People with depression eat more chocolate, a mood food

Women and men consume more chocolate as the severity of their depression increases

Researchers at the University of California, San Diego School of Medicine have found that women and men eat more chocolate as depressive symptoms increase, suggesting an association between mood and chocolate.

Results of this paper, co-authored by Beatrice Golomb, MD, PhD, associate professor of medicine at UCSD School of Medicine, will appear in the April 26 issue of *Archives of Internal Medicine*.

"Our study confirms long-held suspicions that eating chocolate is something that people do when they are feeling down," said Dr. Golomb. "Because it was a cross sectional study, meaning a slice in time, it did not tell us whether the chocolate decreased or intensified the depression."

Golomb and her colleagues examined the relationship of chocolate consumption to mood in an adult study sample of about 1,000 subjects who were not on antidepressant medications and did not have any known cardiovascular disease or diabetes. Participants were asked questions regarding how many servings of chocolate they ate in a week, and were screened using the Center for Epidemiologic Studies Depression Scale (CES-D) to measure mood.

The researchers found that both men and women who had higher depression scores consumed almost 12 servings of chocolate per month, those with lesser depression scores ate about eight servings of chocolate per month, and those with no depression had five servings per month. No differentiation was made between dark and milk chocolate; a medium serving of chocolate was one ounce, which is slightly less than an average chocolate candy bar.

"The findings did not appear to be explained by a general increase in caffeine, fat, carbohydrate or energy intake, suggesting that our findings are specific to chocolate," said Golomb. There was also no difference in the consumption of other antioxidant-rich foods, such as fish, coffee, fruits and vegetables between those with depression and those without.

Golomb added that future studies will be required to determine the basis of this association, as well as the role of chocolate in depression, as cause or cure.

Additional contributors are Sabrina Koperski, University of California, San Diego, Department of Medicine, and Natalie Rose, University of California, Davis, Department of Obstetrics and Gynecology.

This study was funded by grants from the National Heart, Lung, and Blood Institute and the UCSD General Clinical Research Center.

The billions that bug us: A genomic view of humans and their microbes

ANAHEIM, CA – The human species is dependent for its survival on the billions of microorganisms that inhabit multiple environmental niches within and on the human body. While microbes are commonly associated with diseases and infections, they are also vital in essential, beneficial roles such as digestion, where they help synthesize vitamins and ferment complex indigestible carbohydrates.

The overwhelming majority of microbial species (>99%) resist cultivation in the laboratory. However, recent advances in microbial genomics and sequencing technology have allowed researchers to study microbes in their natural environment. The identification and characterization of these microbial communities will undoubtedly establish links between these microorganisms and disease, their roles in the development of the immune system and their overall impact on human evolution.

Claire Fraser-Liggett, director of the Institute for Genome Sciences at the University of Maryland School of Medicine and a globally recognized microbial genomics scientist, is a lead researcher with the Human Microbiome Project (HMP), an international National Institutes of Health roadmap initiative to study the impact of microbes on human health and disease.

Fraser-Liggett's research focuses on microbes' roles in the development of the immune system and their overall impact on human health. Her HMP research has particular emphasis on the human gastrointestinal tract, since this environment is home to the largest number of microbial "partners." One of the ultimate goals of the HMP is to better understand our microbiota, and, in the future, to be able to optimize the beneficial effects of microbiota for each individual.

"The human GI tract contains the densest concentration of bacteria in our bodies, and studying these GI microbes gives us insights into health and illness in the developed world and in developing countries," said Fraser-Liggett.

Fraser-Liggett will present a talk at the American Society for Biochemistry and Molecular Biology's annual meeting titled "The Role of Microbial Communities in Health and Disease." The talk will take place on Monday, April 26, at 3:30 pm PST in Anaheim Convention Center Room 304D.

NOTE TO EDITORS: The American Society for Biochemistry and Molecular Biology annual meeting is part of the Experimental Biology 2010 conference that will be held April 24-28, 2010 at the Anaheim Convention Center. The press is

invited to attend or to make an appointment to interview Dr. Fraser-Liggett. Please contact Nicole Kresge at 202.316.5447 or nkresge@asbmb.org.

What's motivation got to do with weight loss?

St. Louis, MO, - Energy in, energy out, it's the basic equation to weight loss, or is it? With more than two thirds of Americans classified as overweight or obese1, a study in the May/June 2010 issue of the *Journal of Nutrition Education and Behavior* examines how motivation might be a large contributor to sticking with weight loss programs.

Researchers at the University of Kentucky and University of North Carolina at Chapel Hill examined two types of motivation, autonomous and controlled, and their relationship to adherence and weight loss in a 16-week Internet weight-loss intervention. To measure the 2 types of motivation, a Treatment Self-Regulation Questionnaire was used to identify those participants motivated by intrinsic and extrinsic controls such as feeling that performance is the best way to help oneself and making changes for personal reasons (autonomous motivation) and those participants motivated by only external controls such as perceived pressure from others and feelings of guilt (controlled motivation). Motivation for weight loss was measured at baseline and 4, 8, 12, and 16 weeks. In addition, study participants recorded their food intake, exercise, and body weight through an on-line self-monitoring system weekly throughout the study.

Over half of the participants (37 of 66) lost 5% of initial body weight at the 16-week follow-up. To examine the relationship between the 2 different types of motivation and weight loss, the sample was divided into those who had and those who had not lost 5% of initial body weight by 16 weeks (37 and 29 participants, respectively). The researchers found that the majority of participants had a significant increase in autonomous and controlled motivation between baseline and 4 weeks, though it's not clear what caused the increase in motivation at 4 weeks, the face-to-face session given at the start of the study, early success with weight loss, or something else. Although motivation increased initially for most participants, the group that went on to achieve a 5% weight loss sustained their autonomous motivation between 4 and 16 weeks, while the group that was less successful experienced a significant decrease in autonomous and controlled motivation over time.

The authors also found that autonomous motivation at 4 weeks was a significant predictor of adherence to self-monitoring and weight loss. Furthermore, this increase in self-monitoring appeared to be a way in which autonomous motivation led to better weight loss. The authors found a positive correlation between weight loss at 4 weeks and higher levels of autonomous motivation especially when compared to participants who had higher levels of controlled motivation..

Writing in the article, the authors state, "It appears that the time period between 4 and 8 weeks may be an important window for weight control programs to consider using techniques designed to enhance autonomous motivation, including giving more intense support or different types of interventions, such as activities to enhance autonomous motivation or contact from a weight-loss counselor in the form of e-mails, phone calls, or face-to-face meetings."

"It is possible that motivation measured a few weeks after the study has begun more accurately captures motivation than baseline motivation for weight loss since participants have become familiar with the behavior changes that will be necessary for weight loss and can better gauge their motivation for making those changes."

"These findings suggest that building motivation may be an effective means of promoting adherence and weight loss."

The article is "Motivation and Its Relationship to Adherence to Self-monitoring and Weight Loss in a 16-week Internet Behavioral Weight Loss Intervention" by Kelly H. Webber, PhD, MPH, RD; Deborah F. Tate, PhD; Dianne S. Ward, EdD; J. Michael Bowling, PhD. It appears in the Journal of Nutrition Education and Behavior, Volume 42, Issue 3, (May/June 2010) published by Elsevier.

1 Flegal KM, Carroll MD, Ogden CL, and Curtin LR. Prevalence and Trends in Obesity Among US Adults, 1999-2008. JAMA. 2010;303(3):235-241.

Why acupuncture aids spinal recovery

11:18 26 April 2010 by **Wendy Zukerman**

Rats with damaged spines can walk again thanks to acupuncture. But it's not due to improvements in their energy flow or "chi". Instead, the ancient treatment seems to stop nerve cell death by reducing inflammation.

Acupuncture's scientific credentials are growing. Trials show that it improves sensory and motor functions in people with spinal cord injuries.

To find out why, Doo Choi and his colleagues at Kyung Hee University in Seoul, South Korea, damaged the spines of 75 rats. One-third were given acupuncture in two locations: Shuigou – between their snout and mouth, and Yanglingquan – in the upper hind leg. Others received no treatment or "simulated acupuncture".

After 35 days, the acupuncture group were able to stand at a steeper incline than the others and walk better. Staining their paws with ink revealed that their forelimb-hindlimb coordination was fairly consistent and that there was very little toe dragging, whereas the control groups still dragged their feet.

Inflamed spines

The rats in the acupuncture group also had less nerve cell death and lower levels of proteins known to induce inflammation after spinal cord injury and make neural damage worse.

One explanation is that sharp needles prompt a stress response that dampens down inflammation. In humans, the inflammation that follows spinal cord injury is known to be responsible for nerve cell death.

Zhen Zheng of the Royal Melbourne Institute of Technology in Australia says the results are "very encouraging". But she says we don't yet know if the results will apply to humans.

For example, the acupuncture treatment on the rats was given almost immediately after injury, but most patients don't seek acupuncture until at least three months after damage to their spines.

Journal reference: Neurobiology of Disease, DOI: 10.1016/j.nbd.2010.04.003

Stem cells from surgery leftovers could repair damaged hearts

Scientists have for the first time succeeded in extracting vital stem cells from sections of vein removed for heart bypass surgery. Researchers funded by the British Heart Foundation (BHF) found that these stem cells can stimulate new blood vessels to grow, which could potentially help repair damaged heart muscle after a heart attack.

The research, by Paolo Madeddu, Professor of Experimental Cardiovascluar Medicine and his team in the Bristol Heart Institute (BHI) at the University of Bristol, is published in the leading journal *Circulation*. Around 20,000 people each year undergo heart bypass surgery. The procedure involves taking a piece of vein from the person's leg and grafting it onto a diseased coronary artery to divert blood around a blockage or narrowing. The surgeon normally takes out a longer section of vein than is needed for the bypass. The Bristol team successfully isolated stem cells from leftover veins that patients had agreed to donate.

In tests in mice, the cells proved able to stimulate new blood vessels to grow into injured leg muscles. Professor Madeddu and his team are now beginning to investigate whether the cells can help the heart to recover from a heart attack.

"This is the first time that anyone has been able to extract stem cells from sections of vein left over from heart bypass operations," Professor Madeddu said. "These cells might make it possible for a person having a bypass to also receive a heart treatment using their body's own stem cells.

"We can also multiply these cells in the lab to make millions more stem cells, which could potentially be stored in a bank and used to treat thousands of patients."

Professor Peter Weissberg, Medical Director of the BHF, said: "Repairing a damaged heart is the holy grail for heart patients. The discovery that cells taken from patients' own blood vessels may be able to stimulate new blood vessels to grow in damaged tissues is a very encouraging and important advance. It brings the possibility of 'cell therapy' for damaged hearts one step closer and, importantly, if the chemical messages produced by the cells can be identified, it is possible that drugs could be developed to achieve the same end."

Chimps 'feel death like humans'

Chimpanzees deal with death in much the same way as humans, studies suggest.

Scientists in Scotland filmed a group of chimps grooming and caressing an elderly female who died, and remaining subdued for several days afterwards.

Other researchers saw females carrying around the bodies of their dead offspring. Both studies are reported in the journal Current Biology.

The scientists say this suggests other species, particularly apes, are more like humans than we might think.

"Several phenomena have at one time or another been considered as setting humans apart from other species: reasoning ability, language ability, tool use, cultural variation, and self-awareness, for example," said James Anderson from Stirling University, who led the research team looking at the death of the elderly female. "But science has provided strong evidence that the boundaries between us and other species are nowhere near to being as clearly defined as many people used to think.

"The awareness of death is another such psychological phenomenon."

Keeping close

Staff at Blair Drummond Safari and Adventure Park in Stirlingshire used video cameras to document the death of a terminally ill female named Pansy, believed to be more than 50 years old.

When she became lethargic in the days leading up to her death, other members of the group became quieter than usual and stayed with her at nights, grooming her more than they did normally.

After her death, her daughter stayed near the body for an entire night, even though she had never slept on that platform before. All of the group were subdued for several days afterwards, and avoided the place where she had died, spending long hours grooming each other.

In the second study, led by scientists at Oxford University, two mothers living in the wild at the Bossou site in Guinea were seen to carry around the bodies of their dead offspring - one of them for nearly 10 weeks.

This behaviour has been seen once before at the site, in 1992; and the researchers suggest it may be learned.

During the period, the babies' bodies slowly mummified as they dried out. The bereaved mothers used tools to fend off flies.

Religious beliefs

"Our observations confirm the existence of an extremely powerful bond between mothers and their offspring which can persist, remarkably, even after the death of the infant," said Oxford's Dora Biro.

"They further call for efforts to elucidate the extent to which chimpanzees understand and are affected by the death of a close relative or group-mate. "This would both have implications for our understanding of the evolutionary origins of human perceptions of death and provide insights into the way chimpanzees interpret the world around them."

Chimpanzees and humans share about 99% of their DNA, and are so closely related that some academics have suggested they should be given rights similar to human rights.

Dr Anderson suggests the treatment of death marks another similarity. “We found several similarities between the chimpanzees' behaviour toward the dying female and their behaviour after her death, and some reactions of humans when faced with the demise of an elderly group member or relative, even though chimpanzees do not have religious beliefs or rituals surrounding death," he said.

Human brain recognizes and reacts to race

TORONTO, ON – The human brain fires differently when dealing with people outside of one's own race, according to new research out of the University of Toronto Scarborough.

This research, conducted by social neuroscientists at UofT Scarborough, explored the sensitivity of the "mirror-neuron-system" to race and ethnicity. The researchers had study participants view a series of videos while hooked up to electroencephalogram (EEG) machines. The participants – all white – watched simple videos in which men of different races picked up a glass and took a sip of water. They watched white, black, South Asian and East Asian men perform the task.

Typically, when people observe others perform a simple task, their motor cortex region fires similarly to when they are performing the task themselves. However, the UofT research team, led by PhD student Jennifer Gutsell and Assistant Professor Dr. Michael Inzlicht, found that participants' motor cortex was significantly less likely to fire when they watched the visible minority men perform the simple task. In some cases when participants watched the non-white men performing the task, their brains actually registered as little activity as when they watched a blank screen.

"Previous research shows people are less likely to feel connected to people outside their own ethnic groups, and we wanted to know why," says Gutsell. "What we found is that there is a basic difference in the way peoples' brains react to those from other ethnic backgrounds. Observing someone of a different race produced significantly less motor-cortex activity than observing a person of one's own race. In other words, people were less likely to mentally simulate the actions of other-race than same-race people"

The trend was even more pronounced for participants who scored high on a test measuring subtle racism, says Gutsell. "The so-called mirror-neuron-system is thought to be an important building block for empathy by allowing people to 'mirror' other people's actions and emotions; our research indicates that this basic building block is less reactive to people who belong to a different race than you," says Inzlicht.

However, the team says cognitive perspective taking exercises, for example, can increase empathy and understanding, thereby offering hope to reduce prejudice. Gutsell and Inzlicht are now investigating if this form of perspective-taking can have measurable effects in the brain.

The team's findings are published in the Journal of Experimental Social Psychology.

An accidental history of science

By Michael Mosley

Scientific discoveries have shaped the development of society and civilisation throughout history, yet many of those with the greatest impact were accidental.

NASA recently announced the discovery of five new exo-planets, planets that lie outside our solar system.

They were found using NASA's Kepler space telescope, designed to find Earth-size planets orbiting sun-like stars. If there is alien life out there, it will probably be living on an exo-planet.

I was particularly pleased to read about NASA's discovery because the man that telescope is named after - Johannes Kepler - is one of those wonderful characters who has contributed so much to our understanding of the universe, yet is something of an unsung hero.

Son of a mercenary, Kepler was a 17th Century German astrologer and mathematician whose mother was tried as a witch. It was Kepler, and not Nicholas Copernicus, who first proved that the sun is the centre of the solar system and that the planets (including our own) travel round it in giant ellipses. It was Kepler's findings that helped lead to Newton's discovery of the laws of universal gravity, which changed our world.

Paranormal

Yet like many of those who feature in my new series, The Story of Science, Kepler's discovery was an unexpected one, even to him. Having spent the last year looking into the history of science, one of the things that really stands out is its glorious unpredictability. History shows that you can never know where a particular bit of research will take you or the questions it will raise. Researchers who start off looking for one thing often end up discovering something quite unexpected.

Like William Crookes, a 19th century British scientist with a passion for the paranormal. He claimed to have seen acts of levitation, an accordion playing by itself and strange phantom figures, some of which he photographed. He could be dismissed as a gullible fool, but the fact was that even in his own laboratory he was coming across things which were very hard to explain.

His most startling discoveries were made using fairly basic equipment: a partially evacuated glass tube, a couple of electrodes and a fluorescent screen.

Crookes found that by passing a high voltage across the electrodes he could produce a green ray inside the tube. This ray could be bent with a magnet, suggesting it was in some way electrical.

He then put a little paddle wheel into the tube and found that the green ray made it spin. Crookes called this "radiant matter" and thought it was a fourth state of matter, one that was perhaps linked to the spirit world.

The physicist, Joseph John Thomson, came up with an equally outrageous, but ultimately more accurate, claim - that the green ray making the paddle wheel spin consisted of a stream of tiny charged particles, particles far smaller than atoms - the first sub-atomic particle to be discovered, later called electrons.

First X-ray image

And that was by no means all. In 1895, while experimenting with a Crookes tube, German physicist, Wilhelm Röntgen, discovered that as well as producing a green ray inside the tube, his equipment was also producing a mysterious ray that could be detected right across the room.

Not knowing what these rays were he called them "X-rays". One of the first pictures he took using these mysterious rays was of his wife's hand. When she saw it she apparently exclaimed "I have seen my death!"

Hearing about Röntgen's work encouraged Frechman Henri Becquerel to investigate some unusual rocks he had in his collection, which glowed in the dark. His curiosity led to the discovery of radioactivity.

An equally unlikely sequence of world changing discoveries came from attempts made in 1856 by an 18-year-old called William Perkin to find a treatment for one of the world's greatest killers, malaria.

In his parents' converted attic in the East End of London, he set to work. But instead of a malaria cure he accidentally created an intense purple dye, which he called mauveine. It became all the rage and led to the discovery of other new colours, and an industry to produce them. Soon artificial dyes were being used not just to brighten clothes, but food and hair. In time they were used to stain cells, leading to the discovery of chromosomes and ultimately DNA.

Dyes were the first chemicals to be made on a truly industrial scale and others, including fertilisers, soap and dynamite, quickly followed. The dye manufacturing process also produced large amounts of toxic chlorine gas, a gas which would later be used to terrifying effect in the First World War.

The true value of blue-sky research is almost impossible to predict, which sometimes makes it hard to justify on purely commercial grounds.

The story goes that Michael Faraday, the 19th century physicist who discovered the principles behind the electric generator and the electric motor, was asked by Gladstone, then Chancellor of the Exchequer, about the practical value of his discoveries. To which Faraday is said to have replied, "one day, sir, you may tax it".

