and 7.5 times the mass of Earth. The researchers, led by Steven Vogt of the University of California, Santa Cruz, and Paul Butler of the Carnegie Institution of Washington, said the two "super-Earths" are the first ones found around Sun-like stars.

"These detections indicate that low-mass planets are quite common around nearby stars. The discovery of potentially habitable nearby worlds may be just a few years away," said Vogt, a professor of astronomy and astrophysics at UCSC.

The team found the new planet systems by combining data gathered at the W. M. Keck Observatory in Hawaii and the Anglo-Australian Telescope (AAT) in New South Wales, Australia. Two papers describing the new planets have been accepted for publication in the *Astrophysical Journal*.

Three of the new planets orbit the bright star 61 Virginis, which can be seen with the naked eye under dark skies in the Spring constellation Virgo. Astronomers and astrobiologists have long been fascinated with this particular star, which is only 28 light-years away. Among hundreds of our nearest stellar neighbors, 61 Vir stands out as being the most nearly similar to the Sun in terms of age, mass, and other essential properties. Vogt and his collaborators have found that 61 Vir hosts at least three planets, with masses ranging from about 5 to 25 times the mass of Earth.

Recently, a separate team of astronomers used NASA's Spitzer Space Telescope to discover that 61 Vir also contains a thick ring of dust at a distance roughly twice as far from 61 Vir as Pluto is from our Sun. The dust is apparently created by collisions of comet-like bodies in the cold outer reaches of the system.

"Spitzer's detection of cold dust orbiting 61 Vir indicates that there's a real kinship between the Sun and 61 Vir," said Eugenio Rivera, a postdoctoral researcher at UCSC. Rivera computed an extensive set of numerical simulations to find that a habitable Earth-like world could easily exist in the as-yet unexplored region between the newly discovered planets and the outer dust disk.

According to Vogt, the planetary system around 61 Vir is an excellent candidate for study by the new Automated Planet Finder (APF) Telescope recently constructed at Lick Observatory on Mount Hamilton near San Jose. "Needless to say, we're very excited to continue monitoring this system using APF," said Vogt, who is the principal investigator for the APF and is building a spectrometer for the new telescope that is optimized for finding planets.

The second new system found by the team features a 7.5-Earth-mass planet orbiting HD 1461, another near-perfect twin of the Sun located 76 light-years away. At least one and possibly two additional planets also orbit the star. Lying in the constellation Cetus, HD 1461 can be seen with the naked eye in the early evening under good dark-sky conditions.

The 7.5-Earth-mass planet, assigned the name HD 1461b, has a mass nearly midway between the masses of Earth and Uranus. The researchers said they cannot tell yet if HD 1461b is a scaled-up version of Earth, composed largely of rock and iron, or whether, like Uranus and Neptune, it is composed mostly of water.

According to Butler, the new detections required state-of-the-art instruments and detection techniques. "The inner planet of the 61 Vir system is among the two or three lowest-amplitude planetary signals that have been identified with confidence," he said. "We've found there is a tremendous advantage to be gained from combining data from the AAT and Keck telescopes, two world-class observatories, and it's clear that we'll have an excellent shot at identifying potentially habitable planets around the very nearest stars within just a few years."

The 61 Vir and HD 1461 detections add to a slew of recent discoveries that have upended conventional thinking regarding planet detection. In the past year, it has become evident that planets orbiting the Sun's nearest neighbors are extremely common. According to Butler, current indications are that fully one-half of nearby stars have a detectable planet with mass equal to or less than Neptune's.

The Lick-Carnegie Exoplanet Survey Team led by Vogt and Butler uses radial velocity measurements from ground-based telescopes to detect the "wobble" induced in a star by the gravitational tug of an orbiting planet. The radial-velocity observations were complemented with precise brightness measurements acquired with robotic telescopes in Arizona by Gregory Henry of Tennessee State University.

"We don't see any brightness variability in either star," said Henry. "This assures us that the wobbles really are due to planets and not changing patterns of dark spots on the stars."

Due to improvements in equipment and observing techniques, these ground-based methods are now capable of finding Earth-mass objects around nearby stars, according to team member Gregory Laughlin, professor of astronomy and astrophysics at UCSC.

"It's come down to a neck-and-neck race as to whether the first potentially habitable planets will be detected from the ground or from space," Laughlin said. "A few years ago, I'd have put my money on space-based detection methods, but now it really appears to be a toss-up. What is truly exciting about the current ground-based radial velocity detection method is that it is capable of locating the very closest potentially habitable planets."

The Lick-Carnegie Exoplanet Survey Team has developed a publicly available tool, the Systemic Console, which enables members of the public to search for the signals of extrasolar planets by exploring real data sets in a straightforward and intuitive way. This tool is available online at www.oklo.org.

This research was supported by the National Science Foundation and NASA. In addition to Vogt, Butler, Rivera, Laughlin, and Henry, the coauthors of the 61 Vir paper include Rob Wittenmyer, C. G. Tinney, and Jeremy Bailey of the University of New South Wales; Simon O'Toole and Hugh Jones of the University of Hertfordshire; Stefano Meschiari of UCSC; Brad Carter of the University of Southern Queensland; and Konstantin Batygin of Caltech. The authors of the HD 1461 paper are Rivera, Butler, Vogt, Laughlin, Henry, and Meschiari.

Ancient DNA, not fossilized bones, shows late survival of Ice Age megafauna

University of Alberta researchers are part of an international team that has used DNA samples from frozen dirt, not fossilized bones, to revise the history of North America's woolly mammoths and ancient horses.

The work of U of A Earth and Atmospheric Sciences professor Duane Froese and his colleagues counters an important extinction theory, based on radiocarbon dating of bones and teeth. That analysis concluded that more than half of the large mammals in North America (the 'megafauna') disappeared about 13,000 years ago.

In the new research, DNA samples recovered from Alaskan permafrost showed that woolly mammoths and ancient horses were still roaming through central Alaska about 10,000 years ago, and possibly as recently as 7600 years ago. That predates the established record from fossil bones and teeth by at least 3,000 years.

The DNA samples were recovered from permafrost near the central Alaskan community of Stevens Village, on the banks of the Yukon River. Analysis of the samples from soils that formed between 10,000 and 7600 years ago showed the presence of mammoth and horse DNA together with animals typically found in the region today, such as moose and arctic hare.

The challenge of dating extinction events is finding fossilized remains from the last animal left standing of any given species. The chances of finding those exact bones are remote. But animals are constantly leaving behind tell-tale samples of DNA in the form of skin cells and feces in the environment. That's what Froese and the other researchers found in the permafrost, at a depth and time line that radically changes the extinction date for two members of North America's megafauna in the late Pleistocene.

Froese, and U of A graduate students Simon Robinson and Alberto Reyes, are co-authors of research that will be published Dec. 14 in Proceedings of the National Academy of Sciences.

Scientists isolate new antifreeze molecule in Alaska beetle

FAIRBANKS, Alaska-- -- Scientists have identified a novel antifreeze molecule in a freeze-tolerant Alaska beetle able to survive temperatures below minus 100 degrees Fahrenheit. Unlike all previously described biological antifreezes that contain protein, this new molecule, called xylomannan, has little or no protein. It is composed of a sugar and a fatty acid and may exist in new places within the cells of organisms.

"The most exciting part of this discovery is that this molecule is a whole new kind of antifreeze that may work in a different location of the cell and in a different way," said zoophysiologicalist Brian Barnes, director of the University of Alaska Fairbanks Institute of Arctic Biology and one of five scientists who participated in the Alaska *Upis ceramboides* beetle project.



Scientists have identified a novel antifreeze molecule in this freeze-tolerant Alaska beetle, *Upis ceramboides*, able to survive temperatures below minus 100 degrees Fahrenheit. Unlike all previously described biological antifreezes that contain protein, this new molecule, called xylomannan, has little or no protein. It is composed of a sugar and a fatty acid and may exist in new places within the cells of organisms. Credit: Todd Sformo/Wildlife biologist, North Slope

Just as ice crystals form over ice cream left too long in a freezer, ice crystals in an insect or other organism can draw so much water out of the organism's cells that those cells die. Antifreeze molecules function to keep small ice crystals small or to prevent ice crystals from forming at all. They may help freeze-tolerant organisms survive by preventing freezing from penetrating into cells, a lethal condition. Other insects use these molecules to resist freezing by supercooling when they lower their body temperature below the freezing point without becoming solid.

UAF graduate student and project collaborator Todd Sformo found that the Alaska Upis beetle, which has no common name, first freezes at about minus 18.5 degrees Fahrenheit in the lab and survives temperatures down to about 104 degrees below zero Fahrenheit.

"It seems paradoxical that we find an antifreeze molecule in an organism that wants to freeze and that's adapted to freezing," said Barnes, whose research group is involved in locating insects, determining their strategies of overwintering and identifying the mechanisms that help them get through the winter

A possible advantage of this novel molecule comes from it having the same fatty acid that cells membranes do. This similarity, says Barnes, may allow the molecule to become part of a cell wall and protect the cell from internal ice crystal formation. Antifreeze molecules made of proteins may not fit into cell membranes.

"There are many difficult studies ahead," said Barnes. "To find out how common this biologic antifreeze is and how it actually prevents freezing and where exactly it's located."

This project was led by Kent Walters at the University of Notre Dame with collaborators Anthony Serianni and John H. Duman of UND and Barnes and Sformo of UAF and was published in the Dec. 1 issue of the journal Proceedings of the National Academy of Sciences.

Veiling in style: How does a stigmatized practice become fashionable?

Why are an increasing number of Turkish women wearing veils in a secular country where the practice is banned in public buildings? A new study in the Journal of Consumer Research says one factor is fashion.

Authors Özlem Sandıkcı and Güliz Ger (both Bilkent University, Ankara, Turkey) report that much like the first people who began wearing blue jeans or getting tattoos, adopting this "stigmatized" fashion signifies independence from the social norms of the secular country. So while the veil is perceived as repressive to Westerners, some Turkish women adopt it as a sign of deviance from the values of their mothers and peers as well as for religious reasons.

According to the authors, in a middle-class, urban, secular social milieu in Turkey, adopting the veil is a choice that runs against the grain of consumer socialization. In many cases, Turkish women wear the veil to rebel against the tradition of their mothers' generation, which has been wearing Western garb since the 1920s.

The study found that the interaction among the market, religion, and the national and international political spheres underlies the emergence of new veiling as an attractive choice for individuals. "Women, in their pursuit of freedom from the discomforts of various political and everyday anxieties and moral threats, willingly chose a stigma symbol and became part of a new community," the authors write.

The fashion industry is responding. The scarves and loose overcoats worn by Muslim women in the 1980s have been replaced by fashionable alternatives. "As women compose new elegant, beautiful, and fashionable styles, they inspire others to adopt veiling. Fashionable veiling owes its spread and visibility partially to a new business sector claiming to 'make covering beautiful,'" the researchers write.

"Faced with increasing demand for fashionable covering, clothing companies catering to a newly emerging clientele proliferate. As new fashionable styles of covering spread and become visible, a new Islamist bourgeois aesthetics gets constructed."

Özlem Sandıkcı and Güliz Ger. "Veiling in Style: How Does a Stigmatized Practice Become Fashionable?" Journal of Consumer Research: June 2010. A preprint of this article (to be officially published online soon) can be found at <http://journals.uchicago.edu/jcr>.

Painkiller undermines aspirin's anti-clotting action

Combining celebrex with low-dose aspirin may reduce protection from heart attack and stroke, study suggests

ANN ARBOR, Mich. - Millions of Americans take Celebrex for arthritis or other pain. Many, if they are middle-aged or older, also take a low-dose aspirin tablet daily to reduce the risk of heart attack and stroke. Yet they may be getting little protection, because Celebrex keeps the aspirin from doing its job effectively, a new study suggests.

In laboratory studies, University of Michigan researchers found that several coxibs, the drug class to which Celebrex belongs, interfere with aspirin's ability to discourage blood clots, if the aspirin is taken in low doses. Celebrex, also known as celecoxib, is the only coxib currently on the market. The results appear online in the Proceedings of the National Academy of Sciences.

Doctors frequently advise daily low-dose aspirin (81 mg) for patients who have heart conditions, notably a serious form of angina known as unstable angina, or for patients who are at risk of second heart attacks. Aspirin is well-known for its ability to discourage formation of blood clots that can lead to heart attack and stroke. In addition, arthritis patients who take Celebrex regularly are often put on low-dose aspirin because this is thought to counteract Celebrex's own potential clot-promoting effect.