Where comets emit dust

Scientists from the Max Planck Institute for Solar System Research identify the active regions on the surface of comets

Studying comets can be quite dangerous - especially from close up. Because the tiny particles of dust emitted into space from the so-called active regions on a comet’s surface can damage space probes. Scientists from the Max Planck Institute for Solar System Research in Germany have now developed a computer model that can locate these regions using only the information available from Earth. The new method could help calculate a

safe flight route for ESA's space probe Rosetta, which is scheduled to arrive at the comet Churyumov-Gerasimenko in 2014. (Astronomy & Astrophysics, 512, A60, 2010)

A comet's nucleus is much more than an unvarying chunk of ice and dust. Under the Sun's influence, volatile substances such as water, carbon dioxide, and carbon monoxide are emitted from certain regions on its surface - the so-called active regions - carrying dust particles with a diameter of up to a few centimetres into space. Seen from Earth, these fountains of dust can be discerned as jets or spiral arms that surround the comet (see figure 1). These structures are embedded in a sheath of gas and dust called the coma that is produced by the more uniform activity of the overall surface.

"Pictures taken from Earth show the comet and its jets as a two-dimensional projection", explains Hermann Böhnhardt from the Max Planck Institute for Solar System Research (MPS). Where exactly the dust particles and gases originate from can not therefore be well identified.

In order to localize the active regions despite this problem, the MPS-researchers chose an indirect approach that for the first time also accounts for the three dimensional shape of the comet. "Until now, computer programs trying to find the active regions assumed the comet as a sphere or ellipsoid", explains Jean-Baptiste Vincent from MPS. Since in reality comets often have quite bizarre shapes, for many applications this approach is not good enough. The researchers therefore decided to take a standard approach: While watching a comet for an entire rotation period, changes in its luminance allow its true form to be calculated.

In a next step, the researchers fed their program with an initial assumption where the active regions might be located. Additionally they made an "educated guess" concerning the physical properties of the dust particles like size and initial velocity upon emission from the nucleus. As a result, the computer simulation delivers an image as it would be seen through a telescope on Earth. By comparing this with the actual image through a telescope the model can be refined step by step until simulation and actual image agree.

Already, the new method has passed its first test: The scientists could successfully apply it to the comet Tempel 1 that was the destination of NASA's Deep Impact Mission in 2005. "Even though ever since this mission we know where Tempel1's active regions are, we pretended not to", explains Vincent. For their computer program the scientists only used information that was available from Earth-base observations - apart from the nucleus shape model that was adopted from the mission results.

Next, the researchers intend to calculate the active regions of the comet Churyumov-Gerasimenko, the rendezvous target for ESA's Rosetta mission on which the Rosetta lander Philae will touch down in late 2014. The mission, to which MPS contributed many scientific instruments, has been on route to its destination beyond the orbit of Mars and the asteroid belt since 2004. In the crucial phase of the mission, the new method could help to determine a safe route for Rosetta through the cometary coma and maybe even find a suitable landing site.

Original work: *J.-B. Vincent, H. Böhnhardt, and L.M. Lara A numerical model of cometary dust coma structures - Application to comet 9P/Tempel 1 Astronomy&Astrophysics 512, A60 (2010) DOI: 10.1051/0004-6361/200913418*

Martian tubes could be home for 'cavenauts'

26 April 2010 by **Stuart Clark**

OUR ancestors made their first homes in caves. Now it looks like the first humans on Mars will do the same.

An analysis of Martian geography suggests where to look for the right kind of caves. "At least two regions, the Tharsis rise and the Elysium rise, contain volcanic features which may be suitable locations for caves," says lead author Kaj Williams of NASA's Ames Research Center in Mountain View, California. What's more, the analysis suggests that caves in these regions will contain a ready supply of water, in the form of ice.

Lava tubes are the most likely form of cave that we could occupy on Mars. These tunnel-like caves were created when ancient lava flows solidified at the surface, while lava inside drained away.

The existence of ice in these caves has been suggested before, but Williams and colleagues have taken the idea one step further by using a computer model to find out exactly how ice might build up inside them. They also looked at how long it might last. The team represented their cave as a box 10 metres square by 8 metres high, with a single small opening to the atmosphere in the roof.

They found that during the Martian day, warm, buoyant air would not enter the cool cave, saving the ice from melting. At night, as the outside air cooled, it would sink into the cave and bring in water vapour that condensed as frost onto the already icy walls. The model showed that the ice would be stable, lasting for up to 100,000 years (*Icarus*, DOI: 10.1016/j.icarus.2010.03.039).

Ice formed on the walls of Martian caves would be stable, lasting for up to 100,000 years

Such ice could prove a handy source of water for habitation and fuel, and could also provide shelter from dangerous solar radiation. Astronauts would find the caves excellent homes, says co-author Brian Toon of the University of Colorado, Boulder. "Perhaps we could call them 'cavenauts'."

Gene silencing prevents its first human disease

20:01 26 April 2010 by **Bob Holmes**

The discovery over a decade ago that snippets of RNA can be used as gene silencers in worms garnered a Nobel prize in 2006. Now, for the first time, RNA interference (RNAi) has been proven effective against a human disease – a common respiratory virus. Under RNAi, short strands of RNA are added to cells to destroy any native RNA molecules with a complementary sequence of letters. Since genes use RNA molecules to make proteins, these snippets effectively "silence" genes that carry the same sequence. In animals, RNAi has shown promise, but progress in people has been slow.

John DeVincenzo studies paediatric infectious disease at the University of Tennessee Health Science Center in Memphis. He and his colleagues tested the ability of short interfering RNA (siRNA) to inhibit viruses of the respiratory tract, where cells are exceptionally willing to take up RNA snippets.

Eighty-five healthy adults were given a nasal spray containing either a placebo or siRNA designed to silence one of the genes of respiratory syncytial virus (RSV), which is the leading cause of infant hospitalisation in the US but fairly harmless in healthy adults.

Delivery issue

They were to use the spray daily for five days. On day two, all the volunteers were infected with live RSV. By day 11, just 44 per cent of those who received the RNAi nasal spray had RSV infections, compared with 71 per cent of the placebo group.

RNAi can trigger an immune response, which might have helped keep infections at bay. But blood samples showed that the risk of RSV infection did not depend on levels of immune molecules, suggesting that RNAi's protective effect was due to the silencing of genes.

The team is now testing the therapy in lung-transplant patients, who take immunity-suppressing drugs that can make RSV infections deadly. DeVincenzo also hopes to test the therapy in infants soon.

For non-respiratory diseases, however, new ways of getting RNA into the target cells are still needed. "Delivery has always been the big issue for RNAi," says John Rossi, a molecular geneticist at City of Hope medical centre in Duarte, California, who is testing RNAi's potential to fight HIV.

Journal reference: Proceedings of the National Academy of Sciences, DOI: 10.1073/pnas.0912186107

Do the blind have a more acute sense of smell?

Universite de Montreal study debunks urban legend

Montreal – An ongoing study by Mathilde Beaulieu-Lefebvre, a graduate student from the Université de Montréal Department of Psychology, has debunked the myth that the blind have a more acute sense of smell than the sighted. Vision loss simply makes blind people pay more attention to how they perceive smells.

"If you enter a room in which coffee is brewing, you will quickly look for the coffee machine. The blind person entering the same room will only have the smell of coffee as information," says Beaulieu-Lefebvre. "That smell will therefore become very important for their spatial representation."

The three-step study tested 25 subjects, 11 of whom were blind from birth. Participants answered a questionnaire and were subjected to two experiments: one where they had to differentiate 16 different perfumes using an olfactometer, another where they lay in a tomodensitometer to identify three smells: a rose, vanilla and butanol (a sweet alcohol).

"There is an urban legend that blind people have better smell than the sighted. We are proving this to be false," says Maurice Ptito, a professor at the Université de Montréal School of Optometry and Beaulieu-Lefebvre's thesis director. "However, the blind do set themselves apart when it comes to cognitive efforts."

Using functional imagery, the team determined that the blind use their secondary olfactory cortex more than the sighted when they smell. They also use the occipital cortex, which is normally used for vision. "That's interesting because it means the blind are recuperating that part of their brain," says Dr. Ptito. "We're not speaking of recycling per se, yet that part of the brain is reorganized and used otherwise."

This research could lead to concrete applications in the re-adaptation of the blind. "For instance, smells are very peculiar in shopping centers," says Beaulieu-Lefebvre. "A hair salon, a pharmacy and a clothing store each have their own distinctive scent. We could easily foresee developing re-adaptation programs for getting around in such places."

Elephant-speak for 'Beware of the bees'

22:00 26 April 2010 by **Andy Coghlan**

Listen: *'Bee rumble' alarm call made by elephants.*

Entire elephant families bolt when they hear recordings of trumpetings made by other elephants fleeing from bees. This is the first demonstration that elephants may make specific sounds to warn of particular threats, although they have also been observed "roaring" when threatened by lions.

"Six out of 10 elephant families fled from the loudspeaker when we played the 'bee rumble' compared to just two when we played a control rumble and one with the same call shifted to a different frequency," says Lucy King of the University of Oxford, who heads a team in Kenya investigating the meanings of elephant vocalisations. The fleeing elephants also shook their heads violently, as if trying to deflect bees.

In 2007, King and her colleagues demonstrated that elephants flee in terror from bees and from recordings of bees. Last year, in follow-up trials, they successfully protected human settlements from encroachment by elephants by wiring beehives together as a fence.

Bee rumble

The latest findings open up the possibility of using recordings of the "bee rumble" as a deterrent as well, helping to prevent potential conflict between humans and elephants.

Elephants are terrified of bees because they can crawl into their trunk and sting them from inside it. They also sting around the animals' eyes, leaving painful welts that take weeks to disappear. The researchers believe that the rumbles alert both the elephant's family and neighbouring herds to the threat, and may teach young elephants that bees are dangerous.

Monkeys and birds are known to produce slightly different sounds to warn of different types of threat. Putty-nosed monkeys native to Nigeria, for example, make different sounds to warn of leopards or eagles.

Journal reference: report to appear in PLoS ONE

Ancient artifacts revealed as northern ice patches melt

Scientists hope to save artifacts as ice recedes

YELLOWKNIFE, NT – High in the Mackenzie Mountains, scientists are finding a treasure trove of ancient hunting tools being revealed as warming temperatures melt patches of ice that have been in place for thousands of years.

Tom Andrews, an archaeologist with the Prince of Wales Northern Heritage Centre in Yellowknife and lead researcher on the International Polar Year Ice Patch Study, is amazed at the implements being discovered by researchers. "We're just like children opening Christmas presents. I kind of pinch myself," says Andrews.

Ice patches are accumulations of annual snow that, until recently, remained frozen all year. For millennia, caribou seeking relief from summer heat and insects have made their way to ice patches where they bed down until cooler temperatures prevail. Hunters noticed caribou were, in effect, marooned on these ice islands and took advantage.

"I'm never surprised at the brilliance of ancient hunters anymore. I feel stupid that we didn't find this sooner," says Andrews.

Ice patch archeology is a recent phenomenon that began in Yukon. In 1997, sheep hunters discovered a 4,300-year-old dart shaft in caribou dung that had become exposed as the ice receded. Scientists who investigated the site found layers of caribou dung buried between annual deposits of ice. They also discovered a repository of well-preserved artifacts.

Andrews first became aware of the importance of ice patches when word about the Yukon find started leaking out. "We began wondering if we had the same phenomenon here."

In 2000, he cobbled together funds to buy satellite imagery of specific areas in the Mackenzie Mountains and began to examine ice patches in the region. Five years later, he had raised enough to support a four-hour helicopter ride to investigate two ice patches. The trip proved fruitful.

"Low and behold, we found a willow bow." That discovery led to a successful application for federal International Polar Year funds which have allowed an interdisciplinary team of researchers to explore eight ice patches for four years.

The results have been extraordinary. Andrews and his team have found 2400-year-old spear throwing tools, a 1000-year-old ground squirrel snare, and bows and arrows dating back 850 years. Biologists involved in the project are examining dung for plant remains, insect parts, pollen and caribou parasites. Others are studying DNA evidence to track the lineage and migration patterns of caribou. Andrews also works closely with the Shutaot'ine or Mountain Dene, drawing on their guiding experience and traditional knowledge.

"The implements are truly amazing. There are wooden arrows and dart shafts so fine you can't believe someone sat down with a stone and made them."

Andrews is currently in a race against time. His IPY funds have run out and he is keenly aware that each summer, the patches continue to melt. In fact, two of the eight original patches have already disappeared.

"We realize that the ice patches are continuing to melt and we have an ethical obligation to collect these artifacts as they are exposed," says Andrews. If left on the ground, exposed artifacts would be trampled by caribou or dissolved by the acidic soils. "In a year or two the artifacts would be gone."

'Uncontrolled brain activity' linked to epilepsy

Researchers have shed new light on the mechanism behind epilepsy attacks in the brain, revealing a potential new target for drug treatment.

Around half a million people in the UK have some form of epilepsy. Until recently the focus of research has been on cells called neurons, but a US study points to a completely different cell. Nature Neuroscience journal reports its behaviour may be key to uncontrolled brain activity behind the condition.

Epilepsy attacks, which can manifest as fits in some people, or "absences" in others, are caused by too much electrical signalling from the brain's neurons. However, in many cases, the reason for this over-activity is poorly understood.

Scientists now believe that, in some cases, although the problem happens at the neuron the underlying reason may be the failure of surrounding cells to help control this activity.

The latest study, from the Tuft University School of Medicine and the Children's Hospital of Philadelphia, provides the strongest evidence yet that a cell called an astrocyte is the culprit.

The astrocyte is known to have a wide range of functions, including supplying nutrients to other brain cells, and even helping the brain cope with damaged nerve cells. In some brain diseases, the astrocytes swell up and behave differently, and it is this condition which the researchers believe is linked to epilepsy.

No inhibition

They induced this swelling in brain samples from mice, then tested whether this made a difference to the ability of the brain cells to "turn down", or inhibit, the brain signals from specific neurons.

They found that the enlarged astrocytes led to reduced levels of a brain chemical known to inhibit electrical signalling from the neurons.

Dr Douglas Coulter, one of the researchers, said: "We already know that inhibition is a powerful force in the brain. "In epilepsy, inhibition is not working properly, and uncontrolled signalling leads to epileptic seizures.

"By better understanding the detailed events that occur in epilepsy, we are gaining knowledge that could ultimately lead to better treatments for epilepsy, and possibly for other neurological diseases."

Professor Vincenzo Crunelli, a neuroscientist from the University of Cardiff, said other research, including his own, now pointed towards a role for astrocytes in various different types of epilepsy.

He said the finding might be particularly relevant in a form of epilepsy called temporal lobe epilepsy, which can be resistant to treatment. He said: "This certainly suggests that the astrocytes may be involved in maintaining this over-excitation of the neurons. "If this is the case, it offers the chance of a new therapeutic target."

The Claim: Lack of Sleep Increases Weight

By ANAHAD O'CONNOR

THE FACTS Looking to lose a little weight? Portion size and exercise are crucial. But don't forget about a good night's rest.

Scientists have known for years that skimping on sleep is associated with weight gain. A good example was a study published in 2005, which looked at 8,000 adults over several years as part of the National Health and Nutrition Examination Survey. Sleeping fewer than seven hours a night corresponded with a greater risk of weight gain and obesity, and the risk increased for every hour of lost sleep.

More recent studies have taken a much closer look.

One published this year in The American Journal of Clinical Nutrition took a small group of men and measured their food intake across two 48-hour periods, one in which they slept eight hours and another in which they slept only four. After the night of abbreviated sleep, the men consumed more than 500 extra calories (roughly 22 percent more) than they did after eight hours of sleep. A University of Chicago study last year had similar findings in both men and women: subjects took in significantly more calories from snacks and carbohydrates after five and a half hours of sleep than after eight and a half hours.

Some studies pin the blame on hormones, arguing that decreased sleep creates a spike in ghrelin, a hormone that stimulates appetite, and a reduction in leptin, which signals satiety. But more study is needed.

THE BOTTOM LINE Losing sleep may increase appetite and, as a result, weight.

Massive Southern Ocean current discovered

A deep ocean current with a volume equivalent to 40 Amazon Rivers has been discovered by Japanese and Australian scientists near the Kerguelen plateau, in the Indian Ocean sector of the Southern Ocean, 4,200 kilometres south-west of Perth.

In a paper published today in *Nature Geoscience*, the researchers described the current -more than three kilometres below the Ocean's surface - as an important pathway in a global network of ocean currents that influence climate patterns.

"The current carries dense, oxygen-rich water that sinks near Antarctica to the deep ocean basins further north," says co-author Dr Steve Rintoul from the Antarctic Climate and Ecosystems CRC and CSIRO's Wealth from Oceans Flagship.

"Without this supply of Antarctic water, the deepest levels of the ocean would have little oxygen.

"The ocean influences climate by storing and transporting heat and carbon dioxide - the more the ocean stores, the slower the rate of climate change. The deep current along the Kerguelen Plateau is part of a global system of ocean currents called the overturning circulation, which determines how much heat and carbon the ocean can soak up."

While earlier expeditions had detected evidence of the current system, they were not able to determine how much water the current carried. The joint Japanese-Australian experiment deployed current-meter moorings anchored to the sea floor at depths of up to 4500m. Each mooring reached from the sea floor to a depth of 1000m and measured current speed, temperature and salinity for a two-year period.

"The continuous measurements provided by the moorings allow us, for the first time, to determine how much water the deep current carries to the north," Dr Rintoul said. The current was found to carry more than 12 million cubic metres per second of Antarctic water colder than 0 °C (because of the salt dissolved in sea water, the ocean does not freeze until the temperature gets close to -2 °C).

"It was a real surprise to see how strong the flow was at this location. With two-year average speeds of more than 20cm per second, these are the strongest mean currents ever measured at depths three kilometres below the sea surface. "Mapping the deep current systems is an important step in understanding the global network of ocean currents that influence climate, now and in the future. Our results show that the deep currents near the Kerguelen Plateau make a large contribution to this global ocean circulation," Dr Rintoul said.

Antarctic waters carried northward by the deep currents eventually fill the deep layers of eastern Indian and Pacific Oceans. *Provided by CSIRO (news : web)*

To Beat the Heat, Drink a Slushie First

By GINA KOLATA

It's no surprise that it's hard to exercise on a hot day. You go slower. An easy workout is grueling. You have no endurance.

The reasons are also no surprise. Blood is directed to the skin for cooling, which means it is diverted from working muscles. The hotter it is, and the harder the effort, the harder exercise becomes. Eventually, you slow down or stop, unable to go on. Exercise physiologists debate why. It could be that muscles are starved for blood. It could be that the brain gets too hot. It could be that the heart eventually can't beat fast enough to satisfy all the demands for blood. But even without knowing why, researchers have found they can delay the time to utter exhaustion by getting people a bit chilled before they start.