"There are many people who take low-dose aspirin, perhaps as many as half of men over 50. If they are also prescribed Celebrex for arthritis or other pain, our results suggest that the Celebrex will probably interfere with the aspirin's action," says William L. Smith, Ph.D., the study's senior author, Minor J. Coon Professor of Biological Chemistry and chair of the biochemistry department at the U-M Medical School.

"The greatest risk is having people take Celebrex who are taking aspirin for cardiovascular problems that are known to be mitigated by aspirin, including patients with unstable angina or those at risk for a second heart attack," he says. In unstable angina, small clots form in arteries and interfere with blood flow.

Previous studies of healthy subjects found no ill effect on blood clotting when Celebrex was combined with aspirin at higher doses, specifically a daily "regular" aspirin tablet (324 mg), Smith notes.

So it may be that a higher aspirin dose, or spreading out the time between taking low-dose aspirin and Celebrex, will allow aspirin to be effective. Aspirin's undesirable effects on the gastrointestinal tract at higher doses when taken long-term would have to be taken into account.

First, though, the effect seen in the U-M study needs to be replicated in studies of low-dose aspirin and Celebrex in people, perhaps in older patients who have conditions such as rheumatoid arthritis, says Smith. If the effect holds true in people, it will be important to determine if a balance in dose and/or dose regimens can be found so that aspirin and Celebrex can both be effective.

Research details

The researchers used biochemical measurements and X-ray crystallography to discover that celecoxib binds to COX-1, an enzyme that promotes clotting, and slows aspirin's COX-1-blocking action. In animal studies, the researchers found more clumping of platelets – the initial stage of clotting – in blood from animals given Celebrex and low-dose aspirin than in animals given only low-dose aspirin.

Background Celebrex is one member of a class of drugs known as coxibs or COX-2 inhibitors, developed to selectively block the action of pain-causing enzymes while minimizing side effects such as gastrointestinal problems. Celebrex is the most widely prescribed COX-2 inhibitor in the United States.

More than half of older patients taking COX-2 inhibitors long-term were also taking aspirin to protect against heart disease, according to a 2004 study in the Archives of Internal Medicine.

Additional authors: Gilad Rimon, U-M and Ben-Gurion University of the Negev, Israel, first author; Ranjinder S. Sidhua, D. Adam Lauver, Jullia Y. Lee, Narayan P. Sharma, Chong Yuan, Ryan A. Frieler, Raymond C. Trievel and Benedict R. Lucchesi, all at U-M.

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New research backs FDA ban on flavored cigarettes

Study shows high-sensation seeking youth drawn to sweet-tasting cigarettes

WASHINGTON DC, Dec. 14, 2009 0- New research showing that thrill-seeking teenagers are especially susceptible to fruit-flavored cigarettes is in line with the recent ban on the sale of flavored cigarettes by the U.S. Food and Drug Administration (FDA) in September 2009. According to the FDA, the ban, authorized by the new Family Smoking Prevention and Tobacco Control Act, is part of a national effort by the FDA to reduce smoking, which is the leading preventable cause of death in America.

"We found that those teens who gravitate toward novel experiences were especially drawn to cigarettes described as having an appealing, sweet flavor, such as cherry," says lead author Kenneth Manning with Colorado State University.

The study, published in the December issue of the journal Tobacco Control, was funded by the Substance Abuse Policy Research Program (SAPRP) of the Robert Wood Johnson Foundation.

Past research has found that high-sensation-seeking youth are more likely to smoke cigarettes than their low-sensation-seeking peers, Manning notes. But until now, no studies have looked at how novel, sweet-tasting cigarettes might impact this group of thrill seekers. The authors proposed that the influence of cigarette flavor descriptors lies in their ability to alter the "arousal potential" of a cigarette brand's marketing communications (such as its packaging). Arousal potential refers to the degree to which a stimulus (like the description of a cigarette's flavor) is capable of gaining attention and exciting the nervous system.

To test this theory, the researchers divided 253 high school students into two groups to evaluate three pictures of cigarette packages: Camel, American Spirit, and a fictitious brand, "Onyx". The first group viewed packages that included traditional cigarette descriptions such as "domestic blend," and the second group of teens viewed packages with the cigarettes described as "cherry." Following exposure to each package, the study participants responded to several questions regarding the appeal of the brand (i.e., beliefs about how enjoyable it would be, overall evaluation, and trial intention).

To determine their sensation-seeking tendencies, the students responded to measures such as "I would like to explore strange places" and "I like friends who are exciting and unpredictable".

Sensation-seeking varies over a continuum, explains Manning. "In our study, we essentially divided half of the students into the high group and the other half into the low group based on their overall sensation-seeking scores."

Results indicated that the appeal of the brands across the belief, attitude, and trial intention measures depended on both the sensation-seeking tendency of the student and whether the student had viewed the brand packages with the traditional or sweet flavor descriptions. In particular, among students who were classified as high-sensation seekers, the cigarette brands were significantly more appealing to those exposed to the packages that included the sweet flavor descriptors than to those who had viewed the packages with the traditional descriptions.

This underscores a key point of the FDA ban - that flavors make cigarettes and other tobacco products more appealing to youth, and are created to attract and allure kids into lifelong addiction. "By enhancing the arousal potential associated with tobacco brands, sweet flavor descriptors boost the appeal of these products among high-sensation seekers," the authors conclude.

The FDA encourages consumers to report continuing sales of flavored cigarettes through a special tobacco hotline (1-877-CTP-1373) and web site (www.fda.gov/flavoredtobacco).

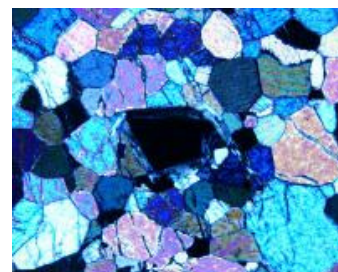
Parents and consumers can learn more about the risks of flavored tobacco products at

<http://www.fda.gov/TobaccoProducts/GuidanceComplianceRegulatoryInformation/FlavoredTobacco/ucm183196.htm>.

The Substance Abuse Policy Research Program (www.saprp.org) of the Robert Wood Johnson Foundation funds research into policies related to alcohol, tobacco and illegal drugs.

Prussian blue linked to the origin of life

A team of researchers from the Astrobiology Centre (INTA-CSIC) has shown that hydrogen cyanide, urea and other substances considered essential to the formation of the most basic biological molecules can be obtained from the salt Prussian blue. In order to carry out this study, published in the journal *Chemistry & Biodiversity*, the scientists recreated the chemical conditions of the early Earth.



This is Prussian blue. This salt could cause substances essential for life. Credit: Nagem R.

"We have shown that when Prussian blue is dissolved in ammoniac solutions it produces hydrogen cyanide, a substance that could have played a fundamental role in the creation of the first bio-organic molecules, as well as other precursors to the origin of life, such as urea, dimethylhydantoin and lactic acid", Marta Ruiz Bermejo, lead author of the study and a researcher at the Astrobiology Centre (CSIC-INTA), tells SINC.

Urea is considered to be an important reagent in synthesising pyrimidines (the derivatives of which form part of the nucleic acids DNA and RNA), and it has been suggested that hydantoins could be the precursors of peptides and amino acids (the components of proteins), while lactic acid is also of biological interest because, along with malic acid, it can play a role in electron donor-recipient systems.

The researcher and her team have proved that these and other compounds originate from the cyanide liberated by the salt Prussian blue (the name of which refers to the dye used in the uniforms of the Prussian Army) when it is subjected for several days to conditions of pH12 and relatively high temperatures (70-150°C) in a damp, oxygen-free ammoniac environment, similar to early conditions on Earth. The results of the study have been published recently in the journal *Chemistry & Biodiversity*.

"In addition, when Prussian blue decomposes in this ammoniac, anoxic environment, this complex salt, called iron (III) hexacyanoferrate (II), also turns out to be an excellent precursor of hematite, the most stable and commonly found form of iron (III) oxide on the surface of the Earth", explains Ruiz Bermejo.

Hematite is related to the so-called Banded Iron Formations (BIF), the biological or geological origin of which is the source of intense debate among scientists. The oldest of these formations, more than two billion years old, have been found in Australia.

The researchers have confirmed in other studies that Prussian blue can be obtained in prebiotic conditions (from iron ions in methane atmosphere conditions with electrical discharges). The synthesis of this salt and its subsequent transformation into hematite offers an alternative model to explain the formation of the banded iron in abiotic conditions in the absence of oxygen.

Ruiz Bermejo concludes that Prussian blue "could act as a carbon concentrator in the prebiotic hydrosphere, and that its wet decomposition in anoxic conditions could liberate hydrogen cyanide and cyanogen, with the subsequent formation of organic molecules and iron oxides".

References: *Marta Ruiz Bermejo, Celia Rogero, César Menor Salván, Susana Osuna Esteban, José Ángel Martín-Gago y Sabino Veintemillas Verdaguer. "Thermal wet decomposition of Prussian Blue: Implications for Prebiotic Chemistry". CHEMISTRY & BIODIVERSITY 6 (9): 1309-1322, 2009.*

Researchers find high leptin levels may protect against Alzheimer's disease and dementia

(Boston) – Researchers from Boston University School of Medicine (BUSM) have found that higher leptin (a protein that controls weight and appetite) levels were associated with a lower incidence of Alzheimer's Disease (AD) and dementia. The study, which appears in the December 16th issue of the Journal of the American Medical Association, may open pathways for possible preventive and therapeutic interventions.

Dementia is increasingly recognized as a life-course illness where a variety of lifestyle choices interact with genetic, vascular and other risk factors to affect risk of disease. Given the rapid aging of developed and developing societies, it is projected that the prevalence of dementia will dramatically increase during the next five decades. Therefore, it is a public health priority to explore pathophysiological pathways underlying the development of dementia and its most common cause, AD.

According to the BUSM researchers, a growing body of evidence suggests that leptin has beneficial effects on brain development and function. It appears to mediate structure and functional changes in the hippocampus and to improve memory function. Leptin also has been shown to increase apolipoprotein E-dependent B amyloid uptake into the cell and reduce brain extracellular concentrations of B-amyloid, the major component of the neuritic plaques that are a histopathological hallmark of AD.

Using participants from the original cohort of the Framingham Heart Study, the researchers measured leptin concentrations in 785 persons without dementia. A subsample of 198 dementia-free survivors underwent volumetric brain MRI between 1999 and 2005, approximately 7.7 years after leptin levels were measured. Two measures of brain aging, total cerebral brain volume and temporal horn volume (which is inversely related to hippocampal volume) were assessed. The researchers found that elevated leptin levels was associated with higher total cerebral brain volume and lower temporal horn volume and higher leptin levels were prospectively associated with a lower incidence of AD and dementia.

"Over a 12-year follow-up, this corresponds to an absolute AD risk of 25 percent for persons with the lowest levels of leptin compared to a six percent risk for persons with the highest levels," said senior author Sudha Seshadri, MD, an associate professor of neurology at BUSM and an investigator at The Framingham Heart Study.

"If our findings are confirmed by others, leptin levels in older adults may serve as one of several possible biomarkers for healthy brain aging and, more importantly, may open new pathways for possible preventive and therapeutic intervention," she added.

The BUSM researchers believe further exploration of the molecular and cellular basis for the observed association may expand their understanding of the pathophysiology underlying brain aging and the development of AD.

Funding for this study was provided by the National Heart, Lung and Blood Institute, the National Institute on Aging and the National Institute of Neurological Disorders and Stroke.

Dr. Seshadri and the Neurology study group would like to thank the Framingham Heart Study participants and staff whose extraordinary commitment and dedication makes such scientific insights possible.

Well

When Lowering the Odds of Cancer Isn't Enough

By TARA PARKER-POPE

If someone invented a pill to cut a cancer risk in half, would you take it?

Who wouldn't?

Apparently the answer is millions of women - people like Cindy Birkhold of Sarasota, Fla.

The pill is tamoxifen, and Ms. Birkhold, now 52, was considered an ideal candidate for it: she tested positive for a breast cancer gene, her mother had ovarian cancer, and her aunt had breast cancer. Yet rather than take tamoxifen, she opted for surgery to remove her breasts and ovaries.

"I even went so far as to get the prescription" for tamoxifen, she said. "But then I started reading more and decided this isn't the way I'm going to go. I don't like to take drugs."

Such decisions have become a topic of growing concern among doctors and researchers, who are increasingly focused on treatments to prevent cancer in high-risk patients.

While many kinds of cancer are resistant to such treatments, tamoxifen is well documented to prevent breast cancer in many women at high risk for it. Now another drug, raloxifene, has been shown to have a similar effect, and a class of drugs called aromatase inhibitors may also be useful. And for men, finasteride has been shown to lower the risk of prostate cancer.

But none of these new chemoprevention drugs will do any good if patients do not use them. University of Michigan set out to learn why they don't.

A woman is considered to be at high risk for breast cancer if she is over 40 and has a mother, sister or daughter with the disease, or has a history of atypical cells on a breast biopsy. Tamoxifen lowers a woman's risk for developing breast cancer by interfering with the activity of estrogen in the body.

The researchers looked at 632 women whose five-year risk for breast cancer made them candidates for the drug. To find out whether the problem was one of information, the scientists created a detailed Internet-based decision tool tailored to each woman's individual risk.

For instance, a 52-year-old woman who had her first child after age 30, and whose own mother had breast cancer, has a five-year risk of 1.9 percent, according to the Gail risk score, a widely accepted statistical model. That means among 1,000 similar women, 19 would be expected to develop breast cancer over the next five years. If those women all took tamoxifen, however, 9 of those women would avoid breast cancer - and, as a bonus, 13 would avoid broken bones from osteoporosis.

It is true that tamoxifen can have side effects, some of them serious. Among 1,000 similar 52-year-old women, the drug would be expected to cause 21 additional cases of endometrial cancer, a cancer of the uterine lining that is typically treatable when caught early. An additional 21 would develop blood clots, 31 would develop cataracts and 12 would develop sexual problems. And while more than half of the 1,000 women would naturally develop hormonal symptoms like hot flashes, changes in vaginal discharge or irregular periods, tamoxifen would cause those symptoms in about an additional 120 women.

While these risks are not to be taken lightly, neither are the risks of failing to use tamoxifen; its benefits for breast and bone are substantial. Yet virtually every woman in the study said she would be unlikely to take the drug. Just 6 percent said they would consider it after talking to their doctors, and only 1 percent reported actually filling a prescription for it. Fully 80 percent cited worries about side effects.

"When the numbers were laid out for them in a way they could clearly understand, they weren't interested in taking tamoxifen," said Angela Fagerlin, associate professor of internal medicine at the University of Michigan and the lead author of the study, published in the journal *Breast Cancer Research and Treatment*. "They didn't think the benefits of tamoxifen outweighed the risks."

Dr. Fagerlin has also conducted a study of women and raloxifene, which has been shown to significantly reduce breast cancer risk but with fewer side effects. Although the data has not yet been published, she said the findings appeared to be similar.

Some women say they simply do not want to take a pill every day. In fact, though, most consumers are willing to take pills for prevention if they are convinced of the benefits. Millions of women take daily birth control pills, for example, and few people seem reluctant to take multivitamins - or aspirin to prevent heart attacks.

But in the case of anticancer drugs, a phenomenon known as omission bias appears to be at work. People tend to worry more about a low risk of harm from something they do (like taking a pill or a vaccine) than about a higher risk of harm from doing nothing.

In a seminal 1994 study of vaccination trends for whooping cough, researchers from the University of Pennsylvania found that parents gave far more credence to hypothetical concerns about side effects than about the very real danger of an unvaccinated child's becoming severely ill with the disease.

"I think this involves complex human psychology," said Dr. Larry Norton, deputy physician in chief for breast cancer programs at Memorial Sloan-Kettering Cancer Center in New York. "A number of studies have shown that people are more concerned about losing something than they are about gaining something."

Dr. Norton said he was optimistic that new research into aromatase inhibitors, which lower the amount of estrogen in the body, would lead to new prevention options with less bothersome side effects. Meanwhile, he said, it was unlikely that large numbers of healthy women would ever be persuaded to take tamoxifen as a breast cancer prevention drug.

"It's not a matter of being right or wrong; it's about what's happening now," he said. "The drug has been available for a long period of time, and the public is as educated as it can be, and we still haven't seen a great use of the drug."

Drug for Alzheimer's disease does not appear to slow cognitive decline

Although there were promising results in a phase 2 trial, patients with mild Alzheimer disease who received the drug tarenflurbil as part of a phase 3 trial did not have better outcomes on measures of cognitive decline or loss of activities of daily living compared to patients who received placebo, according to a study in the December 16 issue of *JAMA*.

A leading theory on the pathophysiology of Alzheimer disease (AD) is the overproduction of amyloid- β ($A\beta$; a peptide of certain amino acids that appear to be the main constituent of amyloid plaques in the brains of patients with AD), particularly 42 amino acid peptide $A\beta_{42}$. "Tarenflurbil, a selective $A\beta_{42}$ -lowering agent,

demonstrated encouraging results on cognitive and functional outcomes among mildly affected patients in an earlier phase 2 trial," the authors write.

Robert C. Green, M.D., M.P.H., of the Boston University Schools of Medicine and Public Health, and colleagues conducted a large phase 3, randomized trial of tarenflurbil for patients with mild AD to determine its efficacy, safety and tolerability. The study, conducted at 133 trial sites in the United States, included 1,684 participants who were randomized, of whom 1,649 were included in the analysis, and 1,046 completed the 18-month trial. Patients were randomized to tarenflurbil, 800 mg, or placebo, administered twice a day.

The researchers found that tarenflurbil had no beneficial effect on the primary outcomes of cognition and activities of daily living after 18 months. There were also no significant differences on secondary outcomes, which included other AD assessment measures such as quality of life and caregiver burden.

Regarding adverse events, more participants taking tarenflurbil than those taking placebo experienced dizziness, upper respiratory tract infections and anemia.

"Our results are ... a reminder that interventions affecting amyloid have not yet been shown to alter the course of AD," the authors conclude.

(JAMA. 2009;302[23]:2557-2564. Available pre-embargo to the media at www.jamamedia.org)

Editor's Note: Please see the article for additional information, including other authors, author contributions and affiliations, financial disclosures, funding and support, etc.

Editorial: Late-Life Dementias - Does This Unyielding Global Challenge Require a Broader View?

In an accompanying editorial, Thomas J. Montine, M.D., Ph.D., of the University of Washington, and Eric B. Larson, M.D., M.P.H., of the Group Health Research Institute, Seattle, comment on the findings of the two studies in this week's JAMA regarding dementia and Alzheimer disease.

"The null outcome for the leading γ -secretase modulator [tarenflurbil] in a phase 3 trial and the surprisingly strong association between plasma leptin and incident Alzheimer disease underscore the need to broaden the current view of potential therapeutic approaches to cognitive impairment and dementia in older individuals. Research must seek a fuller understanding of the complex convergence of Alzheimer disease with vascular disease and Lewy body disease [a type of dementia], the application of biomarkers and other surrogates to clinical trials to quantify specific pharmacologic effects, and a multimodal approach to prevention and treatment. Doing so could have profound effects on the increasing numbers of older persons and on the societies confronting the global challenge of late-life dementias in decades to come."

(JAMA. 2009;302[23]:2593-2594. Available pre-embargo to the media at www.jamamedia.org)

Septic shock: Nitric oxide beneficial after all

Ghent, 15 December 2009 - Scientists at VIB and Ghent University in Flanders, Belgium have found an unexpected ally for the treatment of septic shock, the major cause of death in intensive care units. By inducing the release of nitric oxide (NO) gas in mice with septic shock, researchers Anje Cauwels and Peter Brouckaert discovered that the animal's organs showed much less damage, while their chances of survival increased significantly. That's contrary to all expectations, since it is generally assumed that nitric oxide is responsible for the potentially lethal drop in blood pressure in septic shock.

Septic shock, or sepsis, is a medical condition in which acute inflammation, low blood pressure, and blood clotting cause a dangerous decrease in the delivery of blood to the organs. Because of the lack of oxygen, the patient's organs start to fail, one after the other. Currently, only supportive treatment is available.

It is generally assumed that nitric oxide (NO) gas is responsible for the hypotension and cardiovascular collapse in septic shock. Therefore, a lot of medical research is focused on combating NO, which is also a messenger molecule in the body. Attempts to inhibit its production paradoxically led to a worsening of the organ damage and in an increased lethality, both in animal models and in a clinical trial in sepsis patients. This led to the assumption that NO also has positive effects in sepsis, but up to now NO remained a prime suspect for the pathogenesis of the cardiovascular shock.

The team in Ghent is turning this paradigm upside-down in an article that will appear in *The Journal of Experimental Medicine* on Monday 21 December 2009. During their research, Cauwels and Brouckaert administered nitrite – a substance that releases NO – to mice with septic shock. The nitrite treatment, in sharp contrast with the worsening effect of inhibiting NO-synthesis, significantly attenuates hypothermia, mitochondrial damage, oxidative stress and dysfunction, tissue infarction, and mortality in mice. It is not yet known what mechanisms are at work behind this observation. That will be the subject of further research.

For now, not only is this discovery revolutionizing the way in which scientists view nitric oxide's role in septic shock – it also opens possibilities for treatment. Instead of trying to prevent the effects of NO, they should rather be imitated or reinforced to provide a solution for saving organs or particular parts of the body where there is a lack of oxygen due to septic shock.

Cases

Exam-Room Rules: What's in a Name?

By ANNE MARIE VALINOTI, M.D.

A patient of mine is a dental hygienist in her late 50s who works in her son's dental practice. On her first day of work, she told me, her son asked her to call him "Doctor."

And, he asked, "Is it O.K. if I call you 'Barbara'?"



Wesley Bedrosian

Sure, she told him. They set to work on the first patient, and after she handed her son an instrument he needed, he graciously said, "Thanks. And, he asked, "Is it O.K. if I call you 'Barbara'?"

Sure, she told him. They set to work on the first patient, and after she handed her son an instrument he needed, he graciously said, "Thanks, Mom."

This got me thinking of how, in my own career, I have always been addressed as "Dr. Valinoti." Freshly minted M.D.'s, some as young as 25, get a title of respect while seasoned nurses in the hospital are Betty, Kaye or Nancy.

I remembered the absurdity of this situation when, as an intern, I was addressing critical care nurses with decades of experience by their first names while they deferentially called me "Doctor." These were women who had started their careers when I was still playing with Barbie dolls, yet where were their professional titles? Like most things in medical training, I got used to it, and it became second nature.

One thing I am still getting used to, though, is when patients call me by my first name. There seems to be a void in this area of etiquette: How does one address one's physician? It is almost always an older patient who will use my first name, in a friendly, offhand way. And, I have observed, these patients are usually men. It might seem natural if I have had a long-term relationship with these people, caring for them over the years, but often these patients seem to make a decision at the outset to be on a first-name basis with me. I wonder about these people. Are they trying to be chummy? Is it a power thing, making them feel less vulnerable while they sit half naked on the exam table? Do they just call everyone by their first names?

At first I thought that perhaps this was a phenomenon particular to female physicians. For example, a colleague with whom I worked was a distinguished physician in the community, yet, she said with a sigh, "All my patients call me 'Sally.'" Clearly, she did not insist on this with her patients; it had just evolved.

But the male physicians in my practice have described the same situation. I remember being on call for the practice one night and speaking to a patient of another physician in my group. She went on in detail about the tests and treatment she was receiving from Adam, her doctor. After the conversation, I assumed that she was his personal friend. "No," he told me the next day. "I really just only met her."

Regardless of whether I am "Anne Marie" or "Dr. Valinoti" to a patient, I rarely call a patient by his or her first name. As a rule, patients who are my senior are always "Mr./Ms./Dr." Patients I meet for the first time are always addressed by their title, even teenagers (it seems silly, I know). Although many patients introduce themselves by their first name, I would never presume to address them as such without their specific permission. And even then, frankly, I find it hard to call a man old enough to be my father "Frank" or "Jim." It is akin to my habit of still addressing old friends of my parents by their formal titles.

A study published in *The British Medical Journal* looked at the question of patient preferences regarding how doctors address them. Interestingly, most patients surveyed, particularly those younger than 65, preferred that their physicians call them by their first name.

But doctors do this at their own peril. A physician friend of mine experienced this firsthand when he made the mistake of calling a woman of a certain age by her first name during a visit. "That's Mrs. White, thank you," she told him, icily.

"I never forgot that one," he said, remembering how he sheepishly finished her exam.

It is helpful for me to think about the doctor-patient relationship from time to time, especially in terms of how my patients and I communicate. The importance of effective communication in that setting cannot be overemphasized. Accurate diagnosis and treatment of medical ailments depend on the doctor's clear understanding of the entire person who sits before her. A good internist will recognize dozens of subtleties during a simple face-to-face interview - subtleties that cannot be detected by the most sophisticated and expensive scans.