So companies sell devices, like cooling vests to wear before exercise, or even portable cold baths for prerace immersion. Researchers have tested methods like having athletes swim for an hour in cold water or sit in a cold room or stand in a cold shower. No matter what the method, companies and researchers report a precooling effect.

The problem is that none of the methods are easy, cheap and practical. But now, a New Zealand endurance athlete and exercise researcher says he has found a method that is. All you have to do is drink an ice slurry, also known as a slushie, before exercising. In a new study, he reports that young male recreational athletes who drank a syrup-flavored ice slurry just before running on a treadmill in hot room could keep going for an average of 50 minutes before they had to stop. When they drank only syrup-flavored cold water, they could run for an average of 40 minutes.

There are limitations - the running test was indoors, so there was no cooling effect from breezes on the skin. In those artificial circumstances, precooling might have had more dramatic effects than it would outdoors. And what athletes really want is to go faster in a race, not run until they drop. But the study tested endurance, not performance, which is typical of such research.

Still, exercise specialists say, the effect was pronounced. "It's a really interesting study, well done and carefully thought out," said Craig Crandell, an exercise physiologist at the University of Texas Southwestern Medical Center, who studies the effects of exercising in the heat.

The effect was short-lived, according to the senior investigator, Paul Laursen, at the New Zealand Academy of Sport in Auckland and a competitor who has raced in 13 Ironman triathlons (a 2.4-mile swim followed by a 112-mile bike race followed by a marathon-distance 26.2-mile run). It would not even begin to last long enough to run a marathon or do a century (100-mile) bike ride, for example. But it would be perfect for a sport like tennis or for a 5- or 10-kilometer race or for team sports like soccer or football, and it might give endurance athletes in longer events a boost by letting them beat the heat, to a certain extent, for the first 50 minutes or so.

Dr. Laursen said he thought of using ice slurries because they can lower brain temperature in swine more effectively than cold water. The swine studies were testing methods to cool the body before surgery. Dr. Laursen reasoned that slurries might also effectively cool the body before exercise. The advantage, he said, is that they are even colder than ice - 30 degrees Fahrenheit - an effect that occurs when sugary water is swirled with crushed ice.

"It's a neat idea," said Scott Montain, an exercise researcher at the United States Army Research Institute of Environmental Medicine in Natick, Mass. "I wouldn't have guessed slurries would have that much of an effect."

It's not so clear why ice slurries or any other method work, though. As Dr. Laursen notes in a review article, "The mechanisms underlying the performance effects associated with precooling are not yet completely understood." One possibility, which Dr. Laursen said might have explained the ice slurry results, was that slurries lowered body temperature before the young men ran, letting them run for a longer time before their bodies became critically hot.

Dr. Montain is not sure. The men did not get that hot, he said. At exhaustion, the mean body temperature of those who drank the slurry and those who drank cold water was about 101 degrees.

He said the limiting factor might have been the men's heart rates. In both groups, exhaustion occurred when heart rates reached about 185 beats per minute. Those who drank the slurry hit that heart rate 10 minutes later than those who drank cold water. Dr. Montain says the heart beats faster and faster, trying to get blood to the skin, for cooling, and to the muscles for exercising, until it just can't keep up.

"The heart can't send blood everywhere without the blood pressure falling," Dr. Montain said. "At some point, you can't maintain your blood pressure." But, Dr. Montain said, what mattered in the end was that the simple solution of drinking an ice slurry worked. He might even try drinking a one himself if he's stuck racing in the heat, something he tries to avoid.

"I try to race when the weather is good," Dr. Montain said. "I live in Massachusetts, so I can choose."

Dr. Crandall, in Dallas, might seem the ideal person to use a slurry before a run. But he's less interested.

"I just run for enjoyment," he said. And if he drank a slurry with its sugary syrup, he said, "all the calories I burned off would be added back." Dr. Laursen, though, is drinking slurries. He gets ice cream headaches when he drinks them - everyone does, he said - but he puts up with the pain. It's worth it.

When he has a slurry before a grueling bout of exercise in the heat, he said, "I feel so much better."

Little-Known Disorder Can Take a Toll on Learning

By TARA PARKER-POPE

Parents and teachers often tell children to pay attention - to be a "good listener." But what if your child's brain doesn't know how to listen?

That's the challenge for children with auditory processing disorder, a poorly understood syndrome that interferes with the brain's ability to recognize and interpret sounds. It's been estimated that 2 to 5 percent of children have the disorder, said Gail D. Chermak, an expert on speech and hearing sciences at Washington State University, and it's likely that many cases have gone undiagnosed or misdiagnosed.

The symptoms of A.P.D. - trouble paying attention and following directions, low academic performance, behavior problems and poor reading and vocabulary - are often mistaken for attention problems or even autism.

But now the disorder is getting some overdue attention, thanks in part to the talk-show host Rosie O'Donnell and her 10-year-old son, Blake, who has A.P.D. In the foreword to a new book, "The Sound of Hope" (Ballantine) - by Lois Kam Heymann, the speech pathologist and auditory therapist who helped Blake - Ms. O'Donnell recounts how she learned something was amiss.

It began with a haircut before her son started first grade. Blake had already been working with a speech therapist on his vague responses and other difficulties, so when he asked for a "little haircut" and she pressed him on his meaning, she told the barber he wanted short hair like his brother's. But in the car later, Blake erupted in tears, and Ms. O'Donnell realized her mistake. By "little haircut," Blake meant little hair should be cut. He wanted a trim. "I pulled off on the freeway and hugged him," Ms. O'Donnell said. "I said: 'Blakey, I'm really sorry. I didn't understand you. I'll do better.' "

That was a turning point. Ms. O'Donnell's quest to do better led her to Ms. Heymann, who determined that while Blake could hear perfectly well, he had trouble distinguishing between sounds. To him, words like "tangerine" and "tambourine," "bed" and "dead," may sound the same.

"The child hears 'And the girl went to dead,' and they know it doesn't make sense," Ms. Heymann told me. "But while they try to figure it out, the teacher continues talking and now they're behind. Those sounds are being distorted or misinterpreted, and it affects how the child is going to learn speech and language."

Blake's brain struggled to retain the words he heard, resulting in a limited vocabulary and trouble with reading and spelling. Abstract language, metaphors like "cover third base," even "knock-knock" jokes, were confusing and frustrating.

Children with auditory processing problems often can't filter out other sounds. The teacher's voice, a chair scraping the floor and crinkling paper are all heard at the same level. "The normal reaction by the parent is 'Why don't you listen?' " Ms. Heymann said. "They were listening, but they weren't hearing the right thing."

The solution is often a comprehensive approach, at school and at home. To dampen unwanted noise, strips of felt or tennis balls may be placed on the legs of chairs and desks. Parents work to simplify language and avoid metaphors and abstract references.

The O'Donnell household cut back on large, noisy gatherings that were upsetting to Blake. Twice-weekly sessions focusing on sounds and words, using rhyme and body gestures, helped him catch up on the learning he had missed.

Help inside the classroom is essential. One family in Westchester County, who asked not to be named to protect their son's privacy, met with his teachers and agreed on an array of adaptations - including having his teacher wear a small microphone that directed her voice more clearly to a speaker on the student's desk so he could better distinguish her voice from competing sounds.

Nobody knows exactly why auditory processing skills don't fully develop in every child, according to the National Institute on Deafness and Other Communication Disorders. Scientists are conducting brain-imaging studies to better understand the neural basis of the condition and find out if there are different forms.

Reassuringly, the disorder seems to have little or nothing to do with intelligence. Blake has an encyclopedic knowledge of animals - he once corrected his mother for referring to a puma as a mountain lion. The Westchester child is now a 17-year-old high school student being recruited by top colleges.

"He's in accelerated Latin, honors science classes," said his mother. "I remember I used to dream of the day he would be able to wake up in the morning and just say, 'Mommy.' "

Not every child does so well, and some children with A.P.D. have other developmental and social problems. But Ms. O'Donnell says that treatment is not just about better grades.

"It definitely affected his whole world," she said of her son. "Not just learning. It cuts them off from society, from interactions. To see the difference in who he is today versus who he was two years ago, and then to contemplate what would have happened had we not been able to catch it - I think he would have been lost."

Q & A

Fish Versus Flax

By C. CLAIBORNE RAY

Q. How does flaxseed oil compare with fish oil in nutritional benefits?

A. Flaxseed oil and fish oil are believed to have similar nutritional benefits, but it takes much more flaxseed oil to obtain these possible benefits, said Dr. Sheldon S. Hendler, co-editor of the "PDR for Nutritional Supplements," the standard reference in the field.

The strongest evidence, from studies of omega-3 fatty acids in fish oil, is for a reduction of triglycerides, a form of fat found in the blood. Other possible benefits include anti-inflammatory activity; action against blood clots and arterial plaque; and protection of the neurons and retina.

Both oils contain omega-3 fatty acids. In fish oil, the major ones are EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid), while in flaxseed oil, the major one is alpha-linolenic acid (ALA), a precursor of EPA and DHA, which is converted to those fatty acids in the body.

The possible health benefits are mainly attributable to EPA and DHA, Dr. Hendler said. "The most studied effect is their ability to lower abnormally elevated serum triglycerides, a risk factor for cardiovascular disease, particularly in those with diabetes," he said.

The recommended amount of EPA plus DHA for this condition is four grams daily, about one teaspoonful, Dr. Hendler said, but it takes 40 grams, or about three tablespoonsful or more, of ALA to produce four grams of EPA and DHA in the body.

Phosphorous in sodas and processed foods accelerates signs of aging say Harvard scientists

New research in the FASEB Journal shows that high levels of phosphate in sodas and processed foods accelerate the aging process in mice and contribute to age-associated complications such as chronic kidney disease

Here's another reason to kick the soda habit. New research published online in the *FASEB Journal* (http://www.fasebj.org) shows that high levels of phosphates may add more "pop" to sodas and processed foods than once thought. That's because researchers found that the high levels of phosphates accelerate signs of aging.

High phosphate levels may also increase the prevalence and severity of age-related complications, such as chronic kidney disease and cardiovascular calcification, and can also induce severe muscle and skin atrophy.

"Humans need a healthy diet and keeping the balance of phosphate in the diet may be important for a healthy life and longevity," said M. Shawkat Razzaque, M.D., Ph.D., from the Department of Medicine, Infection and Immunity at the Harvard School of Dental Medicine. "Avoid phosphate toxicity and enjoy a healthy life."

To make this discovery, Razzaque and colleague examined the effects of high phosphate levels in three groups of mice. The first group of mice was missing a gene (klotho), which when absent, causes mice to have toxic levels of phosphate in their bodies. These mice lived 8 to 15 weeks. The second group of mice was missing the klotho gene and a second gene (NaPi2a), which when absent at the same time, substantially lowered the amount of phosphate in their bodies. These mice lived to 20 weeks. The third group of mice was like the second group (missing both the klotho and NaPi2a genes), except they were fed a high-phosphate diet. All of these mice died by 15 weeks, like those in the first group. This suggests that phosphate has toxic effects in mice, and may have a similar effect in other mammals, including humans.

"Soda is the caffeine delivery vehicle of choice for millions of people worldwide, but comes with phosphorous as a passenger" said Gerald Weissmann, M.D., Editor-in-Chief of the *FASEB Journal*. "This research suggests that our phosphorous balance influences the aging process, so don't tip it."

New Drug May Treat Cystic Fibrosis, Other Diseases Caused by "Nonsense Mutations," Says UAB Researcher

BIRMINGHAM, Ala. - Inherited diseases such as cystic fibrosis can be caused by genetic "nonsense mutations" that disrupt the way human cells make proteins. David Bedwell, Ph.D., a professor in the University of Alabama at Birmingham (UAB) Department of Microbiology, says scientists are now closer to producing drugs that will fix this disruption and drastically improve treatment of genetic disease.

Bedwell is a renowned researcher on the select group of genetic alterations called nonsense mutations - DNA alterations that can lead to nonfunctional or missing proteins. He presented recent findings on an experimental drug that may help to treat some cystic fibrosis patients during the Experimental Biology 2010 conference in Anaheim, Calif., April 26. This drug ataluren (formerly called PTC124) also holds promise in treating more than 2,400 different genetic disorders caused by nonsense mutations.

"When you treat a genetic disease, the bottom line is how much of the missing protein do you need to restore to have a therapeutic benefit," Bedwell says. "It comes down to the threshold of protein rescue. For some diseases, it might be 1 percent of protein you need restored, and for other diseases you may need 50 percent of protein restored."

In Bedwell's most well-known study, ataluren restored up to 29 percent of normal protein function in mice with cystic fibrosis. Another researcher not affiliated with UAB has reported ataluren restored up to 25 percent of the missing or abnormal protein function in mice with Duchenne muscular dystrophy.

An estimated one-third of gene defects responsible for human disease are thought to come from nonsense mutations. In the case of cystic fibrosis, the absence of a certain protein leads to an imbalance of salt and water in the linings of the lungs and other membranes. The UAB study showed that ataluren allowed the protein to be made in mouse cells where it was previously absent, and it helped the body's regulatory system to restore salt and water balance in the membrane.

Bedwell says the true promise of drugs that suppress nonsense mutations is their selectiveness, meaning the drugs work well in fixing disease-causing mutations while generally sparing healthy genes.

Ataluren is now being tested in humans for its effectiveness in treating Duchenne/Becker muscular dystrophy, cystic fibrosis, hemophilia A, hemophilia B and other conditions. The agent works in an oral form.

The research is a partnership with Bedwell and UAB's Gregory Fleming James Cystic Fibrosis Research Center. It is funded by PTC Therapeutics Inc. with assistance from the National Institutes of Health.

***Editor's Note**: Bedwell reports a consulting relationship with ataluren-maker PTC Therapeutics.*

Asphalt volcanoes discovered off California

12:32 27 April 2010 by **Jim Giles**

Seven small undersea "volcanoes" that once spewed asphalt into the Pacific Ocean have been mapped off the coast of California. They could be the cause of a prehistoric marine dead zone thought to exist in the area.

David Valentine and colleagues at the University of California, Santa Barbara, surveyed the sea floor and discovered the mounds, the largest of which rises 20 metres above the seabed, made from tar. Some were still releasing methane. It is the first time that asphalt volcanoes have been identified in the area. Valentine says they formed as sticky hydrocarbons seeped from the seabed around 40,000 years ago.

Methane would also have been released at a rate that greatly exceeds today's output, with devastating consequences for the local ecosystem. The gas would have attracted bacteria that metabolise methane and

deplete oxygen. That fits with analysis of sea-floor sediments, which suggests that a dead zone of around 600 square kilometres formed here about 40,000 years ago. *Journal reference: Nature Geoscience, DOI: 10.1038/ngeo848*

Reward-driven people win more, even when no reward at stake

Brain scans show persistent motivation regardless of payoff

By Tony Fitzpatrick

The brain's lateral prefrontal cortex (in yellow) shows heightened and long-lasting activity in people more driven by rewards, even when a reward is not offered.

Whether it's for money, marbles or chalk, the brains of reward-driven people keep their game faces on, helping them win at every step of the way. Surprisingly, they win most often when there is no reward.

That's the finding of neuroscientists at Washington University in St. Louis, who tested 31 randomly selected subjects with word games, some of which had monetary rewards of either 25 cents or 75 cents per correct answer, others of which had no money attached.

Subjects were given a short list of five words to memorize in a matter of seconds, then a 3.5-second interval or pause, then a few seconds to respond to a solitary word that either had been on the list or had not. Test performance had no consequence in some trials, but in others, a computer graded the responses, providing an opportunity to win either 25 cents or 75 cents for quick and accurate answers. Even during these periods, subjects were sometimes alerted that their performance would not be rewarded on that trial.

Prior to testing, subjects were submitted to a battery of personality tests that rated their degree of competitiveness and their sensitivity to monetary rewards.

Designed to test the hypothesis that excitement in the brains of the most monetary-reward-sensitive subjects would slacken during trials that did not pay, the study is co-authored by Koji Jimura, PhD, a postdoctoral researcher in psychology in Arts & Sciences, and Todd Braver, PhD, professor of psychology. Braver also is a member of the neuroscience program and radiology department at Washington University School of Medicine in St. Louis.

But the researchers found a paradoxical result: The performance of the most reward-driven individuals actually was most improved - relative to the less reward-driven - in the trials that paid nothing, not the ones in which there was money at stake.

Even more striking was that the brain scans taken using functional Magnetic Resonance Imaging (fMRI) showed a change in the pattern of activity during the non-rewarded trials within the lateral prefrontal cortex (PFC), located right behind the outer corner of the eyebrow, an area that is strongly linked to intelligence, goal-driven behavior and cognitive strategies. The change in lateral PFC activity was statistically linked to the extra-behavioral benefits observed in the reward-driven individuals.

The researchers suggest that this change in lateral PFC activity patterns represents a flexible shift in response to the motivational importance of the task, translating this into a superior task strategy that the researchers term "proactive cognitive control."

In other words, once the rewarding motivational context is established in the brain indicating there is a goal-driven contest at hand, the brain actually rallies its neuronal troops and readies itself for the next trial, whether it's for money or not.

"It sounds reasonable now, but when I happened upon this result, I couldn't believe it because we expected the opposite results," says Jimura, first author of the paper. "I had to analyze the data thoroughly to persuade myself.

"The important finding of our study is that the brains of these reward-sensitive individuals do not respond to the reward information on individual trials," Jimura says. "Instead, it shows that they have persistent motivation, even in the absence of a reward. You'd think you'd have to reward them on every trial to do well. But it seems that their brains recognized the rewarding motivational context that carried over across all the trials."

The finding sheds more light on the workings of the lateral PFC and provides potential behavioral clues about personality, motivation, goals and cognitive strategies.

The research has important implications for understanding the nature of persistent motivation, how the brain creates such states, and why some people seem to be able to use motivation more effectively than others. By understanding the brain circuitry involved, it might be possible to create motivational situations that are more effective for all individuals, not just the most reward-driven ones, or to develop drug therapies for individuals that suffer from chronic motivational problems.

Their results were published April 26 in the early online edition of the *Proceedings of the National Academy of Science*.

Everyone knows of competitive people who have to win, whether in a game of HORSE, golf or the office NCAA basketball tournament pool. The findings might tell researchers something about the competitive drive.

The researchers are interested in the signaling chain that ignites the prefrontal cortex when it acts on reward-driven impulses, and they speculate that the brain chemical dopamine could be involved. That could be a potential direction of future studies.

Dopamine neurons, once thought to be involved in a host of pleasurable situations but now considered more of a learning or predictive signal, might respond to cues that let the lateral PFC know that it's in for something good. This signal might help to keep information about the goals, rules or best strategies for the task active in mind to increase the chances of obtaining the desired outcome.

In the context of this study, when a 75-cent reward is available for a trial, the dopamine-releasing neurons could be sending signals to the lateral PFC that jump-start it to do the right procedures to get a reward.