As medical costs climb skyward in our country, there is growing recognition that excellent primary care might be the foundation of a more accessible, affordable health care system. Great primary care doctors are, by necessity, great communicators. And, let's face it: all communication starts with what we call one another.

Dr. Anne Marie Valinoti is an internist in northern New Jersey.

First immunological clue to why some H1N1 patients get very ill or die

An international team of Canadian and Spanish scientists have found the first potential immunological clue of why some people develop severe pneumonia when infected by the pandemic H1N1 virus.

The study analyzed different levels of regulating molecules for 20 hospitalized patients, 15 outpatients and 15 control subjects in 10 Spanish hospitals during the first pandemic wave in July and August 2009. Researchers from the Hospital Clinico Universitario de Valladolid in Spain and the University Health Network found high levels of a molecule called interleukin 17 in the blood of severe H1N1 patients, and low levels in patients with the mild form of the disease.

Interleukin 17 is produced by the body and is important in the normal regulation of white blood cells which fight infection and disease. In certain circumstances, the molecule becomes "out of control", leading to inflammation and autoimmune diseases. The research paper titled, "Th1 and Th17 hypercytokinemia as early host response signature in severe pandemic influenza" is published in the December issue (13) of the Critical Care journal: <http://ccforum.com/> .

"In rare cases, the virus causes lung infections requiring patients to be treated in hospital. By targeting or blocking TH17 in the future, we could potentially reduce the amount of inflammation in the lungs and speed up recovery," says Dr. David Kelvin, the leader of the Canadian team, Head of the Experimental Therapeutics Division, Toronto General Hospital Research Institute, University Health Network and Professor of Immunology, University of Toronto. Dr. Kelvin added that the clinical applications of this work is still many years away.

Dr. Kelvin did note, however, that a test to determine who has high levels of the molecule is possible in the near future. "A diagnostic test could let us know early who is at risk for the severe form of this illness quickly," he said, adding that high levels would indicate a failure of the immune system to eliminate the virus, similar to what happened during the 1918 Spanish flu when huge numbers of deaths occurred due to a deadly influenza A virus strain of subtype H1N1.

Dr. Jesus Bermejo-Martin, the coordinator of the Spanish team, thinks that identifying drugs able to regulate the activity of IL-17 may provide alternative treatments for patients with severe H1N1.

Researchers take the inside route to halt bleeding

Synthetic platelets halve clotting time

Blood loss is a major cause of death from roadside bombs to freeway crashes. Traumatic injury, the leading cause of death for people age 4 to 44, often overwhelms the body's natural blood-clotting process.

In an effort to enhance the natural process, a team led by Erin Lavik, a new Case Western Reserve University biomedical engineering professor, and her former doctoral student, James P. Bertram, built synthetic platelets that show promise in halting internal and external bleeding.

Their work is published in Science Translational Medicine.

The researchers were inspired by studies showing there are few options to treat soldiers suffering from internal injuries in Afghanistan and Iraq. They wanted to develop a treatment medics can keep in their field packs.

"The military has been phenomenal at developing technology to halt bleeding, but the technology has been effective only on external or compressible injuries," Lavik said. "This could be a compliment to current therapies."

Blood platelets are the structural and chemical foundation of blood clotting, a complex cascade of events that works well with normal cuts and scrapes but can be overmatched by serious injury.

Using other's platelets can enhance clotting but carries risks of several complications. And these platelets must be refrigerated and have a short shelf life.

Bertram and Lavik developed platelets made from biodegradable polymers. The synthetic platelets are designed to home in and link up with natural platelets at the site of an injury.

In essence, adding artificial platelets to a traumatic injury site is akin to adding sand bags to a levy along a flooding river.

The natural platelets, activated by injury, emit chemicals that bind natural platelets and the additional synthetics into a larger clot that quickly stems the bleeding.

In testing, rat models injected with synthetic platelets prior to injury stopped bleeding in half the time of untreated models. Untreated models injected 20 seconds after injury stopped bleeding in 23 percent less time than models left untreated.

In another comparison, the artificial platelets resulted in clotting times about 25 percent faster than wounds treated with recombinant factor VIIa, which is the current state of the art treatment for uncontrolled bleeding in surgery and emergency rooms. While the recombinant factor is used on various injuries, its cost can be in the

tens of thousands of dollars per treatment and is not used in patients suffering head or spinal cord injuries, due to risk of complications.

Lavik said her team made platelets from polymers already used in treatments approved by the Food and Drug Administration in hopes the new treatment might be approved faster. They also built the parts of the synthetic platelets that bind to natural platelets from relatively short pieces of proteins because they're more stable than longer pieces and cheaper.

To avoid formation of an artificial clot, each synthetic platelet is built with a surrounding water shield. Fluorescing compounds showed the synthetic platelets not bound in clots were flushed from the rat model's system in a day. No ill effects were seen in the following week.

Testing also showed the synthetic platelets remain viable after sitting on a shelf for at least two weeks.

Lavik is seeking grants to further test the platelets.

Soap opera in the marsh: Coots foil nest invaders, reject impostors

SANTA CRUZ, CA--The American coot is a drab, seemingly unremarkable marsh bird common throughout North America. But its reproductive life is full of deception and violence.

According to biologists at the University of California, Santa Cruz, coots have evolved a remarkable set of cognitive abilities to thwart other coots that lay eggs in their neighbors' nests. In 2003, the researchers showed that coots can count their own eggs and reject ones laid in their nests by other coots. Their latest findings, published this week in *Nature*, show that coot parents can tell the difference between their own chicks and any impostors that manage to hatch in their nest, and they will violently reject most impostor chicks.

The findings are particularly striking because so many birds seem to be unable to recognize the chicks of species such as cowbirds and cuckoos, which always lay their eggs in the nests of other birds. This behavior is called brood parasitism, and its success has posed a longstanding challenge to evolutionary theorists.

"When you see a little songbird struggling to feed an enormous cowbird chick, you have to wonder why it can't recognize the parasitic chick when it is so obvious to us," said Bruce Lyon, professor of ecology and evolutionary biology at UCSC and coauthor of the paper. "The coot study shows that chick recognition can evolve, even when the chicks are the same species and all look the same to us."

The researchers found that coots learn to recognize their own chicks each year by using the first-hatched chicks as a template to which other chicks are compared. This learning mechanism may explain why it is so hard for chick recognition to evolve among the hosts of cowbirds and cuckoos, said Dai Shizuka, a UCSC graduate student and first author of the paper.

"Cuckoo and cowbird chicks tend to hatch before the host chicks, so their hosts can't use hatching order as a cue for chick recognition," Shizuka said. "As long as recognition has to be learned, you run the risk of learning incorrectly, and that could be the bottleneck."

These findings provide indirect support for a theory proposed by Arnon Lotem of Tel Aviv University, who attributed the absence of chick recognition in most cuckoo hosts to the high cost of mistaken imprinting. By experimentally causing mistaken imprinting in coots, Shizuka and Lyon confirmed that learned chick recognition does have potential costs.

Lotem assumed a classic imprinting mechanism that would occur only once, during the adult bird's first breeding season. Coots, however, seem to "imprint" on their first-hatched chicks each year. Coots reliably imprint on their own chicks because the first-laid eggs are the first to hatch, and parasitic eggs are deposited only in nests that already have eggs in them.

"It's not that coots are exceptionally smart. They just have reliable information that allows them to do what we expect all hosts 'should' be doing to defend themselves against parasitism," Shizuka said.

The common cuckoo and brown-headed cowbird are specialists in brood parasitism, shifting the burden of parental care onto other species rather than building their own nests. In coots, brood parasitism seems to be an optional component of a reproductive strategy based on laying large numbers of eggs. Depositing a few eggs in a neighbor's nest is just another way to increase the number of potential offspring.

The chances of survival in a neighbor's nest may be slim, but coots habitually lay more eggs than are likely to survive, Lyon said. Only in the best of years is there enough food for all of the chicks; in a typical year, about half of the chicks in each brood starve to death, he said. If a parasitic chick survives, another chick in the brood must die, which explains why coots have evolved such strong defenses against parasitism.

"We actually set out to study how coots bring their brood size into alignment with the availability of food, and what role hatching order plays in the culling process. But we kept seeing anecdotal evidence in the field that something else was going on," Lyon said. "With the parasitic chicks, they don't just let them starve, they attack them with a viciousness we hadn't seen before."

The researchers got a one-year extension to their grant, funded by the National Science Foundation, to study chick recognition at their study site in British Columbia. The experiment required removing eggs from the nests at the pipping stage (when the chick starts trying to break the shell) and hatching them in incubators. This allowed the researchers to tag the chicks and record which eggs they came from before returning them to the nests in a controlled sequence.

In one set of nests, the parents got their own chicks back on the first day. After that, chicks were returned to the nests in pairs consisting of an unrelated chick and a chick that belonged to the parents. The unrelated chicks were all siblings. In a second set of nests, the first chicks returned were not related to the parents, after which chicks were returned in pairs as in the first set of nests.

In all cases, a chick's chances of survival were highest if it was returned to the nest on the first day or was a sibling of the first chicks. If the first chicks were unrelated to the parents, the parents would favor them and their siblings and drive off their own chicks. "The parents learn the first chicks they start taking care of as their own, and base their decisions about later chicks on that," Shizuka said.

Using first-hatched chicks as the basis for recognition will be adaptive only if there is a low probability of parasitic chicks hatching first, he said. In a search of the scientific literature, Shizuka found two recent examples of birds, both in Australia, that appear to be able to recognize and reject cuckoo chicks. He said he hopes to learn more about those species and find out how they compare to coots.

The researchers also want to find out what cues coot parents use to recognize their chicks. The possibilities include smell, vocal calls, and visual cues such as plumage. "Those are all plausible hypotheses, but we don't know yet," Shizuka said.

Should flowers be banned in hospitals?

Does flower water harbour potentially deadly bacteria? Do bedside blooms compete with patients for oxygen? Do bouquets pose a health and safety risk around medical equipment?

These are some of the reasons given by many hospital wards in the UK to ban, or at least discourage, bedside bouquets. But is this anxiety justified, and what do patients feel about flower policies?

To find out more, Giskin Day and Naiome Carter of Imperial College London surveyed the literature and talked to patients and staff at the Royal Brompton Hospital and the Chelsea & Westminster Hospital about their attitudes towards flowers. Their findings are published on bmj.com today, as part of the Christmas issue.

A 1973 study found that flower water contained high counts of bacteria. However, subsequent research found no evidence that flower water has ever caused hospital acquired infection. Yet hospitals continue to prohibit flowers on the ward in the absence of any official ruling from the Department of Health.

Other negative effects have been ascribed to flowers. In the late 1900s it was common to remove flowers from bedsides at night as there was widespread belief that the blooms competed for patients' oxygen. But this was dismissed as a myth when studies showed that the impact of flowers on air composition in wards was negligible and did not justify the labour involved in moving flowers to and fro.

Southend University Hospital recently imposed a blanket ban on flowers on the grounds that they posed a health and safety risk around high tech medical equipment, but it could be argued that flower vases are no more risky than having crockery containing drinks or food around bedsides.

There is some evidence that most nurses are not in favour of flowers, partly because of the amount of work generated. Interviews with staff in this study also suggest that they are more concerned about the practical implications of managing flowers than risks of infection.

Other studies report that flowers have immediate and long term beneficial effects on emotional reactions, mood, social behaviours, and memory for men and women alike. One trial found that patients in hospital rooms with plants and flowers needed significantly fewer postoperative analgesics; had reduced systolic blood pressure and heart rate; lower ratings of pain, anxiety, and fatigue; and had more positive feelings than patients in the control group.

Given that flowers and herbs have been used as remedies in the earliest hospitals, and as a means of cheering up the hospital environment for at least 200 years, it seems remarkable that flowers still tend to be treated in an ad hoc fashion in hospitals, say the authors. Although flowers undoubtedly can be a time consuming nuisance, the giving and receiving of flowers is a culturally important transaction, they conclude.

In an accompanying editorial, Simon Cohn, a medical anthropologist at Cambridge University argues that flowers have fallen victim to new definitions of care.

He suggests that the decision to ban flowers "seems to reflect a much broader shift towards a model of care that has little time or place for more messy and nebulous elements."

Christmas is a time for giving, so perhaps now is a good time to think about care not as an outcome that can be delivered but as a relationship that can be exchanged, he concludes.