"It would be like the dopamine neurons recognize a cup of Ben & Jerry's ice cream and tell the lateral PFC the right action strategy to get the reward - to grab a spoon and bring the ice cream to your mouth," Braver says. "We think that the dopamine neurons fires to the cue rather than the reward itself, especially after the brain learns the relationship between the two. We'd like to explore that some more."

They also are interested in the "reward carryover state," or the proactive cognitive strategy that keeps the brain excited even in gaps, such as pauses between trials or trials without rewards. They might consider a study in which rewards are far fewer.

"It's possible we'd see more slackers with less rewards," Braver says. "That might have an effect on the reward carryover state. There are a host of interesting further questions that this work brings up, which we plan to pursue."

The Search for Genes Leads to Unexpected Places

By CARL ZIMMER

Edward M. Marcotte is looking for drugs that can kill tumors by stopping blood vessel growth, and he and his colleagues at the University of Texas at Austin recently found some good targets - five human genes that are essential for that growth. Now they're hunting for drugs that can stop those genes from working. Strangely, though, Dr. Marcotte did not discover the new genes in the human genome, nor in lab mice or even fruit flies. He and his colleagues found the genes in yeast.

"On the face of it, it's just crazy," Dr. Marcotte said. After all, these single-cell fungi don't make blood vessels. They don't even make blood. In yeast, it turns out, these five genes work together on a completely unrelated task: fixing cell walls.

Crazier still, Dr. Marcotte and his colleagues have discovered hundreds of other genes involved in human disorders by looking at distantly related species. They have found genes associated with deafness in plants, for example, and genes associated with breast cancer in nematode worms. The researchers reported their results recently in The Proceedings of the National Academy of Sciences.

The scientists took advantage of a peculiar feature of our evolutionary history. In our distant, amoeba-like ancestors, clusters of genes were already forming to work together on building cell walls and on other very basic tasks essential to life. Many of those genes still work together in those same clusters, over a billion years later, but on different tasks in different organisms.

Studies like this offer a new twist on Charles Darwin's original ideas about evolution. Anatomists in the mid-1800s were fascinated by the underlying similarities of traits in different species - the fact that a bat's wing, for example, has all the same parts as a human hand. Darwin argued that this kind of similarity - known as homology - was just a matter of genealogy. Bats and humans share a common ancestor, and thus they inherited limbs with five digits.

Some 150 years of research have amply confirmed Darwin's insight. Paleontologists, for example, have brought ambiguous homologies into sharp focus with the discovery of transitional fossils. A case in point is the connection between the blowholes of whales and dolphins and the nostrils of humans. Fossils show how the nostrils of ancestral whales moved from the tip of the snout to the top of the head.

In the 1950s, the study of homology entered a new phase. Scientists began to discover similarities in the structure of proteins. Different species have different forms of hemoglobin, for example. Each form is adapted to a particular way of life, but all descended from one ancestral molecule.

When scientists started sequencing DNA, they were able to find homologies between genes as well. From generation to generation, genes sometimes get accidentally copied. Each copy goes on to pick up unique mutations. But their sequence remains similar enough to reveal their shared ancestry.

A trait like an arm is encoded in many genes, which cooperate with one another to build it. Some genes produce proteins that physically join together to do a job. In other cases, a protein encoded by one gene is required to switch on other genes.

It turns out that clusters of these genes - sometimes called modules - tend to keep working together over the course of millions of years. But they get rewired along the way. They respond to new signals, and act to help build new traits.

In an influential 1997 paper, Sean B. Carroll of the University of Wisconsin, Neil Shubin of the University of Chicago and Cliff Tabin of Harvard Medical School coined a term for these borrowed modules: “deep homology.”

Since then, scientists have gotten a far more detailed look at many examples of deep homology. Dr. Carroll and his colleagues, for example, recently figured out how the spots on a fly’s wing evolved through rewiring modules. A tiny fly called Drosophila guttifera sports a distinctive pattern of 16 polka dots on its wings. Dr. Carroll and his colleagues discovered that the module of genes that sets the location of the spots is the same module that lays out the veins and sensory organs in the wings of many fly species. The module was later borrowed in Drosophila guttifera to lay down dots, too.

Our own eyes are also the product of deep homology. The light-sensing organs of jellyfish seem very different from our eyes, for example, but both use the same module of genes to build light-catching molecules.

Scientists are also discovering that our nervous system shares an even deeper homology with single-celled organisms. Neurons communicate with each other by forming connections called synapses. The neurons use a network of genes to build a complete scaffolding to support the synapse. In February, Alexandre Alié and Michael Manuel of the National Center for Scientific Research in France reported finding 13 of these scaffold-building genes in single-celled relatives of animals known as choanoflagellates.

No one is sure what choanoflagellates use these neuron-building genes for. The one thing that is certain is that they don’t build neurons with them. Until now, scientists have simply stumbled across examples of deep homology. Dr. Marcotte wondered if it was possible to speed up the pace of discovery.

The evidence for deep homologies, he reasoned, might already be waiting to be found in the scientific literature - specifically, in the hundreds of thousands of studies scientists have conducted on how various genes worked in various species.

Scientists have identified thousands of genes that can give rise to diseases in humans when they mutate. Other researchers have systematically mutated each of the 6,600 genes in yeast and observed how the mutant yeast fare under different conditions. If Dr. Marcotte could analyze data like these, he reasoned, he might find gene modules doing different things in distantly related species.

Dr. Marcotte and his colleagues amassed a database of 1,923 associations between genes and diseases in humans. They added more than 100,000 additional associations between genes and traits in species including mice, yeast and nematode worms. The scientists then searched for related genes that produced different traits in different species. They discovered, for example, that five genes known to help build blood vessels were closely related to five genes that yeast cells use to fix their cell walls.

Discovering these shared genes then allowed Dr. Marcotte and his colleagues to make new discoveries. Their database had a total of 67 genes that fix cell walls in yeast. If yeast and humans inherited an ancient gene module, we might use related versions of other yeast genes to build blood vessels.

The scientists studied the 62 other wall-fixing yeast genes. To do so, they found related versions in frogs and watched how each one behaved in the developing frog embryo. The scientists discovered that five of the additional yeast genes also made proteins found in developing blood vessels. To see how important these proteins were for building blood vessels, the scientists shut down, one by one, the genes that carried the instructions for each protein, and observed how frog embryos developed.

“We ended up with a dramatic loss of blood vessels,” said John Wallingford, a University of Texas developmental biologist and co-author of the study. Dr. Marcotte wondered if humans might also share modules with much more distantly related organisms: plants. He and his colleagues expanded their database with 22,921 associations between genes and traits scientists have found in the mustard plant Arabidopsis thaliana.

To their surprise, the scientists discovered 48 modules shared by plants and people. “There was a lot of screaming in the halls for that one,” Dr. Marcotte said.

The scientists picked out one particularly strange module shared by plants and people for closer study. In humans, the genes have been linked to a rare genetic disorder called Waardenburg syndrome. It is caused by a disturbance in a group of cells in embryos called neural crest cells. Normally, the neural crest cells crawl through the embryo and form a strip running along the back. They then give rise to nerve cells, pigment-producing cells and some bones of the skull. People with Waardenburg syndrome have symptoms scattered across the parts of the body produced by neural crest cells. They may include deafness; widely spaced eyes; a white forelock of hair; and white patches on their face.

The scientists discovered that two Waardenburg-linked genes matched mustard plant genes for sensing gravity. If these genes are disabled by a mutation, a plant can't grow upright.

Dr. Marcotte and his colleagues found three more gravity-sensing plant genes in their database. They decided to see if any of the three also played a role in Waardenburg syndrome.

The scientists found that one of the gravity-sensing plant genes became active in the neural crest cells of frog embryos. When they silenced the gene in those neural crest cells, the embryos became deformed.

Dr. Carroll (who also writes a science column for The New York Times) saw the new research as a logical progression from early studies. "It warms our hearts that deep homology is gaining traction like this," he said.

"This is a very effective way to find human disease genes," said David Platchetzski of the University of California, Davis, who was not involved in the study. "You can move forward much more quickly."

Be a good dog and you'll live a long, healthy life

LIVE fast, die young: it's an adage that applies not just to humans. Disobedient dog breeds tend to die earlier than docile dogs, according to a study that compared the longevity of different breeds.

Vincent Careau at the University of Sherbrooke in Quebec, Canada, compared data from previous studies of personality in a number of dog breeds, and mortality data on the same varieties. Some of the data came from insurance companies that sell pet policies. After controlling for size - big dogs tend to die younger than small ones - Careau's team found the most obedient breeds, such as German shepherds, poodles and bichon frises, tended to be the longest lived, while hard-to-train dogs such as pomeranians and beagles were more likely to die younger. Another trait, aggressiveness, was linked to metabolic rate, with docile dogs such as collies burning calories more slowly than territorial great danes, for instance (*The American Naturalist* DOI: 10.1086/652435).

Dogs were domesticated from wolves more than 10,000 years ago, but Careau doubts that long lifespan or rapid metabolism were selected on purpose. Most of today's 400-plus recognised breeds are the product of intensive breeding over the past 100 years and it is more likely that by selecting dogs that are easier to train or more aggressive, we ended up with long-lived and calorie-hungry breeds, he says.

New study: The kitchen-counter diet

Keep the pasta bowl off the table and eat 20 percent less

ANAHEIM, CA: Can eating less be as simple as leaving serving dishes on the stove and off the table? According to a team of researchers from Cornell University, it can.

At this week's Experimental Biology conference in Anaheim, Calif., researchers led by Brian Wansink, director of the Cornell Food and Brand Lab, shared findings of their "Serve Here; Eat There" study of 78 adults.

"We looked at whether serving foods from the kitchen counter, instead of at the table, would reduce the number of times a person refilled his or her plate," Wansink said.

"Quite simply, it is a case of 'out of sight, out of mind,'" he continued. "When we kept the serving dishes off the table, people ate 20% fewer calories. Men ate close to 29% less."

The same strategy can be used to help increase the consumption of healthier foods, Wansink explained.

"If fruits and vegetables are kept in plain sight, we'll be much more likely to choose them, rather than a piece of cake hidden in the refrigerator."

Dining environment, plate and portion size, and other hidden cues that determine what, when and how much we eat are familiar topics in Wansink's work. He is the author of Mindless Eating: Why We Eat More Than We Think.

Scientists identify freezing times for Cretaceous dinosaurs

Scientists studying fossils and minerals from Arctic Svalbard, in Norway, have discovered evidence that the 'greenhouse' climate of the Cretaceous period was punctuated by a sudden drop in global temperatures.

The drop is estimated to have occurred some 137 million years ago during a time when dinosaurs roamed the Earth, and would have seen the islands fall from an average of 13 degrees centigrade (ocean temperature) to as low as four degrees.

The findings, which were published in the journal *Geology* and featured as a highlight in *Nature Geoscience*, will further contribute to the debate over climate change as they appear to contradict the common model which links high levels of Carbon Dioxide (CO2) - as recorded in the Cretaceous era - with reduced polar ice caps.

Despite being located in the Arctic Circle, Svalbard was home to numerous species of dinosaur and was typically characterised by warm, shallow seas and swamps.

But the research team, led by Dr Gregory Price of the University of Plymouth, found evidence in fossils and carbonate materials preserved in marine rocks in the region of a transient shift to cooler glacial conditions around 137 million years ago.

Dr Price said: "At certain times in the geological past, the world has been dominated by greenhouse conditions with elevated CO2 levels and warm Polar Regions, and hence, these are seen as analogues of future global climate. “But this research suggests that for short periods of time the Earth plunged back to colder temperatures, which not only poses interesting questions in terms of how the dinosaurs might have coped, but also over the nature of climate change itself.”

Dr Price, along with Dr Elizabeth Nunn, of Johannes Gutenburg Universitat in Mainz, Germany, first visited Svalbard in 2005 to collect fossils and samples, in an area famed for a number of paleontological discoveries, including giant marine reptiles such as pliosaurs and icthyosaurs.

The samples were analysed back in Plymouth and prompted return trips to the area to gather more evidence.

“The flourishing of the dinosaurs and a range of other data indicates that the Cretaceous period was considerably warmer and boasted a high degree of CO2 in the atmosphere,” said Dr Price.

“But over a period of a few hundred or a few thousand years, ocean temperatures fell from an average of 13 degrees centigrade to between eight and four degrees.

“Although a short episode of cool polar conditions is potentially at odds with a high CO2 world, our data demonstrates the variability of climate over long timescales.”

Insect May Make Moves to Survive the Harvest

By HENRY FOUNTAIN

One thing about evolution - you never know what’s going to influence it. Take the European corn borer, for instance. Researchers have just made a strong case that a certain aspect of its behavior has evolved because of human harvesting of corn.

The corn borer, Ostrinia nubilalis, is a pest caterpillar that spends spring and summer feeding on its host corn stalk before spinning a cocoon for the winter. It is almost identical to a related species, O. scapulalis - in fact, until recently the two were thought to be one. But O. scapulalis’s host plant is not corn, but a weed known as mugwort.

In a paper in The Proceedings of the Royal Society B: Biological Sciences, Vincent Calcagno, a biologist now at McGill University, and colleagues show that, behaviorally, that makes all the difference in the world. For mugwort is neither harvested nor grazed, while corn has been harvested for centuries.

In harvesting, either mechanically or by hand, the stalks are cut off some height - often 6 to 15 inches - above the ground. Any corn borers above that height will surely not survive when the stalks are shredded, burned or fed to animals.

Through field and laboratory tests, the researchers discovered that before it stops eating and spins its cocoon, the corn borer travels down the stalk, usually reaching a height at which it is safe. O. scapulalis does not exhibit this descending behavior, called geotaxis.

Dr. Calcagno said the likeliest explanation for the behavior is the selection pressure of harvesting - over generations, those caterpillars that did not descend, or did not go far enough, did not survive. “There could be other reasons that explain the tendency to move down, but we have no evidence of what those reasons could be,” he said. This harvesting-induced selection, he added, could be widespread in other pests.

'Tissue Paper' Could Stop Bullets, Harness Solar Energy

Who wouldn't want a shirt that could stop a bullet and power your iPod? A new fabric can do just that.

By Eric Bland

THE GIST:
A new fabric made from germanium is nearly as strong Kevlar.
The material is as soft and flexible as tissue paper.
The fabric could lead to solar powered, bulletproof clothing.

A soft "tissue paper" made from normally brittle germanium and silicon contains individual fibers as strong as bulletproof Kevlar. Woven into traditional fabric or embedded in hard plastics, the new nanowires could stop bullets, harvest solar energy or perform dozens of other tasks.

"Paper is made of wood fibers compressed together," said Brian Korgel, a scientist at the University of Texas at Austin and co-author of a new paper in *ACS Nano* that describes the germanium nanowires. "In this case, we took bulk semiconductors, turned them into nanowires and compressed them together to make a material with a tissue paper consistency."

Germanium is usually quite hard and brittle. "When I handle a block of the bulk material, I have to handle it very carefully so it doesn't break," said Korgel. Unlike bulk germanium, however, germanium tissue paper is flexible and won't break when bent. The individual nanowires that make up the tissue paper are also incredibly strong, having a similar strength-to-weight ratio as Kevlar. They can even absorb blows that would ordinarily

shatter a block of germanium. The germanium wires have the strength of Kevlar, but that doesn't mean they will make ordinary clothing bulletproof -- at least not immediately.

Kevlar stops bullets because not only are individual fibers strong, but so are the bonds between the fibers. However, individual germanium nanowires are not there yet. Korgel compares the bonds between his strong germanium nanowires with the proteins spiders use to make drag line silk as strong as steel.

"Scientists know how to make the proteins spiders use in test tubes," said Korgel. "But you have to take those proteins and spin them into a web to match their mechanical properties."

Even after decades of research, scientists still can't match the spider's silk exactly. It will likely be years before scientists can bond germanium nanowires tightly enough to make next generation body armor.

In the meantime, however, Korgel and his colleagues plan to use the new fabric's semiconducting properties for another use: solar power. Germanium absorbs light that the human eye can see, as well as infrared light that are invisible. Woven into a soft shirt or surrounded by hard plastic, germanium nanowires could then turn solar power into electrical energy to power embedded sensors or other electrical devices.

A germanium-based photovoltaic won't absorb light as well as its more widely used cousin, silicon. Luckily, the University of Texas scientists have also developed a similar tissue-like fabric made from silicon nanowires.

Besides turning more sunlight into electricity, individual silicon nanowires are about 35 percent stronger than the germanium nanowires. They are also more resistant to corrosion. Korgel and his colleagues are currently preparing a more detailed paper describing their silicon nanowires for peer review.

Jillian Buriak, a scientist from the University of Alberta, said that Korgel's work bridges the gap between nanotechnology research and practical applications.

"(Korgel and his team) have really brought nanotechnology to the level where other people can use it," said Buriak. Electrically conductive paper, ultra thin LED displays, flexible batteries, biomedical implants and any number of other devices could result from the germanium and silicon tissue paper.

"It's so neat when people do what nanoscience is supposed to do: cramming these well known materials into very small dimensions to got entirely new properties out of them," said Buriak. "It's like teaching an old dog new tricks."

An underlying cause for psychopathic behavior?

New study links psychopathy to frontal lobe dysfunction

Milan, Italy - Psychopaths are known to be characterized by callousness, diminished capacity for remorse, and lack of empathy. However, the exact cause of these personality traits is an area of scientific debate. The results of a new study, reported in the May 2010 issue of Elsevier's *Cortex* (http://www.elsevier.com/locate/cortex), show striking similarities between the mental impairments observed in psychopaths and those seen in patients with frontal lobe damage.

One previous explanation for psychopathic tendencies has been a reduced capacity to make inferences about the mental states of other people, an ability known as Theory of Mind (ToM). On the other hand, psychopaths are also known to be extremely good manipulators and deceivers, which would imply that they have good skills in inferring the knowledge, needs, intentions, and beliefs of other people. Therefore, it has been suggested recently that ToM is made up of different aspects: a cognitive part, which requires inferences about knowledge and beliefs, and another part which requires the understanding of emotions.

Dr Simone Shamay-Tsoory, from the University of Haifa in Israel, along with colleagues from The Shalvata Mental Health Care Center and the Rambam Medical Center, tested the hypothesis that impairment in the emotional aspects of these abilities may account for psychopathic behaviour. Earlier research from the same group had shown that patients with damage to the frontal lobes of the brain lack some of the emotional aspects of Theory of Mind, so they speculated that psychopathy may also be linked to frontal lobe dysfunction.

The emotional and cognitive aspects of Theory of Mind abilities were examined for participants in the new study, which consisted of a number of different groups: criminal offenders, who had been diagnosed as having antisocial personality disorder with highly psychopathic tendencies, patients with damage to the frontal lobes of the brain, patients with damage to other areas of the brain, and healthy control subjects. The pattern of impairments in the psychopathic participants showed a remarkable resemblance to those in the participants with frontal lobe damage, suggesting that an underlying cause of the behavioural disturbances observed in psychopathy may be dysfunction in the frontal lobes.

Notes to Editors:

The article is "The role of the orbitofrontal cortex in affective theory of mind deficits in criminal offenders with psychopathic tendencies" by Simone G. Shamay-Tsoory, Hagai Harari, Judith Aharon-Peretz and Yechiel Levkovitz and appears in Cortex, Volume 46, Issue 5 (May 2010), published by Elsevier in Italy. Full text of the article featured above is available to members of the media upon request. Please contact the Elsevier press office, newsroom@elsevier.com. To schedule an interview, contact Dr Simone Shamay-Tsoory, sshamay@psy.haifa.ac.il.

The Kiss of Death: Research targets lethal disease spread by insect that bites lips

It makes your skin crawl -- a bug that crawls onto your lips while you sleep, drawn by the exhaled carbon dioxide, numbs your skin, bites, then gorges on your blood. And if that's not insult enough, it promptly defecates on the wound-and passes on a potentially deadly disease.

Now Jean-Paul Paluzzi, a PhD candidate in biology at the University of Toronto Mississauga, believes that manipulating physiology to prevent the insects from leaving their messy calling card represents the best hope for stopping the transmission of the illness, known as Chagas' disease.

"This is a disease of the poor," says Paluzzi, who has visited parts of the world affected by the illness. "The bugs are found in makeshift homes with mud walls and palm tree-like ceilings. Unfortunately, the people of Central and South America that this affects don't have sufficient voice to get help. Given that there are roughly 15 to 19 million people that are infected-a substantial proportion of that area's population-it's a disease that's been neglected."

Chagas' disease is one of the major health problems in South and Central America and is spread by reduvid bugs, also known as "kissing bugs" because of their fondness for lips. The disease they transmit is caused by Trypanosoma cruzi, a parasite that lives in their gut. In the initial acute stage, symptoms are relatively mild, but as the disease progresses over several years, serious chronic symptoms can appear, such as heart disease and malformation of the intestines. Without treatment, it can be fatal. Currently, insecticide sprays are used to control insect populations, and anti-parasitic drugs are somewhat successful at treating acute infections. Once the disease is chronic, it cannot be cured.

To make matters worse, kissing bugs are particularly "bloodthirsty". In mosquitoes, which go through four distinct stages of development, only adult females feed on blood (and potentially transmit disease). This means that pest control methods need to target only one out of eight stages (when you include both sexes). But in kissing bugs, each sex feeds on blood through all fives stages of development. "So you have about a ten-fold greater chance of infection just because of the number of times that these insects have to feed," says Paluzzi.

His research focuses on insect diuresis-more specifically, the genes and peptides that control how the kissing bug eliminates excess fluid in its gut after it gorges on blood. For the insect, the real prize in its meal is the red blood cells, while the water and salt is "excess baggage". After they feed, the bugs are bloated and sluggish, and must jettison the waste so they can make their escape.

Here's how it happens: when the kissing bug finds a snoozing victim and feeds, its levels of serotonin and diuretic hormones rise sharply, targeting the insect's midgut and Malpighian tubules (the equivalent of kidneys), and triggering the release of waste. About four hours later, a peptide named CAP2b is released in the insect's gut, abolishing the effect of the diuretic hormones.

Paluzzi has identified two genes (RhoprCAPA-alpha and RhoprCAPA-beta) that carry the chemical recipe for the peptides that stop diuresis. With that information, he hopes to create a peptide "agonist"-something that would enhance the activity of the CAP2B peptide and prevent the insect from leaving waste (and the parasite) on the wound. In theory, says Paluzzi, this might be an insecticide-like room spray or topical lotion that is biologically stable and has no effect on humans or other insects. Paluzzi is collaborating with a structural biochemist at the U.S. Food and Drug Administration in Texas, with the ultimate goal of creating a pest control solution, but he cautions that a market-ready product is many years away.

Provided by University of Toronto Mississauga

Earth Microbes May Contaminate the Search for Life on Mars

WASHINGTON, DC -- Bacteria common to spacecraft may be able to survive the harsh environs of Mars long enough to inadvertently contaminate Mars with terrestrial life according to research published in the April 2010 issue of the journal *Applied and Environmental Microbiology*.

The search for life on Mars remains a stated goal of NASA's Mars Exploration Program and Astrobiology Institutes. To preserve the pristine environments, the bioloads on spacecraft headed to Mars are subject to sterilization designed to prevent the contamination of the Martian surface.

Despite sterilization efforts made to reduce the bioload on spacecraft, recent studies have shown that diverse microbial communities remain at the time of launch. The sterile nature of spacecraft assembly facilities ensures that only the most resilient species survive, including acinetobacter, bacillus, escherichia, staphylococcus and streptococcus.

Researchers from the University of Central Florida replicated Mars-like conditions by inducing desiccation, hypobaria, low temperatures, and UV irradiation. During the week-long study they found that *Escherichia coli* a potential spacecraft contaminant, may likely survive but not grow on the surface of Mars if it were shielded from UV irradiation by thin layers of dust or UV-protected niches in spacecraft.

“If long-term microbial survival is possible on Mars, then past and future explorations of Mars may provide the microbial inoculum for seeding Mars with terrestrial life,” say the researchers. “Thus, a diversity of microbial species should be studied to characterize their potential for long term survival on Mars.”

Alzheimer's memory problems originate with protein clumps floating in the brain, not amyloid plaques

Using a new mouse model of Alzheimer's disease, researchers at Mount Sinai School of Medicine have found that Alzheimer's pathology originates in Amyloid-Beta (Abeta) oligomers in the brain, rather than the amyloid plaques previously thought by many researchers to cause the disease.

The study, which was supported by the "Oligomer Research Consortium" of the Cure Alzheimer Fund and a MERIT Award from the Veterans Administration, appears in the journal *Annals of Neurology*.

"The buildup of amyloid plaques was described over 100 years ago and has received the bulk of the attention in Alzheimer's pathology," said lead author Sam Gandy, MD, PhD, Professor of Neurology and Psychiatry, and Associate Director of the Alzheimer's Disease Research Center, Mount Sinai School of Medicine. "But there has been a longstanding debate over whether plaques are toxic, protective, or inert."

Several research groups had previously proposed that rather than plaques, floating clumps of amyloid (called oligomers) are the key components that impede brain cell function in Alzheimer's patients. To study this, the Mount Sinai team developed a mouse that forms only these oligomers, and never any plaques, throughout their lives.

The researchers found that the mice that never develop plaques were just as impaired by the disease as mice with both plaques and oligomers. Moreover, when a gene that converted oligomers into plaques was added to the mice, the mice were no more impaired than they had been before.

"These findings may enable the development of neuroimaging agents and drugs that visualize or detoxify oligomers," said Dr. Gandy. "New neuroimaging agents that could monitor changes in Abeta oligomer presence would be a major advance. Innovative neuroimaging agents that will allow visualization of brain oligomer accumulation, in tandem with careful clinical observations, could lead to breakthroughs in managing, slowing, stopping or even preventing Alzheimer's.

"This is especially important in light of research reported in March showing that 70 weeks of infusion of the Abeta immunotherapeutic Bapineuzumab® cleared away 25 percent of the Abeta plaque, yet no clinical benefit was evident."

The Mount Sinai team included Michelle Ehrlich, MD, Professor of Pediatrics, Neurology, and Genetics and Genomic Sciences, and John Steele, a Mount Sinai graduate student, who performed the key analyses of the behavioral data. Dr. Charles Glabe, an oligomer expert and a member of the Cure Alzheimer Fund research consortium, is also a co-author of the paper. Dr Gandy is also a neurologist at the James J Peters Veterans Affairs Medical Center, an affiliate of Mount Sinai School of Medicine.

Mount Sinai researchers discover potential treatment for bone death in the hip from osteonecrosis

Researchers at Mount Sinai School of Medicine have found a potential new treatment for osteonecrosis, or the death of bone tissue, in people who are treated with steroids for several common medical conditions. There are currently no treatment options for people with this debilitating disease. The research is published in the April 27 issue of *Proceedings of the National Academy of Sciences*.

Glucocorticoids are a class of steroids used to treat several common diseases, including asthma, ulcerative colitis, kidney diseases, and rheumatologic disorders. These steroids cause bone loss, and can eventually cause severe osteoporosis and fracture, as well as osteonecrosis. The Mount Sinai team, led by Mone Zaidi, MD, PhD, FRCP, Professor of Medicine and Physiology and Director of The Mount Sinai Bone Program at Mount Sinai School of Medicine, discovered that injecting the naturally-produced hormone adrenocorticotropic hormone (ACTH) in rabbits with osteonecrosis caused by treatment with glucocorticoids significantly reduced bone death in the hip.

"Osteonecrosis is a very painful condition that has the potential to affect hundreds of thousands of Americans who are treated with steroids, with no treatment option until now except hip replacement," said Dr. Zaidi. "Our research is the first to show the therapeutic benefit of ACTH in experimental osteonecrosis, providing the first treatment option for these patients."

Glucocorticoids cause reduced blood flow to bone cells in the hip, resulting in cell death, and ACTH reduces these devastating side effects. However, research indicates that osteonecrosis is not significant in people in which steroid levels are high in the blood. Dr. Zaidi's team knew that these tumors produce excess ACTH, and this spurred the team to evaluate the ACTH's potential therapeutic effect.

The researchers injected one group of rabbits with depomedrol, a type of steroid, and another group with depomedrol plus ACTH. Osteonecrosis was dramatically reduced in the rabbits that were treated with ACTH.

Dr. Zaidi's team found that ACTH stimulates the vascular endothelial growth factor (VEGF), a protein that signals for the growth of new blood vessels. The stimulation of VEGF results in increased blood flow to the bone cells, preventing cell death.

"The results confirm that ACTH may be of value as a drug to prevent osteonecrosis," said Dr. Zaidi. "While more research is required, we hope to someday evaluate the efficacy of ACTH in treating osteoporosis as well."

'Epigenetic' concepts offer new approach to degenerative disease

ANAHEIM, CA – In studies on cancer, heart disease, neurological disorders and other degenerative conditions, some scientists are moving away from the "nature versus nurture" debate, and are finding you're not a creature of either genetics or environment, but both - with enormous implications for a new approach to health.

The new field of "epigenetics" is rapidly revealing how people, plants and animals do start with a certain genetic code at conception. But, the choice of which genes are "expressed," or activated, is strongly affected by environmental influences. The expression of genes can change quite rapidly over time, they can be influenced by external factors, those changes can be passed along to offspring, and they can literally hold the key to life and death.

According to Rod Dashwood, a professor of environmental and molecular toxicology at the Linus Pauling Institute at Oregon State University, epigenetics is a unifying theory in which many health problems, ranging from cancer to cardiovascular disease and neurological disorders, can all be caused at least in part by altered "histone modifications," and their effects on the reading of DNA in cells.

"We believe that many diseases which have aberrant gene expression at their root can be linked to how DNA is packaged, and the actions of enzymes such as histone deacetylases, or HDACs," Dashwood said. "As recently as 10 years ago we knew almost nothing about HDAC dysregulation in cancer or other diseases, but it's now one of the most promising areas of health-related research."

In the case of cancer, tumor suppressor genes can cause cancer cells to die by acting as a brake on unrestrained cell growth. But too much of the HDAC enzyme can "switch off" tumor suppressor genes, even though the underlying DNA sequence of the cell – its genetic structure – has not been changed or mutated. If this happens, cells continue to replicate without restraint, which is a fundamental characteristic of cancer development.

The good news – for cancer and perhaps many other health problems – is that "HDAC inhibitors" can stop this degenerative process, and some of them have already been identified in common foods. Examples include sulforaphane in broccoli, indole-3-carbinol in cruciferous vegetables, and organosulfur compounds in vegetables like garlic and onions. Butyrate, a compound produced in the intestine when dietary fiber is fermented, is an HDAC inhibitor, and it provides one possible explanation for why higher intake of dietary fiber might help prevent cancer.

"Metabolism seems to be a key factor, too, generating the active HDAC inhibitor at the site of action," Dashwood said. "In cancer cells, tumor suppressors such as p21 and p53 often become epigenetically silenced. HDAC inhibitors can help turn them on again, and trick the cancer cell into committing suicide via apoptosis.

"We already know some of the things people can do to help prevent cancer with certain dietary or lifestyle approaches," Dashwood said. "Now we're hoping to more fully understand the molecular processes going on, including at the epigenetic level. This should open the door for new approaches to disease prevention or treatment through diet, as well as in complementing conventional drug therapies."

Dashwood, who is also head of LPI's Cancer Chemoprotection Program, will be presenting some of this research in a talk titled "Metabolism as a key to HDAC inhibition by dietary constituents," at the American Society for Biochemistry and Molecular Biology's annual meeting. The talk will take place in Anaheim Convention Center Ballroom E on Wednesday, April 28 at 1:30 pm PST.

OSU scientists recently received an $8.5 million grant from the National Cancer Institute to explore these issues, making the LPI program one of the leaders in the nation on diet, epigenetics, and cancer prevention. The positive findings of laboratory research are already being converted to placebo-controlled human intervention trials on such health concerns as colon and prostate cancer, which are among the most common cancers in the United States.

OSU scientists have published a number of studies on these topics in professional journals such as Cancer Research, Cancer Prevention Research, Carcinogenesis, and Seminars in Cancer Biology. Among the most recent findings is that naturally occurring organoselenium compounds in the diet might prevent the progress of human prostate and colon cancer through an HDAC inhibition mechanism.

"Some therapeutic drugs already used for cancer treatment in the clinical setting probably work, at least in part, because they are acting as HDAC inhibitors," Dashwood said. "And what's most intriguing is that HDAC inhibition may affect many degenerative health issues, not just cancer. Heart disease, stroke, bipolar disorder, and even aging may all have links to HDAC/histone alterations.

"In the future, a single HDAC inhibitor conceptually could have benefits for more than one degenerative disease problem."

Testosterone directly amplifies but does not program male behaviors

New research uncovers some surprising information about how sex hormones control masculinization of the brain during development and drive gender related behaviors in adult males. The study, published by Cell Press in the April 29 issue of the journal *Neuron*, demonstrates that direct action of testosterone, the prototypical male hormone, is unnecessary for masculinizing the brain and behavior.

Testosterone and estrogen are thought to play an essential role in organizing and activating gender-specific patterns of behavior in sexually reproducing animals. Testosterone is produced by the testes and directly activates the androgen receptor (AR) in target tissues such as muscle. Estrogen is produced by the ovaries and is nearly undetectable in the circulation of males of most species. However, circulating testosterone in males can be converted into estrogen in the brain, and this testosterone-derived estrogen has been shown to control many male behaviors.

"It was known that testosterone and estrogen are essential for typical male behaviors in many vertebrate species," explains the study's senior author, Dr. Nirao M. Shah from the Department of Anatomy at the University of California, San Francisco. "However, how these two hormones interact to control masculinization of the brain and behavior remained to be established."

Dr. Shah and colleagues found that during the neonatal testosterone surge there is very little AR expressed in the developing brain, making it unlikely that testosterone signaling via AR plays a major role in masculinizing neural pathways. Importantly, they went on to show that the male pattern of AR expression in the brain was dependent on testosterone-derived estrogen signaling.

The researchers then used a genetic approach to knock out the AR in the mouse nervous system and observed that these mutants still exhibited male type mating, fighting, and territorial marking behaviors. However, these mutant males had striking reductions in specific components of these masculine behaviors. These results show that testosterone signaling via AR does not control masculine differentiation of the brain and behavior but regulates the frequency and extent of male typical behaviors.

"Our findings in conjunction with previous work suggest a model for the control of male pattern behaviors in which estrogen masculinizes the neural circuits for mating, fighting, and territory marking, and testosterone and estrogen signaling generate the male typical levels of these behaviors," concludes Dr. Shah. "It will be interesting in future studies to identify the molecular and circuit level mechanisms that are controlled by these hormones."

The researchers include Scott A. Juntti, University of California, San Francisco, San Francisco, CA; Jessica Tollkuhn, University of California, San Francisco, San Francisco, CA; Melody V. Wu, University of California, San Francisco, San Francisco, CA; Eleanor J. Fraser, University of California, San Francisco, San Francisco, CA; Taylor Soderborg, University of California, San Francisco, San Francisco, CA; Stella Tan, University of California, San Francisco, San Francisco, CA; Shin-Ichiro Honda, Fujita Health University, Toyoake, Aichi, Japan; Nobuhiro Harada, Fujita Health University, Toyoake, Aichi, Japan; and Nirao M. Shah, University of California, San Francisco, San Francisco, CA.

MS study suggests key role of environmental factor in the disease

Scientists are reporting what they say is compelling evidence that some powerful non-heritable, environmental factor likely plays a key role in the development of multiple sclerosis.

Their finding, the cover article in the April 29, 2010 issue of *Nature*, results from the most advanced genomic analysis ever conducted on identical, or "monozygote," twins where one sibling has multiple sclerosis and the other does not.

"Even with the very high resolution at which we sequenced the genomes of our study participants, we did not find evidence for genetic, or epigenetic differences that explained why one sibling developed the disease and the other did not," says the lead author of the study, Sergio Baranzini, PhD, associate adjunct professor of neurology and a member of the Multiple Sclerosis Research Group at University of California, San Francisco.

The finding does not mean that genes do not play a role in the disease. In cases where one identical twin has MS, there is a 30-percent increased risk that the identical sibling also will develop the disease. In cases where a non-identical twin or other sibling has the disease, there is an increased risk of nearly 5 percent. However, says Baranzini, while limitations of current technology or small study size may have caused the team to miss important genetic divergence between twins, they consider the findings significant.

The study was the first to examine all three levels of a human genome at the same time, giving the first full picture of a living genome. The scientists examined the genome sequences of one MS-discordant identical twin pair and the messenger RNA transcriptome and epigenome sequences of CD4+ lympohoctyes from three MS-discordant identical twin pairs.

As a probe of a human genome, the study was a tour de force. The MS genome was explored at a depth of 20–fold coverage. By comparison, the first two single human genomes ever published – those of biologist and entrepreneur Craig Venter, PhD, followed by Nobel laureate James Watson, PhD – were sequenced at a depth of 7 to 8 fold coverage. In addition, the study investigated the first female genomes, the first genomes of twins and the first autoimmune disease individual genome sequences.

The next step in the team's research, says Baranzini, will be to look at genetic samples of additional MS-discordant twin pairs. "Since the study began, the cost of the 'next-generation sequencers' we used has come down dramatically. This will allow us to broaden the study."