Astronomers find world with thick, inhospitable atmosphere and an icy heart

In this week's issue of *Nature*, astronomers announce the discovery of a planet around the nearby, low-mass star GJ1214 [2]. It is the second time a transiting super-Earth has been detected, after the recent discovery of the planet Corot-7b [3]. A transit occurs when the planet's orbit is aligned so that we see it crossing the face of its parent star. The newly discovered planet has a mass about six times that of our terrestrial home and 2.7 times its radius, falling in size between the Earth and the ice giants of the Solar System, Uranus and Neptune.

Although the mass of GJ1214b is similar to that of Corot-7b, its radius is much larger, suggesting that the composition of the two planets must be quite different. While Corot-7b probably has a rocky core and may be covered with lava, astronomers believe that three quarters of GJ1214b is composed of water ice, the rest being made of silicon and iron.

GJ1214b orbits its star once every 38 hours at a distance of only two million kilometres - 70 times closer to its star than the Earth is to the Sun. "Being so close to its host star, the planet must have a surface temperature of about 200 degrees Celsius, too hot for water to be liquid," says David Charbonneau, lead author of the paper reporting the discovery.

When the astronomers compared the measured radius of GJ1214b with theoretical models of planets, they found that the observed radius exceeds the models' predictions: there is something more than the planet's solid surface blocking the star's light - a surrounding atmosphere, 200 km thick. "This atmosphere is much thicker than that of the Earth, so the high pressure and absence of light would rule out life as we know it," says Charbonneau, "but these conditions are still very interesting, as they could allow for some complex chemistry to take place."

The differences between the two planets suggest that super-Earths form in many different ways, says David Charbonneau of Harvard University, who led the team that discovered GJ 1214b. If it is a water world, "it could be the first clear example of a whole new population of exoplanets", says Sara Seager of the Massachusetts Institute of Technology.

Theoretical models by Seager and student Leslie Rogers show that such a planet could form if it began life much farther from its star. The lower temperatures there would have led to an ice-rock composition similar to Jupiter's moon Ganymede. Later, as the planet shifted into a tighter orbit, it would become a water world with a steamy atmosphere. Other possibilities include a small rocky planet with an implausibly vast atmosphere possibly replenished by volcanic activity.

"Because the planet is too hot to have kept an atmosphere for long, GJ1214b represents the first opportunity to study a newly formed atmosphere enshrouding a world orbiting another star," adds team member Xavier Bonfils. "Because the planet is so close to us, it will be possible to study its atmosphere even with current facilities."

The planet was first discovered as a transiting object within the M_{Earth} project, which follows about 2000 low-mass stars to look for transits by exoplanets [4]. To confirm the planetary nature of GJ1214b and to obtain its mass (using the so-called Doppler method), the astronomers needed the full precision of the HARPS spectrograph, attached to ESO's 3.6-metre telescope at La Silla. An instrument with unrivalled stability and great precision, HARPS is the world's most successful hunter for small exoplanets.

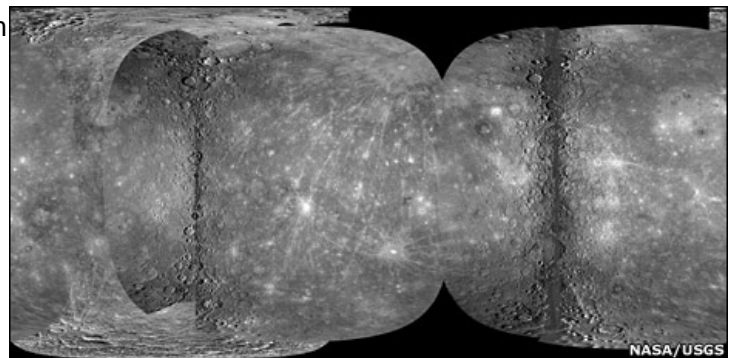
"This is the second super-Earth exoplanet for which the mass and radius could be obtained, allowing us to determine the density and to infer the inner structure," adds co-author Stephane Udry. "In both cases, data from HARPS was essential to characterise the planet."

"The differences in composition between these two planets are relevant to the quest for habitable worlds," concludes Charbonneau. If super-Earth planets in general are surrounded by an atmosphere similar to that of GJ1214b, they may well be inhospitable to the development of life as we know it on our own planet.

Best ever atlas of 'iron planet'

By Jonathan Amos Science correspondent, BBC News, San Francisco

The most complete and most detailed atlas of Mercury has been assembled. It is only now thanks to the Messenger spacecraft that researchers have the imagery necessary to construct a truly global map of the innermost planet. The probe's latest pictures added to those of the earlier Mariner 10 mission give near-total coverage.



About 2% of the planet's surface remains to be mapped

Mapping experts at the US Geological Survey have been working to piece together all of these images in their possession into a giant mosaic. This has been displayed here at the American Geophysical Union's (AGU) Fall Meeting, the world's largest annual gathering of Earth scientists.

"Mariner 10 in the 1970s took about 40% of the images of the surface and with the flybys of Messenger, we've now got 98% of the surface; and the only parts that we don't have are at the poles - parts of the north pole and the south pole," explained Kris Becker, a cartographer and programmer at the USGS Astrogeology Research Center in Flagstaff, Arizona.

In March 2011, Messenger will go into orbit around Mercury and it will begin systematic mapping of the planet. The expectation is that the finished atlas of the "iron planet" will have a resolution of 200m per pixel.

Even so there will still be some small areas in permanently shadowed craters that will remain unseen.

Crater posterity

Many people will have used "stitch software" that comes with their digital cameras to turn holiday snaps into panoramas. The USGS is doing something similar when it joins up the Messenger and Mariner images, but the task is obviously a great deal more complex and sophisticated. "It's a bit of a challenge," said Mr Becker.

"You've got different resolutions and different lighting conditions in there. So we have software that helps us start a control network that ties all the image common features together, and it basically creates a minimisation of the errors in among all those pictures."

A good atlas will be an important tool for mission scientists when Messenger finally settles into orbit. It will be used to target better the scientific observations made by the probe's instruments.

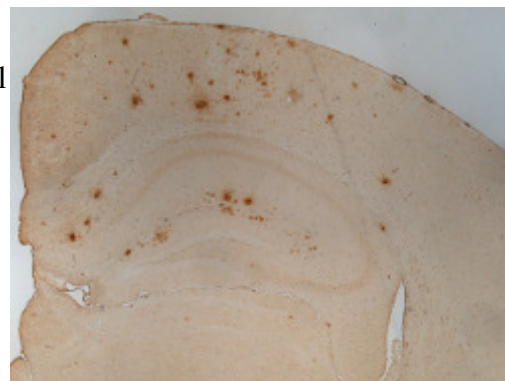
One critical task ahead will be naming all the features visible in the atlas. Cliffs on Mercury are named after the ships of famous explorers. The planet's craters can carry the names of long-dead artists, musicians, or authors.

The European Space Agency (Esa) has recently approved construction of a mission to the planet called BepiColombo. It will be launched in 2014. The mission consists of two spacecraft - an orbiter for planetary investigation, led by Esa, and one for magnetospheric studies, led by the Jaxa (Japan Aerospace Exploration Agency). The satellite duo will reach Mercury in 2020 after a six-year, seven-billion-km flight towards the inner Solar System.

Diet high in methionine could increase risk of Alzheimer's

A diet rich in methionine, an amino acid typically found in red meats, fish, beans, eggs, garlic, lentils, onions, yogurt and seeds, can possibly increase the risk of developing Alzheimer's disease, according to a study by Temple researchers. The researchers published their findings, titled "Diet-induced hyperhomocysteinemia increases Amyloid- β formation and deposition in a mouse model of Alzheimer's disease," in the journal *Current Alzheimer Research*.

"When methionine reaches too high a level, our body tries to protect itself by transforming it into a particular amino acid called homocysteine," said lead researcher Domenico Praticò, an associate professor of pharmacology in the School of Medicine. "The data from previous studies show - even in humans - when the level of homocysteine in the blood is high, there is a higher risk of developing dementia. We hypothesized that high levels of homocysteine in an animal model of Alzheimer's would accelerate the disease."



A brain sample taken from mice used in the study shows dark spots consistent with amyloid plaque, indicative of the progression of Alzheimer's disease. Mice fed diets rich in methionine had an increased level of homocysteine and up to 40 percent more amyloid plaque in their brains. Temple University Department of Pharmacology

Using a seven-month old mouse model of the disease, they fed one group an eight-month diet of regular food and another group a diet high in methionine. The mice were then tested at 15 months of age - the equivalent of a 70-year-old human.

"We found that the mice with the normal diet had normal homocysteine levels, but the mice with the high methionine diet had significantly increased levels of homocysteine, very similar to human subjects with hyperhomocysteinemia," said Praticò. "The group with the high methionine diet also had up to 40 percent more amyloid plaque in their brains, which is a measurement of how much Alzheimer's disease has developed."

The researchers also examined capacity to learn a new task and found it diminished in the group with the diet high in methionine.

Still, Praticò emphasized, methionine is an essential amino acid for the human body and "stopping one's intake of methionine won't prevent Alzheimer's. But people who have a diet high in red meat, for instance,

could be more at risk because they are more likely to develop this high level of circulating homocysteine," he said.

In addition to Praticò, other researchers working on the study included Jia-Min Zhuo and Hong Wang from Temple's Department of Pharmacology, Thomas J. Gould and George S. Portugal from Temple's Department of Psychology, and Warren D. Kruger from the Fox Chase Cancer Center.

The study was funded by grants from the National Institute of Health and the Alzheimer's Association, in addition to support from Pennsylvania Commonwealth through the Fox Chase Cancer Center.

Researchers discover new 'golden ratios' for female facial beauty

TORONTO, ON – Beauty is not only in the eye of the beholder but also in the relationship of the eyes and mouth of the beholder. The distance between a woman's eyes and the distance between her eyes and her mouth are key factors in determining how attractive she is to others, according to new psychology research from the University of California, San Diego and the University of Toronto.

Pamela Pallett and Stephen Link of UC San Diego and Kang Lee of the University of Toronto tested the existence of an ideal facial feature arrangement. They successfully identified the optimal relation between the eyes, the mouth and the edge of the face for individual beauty.

In four separate experiments, the researchers asked university students to make paired comparisons of attractiveness between female faces with identical facial features but different eye-mouth distances and different distances between the eyes.

They discovered two "golden ratios," one for length and one for width. Female faces were judged more attractive when the vertical distance between their eyes and the mouth was approximately 36 percent of the face's length, and the horizontal distance between their eyes was approximately 46 percent of the face's width.

Interestingly, these proportions correspond with those of an average face.

"People have tried and failed to find these ratios since antiquity. The ancient Greeks found what they believed was a 'golden ratio' – also known as 'phi' or the 'divine proportion' – and used it in their architecture and art. Some even suggest that Leonardo Da Vinci used the golden ratio when painting his 'Mona Lisa.' But there was never any proof that the golden ratio was special. As it turns out, it isn't. Instead of phi, we showed that average distances between the eyes, mouth and face contour form the true golden ratios," said Pallett, a post-doctoral fellow in psychology at UC San Diego and also an alumna of the department.

"We already know that different facial features make a female face attractive – large eyes, for example, or full lips," said Lee, a professor at University of Toronto and the director of the Institute of Child Study at the Ontario Institute for Studies in Education. "Our study conclusively proves that the structure of faces – the relation between our face contour and the eyes, mouth and nose – also contributes to our perception of facial attractiveness. Our finding also explains why sometimes an attractive person looks unattractive or vice versa after a haircut, because hairdos change the ratios."

The researchers suggest that the perception of facial attractiveness is a result of a cognitive averaging process by which people take in all the faces they see and average them to get an ideal width ratio and an ideal length ratio. They also posit that "averageness" (like symmetry) is a proxy for health, and that we may be predisposed by biology and evolution to find average faces attractive.

The authors note that only Caucasian female faces were studied. Further studies are needed to know whether there is a different set of golden ratios for male faces and for faces from other races or for children's faces.

The research is published by the journal Vision Research and was supported by grants from the National Institutes of Health and the American Psychological Association.

UR Study Reveals Chemo's Toxicity to Brain, Possible Treatment

Researchers have developed a novel animal model showing that four commonly used chemotherapy drugs disrupt the birth of new brain cells, and that the condition could be partially reversed with the growth factor IGF-1. Published early online in the journal Cancer Investigation, the University of Rochester Medical Center study is relevant to the legions of cancer survivors who experience a frustrating decline in cognitive function after chemotherapy treatment, known as chemo brain.

"It is not yet clear how our results can be generally applied to humans but we have taken a very significant step toward reproducing a debilitating condition and finding ways to treat it," said Robert Gross, M.D., Ph.D., professor of Neurology and of Pharmacology and Physiology at URM and principal investigator of the study.