As far as what environmental factor(s) could be playing a role in multiple sclerosis, the scientists did not speculate in their paper. The most prominent theory in the field is that a viral infection triggers the immune reactions that initiate the disease; Epstein-Barr virus is considered the most likely culprit. If this were the case, each person's unique genetic make-up would influence the body's immune reactions and determine whether they would lead to the disease. While no viral trigger for MS has been confirmed, several genetic risk factors have been identified. Other current hypotheses include vitamin D deficiency brought on by a lack of exposure to sunlight, and smoking.

Multiple sclerosis is thought to be an autoimmune disease, a condition in which cells of the immune system turn against a particular tissue of the body. In the case of MS, the attack, directed by CD4+ T-cell lymphocytes, occurs against myelin, the protective sheath that insulates nerve fibers. The attack causes hardened plaques within the brain and spinal cord that prevent electrical impulses from traveling between nerve cells, affecting neurological function.

Because there is MS discordance in 70 percent of monozygote twin MS cases, scientists have suspected that both environmental effects and genetic components contribute to MS development. Recently, however, genetic (DNA) and epigenetic (DNA methylation or imprinting) differences between monozygote twins have been described. The current study was designed to investigate whether monozygotic twins are truly identical and whether there were genetic or epigenetic differences between identical twins that were discordant for MS.

"The results," says Baranzini, "put us a step closer to teasing out the relative contributions of genetic and environmental factors on multiple sclerosis."

Interestingly, the researchers noticed a surprising difference between the genomes of twins that was not correlated to MS. They discovered an imbalance in which one copy of a gene is expressed at higher levels than the other copy. This phenomenon, known as allelic imbalance, causes differences in the levels of mRNA expression.

"We found many instances where an allelic imbalance was larger in one twin than in the other, or where the imbalance was flipped between the two alleles," said Baranzini. Those differences were unexpected and are likely to be of interest in future studies of twins, whether the focus is on MS or other diseases, he said.

The study was conceived of by Stephen L. Hauser, MD, chairman of the Department of Neurology at UCSF, in collaboration with Jorge Oksenberg, PhD, UCSF professor of neurology. The genetic sequencing was conducted by scientists at the non-profit National Center for Genome Resources. The senior author of the study was Stephen F. Kingsmore, MB, ChB, BAO, a physician-scientist and president of NCGR, in Santa Fe.

Other co-authors were Pouya Khankhanian, Stacy J. Caillier, Joseph P. McElroy, Refujia Gomez and Pui-yan Kwok of UCSF; Joann Mudge, Jennifer C. van Velkinburgh, Neil A. Miller, Andrew D. Farmer, Callum J. Bell, Ryan W. Kim, Greg D. May, Jimmy E. Woodward, Leonda E. Clendenen, Elena E. Ganusova, Faye D. Schilkey, Thiru Ramaraj of NCGR; Irina Khrebtukova, Lu Zhang, Jim J. Huntley, Shujun Luo, Gary P. Schroth of Illumina Inc.; Marcelo J. Pando of Stanford Medical School Blood Center; Omar A. Khan of Wayne State Medical School; and Thomas D. Wu of Genentech Inc.

The study was funded by Small Ventures USA Inc., A. J. Brass Foundation, Nancy Davis Foundation, the National Institutes of Health, and National MS Society.

Melting icebergs causing sea level rise

Scientists have discovered that changes in the amount of ice floating in the polar oceans are causing sea levels to rise. The research, published this week in *Geophysical Research Letters*, is the first assessment of how quickly floating ice is being lost today.

According to Archimedes' principle, any floating object displaces its own weight of fluid. For example, an ice cube in a glass of water does not cause the glass to overflow as it melts. But because sea water is warmer and more salty than floating ice, changes in the amount of this ice are having an effect on global sea levels.

The loss of floating ice is equivalent to 1.5 million Titanic-sized icebergs each year. However, the study shows that spread across the global oceans, recent losses of floating ice amount to a sea level rise of just 49 micrometers per year – about a hair's breadth.

According to lead author Professor Andrew Shepherd, of the University of Leeds, it would be unwise to discount this signal. "Over recent decades there have been dramatic reductions in the quantity of Earth's floating ice, including collapses of Antarctic ice shelves and the retreat of Arctic sea ice," said Prof Shepherd.

"These changes have had major impacts on regional climate and, because oceans are expected to warm considerably over the course of the 21st century, the melting of floating ice should be considered in future assessments of sea level rise."

Professor Shepherd and his team used a combination of satellite observations and a computer model to make their assessment. They looked at changes in the area and thickness of sea ice and ice shelves, and found that the overall signal amounts to a 742 cubic kilometres per year reduction in the volume of floating.

Because of differences in the density and temperature of ice and sea water, the net effect is to increase sea level by 2.6% of this volume, equivalent to 49 micrometers per year spread across the global oceans.

The greatest losses were due to the rapid retreat of Arctic Sea ice and to the collapse and thinning of ice shelves at the Antarctic Peninsula and in the Amundsen Sea.

Curcumin nanoparticles 'open up' resistant cancers

Pre-treatment with curcumin, a component of the spice turmeric, makes ovarian cancer cells more vulnerable to chemotherapy and radiotherapy. Researchers writing in BioMed Central's open access *Journal of Ovarian Research* found that delivering the curcumin via very small (less than 100nm) nanoparticles enhanced the sensitizing effect.

Subhash Chauhan, PhD, and Meena Jaggi, PhD, led a team of researchers from Sanford Research and the University of South Dakota, USA, who carried out the in vitro study. They said, "One strategy to improve the effectiveness and limit the toxicity of cancer therapy is to induce chemo/radio-sensitization in cancer cells using natural dietary phytochemicals like curcumin. However, curcumin is poorly absorbed by the body, which limits its effectiveness. We have developed a nanoparticle formulation, Nano-CUR, to provide increased bioavailability as well as targeted delivery of curcumin into tumors".

The researchers tested the effects of their curcumin formulation on therapy-resistant ovarian cancer cells. They were able to show, for the first time, that the pre-treatment lowers the dose of cisplatin and radiation treatment needed to suppress the growth of the cancer cells. According to Chauhan, "Nanoparticle mediated curcumin delivery will further improve the sensitization and therapeutic capabilities. This study demonstrates a novel pre-treatment strategy that could be implemented in pre-clinical animal models and in future clinical trials".

Notes to Editors

1. Curcumin induces chemo/radio-sensitization in ovarian cancer cells and curcumin nanoparticles inhibit ovarian cancer cell growth Murali M Yallapu, Diane M Maher, Vasudha Sundram, Maria C Bell, Meena Jaggi and Subhash C Chauhan Journal of Ovarian Research (in press)

http://www.ovarianresearch.com/imedia/5213824743515181_article.pdf?random=247872

There's no doubt about the health dangers of salt

18:00 28 April 2010 by **Franco Cappuccio** and **Simon Capewell**

SALT hidden in food kills millions of people worldwide. Reducing dietary salt is therefore important for public health; it is also one of the cheapest and easiest ways to save lives. So why are efforts to cut dietary salt being met with fierce resistance?

First the facts. Decreasing salt intake substantially reduces blood pressure, thus lowering the risk of heart attacks and strokes. An analysis of all the available evidence, published in 2007, suggested that reducing salt intake around the world by 15 per cent could prevent almost 9 million deaths by 2015. That is on par with the public health benefits of reducing cholesterol and stopping smoking (*The Lancet*, vol 370, p 2044).

Other analyses have concluded that cutting daily salt intake by 5 grams could reduce strokes by 23 per cent and cardiovascular disease by 14 per cent (*BMJ*, vol 339, p b4567; *Journal of Human Hypertension*, vol 23, p 363).

The benefits of salt reduction may also extend further. Links have repeatedly been reported between high salt intake and chronic kidney damage, stomach cancer and osteoporosis.

There is no doubt that our salt intake is excessive. A typical British adult consumes roughly 8.6 grams of salt per day. Americans consume even more, about 10 g, which is almost twice the recommended limit in the US. It is also over six times what the body actually needs.

According to US national dietary guidelines, adults should eat no more than 6 g of salt a day. The World Health Organization recommends 5 g. Even this is in excess of bodily needs. The physiological "adequate intake" for an adult is only about 1.5 g.

US guidelines are being updated and the 2010 version is widely expected to recommend a lower salt intake. New UK recommendations, from the National Institute for Health and Clinical Excellence, are also awaited with interest.

This excess intake is not a matter of personal choice. Only about 15 per cent of the salt in our diets comes from our own salt shakers; the rest is added to foods before they are sold. Salt is added to make food more palatable, to increase the water content of meat products and to increase thirst. All generate profit for the food and drink industry.

This hidden salt means it is important to read labels and buy foods that are low in salt. That, however, is not enough. It is fine for people with the education, income and time to read and understand labels and the energy to modify their behaviour. But real life is rather different for many of us. Hence the need for public health interventions.

Most people agree that even in free-market economies, governments have a duty of care. This is especially true for children, who are particularly vulnerable to high salt intake.

This is the ethical justification for public health interventions in salt consumption. Governments legislate to make public spaces smoke-free, and they mandate cholera-free drinking water. They should also aim to progressively reduce the salt hidden in food.

In the US, the New York City Health Department is doing exactly that. It is coordinating the National Salt Reduction Initiative, a coalition of cities, states and health organisations working to help food manufacturers and restaurants voluntarily reduce salt. Fifteen state health departments are already signed up. The goal is to reduce Americans' salt intake by 20 per cent over five years. An authoritative analysis suggests that this may save tens of thousands of lives each year and avoid billions of dollars in healthcare costs (*The New England Journal of Medicine*, vol 362, p 650).

It can be done. Since 2004, the UK Food Standards Agency has been working with the food industry to reduce salt through clearer labelling and progressive reduction of salt so that consumers neither notice nor mind. As a direct result, average UK salt intake has fallen from 9.5 g to 8.6 g per day.

Other countries, notably Japan, Portugal and Finland, have done much better, reducing average salt intake by 5 g or more per day via a combination of regulation, labelling, public education and collaboration with industry.

Earlier this month the US Institute of Medicine recommended government intervention to reduce salt intake. However, the food industry is fighting a bitter rearguard action against any such move. The salt industry's annual turnover is several billion dollars and it has no plans to downsize. Thus, in advance of the new US guidelines, articles have appeared in *The New York Times* and elsewhere claiming that the evidence for reducing salt is not clear-cut.

This controversy is fake. The evidence for salt reduction is clear and consistent. Most of the "contradictory research" comes from a very small number of scientists, most of whom are linked to the salt industry. However, it takes skill to spot misinformation and subterfuge. And so the confusion is successfully promulgated.

It is a familiar story. The tobacco industry spent decades denying that smoking caused fatal diseases. Their very successful strategies included accusations of scientific conspiracies, selective use of scientific evidence, and paying scientists to produce evidence to contradict the public health experts and confuse the public. In general, the food industry is more ethical, but it is far from squeaky clean.

Lives can be saved by cutting salt. How many depends on whether politicians choose to accept the evidence, or cave in to industry pressure instead.

Franco Cappuccio is director of the European Centre of Excellence in Hypertension and Cardio-Metabolic Research and head of the World Health Organization Collaborating Centre for Nutrition, both based at the University of Warwick, UK

Simon Capewell is professor of clinical epidemiology at the University of Liverpool, UK

Scientists finds evidence of water ice on asteroid's surface

Asteroids, once thought as dry and lifeless, may be home to water and organic materials, also known as the building blocks of life

KNOXVILLE -- Asteroids may not be the dark, dry, lifeless chunks of rock scientists have long thought.

Josh Emery, research assistant professor with the earth and planetary sciences department at the University of Tennessee, Knoxville, has found evidence of water ice and organic material on the asteroid 24 Themis. This evidence supports the idea that asteroids could be responsible for bringing water and organic material to Earth.

The findings are detailed in the April 29 issue of the journal "*Nature*."

Using NASA's Infrared Telescope Facility on Hawaii's Mauna Kea, Emery and Andrew Rivkin of Johns Hopkins University in Laurel, Md., examined the surface of 24 Themis, a 200-kilometer wide asteroid that sits halfway between Mars and Jupiter. By measuring the spectrum of infrared sunlight reflected by the object, the researchers found the spectrum consistent with frozen water and determined that 24 Themis is coated with a thin film of ice. They also detected organic material.

"The organics we detected appear to be complex, long-chained molecules. Raining down on a barren Earth in meteorites, these could have given a big kick-start to the development of life," Emery said.

Emery noted that finding ice on the surface of 24 Themis was a surprise because the surface is too warm for ice to stick around for a long time.

"This implies that ice is quite abundant in the interior of 24 Themis and perhaps many other asteroids. This ice on asteroids may be the answer to the puzzle of where Earth's water came from," he said.

Still, how the water ice got there is unclear.

24 Themis' proximity to the sun causes ice to vaporize. However, the researchers' findings suggest the asteroid's lifetime of ice ranges from thousands to millions of years depending on the latitude. Therefore, the ice is regularly being replenished. The scientists theorize this is done by a process of "outgassing" in which ice buried within the asteroid escapes slowly as vapor migrates through cracks to the surface or as vapor escapes quickly and sporadically when 24 Themis is hit by space debris. Since Themis is part of an asteroid "family" that was formed from a large impact and the subsequent fragmentation of a larger body long ago, this scenario means the parent body also had ice and has deep implications for how our solar system formed.

The discovery of abundant ice on 24 Themis demonstrates that water is much more common in the Main Belt of asteroids than previously thought.

"Asteroids have generally been viewed as being very dry. It now appears that when the asteroids and planets were first forming in the very early Solar System, ice extended far into the Main Belt region," Emery said. "Extending this refined view to planetary systems around other stars, the building blocks of life -- water and organics -- may be more common near each star's habitable zone. The coming years will be truly exciting as astronomers search to discover whether these building blocks of life have worked their magic there as well."

The scientists' discovery also further blurs the line between comets and asteroids. Asteroids have long been considered to be rocky and comets icy. Furthermore, it was once believed that comets could have brought water to Earth. This theory was nixed when it was discovered comets' water has different isotopic signatures than water on Earth.

Now, due to Emery and Rivkin's findings, many wonder if asteroids could be responsible for seeding Earth with the ingredients for life.

The Nature article is entitled "Detection of Ice and Organics on an Asteroidal Surface." The researchers' work was supported by the NASA Planetary Astronomy program.

Lottery game helps to assess brain damage following stroke

Milan, Italy, 28 April 2010 – Patients recovering from stroke sometimes behave as if completely unaware of one half of the world: colliding with obstacles on their left, eating food only from the right side of their plate, or failing to dress their left side. This puzzling phenomenon is termed "spatial neglect" and it affects roughly 45% of patients suffering from a stroke in the right side of the brain. The condition can indicate a long road to recovery, but researchers have now developed a quick and simple lottery game, which can be used to assess the extent of these symptoms and potentially aid the design of rehabilitation programmes. The findings are reported in the May 2010 issue of Elsevier's *Cortex* (http://www.elsevier.com/locate/cortex).

Dr Tobias Loetscher (University of Melbourne) and colleagues studied a group of stroke patients, using tests based on a simple lottery game in which patients first chose six lottery numbers by marking them with a pencil on a real lottery ticket. Predictably, the patients with spatial neglect tended to pick numbers located on the right-hand side of the ticket, neglecting those on the left.

However, spatial neglect does not only affect a patient's interaction with the "real world"; it can also affect spatial imagination. In the second part of the test, patients were asked to spontaneously name six numbers without the aid of a lottery ticket. It is commonly believed that when we think of numbers we visualize them arranged along a mental number line with numbers increasing from left to right. The results of the study showed some patients picking only large numbers, indicating that they were unable to access the left side of mental images.

The information obtained from such simple bed-side tests could potentially be used to tailor effective rehabilitation procedures, which suit the individual patient. For example, patients who show signs of spatial neglect when marking numbers on the real lottery ticket, but not when picking numbers from their imagination, could be taught how to scan the missing part of their "real world", since they may be able to envisage it in their minds.

Notes to Editors: *The article is "Lucky numbers: Spatial neglect affects physical, but not representational, choices in a Lotto task" by Tobias Loetscher, Michael E.R. Nicholls, John N. Towse, John L. Bradshaw and Peter Brugger and appears in Cortex, Volume 46, Issue 5 (May 2010), published by Elsevier in Italy. Full text of the article featured above is available to members of the media upon request. Please contact the Elsevier press office, newsroom@elsevier.com. To schedule an interview, contact Dr Tobias Loetscher, tobias.loetscher@alumni.ethz.ch.*

Scientists probe Earth's core

University of Calgary researchers listen to earthquake "whispers" reveals new clues about Earth's formation

We know more about distant galaxies than we do about the interior of our own planet. However, by observing distant earthquakes, researchers at the University of Calgary have revealed new clues about the top of the Earth's core in a paper published in the May edition of the journal *Physics of the Earth and Planetary Interiors*.

Knowledge of the composition and state in this zone is key to unraveling the source of the Earth's magnetic field and the formation of our planet.

"Some scientists have proposed a region of sediment accumulation at the top of the core, or even distinct liquid layers, but this study shows that the outer core is, in fact, well mixed," says professor Dave Eaton, co-author of the paper. "This inaccessible region is composed of molten iron, nickel and other as-yet unknown lighter elements such as silicon, sulfur, carbon or oxygen."

To help try and determine the materials that make up the Earth's core, which is 2,891 km below the surface, Eaton and co-author Catrina Alexandrakis, University of Calgary PhD student, measured the seismic wave speed (speed of sound) at the top of Earth's core.

"Observation of distant earthquakes is one of the few tools that scientists have to investigate deep parts of the Earth," says Alexandrakis. "This isn't the first time earthquake data has been used, but our research method is the most definitive to date."

The researchers' method is based on 'listening' to earthquakes on the other side of the planet using an approach that is akin to hearing a conversation across a whispering gallery, such as those in the domes of some large cathedrals.

Using a novel digital processing approach, they analyzed faint signals, produced by 44 earthquakes, and were able to measure the sound speed at the top of Earth's core with unprecedented accuracy.

Their results will help to guide research efforts at laboratories where core composition is studied by simulating extreme pressure and temperature conditions that exist in the Earth's core.

Precise seismic-wave velocity atop Earth's core: No evidence for outer-core stratification by Catherine Alexandrakis and David Eaton is published in the journal Physics of the Earth and Planetary Interiors:
http://dx.doi.org/10.1016/j.pepi.2010.02.011

Military develops multipurpose 'green' decontaminants for terrorist attack sites

Chemists with the United States military have developed a set of ultra-strength cleaners that could be used in the aftermath of a terrorist attack. The new formulas are tough enough to get rid of nerve gas, mustard gas, radioactive isotopes, and anthrax. But they are also non-toxic, based on ingredients found in foods, cosmetics, and other consumer products. A detailed evaluation of the cleansers appears in ACS' *Industrial Engineering and Chemistry Research*, a bi-monthly journal.