Chemo brain is a newly recognized condition. The URM team found surprising data about how the four drugs impact the brain, Gross said, and they are the first to report that the experimental insulin-like growth factor, IGF-1, may be beneficial.

The study was funded by a Department of Defense grant to Gross and by the National Cancer Institute to co-investigator and lead author, Michelle Janelins, Ph.D., research assistant professor of Radiation Oncology at the James P. Wilmot Cancer Center.

More than 11 million Americans are living today after receiving a cancer diagnosis. Many of them have endured chemotherapy and although the side effects during treatment are well known, the lingering neurological effects are more puzzling. Patients often report memory lapses, trouble concentrating, confusion, difficulty multi-tasking and slow thinking for weeks, months or years after treatment ends.

The URMC team hypothesized that cognitive problems might stem from chemo destroying the ability of brain cells to regenerate in the hippocampus, which is primarily involved in memory formation and mood. They sought a way to find the mechanisms at work and to manage the adverse effects on the brain before, during and after chemotherapy treatment.

Researchers also hypothesized that chemotherapy drugs known to cross the blood-brain barrier would be a bigger threat to brain cells than drugs that do not cross the blood-brain barrier. To test the hypothesis, they investigated the effects of routinely used doses of cyclophosphamide and fluorouracil, which do cross into the brain, against paclitaxel and doxorubicin, which do not.

Unexpectedly, all four drugs caused a significant breakdown in brain cell proliferation in the animal model. A statistical analysis of cell regeneration showed a 15.4 percent reduction in new brain cells following fluorouracil, a 30.5 percent reduction following cyclophosphamide, a 22.4 percent reduction following doxorubicin, and a 36 percent reduction following paclitaxel.

"It could be that all of the chemo drugs cross into the brain after all, or that they act via peripheral mechanisms, such as inflammation, that could open up the blood-brain barrier," Gross said.

"Neurogenesis can also be altered by stress, sleep deprivation and depression, all of which are common among cancer patients," added Janelsins. "More thorough studies are needed to understand the interplay of these factors and the long-term effects of chemotherapy on the brain."

Researchers conducted a second study of a single high dose of cyclophosphamide, a mainstay of adjuvant chemotherapy for breast cancer, because chemo brain is a frequent complaint of people receiving this drug. The single high dose resulted in a 40.9 percent reduction in newly divided brain cells, the study said.

In previous studies the experimental growth hormone IGF-1 had demonstrated that it could generally promote new brain cell development within the central nervous system. Thus, investigators chose to test its effect in the animal model.

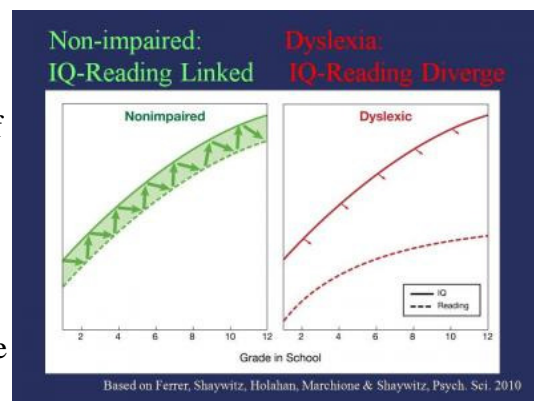
They administered IGF-1 prior to and following a conventional cyclophosphamide multiple-dose regimen, and a single, high-dose of cyclophosphamide. The IGF-1 seemed to increase the number of new brain cells in both models, but was more effective in the high-dose model, the study concluded.

The research team plans to conduct additional studies which will allow them to further test the impact of IGF-1 and other related interventions on the molecular and behavioral consequences of chemotherapy. *A multidisciplinary group of scientists participated in the study. The research grew from discussions between URMC cancer investigators and experts in epilepsy, who also study damage to the hippocampus region and wondered about a connection to chemo-brain. In addition to Gross and Janelsins, collaborators included Wilmet Cancer Center faculty Joseph A. Roscoe, Ph.D., Gary R. Morrow, Ph.D., Charles E. Heckler, Ph.D., and Pascal Jean-Pierre, Ph.D.; Lisa A. Opanashuk, Ph.D., and Bryan D. Thompson, of the Department of Environmental Medicine; and Michel J. Berg, M.D., of the Department of Neurology.*

Dyslexia defined: New Yale study 'uncouples' reading and IQ over time

Contrary to popular belief, some very smart, accomplished people cannot read well. This unexpected difficulty in reading in relation to intelligence, education and professional status is called dyslexia, and researchers at Yale School of Medicine and University of California Davis, have presented new data that explain how otherwise bright and intelligent people struggle to read.

The study, which will be published in the January 1, 2010 issue of the journal *Psychological Science*, provides a validated definition of dyslexia. "For the first time, we've found empirical evidence that shows the relationship between IQ and reading over time differs for typical compared to dyslexic readers," said Sally E. Shaywitz, M.D., the Audrey G. Ratner Professor in Learning Development at Yale School of Medicine's Department of Pediatrics, and co-director of the newly formed Yale Center for Dyslexia and Creativity.



This graph shows the divergence between IQ and Reading ability in dyslexics. It also shows that IQ and reading ability track together in typical readers. Sally and Bennett Shaywitz, Yale University, Psychological Science

Using data from the Connecticut Longitudinal Study, an ongoing 12-year study of cognitive and behavioral development in a representative sample of 445 Connecticut schoolchildren, Shaywitz and her team tested each

child in reading every year and tested for IQ every other year. They were looking for evidence to show how the dissociation between cognitive ability and reading ability might develop in children.

The researchers found that in typical readers, IQ and reading not only track together, but also influence each other over time. But in children with dyslexia, IQ and reading are not linked over time and do not influence one another. This explains why a dyslexic can be both bright and not read well.

"I've seen so many children who are struggling to read but have a high IQ," said Shaywitz. "Our findings of an uncoupling between IQ and reading, and the influence of this uncoupling on the developmental trajectory of reading, provide evidence to support the concept that dyslexia is an unexpected difficulty with reading in children who otherwise have the intelligence to learn to read."

Typical readers learn how to associate letters with a specific sound. "All they have to do is look at the letters and it's automatic," Shaywitz explained. "It's like breathing; you don't have to tell your lungs to take in air. In dyslexia, this process remains manual." Each time a dyslexic sees a word, it's as if they've never seen it before. People with dyslexia have to read slowly, re-read, and sometimes use a marker so they don't lose their place.

"A key characteristic of dyslexia is that the unexpected difficulty refers to a disparity within the person rather than, for example, a relative weakness compared to the general population," said co-author Bennett A. Shaywitz, M.D., the Charles and Helen Schwab Professor in Dyslexia and Learning Development and co-director of the Yale Center for Dyslexia and Creativity.

Sally Shaywitz estimates that one in five people are dyslexic and points to many accomplished writers, physicians and attorneys with dyslexia who struggle with the condition in their daily lives, including Carol Greider, the 2009 Nobel laureate in medicine. She hopes to dispel many of the myths surrounding the condition.

"High-performing dyslexics are very intelligent, often out-of-the box thinkers and problem-solvers," she said. "The neural signature for dyslexia is seen in children and adults. You don't outgrow dyslexia. Once you're diagnosed, it is with you for life."

Shaywitz also stresses that the problem is with both basic spoken and written language. People with dyslexia take a long time to retrieve words, so they might not speak or read as fluidly as others. In students, the time pressure around standardized tests like the SATs and entrance exams for professional schools increases anxiety and can make dyslexia worse, so the need for accommodations is key in helping those with the disorder realize their potential, she says.

Other authors on the study include Emilio Ferrer at the University of California Davis and John M. Holahan and Karen Marchione at Yale School of Medicine.

The study was funded by the National Institute of Child Health and Human Development, the National Science Foundation, and the National Institute of Neurological Disorders and Stroke.

WHOI-operated ROV Jason images the discovery of the deepest explosive eruption on the sea floor

Oceanographers using the remotely operated vehicle (ROV) Jason discovered and recorded the first video and still images of a deep-sea volcano actively erupting molten lava on the seafloor.

Jason, designed and operated by the Woods Hole Oceanographic Institution for the National Deep Submergence Facility, utilized a prototype, high-definition still and video camera to capture the powerful event nearly 4,000 feet below the surface of the Pacific Ocean, in an area bounded by Fiji, Tonga and Samoa.

"I felt immense satisfaction at being able to bring [the science team] the virtual presence that Jason provides," says Jason expedition leader Albert Collasius, who remotely piloted the ROV over the seafloor. "There were fifteen exuberant scientists in the control van who all felt like they hit a home run. "

Collasius led a team that operated the unmanned, tethered vehicle from a control van on the research vessel and used a joystick to "fly" Jason over the seafloor to within 10 feet of the erupting volcano. Its two robotic arms collected samples of rocks, hot spring waters, microbes, and macro biological specimens.

Through its fiber optic tether, ROV Jason transmitted-high definition video of the eruption as it was occurring. The unique camera system, developed and operated by the Advanced Imaging and Visualization Lab at WHOI, was installed on Jason for the expedition to acquire high quality imagery of the seafloor. The AIVL designs, develops, and operates high resolution imaging systems for scientific monitoring, survey, and entertainment purposes. AIVL imagery has been used in several IMAX films and hundreds of television programs and documentaries.

The video from the research expedition, which departed Western Samoa aboard the RV Thomas Thompson on May 5, 2009, was shown for the first time today at the American Geophysical Union fall meeting in San Francisco.

"Less than 24 hours after leaving port, we located the ongoing eruption and observed, for the first time, molten lava flowing across the deep-ocean seafloor, glowing bubbles three feet across, and explosions of

volcanic rock," reported Joe Resing, a chemical oceanographer at the University of Washington and NOAA, and chief scientist on the NOAA- and National Science Foundation-funded expedition.

For more than a decade, monitoring systems have allowed scientists to listen for seafloor eruptions but there has always been a time lag between hearing an eruption and assembling a team and a research vessel to see it. This has meant that scientists have always observed eruptions after the fact.

"We saw a lot of interesting phenomena, but we never saw an eruption because it happens so quickly," said Robert Embley, a NOAA PMEL marine geologist and co-chief scientist on the expedition. "As geologists, you want to see the process in action. You learn a lot more about it watching the process."

The scientists involved in the expedition had praise for the people and the technology that helped bring that dream to fruition.

"I don't think there are too many systems in the world that could do what Jason does," said Embley. "It takes a good vehicle, but a great group of experienced people to get close [to an eruption], hold station, and have the wisdom to understand what they can and cannot do."

The Jason team maneuvered the vehicle to give scientists an up-close view of the glowing red vents explosively ejecting lava into the sea- often not more than a few feet away from the exploding lava – and the ability to take samples.

Enhancing the experience was the ability to view the eruption in high-definition video. Designed to operate at depths of up to 7,000 meters, the unique still and video camera system acquired 30-60 still images per second, at the same time generating motion, high def video at 30 frames per second. The system uses a high-definition zoom lens – nearly twice the focal length of Jason's present standard definition camera -- that enables researchers to see up-close details of underwater areas of interest that they otherwise could not see.

"We were lucky to have those cameras on the vehicle. They are important to the science," said Tim Shank, a WHOI macro-biologist on the expedition. "We use the high def cameras to try to identify species. They allow us to look at the morphology of the animals -- some smaller than 3 or 4 inches long."

"In terms of understanding how the volcano is erupting, the high frame rate lets you stop the motion and look to see what is happening," said Resing. "You can see the processes better."

The National Science Foundation funded the installation of the camera system for this expedition. The system is being tested in advance of a permanent upgrade in 2010 to the cameras on Jason as well as the manned submersible Alvin. Maryann Keith, of WHOI's AIVL, Shank, and other scientists operated the camera system with the assistance of the Jason team during the expedition.

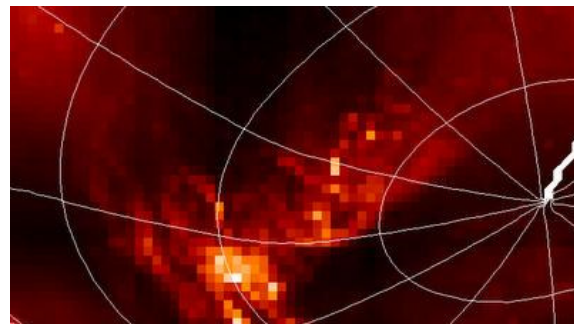
In addition to the benefits to science, the cameras will serve the added purpose of giving the public more access to seafloor discoveries.

"Seeing an eruption in high definition video for the first time really brings it home for all of us, when we can see for ourselves the very exciting things happening on our planet, that we know so little about," Embley said.

Caltech scientists discover fog on Titan

PASADENA, Calif. - Saturn's largest moon, Titan, looks to be the only place in the solar system - aside from our home planet, Earth - with copious quantities of liquid (largely, liquid methane and ethane) sitting on its surface. According to planetary astronomer Mike Brown of the California Institute of Technology (Caltech), Earth and Titan share yet another feature, which is inextricably linked with that surface liquid: common fog.

The presence of fog provides the first direct evidence for the exchange of material between the surface and the atmosphere, and thus of an active hydrological cycle, which previously had only been known to exist on Earth.



Fingers of fog can be seen moving across the south pole of Titan in this image constructed by Mike Brown and his colleagues using data from the Cassini spacecraft. The fog shows regions where pools of liquid methane sitting on the surface of Titan are evaporating into the atmosphere. After a long summer of frequent clouds and rain at the south pole, it appears in this late summer image that evaporating liquid methane covers large areas of the pole. Mike

Brown/Caltech



[West Mata Eruption, 2009 \(Clip 1\)](#)
(Courtesy NSF, NOAA, and WHOI
Advanced Imaging and Visualization Lab)
» [View Video \(Quicktime\)](#)

[West Mata Eruption, 2009 \(Clip 2\)](#)
(Courtesy NSF, NOAA, and WHOI
Advanced Imaging and Visualization Lab)
» [View Video \(Quicktime\)](#)

In a talk to be delivered December 18 at the American Geophysical Union's 2009 Fall Meeting in San Francisco, Brown, the Richard and Barbara Rosenberg Professor and professor of planetary astronomy, details evidence that Titan's south pole is spotted "more or less everywhere" with puddles of methane that give rise to sporadic layers of fog. (Technically, fog is just a cloud or bank of clouds that touch the ground).

Brown and his colleagues also describe their findings in a recent paper published in *The Astrophysical Journal Letters*.

The researchers made their discovery using data from the Visual and Infrared Mapping Spectrometer (VIMS) onboard the Cassini spacecraft, which has been observing Saturn's system for the past five years.

The VIMS instrument provides "hyperspectral" imaging, covering a large swath of the visible and infrared spectrum.

Brown and his colleagues - including Caltech undergraduate students Alex Smith and Clare Chen, who were working with Brown as part of a Summer Undergraduate Research Fellowship (SURF) project - searched public online archives to find all Cassini data collected over the moon's south pole from October 2006 through March 2007. They filtered the data to separate out features occurring at different depths in the atmosphere, ranging from 20 kilometers (12.4 miles) to .25 kilometers (820 feet) above the surface. Using other filters, they homed in on "bright" features caused by the scattering of light off small particles - such as the methane droplets present in clouds.

In this way, they isolated clouds located about 750 meters (less than a half-mile) above the ground. These clouds did not extend into the higher altitudes - into the moon's troposphere, where regular clouds form. In other words, says Brown, they had found fog.

"Fog - or clouds, or dew, or condensation in general - can form whenever air reaches about 100 percent humidity," Brown says. "There are two ways to get there. The first is obvious: add water (on Earth) or methane (on Titan) to the surrounding air. The second is much more common: make the air colder so it can hold less water (or liquid methane), and all of that excess needs to condense."

This, he explains, is the same process that causes water droplets to form on the outside of a cool glass.

On Earth, this is the most common method of making fog, Brown says. "That fog you often see at sunrise hugging the ground is caused by ground-level air cooling overnight, to the point where it cannot hang onto its water. As the sun rises and the air heats, the fog goes away."

Similarly, fog can form when wet air passes over cold ground; as the air cools, the water condenses. And mountain fog occurs when air gets pushed up the side of a mountain and cools, causing the water to condense.

However, none of these mechanisms work on Titan.

The reason is that Titan's muggy atmosphere takes a notoriously long time to cool (or warm). "If you were to turn the sun totally off, Titan's atmosphere would still take something like 100 years to cool down," Brown says. "Even the coldest parts of the surface are much too warm to ever cause fog to condense."

Mountain fog is also out of the question, he adds. "A Titanian mountain would have to be about 15,000 feet high before the air would get cold enough to condense," he says. And yet the tallest mountains the moon could possibly carry (because of its fragile, icy crust) would be no more than 3000 feet high.

The only possible way to make Titanian fog, then, is to add humidity to the air. And the only way to do that, Brown says, is by evaporating liquid - in this case, methane, the most common hydrocarbon on the moon, which exists in solid, liquid, and gaseous forms.

Brown notes that evaporating methane on Titan "means it must have rained, and rain means streams and pools and erosion and geology. The presence of fog on Titan proves, for the first time, that the moon has a currently active methane hydrological cycle."

The presence of fog also proves that the moon must be dotted with methane pools, Brown says. That's because any ground-level air, after becoming 100 percent humid and turning into fog, would instantly rise up into the atmosphere like a giant cumulus cloud. "The only way to make the fog stick around on the ground is to both add humidity and cool the air just a little," he explains. "The way to cool the air just a little is to have it in contact with something cold, like a pool of evaporating liquid methane."

In addition to Smith and Chen, *The Astrophysical Journal Letters* paper, "Discovery of Fog at the South Pole of Titan," was coauthored by Máté Ádámkóvics from the University of California, Berkeley. The work was funded by a grant from the National Science Foundation's Planetary Astronomy program.

For more information about the discovery, go to Brown's blog at <http://www.mikebrownsplanets.com/2009/08/fog-titan-titan-fog-and-peer-review.html>.

At a Mine's Bottom, Hints of Dark Matter

By DENNIS OVERBYE

An international team of physicists working in the bottom of an old iron mine in Minnesota said Thursday that they might have registered the first faint hints of a ghostly sea of subatomic particles known as dark matter long thought to permeate the cosmos.

The particles showed as two tiny pulses of heat deposited over the course of two years in chunks of germanium and silicon that had been cooled to a temperature near absolute zero. But, the scientists said, there was more than a 20 percent chance that the pulses were caused by fluctuations in the background radioactivity of their cavern, so the results were tantalizing, but not definitive.

Gordon Kane, a physicist from the University of Michigan, called the results "inconclusive, sadly," adding, "It seems likely it is dark matter detection, but no proof." Dr. Kane said results from bigger and thus more sensitive experiments would be available in a couple of months.

The team, known as the Cryogenic Dark Matter Search, announced its results in a pair of simultaneous talks by Jodi Cooley from Southern Methodist University at the SLAC National Acceleratory Laboratory in California and by Lauren Hsu of the Fermi National Accelerator Laboratory in Illinois at Fermilab, and they say they plan to post a paper on the Internet.

The stakes for astronomy and physics could hardly be greater. If the particles are confirmed by tests at other detectors, it would mean that, after more than half a century of speculation, astronomers are zeroing in on the identity of the invisible material that accounts for 25 percent of the universe and determines the architecture of the visible universe.

Confirmation of the particles would also constitute the first evidence for a new feature of nature, called supersymmetry, that physicists have been seeking as avidly as the astronomers have been seeking dark matter. It is central to theoretical efforts like string theory, which unify all of the forces of nature into one mathematical expression.

The report ended weeks of speculation on physics blogs and in laboratory cafeterias around the world. At the Kavli Institute for Theoretical Physics in Santa Barbara, Calif., where dark matter experts who had gathered for a two-week workshop watched the talks on the Web, Dr. Kane, who was present, described the mood at the workshop as "a high level of serious hysteria."

Dark matter became a serious issue in the 1970s, when Vera Rubin of the Carnegie Institution of Washington and her colleagues charted the rotation speeds of galaxies and found that they seemed to be enveloped in halos of dark matter, then called missing mass.

A wide range of astrophysical and cosmological measurements have subsequently converged on an intimidating recipe for the cosmos of 4 percent atoms, 25 percent dark matter and 70 percent a mysterious energy that has been called dark energy and has nothing to do with the news on Thursday.

The cryogenic experiment is nearly half a mile underground in an old iron mine in Soudan, Minn., to shield it from cosmic rays. It consists of a stack of germanium and silicon detectors, cooled to one-hundredth of a degree Kelvin. When a particle hits one of the detectors, it produces an electrical charge and deposits a small bit of energy in the form of heat, each of which are independently measured.

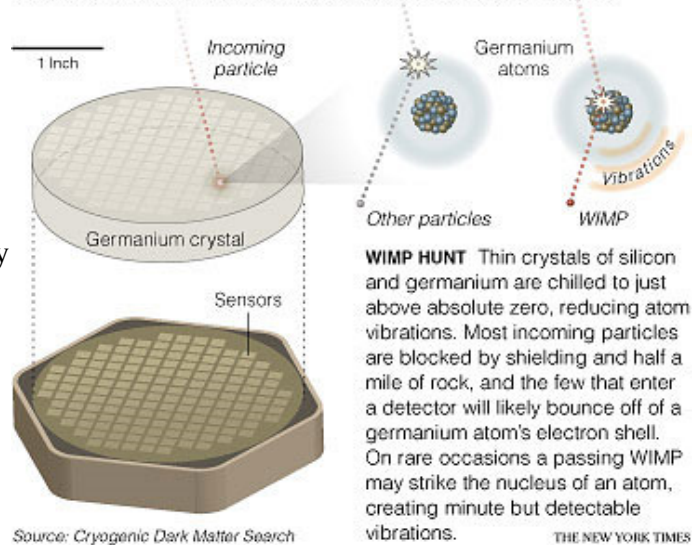
By comparing the amounts of charge and heat left behind, the collaboration's physicists can tell so-called wimps from more mundane particles like neutrons, which are expected to flood the underground chamber from radioactivity in the rocks around it.

The team is planning a larger detector, called SuperCDMS. In the meantime, Elena Aprile of Columbia, who was also present in Santa Barbara, said the results would be tested soon by her own detector, called Xenon, filled with liquid xenon, which just began working this fall under the Alps in Italy.

"All eyes will be on Xenon," she said in an interview a few days before, explaining that her detector, which is bigger, should see more events, adding, "Otherwise there will be a big clash."

Faint Hints of an Elusive Particle

A set of 30 detectors buried deep in a Minnesota mine has sensed two possible impacts from weakly interacting massive particles, or WIMPs. Long theorized but never confirmed, slow-moving WIMPs are particles of dark matter, which is thought to make up 25 percent of the universe.



'Boat' could explore Saturn moon

By Jonathan Amos Science correspondent, BBC News, San Francisco

A daring proposal to try to put a "boat" down on a sea of Saturn's moon Titan is about to be submitted to Nasa.

The scientific team behind the idea is targeting Ligeia Mare, a vast body of liquid methane sited in the high north of Saturn's largest moon.

The concept will be suggested to the US space agency for one of its future mission opportunities that will test a novel power system. It would be the first exploration of a planetary sea beyond Earth.

"It is something that would really capture the imagination," said Dr Ellen Stofan, from Proxemy Research, who leads the study team. "The story of human exploration on Earth has been one of navigation and seafaring, and the idea that we could explore for the first time an extraterrestrial sea I think would be mind-blowing for most people," she told BBC News.

Dr Stofan, who is also an honorary professor at University College London, has been describing her group's idea here at the American Geophysical Union's (AGU) Fall Meeting, the world's largest annual gathering of Earth scientists.

Low cost

The Cassini mission currently in orbit around Saturn has confirmed the haze-shrouded moon Titan to be an extraordinary place. Great lakes exist on its surface, fed by rivers that wash down valleys whenever it rains.

In many respects, it resembles Earth and the way it cycles water between the surface and the atmosphere, except in the frigid temperatures of Titan it is not water but liquid hydrocarbons that are in constant circulation.

Scientists got a few brief hours worth of data back from Titan's land surface in 2005 when the Huygens probe touched down in an equatorial region of the moon.

Now a number of those same researchers are desperate to go back for a longer-lived stay, but to investigate this time the huge pools that contain methane, ethane, propane and probably many other types of hydrocarbon (carbon-rich) compounds.

The Titan Mare Explorer (TiME) has already been under study for about two years. It is envisaged as a relatively low-cost endeavour - in the low \$400m range. It could launch in January 2016, and make some flybys of Earth and Jupiter to pick up the gravitational energy it would need to head straight at the Saturnian moon for a splash down in June 2023. The scientists have a couple of seas in mind for their off-world maritime research vessel. Ligeia Mare and Kraken Mare are both about 500km across.