George Wagner and colleagues explained that chlorine- and lye-based decontamination agents have serious drawbacks. In addition to being potentially hazardous, they can react with chemical weapons and materials in the environment to form new toxic substances. If the military needed to decontaminate a large area, the runoff could harm people and the environment. To solve that problem, military scientists developed the Decon Green suite of decontamination agents. The main ingredients in each Decon Green formula are peroxides, the same substances that are in many household cleaners and whitening toothpaste. To bolster their effectiveness, the peroxides are mixed with bicarbonates or other non-toxic bases. That combination produces peroxyanions, highly reactive ions that can clean just about anything. It ensures that chemical weapons, like nerve gas, will break down completely.

Wagner describes putting the new cleaning agents through an exhaustive battery of tests. His team concluded that each formula can break down toxic chemicals, rather than just washing them away. They also showed that Decon Green is quite good at killing anthrax spores, and removing radioactive cesium and cobalt from smooth surfaces. One of the formulas that they tested can work in sub-zero temperatures. Another is a powder, which can be easily transported and mixed with water at the scene of an emergency. All but one of the ingredients in liquid Decon Green can be found in food, cosmetics, hygiene products, or vitamin pills.

ARTICLE FOR IMMEDIATE RELEASE "All-Weather Hydrogen Peroxide-Based Decontamination of CBRN Contaminants"
DOWNLOAD FULL TEXT ARTICLE http://pubs.acs.org/stoken/presspac/presspac/full/10.1021/ie9019177

Research shows part of Alaska inundated by ancient megafloods

New research indicates that one of the largest fresh-water floods in Earth's history happened about 17,000 years ago and inundated a large area of Alaska that is now occupied in part by the city of Wasilla, widely known because of the 2008 presidential campaign.

The event was one of at least four "megafloods" as Glacial Lake Atna breached ice dams and discharged water. The lake covered more than 3,500 square miles in the Copper River Basin northeast of Anchorage and Wasilla.

The megaflood that covered the Wasilla region released as much as 1,400 cubic kilometers, or 336 cubic miles, of water, enough to cover an area the size of Washington, D.C., to a depth of nearly 5 miles. That water volume drained from the lake in about a week and, at such great velocity, formed dunes higher than 110 feet, with at least a half-mile between crests. The dunes appear on topographical maps but today are covered by roads, buildings and other development.

"Your mind doesn't get around dunes of that size. Obviously the water had to be very deep to form them," said Michael Wiedmer, an Anchorage native who is pursuing graduate studies in forest resources at the University of Washington.

Wiedmer is the lead author of a paper describing the Wasilla-area megaflood, published in the May edition of the journal *Quaternary Research*. Co-authors are David R. Montgomery and Alan Gillespie, UW professors of Earth and space sciences, and Harvey Greenberg, a computer specialist in that department.

By definition, a megaflood has a flow of at least 1 million cubic meters of water per second (a cubic meter is about 264 gallons). The largest known fresh-water flood, at about 17 million cubic meters per second, originated in Glacial Lake Missoula in Montana and was one of a series of cataclysmic floods that formed the Channeled Scablands of eastern Washington.

The megaflood from Glacial Lake Atna down what is now the Matanuska River to the Wasilla region might have had a flow of about 3 million cubic meters per second. Another suspected Atna megaflood along a different course to the Wasilla region, down the Susitna River, might have had a flow of about 11 million cubic meters per second. The researchers also found evidence for two smaller Atna megafloods, down the Tok and Copper rivers.

Wiedmer, who retired from the Alaska Department of Fish and Game in 2006, began the research in 2005 when he discovered pygmy whitefish living in Lake George, a glacial lake 50 miles from Anchorage. The lake has essentially emptied numerous times in its history and was not thought to support much life. Examination of physical traits indicate those fish are more closely related to pygmy whitefish in three other mountain lakes, all remnants of Lake Atna, than they are to any others of that species. Their existence in Lake George, some distance from the other lakes, is one piece of evidence for a megaflood from Lake Atna.

"Lake Atna linked up with four distinct drainages, and we think that helped it act like a pump for freshwater organisms," he said.

The megaflood also could explain some of the catastrophic damage that occurred in the magnitude 9.2 Great Alaskan Earthquake of 1964. Wiedmer noted that much of Anchorage is built on marine sediments, and one layer of those sediments liquefied and collapsed, allowing the layer above to slide toward the sea. As the upper layer moved toward the water, structures built on top of it collapsed.

Though the marine sediments extend about 200 feet deep, the failure only occurred within a narrow 3-foot layer. Scientists later discovered that layer had been infused with fresh water, which was unexpected in sediments deposited under salt water. The ancient megaflood could account for the fresh water.

"We suspect that this is evidence of the flood that came down the Matanuska," Wiedmer said. "The location is right at the mouth of where the flood came down, and the time appears to be right."

The work was supported by grants from the UW Quaternary Research Center, the UW School of Forest Resources and the U.S. Fish and Wildlife Service.

Independent Panel Finds Insufficient Evidence to Support Preventive Measures for Alzheimer's Disease

Many preventive measures for cognitive decline and for preventing Alzheimer's disease—mental stimulation, exercise, and a variety of dietary supplements—have been studied over the years. However, an independent panel convened this week by the National Institutes of Health determined that the value of these strategies for delaying the onset and/or reducing the severity of decline or disease hasn't been demonstrated in rigorous studies.

"Alzheimer's disease is a feared and heart-breaking disease," said Dr. Martha L. Daviglus, conference panel chair and professor of preventive medicine and medicine at Northwestern University, Chicago. "We wish we could tell people that taking a pill or doing a puzzle every day would prevent this terrible disease, but current evidence doesn't support this."

The panel's assessment of the available evidence revealed that progress to understand how the onset of these conditions might be delayed or prevented is limited by inconsistent definitions of what constitutes Alzheimer's disease and cognitive decline. Other factors include incomplete understanding of the natural history of the disease and limited understanding of the aging process in general. The panel recommended that the research community and clinicians collaborate to develop, test, and uniformly adopt objective measures of baseline cognitive function and changes over time.

Although many non-modifiable risk factors have been examined, age is the strongest known risk factor for Alzheimer's disease. Additionally, a genetic variant of a cholesterol-ferrying protein (apolipoprotein E), has strong evidence of association with the risk for developing Alzheimer's disease. Although it is hoped that improved understanding of genetic risk factors may ultimately lead to effective therapies, currently these associations are primarily useful in the clinical research setting.

The panel determined that there is currently no evidence of even moderate scientific quality supporting the association of any modifiable factor—dietary supplement intake, use of prescription or non-prescription drugs, diet, exercise, and social engagement—with reduced risk of Alzheimer's disease. The evidence surrounding risk reduction for cognitive decline is similarly limited. Low-grade evidence shows weak associations between many lifestyle choices and reduced risk of Alzheimer's disease and cognitive decline.

Although there is little evidence that these interventions lessen cognitive decline, some are not necessarily harmful and may confer other benefits. However, the panel also emphasized the need for enhanced public understanding that these proposed prevention strategies are currently, at best, only loosely associated with improved outcomes. This means that carefully-designed randomized studies may reveal that these modifiable factors enhance, detract, or have no effect on preventing Alzheimer's disease and cognitive decline.

"These associations are examples of the classic chicken or the egg quandary. Are people able to stay mentally sharp over time because they are physically active and socially engaged or are they simply more likely to stay physically active and socially engaged because they are mentally sharp?" added Dr. Daviglus. "An association only tells us that these things are related, not that one causes the other."

The panel found that certain chronic diseases, such as diabetes and depression, and risk factors such as smoking are associated with increased risk of both Alzheimer's disease and cognitive decline. However, studies have not yet demonstrated that these medical or lifestyle factors actually cause or prevent Alzheimer's disease or cognitive decline, only that they are related.

There is insufficient evidence to support the use of pharmaceuticals or dietary supplements to prevent Alzheimer's disease or cognitive decline. Ongoing studies exploring factors including but not limited to physical activity, omega-3 fatty acids (typically found in fish), antihypertensive medications, and cognitive engagement may provide new insight into Alzheimer's disease and cognitive decline prevention.

The panel made a variety of recommendations to shape the future research agenda and fill identified gaps, while acknowledging that advancing our understanding of these complex conditions in order to develop conclusive, evidence-based prevention recommendations will require considerable time and resources. For example, the panel advocated launching long-term, longitudinal studies to better characterize the natural history and progression of these diseases in the community. They also recommended the establishment of registries for Alzheimer's disease and cognitive decline, modeled on existing registries for cancer.

Extensive research over the past 20 years has provided important insights on the nature of Alzheimer's disease and cognitive decline and the magnitude of the problem. Nevertheless, there remain important and formidable challenges in conducting research on these diseases, particularly in the area of prevention. There are numerous ongoing or planned investigations which may offer promising new insights regarding the causes and prevention of these diseases.

An updated version of the panel's draft consensus statement, which incorporates comments received during this morning's public session, will be posted later today at http://consensus.nih.gov.

The panel will hold a press telebriefing to discuss their findings today at 2:00 p.m. EDT. To participate, call 1-888-428-7458 (US) or 201-604-1577 (International) and reference the NIH Alzheimer's conference. Audio playback will be available shortly after conclusion of the telebriefing, by calling 1-888-632-8973 (U.S.) or 201-499-0429 (International) and entering replay code 35986458.

The conference was sponsored by the NIH Office of Medical Applications of Research and the National Institute on Aging, along with other NIH and Department of Health and Human Services components. This conference was conducted under the NIH Consensus Development Program, which convenes conferences to assess the available scientific evidence and develop objective statements on controversial medical issues.

The 15-member panel included experts in the fields of preventive medicine, geriatrics, internal medicine, neurology, neurological surgery, psychiatry, mental health, human nutrition, pharmacology, genetic medicine, nursing, health economics, health services research, and family caregiving. A complete listing of the panel members and their institutional affiliations is included in the draft conference statement. Additional materials, including panel bios, photos, and other related resources, are available at http://consensus.nih.gov/2010/alzmedia.htm. Interviews with panel members can be arranged by contacting Lisa Ahramjian at 301-496-4999 or AhramjianL@od.nih.gov.

The conference was webcast live and will be archived shortly. Links to the archived webcast will be available at http://consensus.nih.gov/2010/alz.htm.

Individuals interested in obtaining resources for patients and families affected by Alzheimer's disease may wish to contact the National Institute on Aging's Alzheimer's Disease Education and Referral Center at 1-800-438-4380 or http://www.nia.nih.gov/alzheimers.

In addition to the material presented at the conference by speakers and the comments of conference participants presented during discussion periods, the panel considered pertinent research from the published literature and the results of a systematic review of the literature. The systematic review was prepared through the Agency for Healthcare Research and Quality Evidence-based Practice Centers (EPC) program, by the Duke University Evidence-based Practice Center. The EPCs develop evidence reports and technology assessments based on rigorous, comprehensive syntheses and analyses of the scientific literature, emphasizing explicit and detailed documentation of methods, rationale, and assumptions. The evidence report on preventing Alzheimer's disease and cognitive decline is available at http://www.ahrq.gov/clinic/tp/alzcogtp.htm.

The panel's statement is an independent report and is not a policy statement of the NIH or the federal government. The NIH Consensus Development Program was established in 1977 as a mechanism to judge controversial topics in medicine and public health in an unbiased, impartial manner. NIH has conducted 122 consensus development conferences, and 34 state-of-the-science (formerly "technology assessment") conferences, addressing a wide range of issues. A backgrounder on the NIH Consensus Development Program process is available at http://consensus.nih.gov/backgrounder.htm.

The Office of the Director, the central office at NIH, is responsible for setting policy for NIH, which includes 27 Institutes and Centers. This involves planning, managing, and coordinating the programs and activities of all NIH components. The Office of the Director also includes program offices which are responsible for stimulating specific areas of research throughout NIH. Additional information is available at http://www.nih.gov/icd/od.

The National Institutes of Health (NIH) — The Nation's Medical Research Agency — *includes 27 Institutes and Centers and is a component of the U.S. Department of Health and Human Services. It is the primary federal agency for conducting and supporting basic, clinical and translational medical research, and it investigates the causes, treatments, and cures for both common and rare diseases. For more information about NIH and its programs, visit www.nih.gov.*

Can 'organic' labels backfire?

Organic snackers underestimate calories, study shows

ANAHEIM, CA: Could organic labels lead you to overeat? These labels certainly appear to make people think their organic snack has a lot fewer calories than it really does.

These findings were presented at this week's Experimental Biology conference in Anaheim, Calif. They showed that people who ate organic cookies labeled as "organic" believed that their snack contained 40% fewer calories than the same cookies that had no label, according to Jenny Wan-Chen Lee, a graduate student with the Cornell Food and Brand Lab.

"An organic label gives a food a 'health halo,' said coauthor, Brian Wansink, Cornell professor and author of the book, Marketing Nutrition. It's the same basic reason people tend to overeat any snack food that's labeled as healthy or low fat. They underestimate the calories and over-reward themselves by eating more."

The study even identified two personality types most likely to make these low estimates— people who claim to "usually buy organic foods," and those who typically read labels for nutritional information.

What if you don't want to overeat an organic food?

"Take your best guess at its calorie count. Then double it. You'll end up being more accurate, and you'll probably eat a lot less," explained Wansink.

Common Mars rock can preserve microfossils after all

00:17 29 April 2010 by **Rachel Courtland**

Life on Mars, if it ever existed, may be easier to find than previously thought. New research on terrestrial rocks suggests that a type of rock common on Mars can preserve fossilised microbial life, rather than erasing evidence of it as previously thought.

Minerals called sulphates, which form in the presence of liquid water, have been found in great abundance on Mars, including at the landing site of NASA's Opportunity rover, Meridiani Planum.

But it has been unclear whether sulphates could preserve evidence of ancient microbial life. The rocks form when sediment compacts and crystallises, a process that – in other sedimentary rocks such as limestone – can crush the edges of microscopic fossils, destroying evidence of their existence.

Now, Bill Schopf of the University of California, Los Angeles, and colleagues have used 3D imaging to reveal a range of fossilised algae in a type of sulphate called gypsum found in northern Italy. The gypsum formed when the Mediterranean Sea evaporated some 5.6 million years ago when tectonic activity temporarily cut it off from the Atlantic Ocean.

"We all assumed there wouldn't be anything in there, and we were wrong," Schopf told reporters during a briefing on Wednesday at the Astrobiology Science Conference in League City, Texas.

Finding such a "diverse assemblage of microfossils … gives us great hope that the sulphates on Mars might harbour a similar kind of suite of fossils," says collaborator Jack Farmer of Arizona State University in Tempe.

'Significant find'

Because gypsum is soft, it should be fairly easy for a future Mars rover to scoop up. The sample could then be dissolved in water to hunt for organic chemicals that would hint at past life.

Alternatively, if the gypsum were brought back to Earth, it could be scanned for fossil structures using high-tech imaging equipment in the lab. That would require a multi-stage sample return mission, one of 28 missions currently being considered for future NASA funding by an advisory panel organised by the US National Research Council.

Rocks formed from evaporated water are good places to look for potential life on Mars, says Linda Kah of the University of Tennessee in Knoxville. "This is a significant find," she told *New Scientist*.

But she adds that it is not clear how well such deposits can capture organic material when it is in short supply – a likely scenario on Mars, which may have been habitable for only short periods of time or in specific locations. "Even though biologically produced materials are rampant on Earth, it is often very difficult to preserve," Kah told *New Scientist*.

Virgin birth: sharks' secret survival trick

29 April 2010 by **Shaoni Bhattacharya**

CAN'T find a mate? Try parthenogenesis. The type of asexual reproduction may be part of an extreme survival strategy for sharks.

In parthenogenesis, females' eggs start dividing without being fertilised. This produces daughters that are genetically similar to the mother. It was first observed in a captive hammerhead shark in 2001, but this was an isolated incident, and the shark pup died after three days, making it difficult to say much about its evolutionary significance.

Kevin Feldheim at the Field Museum in Chicago, and an international team of colleagues, have now shown that the incident was not exceptional and sharks born from a virgin mother can survive for many years (*Journal of Heredity*, vol 101, p 374).

The team were inspired by the 2001 birth to keep eggs produced by a captive white-spotted bamboo shark at the Belle Isle Aquarium of the Detroit Zoological Institute. The female had never encountered a male during her adult life and biologists had assumed the eggs were infertile. To their surprise seven incubated eggs produced two pups that survived five years before they were transferred to another facility. Genetic analysis confirmed that they were parthenogens.

"This suggests that parthenogenesis is a viable shark survival strategy," says Paulo Prodöhl of Queen's University Belfast, UK, who is investigating a possible case of virgin birth in the whitetip reef shark.

Modern sharks have been on Earth for several hundred million years. One theory is that switching from sexual reproduction to virgin birth might have helped these ancient creatures survive so long. Prodöhl suggests virgin birth could have been a safeguard mechanism. Several shark species live in single-sex groups and he says parthenogenesis may have ensured that isolated populations of females could survive without males.

Giant NASA Balloon Crashes, Destroys Telescope

Analysis by Irene Klotz

A gigantic NASA balloon designed to carry science instruments to the edge of space crashed during takeoff from Australia's Alice Springs launch site on Thursday, destroying a multimillion-dollar telescope.

The Nuclear Compton Telescope (NCT), owned by University of California at Berkeley, was designed to study the polarization of gamma rays and other astrophysical phenomena. It was serving as a test bed for instruments being developed for the Advanced Compton Telescope, scheduled to be launched in 2015, according to the project's website.

NASA is still trying to sort out what happened, but a video taken by an ABC News team shows the balloon's undercarriage coming loose, smashing through a fence and toppling an SUV before landing in pieces on the ground.

"We just barely made it out without getting smashed," a bystander interviewed by ABC said. "It looks like the wind shifted and pushed it further than they expected."

When inflated, the balloon is about the size of a football field and capable of carrying science instruments to an altitude of about 25 miles -- above 99 percent of the atmosphere.

NEWS: High-altitude balloons are often used to facilitate astronomical studies. In Antarctica, NASA is using a balloon-borne instrument to look for antimatter.

Thursday's launch was the second of three planned for the Alice Springs site this spring. The first mission, which launched on April 15, carried the Tracking and Imaging Gamma Ray Experiment, which searches the galactic center of the sky for gamma ray emissions. The third flight, scheduled for May, will launch a Marshall Space Flight Center X-ray telescope known as HERO, though that could be delayed depending on the results of the accident investigation, said Keith Koehler, a NASA spokesman at Wallops Flight Facility, which oversees the balloon program.

First case of animals making their own carotene

The insects known as aphids can make their own essential nutrients called carotenoids, according to University of Arizona researchers.

No other animals are known to make the potent antioxidants. Until now scientists thought the only way animals could obtain the orangey-red compounds was from their diet.

"It is written everywhere that animals do not make carotenoids," said Nancy Moran, leader of the UA team that overturned the conventional wisdom.