Earth relevance

The primary objective of the mission would be to determine the precise chemistry of one of these lakes; but also to do meteorology, to help scientists better understand how the "methane-ologic cycle" on Titan actually works.

"The key instrument is a mass spectrometer because you want to know what the lake is made of, but we also want to do things like depth-sounding," said Dr Stofan. "We suspect from Cassini radar data that the lakes are many metres deep, but we'd love to know the overall shape of the lake basins. "Other instruments would test different properties of the lake which would give you a handle on how the density of the liquid varied as the craft drifted along."

According to team-member Dr Ralph Lorenz, what we learn from Titan's lakes could be relevant here on Earth. It would give scientists the opportunity to study shared climate processes at work under very different conditions.

"If we have models that will work on Earth and on Titan then we can be much more confident that those models understand the fundamentals of what's going on," explained the researcher from the Johns Hopkins University Applied Physics Laboratory.

"The photogenic appeal and the mystique of exploring a sea on another world speak for themselves, but there is a genuine practical application to do with the science that will help us address problems here on Earth."

Mission sequence

Pictures will be essential, though. The Huygens lander sent back a vista of orange pebbles - one of the most iconic images in Solar System exploration history. A view from the surface of a methane lake, looking towards the shore would be just as amazing.

TITAN MARE EXPLORER (TiME)



**A Nasa Discovery Class proposal, powered by ASRG technology
Simple mission concept would hope to be low cost - <\$425m
Launch 2016; Earth and Jupiter flybys; splash-down 2023
Science payload: Mass spectrometer, sonar, meteorology and imaging instruments**

Nasa and Esa (European Space agency) are currently considering a joint multi-billion-dollar mission to the outer planets, but they have the Jupiter system and not Saturn as their next priority.

If TiME is to make it off the launch pad it will have to grasp one of the smaller mission opportunities that Nasa periodically offers, such as the one it runs under its Discovery Class programme. Bids for this opportunity will be invited in the coming months.

The agency will be considering mission concepts that can carry an Advanced Stirling Radioisotope Generator (ASRG). This is a plutonium-driven device that produces power far more efficiently than the traditional Radioisotope Thermoelectric Generators (RTGs) used hitherto on space missions, such as on Cassini.

ASRGs would give TiME sufficient energy to support a very capable instrument suite and a direct-to-Earth communications system to get its data home. The generators - TiME would carry two - could conceivably sustain several years of service on the lake surface.

Whatever the outcome of the Discovery competition - and there will be many bids from other mission hopefuls - Dr Lorenz believes the scientific case for going to Titan is compelling, and he envisages the orangey moon becoming a popular destination in the decades ahead.

"I think the range of science questions that there are there, and the methodologies and types of vehicle that we use to address that science, is going to follow very much the Mars model - we'll have one mission building on the success of another and exploring different questions," he told BBC News.

"Hopefully, TiME will just be the first of many exciting missions to Titan."

**As CDC Issues New Autism Prevalence Report, Autism Speaks Asks, "What Will It Take?" for Government to Meet the Challenge of this National Health Crisis
Leading Autism Advocacy Organization Calls for Dramatic Increase in Federal Funding for Research and Services**

NEW YORK, N.Y.- In the wake of today's new report from the U.S. Centers for Disease Control (CDC) stating that autism now affects 1 in every 110 American children, Autism Speaks, the nation's largest autism science and advocacy organization, called on the federal government to immediately step up its efforts – and dramatically increase funding – to address the growing national autism public health crisis.

“Now that the government has confirmed that one percent of American children have autism, the question becomes what it will take to get our elected leaders to wake up and take on this crisis in an appropriate way,” said Bob Wright, co-founder of Autism Speaks. “Must we wait until every member of Congress has a child or grandchild with autism, or until every household is impacted by this devastating disorder? With nearly 750,000 children on the autism spectrum, we need meaningful action now that acknowledges the scope of this problem and allocates the resources necessary to take the fight against autism to a new level. We cannot expect the millions of people impacted by this crisis to wait another 20 years for answers.”

The CDC report, published in this week's Morbidity and Mortality Weekly Report (MMWR), states that 1% or 1 in every 110 children has been diagnosed with autism, including 1 in 70 boys. This represents a staggering 57 percent increase from 2002 to 2006, and a 600 percent increase in just the past 20 years. Other significant findings include that a broader definition of ASDs does not account for the increase, and while improved and earlier diagnosis accounts for some of the increase, it does not fully account for the increase. Thus, a true increase in the risk for ASD cannot be ruled out. Even though parents typically express concerns about their child's developmental progress before age three, the average age of diagnoses is not until 53 months, although diagnoses are occurring earlier than found in the 2002 study. The report uses the same methodology that produced the CDC's 2007 prevalence findings of 1 in 150 children with autism.

“This study provides strong evidence that the prevalence of autism spectrum disorder is, in fact, dramatically increasing,” said Geraldine Dawson, Ph.D., Autism Speaks chief science officer, who noted that recent research indicates that a significant amount of the increase in autism prevalence cannot be explained by better, broader or earlier diagnosis. “It is imperative that the federal government, primarily through the National Institutes of Health and CDC, quickly and significantly increase funding for autism research. We have learned a lot about autism during the past five years. However, most of the critical questions about the factors that cause the many manifestations of autism – and how we can better treat this disorder – remain unanswered.”

“The CDC numbers validate what we already know: We have a major public health emergency on our hands that is taking an enormous toll on millions of families across the country,” said Autism Speaks President Mark Roithmayr. “These families want answers that can only come through further research. They also desperately want access to services that are, at this point, grossly inadequate to meet the current and growing needs of people with autism. That must change quickly, before our society becomes overwhelmed by the demand for these services in the coming years and decades.”

According to a 2007 Harvard School of Public Health study, it costs approximately \$35 billion each year to care for people with autism – a number that has clearly increased over the past 2 years with the rising prevalence among the youngest people with ASD and a growing demand for housing, work skills and opportunities, healthcare, and other services that simply do not exist for adults with ASD. In FY 2008, total federal spending on autism research was just \$177 million, expected to increase to \$282 million in FY 2009 – only because of a one-time infusion of \$89 million in stimulus spending.

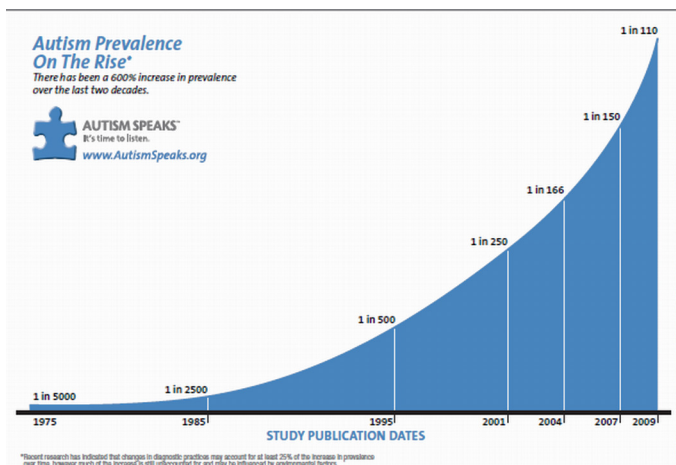
“During his campaign, President Obama committed to \$1 billion of annual federal spending on autism by 2012. In October, he identified autism as one of his administration's top three public health priorities. This new prevalence data must compel Congress to take action to fulfill the President's promise in the upcoming FY 2011 budget process,” said Wright. “It is also vital that any healthcare reform legislation sent by Congress to the President must include – as both the current House and Senate versions do – an end to insurance marketplace discrimination against people with autism by requiring insurers to deliver coverage for behavioral health treatments.”

“There are too many children with autism who are being diagnosed at six, seven or even eight years of age, which is far too late for them to experience the maximum benefits of early intervention services,” said Dawson. “Clearly, we need to do a better job of diagnosing children as early as possible – ideally by age two. We know that early intervention can make a critical difference in a child's outcome.”

Autism Speaks has committed more than \$141 million to date to fund research into the causes, diagnosis and treatment for autism through 2014. It is currently funding research into potential genetic and environmental factors involved with autism, as well as improved methods of early diagnosis and new treatment models. Read more about Autism Speaks' science portfolio [here](#).

[See a graph of the increase in prevalence over the years here \(PDF\).](#)

[See media coverage of the new CDC prevalence numbers here.](#)



Humans feasting on grains for at least 100,000 years

By Katherine Harmon

Although cupcakes and crumpets were still a long way off during the Middle Stone Age, new evidence suggests that at least some humans of that time period were eating starchy, cereal-based snacks as early as 105,000 years ago. The findings, gleaned from grass seed residue found on ancient African stone tools, are detailed online Thursday in *Science*.

Researchers have assumed that humans were foraging for fruits, nuts and roots long before 100,000 years ago, but cereal grains are quite a new addition to the early prehistoric gastronomic picture. "This broadens the timeline for the use of grass seeds by our species," Julio Mercader, an assistant professor at University of Calgary's Department of Archeology and author of the paper, said in a prepared statement.



Sorghum Courtesy of J. Mercader

Plant domestication, most scientists think, made its debut some 10,000 years ago, with grain storage cropping up about 11,000 years ago. An ancient site in Israel yielded a hearty collection of grains, which were dated to about 23,000 years ago, according to a 2004 *Proceedings of the National Academy of Sciences* paper. But such an early appearance of wild cereals in the human diet - as this new paper proposes - would push the assumed date of substantial grass-seed eating back more than 70,000 years.

So just what were these gatherers purportedly gnashing?

Mercader and a team from Mozambique's University of Eduardo Molande had uncovered hundreds of ancient artifacts in a limestone cave near Lake Nissa in Mozambique. Analyzing the surface of 70 of these tools, Mercader found some 2,370 granules of plant starch, which, he reasons, could not have accidentally come from growing plants in such dark reaches of the cave. And the fact that so many of the tools had a coating is evidence of at least some processing to make the seeds more edible.

"The inclusion of cereals in our diet is considered an important step in human evolution because of the technical complexity and the culinary manipulation that are required to turn grains into staples," Mercader said. Indeed, a descendent of the wild sorghum found on the tools still makes up a large portion of modern diets in sub-Saharan products including breads, porridge and even beer.

Other tidbits that these hungry humans appear to have been dining on during that period include the African false banana, pigeon peas, wild oranges, African wine palm and the African potato, the researchers concluded. These finds are "proof of an expanded and sophisticated diet much earlier than we believed," Mercader said. And grain consumption was the first step toward grains' domestication—and, eventually, cupcakes.

Global warming likely to be amplified by slow changes to Earth systems

SANTA CRUZ, CA--Researchers studying a period of high carbon dioxide levels and warm climate several million years ago have concluded that slow changes such as melting ice sheets amplified the initial warming caused by greenhouse gases.

The study, published in the journal *Nature Geoscience*, found that a relatively small rise in atmospheric carbon dioxide levels was associated with substantial global warming about 4.5 million years ago during the early Pliocene.

Coauthor Christina Ravelo, professor of ocean sciences at the University of California, Santa Cruz, said the study indicates that the sensitivity of Earth's temperature to increases in carbon dioxide in the atmosphere is greater than has been expected on the basis of climate models that only include rapid responses.

Carbon dioxide and other greenhouse gases trap heat in the atmosphere, leading to increased atmospheric and sea-surface temperatures. Relatively rapid feedbacks include changes in atmospheric water vapor, clouds, and sea ice. These short-term changes probably set in motion long-term changes in other factors--such as the extent of continental ice sheets, vegetation cover on land, and deep ocean circulation--that lead to additional global warming, Ravelo said.

"The implication is that these slow components of the Earth system, once they have time to change and equilibrate, may amplify the effects of small changes in the greenhouse gas composition of the atmosphere," she said.

The researchers used sediment cores drilled from the seafloor at six different locations around the world to reconstruct carbon dioxide levels over the past five million years. They found that during the early and middle Pliocene (3 to 5 million years ago), when average global temperatures were at least 2 to 3 degrees Celsius warmer than today, the concentration of carbon dioxide in the atmosphere was similar to today's levels, about 30 percent higher than preindustrial levels.

"Since there is no indication that the future will behave differently than the past, we should expect a couple of degrees of continued warming even if we held carbon dioxide concentrations at the current level," said lead author Mark Pagani, an associate professor of geology and geophysics at Yale University.

In addition to Pagani and Ravelo, the coauthors of the paper include Yale postdoctoral researcher Zhonghui Liu and UCSC graduate student Jonathan LaRiviere. The study used samples supplied by the Integrated Ocean Drilling Program and was funded by the National Science Foundation and supported by the Yale Climate and Energy Institute.