Carotenoids are building blocks for molecules crucial for vision, healthy skin, bone growth and other key physiological functions. Beta-carotene, the pigment that makes carrots orange, is the building block for Vitamin A.

"Once you start realizing how widespread carotenoids are, you realize that they're everywhere in life," said Moran, a UA Regents' Professor of ecology and evolutionary biology.

"The yellow color in egg yolks, the pink in shrimp and salmon, the pink in flamingos, tomatoes, carrots, peppers, Mexican poppies, marigolds – the yellow, orange, and red are all carotenoids."

Moran and her co-author Tyler Jarvik also figured out how the aphids they studied, known as pea aphids, acquired the ability to make carotenoids. "What happened is a fungal gene got into an aphid and was copied," Moran said. She added that, although gene transfers between microorganisms are common, finding a functional fungus gene as part of an animal's DNA is a first.

"Animals have a lot of requirements that reflect ancestral gene loss. This is why we require so many amino acids and vitamins in the diet," she said. "Until now it has been thought that there is simply no way to regain these lost capabilities. But this case in aphids shows that it is indeed possible to acquire the capacity to make needed compounds.

"Possibly this will be an extraordinarily rare case. But so far in genomic studies, a single initial case usually turns out to be only an example of something more widespread."

She and Jarvik, a research specialist in UA's department of chemistry and biochemistry, report their discovery in the paper, "Lateral Transfer of Genes from Fungi Underlies Carotenoid Production in Aphids," to be published in the April 30 issue of the journal *Science*. The National Science Foundation funded the research.

A lucky accident in the lab plus the recent sequencing of the pea aphid genome made the discovery possible, Moran said.

Pea aphids, known to scientists as Acyrthosiphon pisum, are either red or green. Aphids are clonal – the mothers give birth to daughters that are genetically identical to their mothers. So when an aphid in the Moran lab's red 5A strain began giving birth to yellowish-green babies, Moran and her colleagues knew they were looking at the results of a mutation.

"We named it 5AY for yellowish," she said. "That yellowish mutant happened in 2007. We just kept the strain as a sort of pet in the lab. I figured that one day we'd figure out how that happened."

Symbiotic bacteria live within aphids in specialized cells. The bacteria, which are passed from mother to babies, supply the insects with crucial nutrition. If their bacteria die, the aphids die.

Moran, who has been studying the pea aphid-bacteria system for decades, already knew the three main species of symbiotic bacteria did not make carotenoids.

She also was pretty sure the aphids didn't get their carotenoids from their diet. Aphids eat by sucking the phloem sap from plants, but the sap is carotenoid-poor. In addition, the carotenoids in the aphids were different from those usually found in plants.

In late 2009, after the complete DNA sequence of the pea aphid became available to researchers, she decided to search it for carotenoid genes.

All organisms use the same biosynthetic pathway to make carotenoids, which made searching for carotenoid genes straightforward, she said. Lucky for Moran, the researchers who sequenced the pea aphid genome used red aphids, which have an extra copy of the carotenoid gene, making the gene causing the red color easier to find.

Next, she figured out whether the genes were from pea aphid DNA or from uncommon symbiotic bacteria or were just contamination from fungi in the sample.

In the laboratory, Moran and Jarvik found eliminating the symbiotic bacteria from a strain of aphids did not change the color of the offspring, meaning the symbiotic bacteria were not the source of the red color.

In addition, tracing the lineages of the red, green and yellow strains of aphids showed the colors had a Mendelian inheritance pattern, indicating the DNA that coded for red was part of the aphid's DNA.

That inheritance pattern also fit with another team's research that suggested both colors were present in nature because red aphids are more susceptible to parasitic wasps, whereas green aphids are more susceptible to predators such as lady-bird beetles.

The final piece of the puzzle was figuring out where the genes came from. The particular sequence of aphid DNA that coded for carotenoids differed from bacterial carotenoid genes and matched those from some fungi.

Moran said a long-term association between aphids and pathogenic fungi could make such a gene transfer possible.

The discovery illustrates "the interweaving of organisms and their genomes over time and their merging in different ways," she said. "The distinctness of different genomes and organisms and lineages is much less than we thought."

Energy drinks work as soon as they touch your tongue

IF YOU spit out an energy drink after taking a sip, it could still boost your strength. This pre-digestive effect is immediate and seems due to a newly discovered neural pathway that links taste buds to muscles.

Nicholas Gant at the University of Auckland in New Zealand previously showed that mouth-rinsing and then spitting out a carbohydrate solution immediately improved performance at sprinting and cycling - even though it takes at least 10 minutes for carbohydrates to be digested and utilised by muscles.

This time, Gant's team had 16 participants tire out their biceps by flexing them for 11 minutes before rinsing their mouths with either a carbohydrate drink or a non-calorific, taste-matched one. One second after rinsing, the team applied transcranial magnetic stimulation to the participants' scalps, which aided the detection of activity in the motor cortex, a brain area known to send signals to biceps.

The team found that the volunteers who swilled with carbohydrates were able to flex with more force immediately afterwards, and had a 30 per cent stronger neural response compared with those given placebo. Gant says it's likely that taste receptors detect carbohydrates, resulting in a signal to fatigued muscles "that help is on the way" so they continue working hard (*Brain Research*, DOI: 10.1016/j.brainres.2010.04.004).

How important is geographical isolation in speciation?

A genetic study of island lizards shows that even those that have been geographically isolated for many millions of years have not evolved into separate species as predicted by conventional evolutionary theory. Professor Roger Thorpe and colleagues Yann Surget-Groba and Helena Johansson, at Bangor University, UK, reveal their findings April 29 in the open-access journal *PLoS Genetics*.

Since Darwin's study of the Galapagos Islands, archipelagos have played a central role in understanding how new species evolve from existing ones (speciation). Islands epitomize allopatric speciation, where geographic isolation causes individuals of an original species to accumulate sufficient genetic differences to prevent them breeding with each other when they are reunited.

Current day Martinique in the Lesser Antilles is composed of several ancient islands that have only recently coalesced into a single entity. The phylogeny and geology show that these ancient islands have had their own tree lizard (anole) species for about six to eight million years.

Capitalizing on the islands' meeting, the authors genetically tested the lizards for reproductive isolation from one another. In using selectively neutral genetic markers, the authors saw that these anoles are freely exchanging genes and therefore not behaving as separate species. Indeed, there is more genetic isolation between conspecifics from different habitats than between those lizards originating from separate ancient islands.

The findings reject allopatric speciation in a case study from a system thought to exemplify it, and suggest the potential importance of speciation due to differences in ecological conditions (ecological speciation). "The next step is to identify the genes controlling the traits influencing the process of speciation", said Roger Thorpe.

FINANCIAL DISCLOSURE: This research was primarily supported by the BBSRC (BB/C500544/1) with additional fellowship (YSG, RST) support from the EC (MEIF-CT-2005-009981) and studentship support (HJ, RST) from NERC (NER/S/A/2004/12449). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript. COMPETING INTERESTS: The authors have declared that no competing interests exist.

CITATION: Thorpe RS, Surget-Groba Y, Johansson H (2010) Genetic Tests for Ecological and Allopatric Speciation in Anoles on an Island Archipelago. PLoS Genet 6(4): e1000929. doi:10.1371/journal.pgen.1000929

Our genes can be set on pause

New evidence in embryonic stem cells shows that mammalian genes may all have a layer of control that acts essentially like the pause button on your DVR. The researchers say the results show that the pausing phenomenon, previously thought to be a peculiarity of particular genes, is actually a much more general feature of the genome. The findings are reported in the April 30th issue of the journal *Cell*, a Cell Press publication.

"We're coming to the realization that we've been missing out on an entire second step in the control of gene expression," said Richard Young of the Whitehead Institute and Massachusetts Institute of Technology. "There's tremendous excitement," he said, and some healthy debate too.

Notably, Young's team has shown that the infamous cancer gene known as c-Myc plays a major role in the pause release of many genes throughout the genome. Their fundamentally important findings may therefore ultimately have practical application in the treatment of some of the nastiest cancers, according to the researchers.

For decades, scientists have known that transcription is controlled by the recruitment of DNA binding factors to promoters, where they act as a kind of molecular Velcro for the polymerase enzymes that copy DNA into the mRNA templates for proteins, Young explains. "We still believe that's true," he said. "The surprise is that's only the first step."

They've now shown that other players cause the recruited polymerases to freeze in their places – in effect pausing gene activity. It is the job of still other transcription factors to act as a pause release.

As evidence for the importance of the pausing function, a genome-wide analysis of embryonic stem cells showed that the bulk of polymerases can be found adjacent to promoters at any given time, even when the genes in question are some of the most actively transcribed. Pause factors (known as DSIF and NELF) are usually there too, consistent with the notion that they bind the enzyme after it has only just gotten started transcribing the DNA. The interactions of still other players, including one that is recruited by the transcription factor c-Myc, must then release the pausing for the genes to come back 'on'.

Young said he initially thought the pausing process might be fairly unique to embryonic stem cells, but he doesn't think so any more. When they began the study, they also expected the embryonic cells would show this sort of pausing at select developmental genes only. Instead, they found that polymerase was paused at about 75 percent of all promoters.

"We found it was occurring everywhere – at all genes," Young said. "The polymerases come for a visit and then they pile up downstream of the promoter." They make only a very small stretch of RNA before they stop, awaiting the signal to continue. Some of the paused polymerases appear to remain in their suspended state indefinitely, he says.

Young said he thinks this second layer of control likely offers cells some added flexibility. In some cases, he notes, this sort of pausing seems to allow a rapid response to particular cues. The pause function might also be necessary, he says, because polymerases can be surprisingly sloppy in doing their jobs. The enzymes will often transcribe in two directions, one of them clearly backwards.

"It's a little clueless," Young said. "Pause control may be a way of ensuring that transcription continues only in the correct direction, and at real genes instead of willy-nilly."

Although Young is not an expert in cancer, he says that the connection of this pausing process to c-Myc could make some waves.

"Myc is so important in cancer," he says, noting that Myc is implicated in at least 15 percent of human cancers including some of those that are the toughest to get rid of and that tend to come back. There is some evidence in mice that shutting Myc down can lead cancer cells to shrivel up and die, but Myc itself isn't an ideal drug target.

"Now we know what Myc does and we know the kinase it recruits," Young said. That's key because kinases often do make good drug targets.

The new findings therefore offer new insight into how Myc works and a new rationale and strategy for trying to shut it down as a way to treat cancer. Young said there is surely a lot more to learn about pause control and its release too, with potentially other implications for human disease.

The researchers include Peter B. Rahl, Whitehead Institute for Biomedical Research, Cambridge, MA; Charles Y. Lin, Whitehead Institute for Biomedical Research, Cambridge, MA, Massachusetts Institute of Technology, Cambridge, MA; Amy C. Seila, Koch Institute, Massachusetts Institute of Technology, Cambridge, MA; Ryan A. Flynn, Koch Institute, Massachusetts Institute of Technology, Cambridge, MA; Scott McCuine, Whitehead Institute for Biomedical Research, Cambridge, MA; Christopher B. Burge, Massachusetts Institute of Technology, Cambridge, MA; Phillip A. Sharp, Massachusetts Institute of Technology, Cambridge, MA, Koch Institute, Massachusetts Institute of Technology, Cambridge, MA; and Richard A. Young, Whitehead Institute for Biomedical Research, Cambridge, MA, Massachusetts Institute of Technology, Cambridge, MA.

Antibiotic regimen effective for reactive arthritis

Controversial treatment approach could lead to a cure

Researchers from University of South Florida College of Medicine found a combination of antibiotics to be an effective treatment for Chlamydia-induced reactive arthritis, a major step forward in the management, and

possibly cure, of this disease. Results of this study are published in the May issue of *Arthritis & Rheumatism*, a journal of the American College of Rheumatology.

Reactive arthritis (ReA), also known as Reiter's syndrome, occurs in response to an infection. According to National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), the bacterium most often associated with ReA is Chlamydia trachomatis. Respiratory infections with Chlamydia pneumoniae can also trigger ReA, while associated infections in the digestive tract include Salmonella, Shigella, Yersinia, and Campylobacter. ReA symptoms usually last 3 to 12 months, although symptoms can return or develop into a long-term disease. In the past it was thought that only a small percentage of people would experience chronic symptoms of ReA. However, more recent data suggests that as many as 30%-50% of patients could develop a chronic form of the disease. In chronic ReA, symptoms can be severe and difficult to control with treatment, which could lead to joint damage.

The use of long-term antibiotic treatment for patients with ReA is controversial. Several reported studies have indicated that prolonged antimicrobial monotherapy is not efficacious, while other studies suggest there might be a benefit, specifically with early-stage Chlamydia-induced ReA.

The study led by J.D. Carter, M.D., focused on combinations including 2 antibiotics found to have specific effects on the Chlamydia bacteria. The first, rifampin, has excellent tissue penetration, an important weapon against intracellular pathogens such as Chlamydia. Rifampin also has been shown to interfere with chlamydial gene transcription, including the heat-shock proteins (HSPs), which can ultimately lead to the demise of the infected cell. Dr. Carter explains why this is important. "Combining this effect with antibiotics that block chlamydial protein synthesis (e.g., doxycycline or azithromycin) may allow for successful eradication of the cell harboring persistently infecting intracellular organisms. A recent pilot study conducted by our group suggested that prolonged treatment with a combination of doxycycline and rifampin significantly improves symptoms of chronic undifferentiated spondylarthritis (SpA) (with a special focus on Chlamydia) compared with doxycycline alone. The goal of the present study was to further investigate whether a 6-month course of combination antibiotics, one of which is rifampin, is effective in the treatment of patients with chronic Chlamydia-induced ReA."

The 9-month, prospective, double-blind, triple-placebo trial screened a total of 80 subjects, and 42 were enrolled and randomized to treatment. Twelve subjects were randomized to doxycycline and rifampin, 15 were randomized to azithromycin and rifampin, and 15 were randomized to matching oral placebos. The primary end point—an improvement of 20% or more—was achieved in 17 of 27 patients (63%) receiving combination antibiotics and in 3 of 15 patients (20%) receiving placebo. Secondary efficacy end points showed similar results, demonstrating that compared with placebo, a 6-month course of combination antibiotics resulted in a significantly higher response rate in patients with chronic Chlamydia-induced ReA, although which combination of antibiotics was most effective remained undetermined as the trial wasn't powered to compare the 2 regimens.

Dr. Carter concludes, "The results of this study are encouraging for the management of chronic post-Chlamydia ReA. These data suggest that there is potential for eradication of this persistent infection and that improvement in the clinical sequelae that are the result of these infections can be achieved in a substantial number of patients."

In an Editorial published in this month's issue, Dr. Henning Zeidler agrees. "The study by Carter et al shows impressive effects and, with them, the potential for the eradication of Chlamydia, which would cure Chlamydia-induced ReA."

Article: "Combination Antibiotics as a Treatment for Chronic Chlamydia-Induced Reactive Arthritis." J. D. Carter, L. R. Espinoza, R. D. Inman, K. B. Sneed, L. R. Ricca, F. B. Vasey, J. Valeriano, J. A. Stanich, C. Oszust, H. C. Gerard, and A. P. Hudson. Arthritis & Rheumatism; Published Online: April 29, 2010 (DOI: 10.1002/art.27394); Print Issue Date: May 2010.

Editorial: "Combination Antibiotics for Chlamydia-Induced Arthritis: Breakthrough to a Cure?" Markus Rihl, Jens G. Kuipers, Lars Kohler, Henning Zeidler. Arthritis & Rheumatism; Published Online: April 29, 2010 (DOI: 10.1002/art.27401); Print Issue Date: May 2010.

Animals' right to privacy denied by documentary-makers

Animals' right to privacy is being denied by makers of television wildlife documentaries according to new research.

Dr Brett Mills from the University of East Anglia argues that while wildlife programmes can play a vital role in engaging citizens in environmental debates, in order to 'do good' they must inevitably deny many species the right to privacy.

Published in the current issue of *Continuum: Journal of Media and Cultural Studies*, Dr Mills' study 'Television wildlife documentaries and animals' right to privacy' analyses the 'making of' documentaries that

accompanied the BBC wildlife series Nature's Great Events (2009). Exploring the debates on ethics, animal welfare and rights and human rights, Dr Mills suggests that animals have a right to privacy but this is turned into a challenge for the production teams, who use newer forms of technology to overcome species' desire not to be seen.

"The aim of the research is to encourage debate, especially within the contemporary environmental context where it is now commonplace for us to question the impact of human movement and behaviour around the globe," explained Dr Mills, a senior lecturer in the School of Film and Television Studies. "In addition, though, perhaps there is an argument for some species, in some circumstances, not to be filmed. At the moment it seems that such arguments are never put forward."

He added: "This is an important debate for two reasons. Firstly, wildlife documentaries are usually seen as important pieces of public service broadcasting, and it's therefore worth us thinking about the ethical contexts within which such productions exist. Secondly, such documentaries are the key way in which many people 'encounter' a range of species from all over the globe, and so they therefore contribute to how we think about other species and human/animal interactions. By exploring what wildlife documentaries do, and how they do it, I hope to contribute to environmental debates at a time when the global effects of human behaviour are rightly under scrutiny."

At the heart of the documentary project is the necessity for animals to be seen. Dr Mills suggests that this necessity itself raises a series of ethical concerns, but these seem to be sidelined in the moral debates surrounding wildlife documentaries. The use of sophisticated aerial technology to film animals, for example, is justified because it does not disturb them, yet the question of whether it is appropriate to film animals in this way is not raised. Underpinning such action is an assumption that animals have no right to privacy, and that the camera crew have no need to determine whether those animals consent to being filmed.

Unlike human activities, a distinction of the public and the private is not made in the animal world. There are many activities which animals engage in which are common to wildlife documentary stories but which are rendered extremely private in the human realm; mating, giving birth, and dying are recurring characteristics in nature documentaries, but the human version of these activities remains largely absent from broadcasting.

Dr Mills said: "It might at first seem odd to claim that animals might have a right to privacy. Privacy, as it is commonly understood, is a culturally human concept. The key idea is to think about animals in terms of the public/private distinction. We can never really know if animals are giving consent, but they often do engage in forms of behaviour which suggest they'd rather not encounter humans, and we might want to think about equating this with a desire for privacy.

"When confronted with such 'secretive' behaviour the response of the wildlife documentary is to read it as a challenge to be overcome with the technologies of television. The question constantly posed by wildlife documentaries is how animals should be filmed: they never ask whether animals should be filmed at all."

A justification could be made for filming animals as they roam plains and deserts and engage in hunting activities because these are 'public' events, which take place in locations which include many other animals, and in which the animal being filmed makes no explicit attempt to not be seen. Yet animal activities which might equate with human notions of the private are treated in a way which suggests the public/private distinction does not hold. For example, many species could be read as desiring not to be seen - animals in burrows and nests have constructed a living space which equates with the human concept of the home, and commonly do this in locations which are, by their very nature, explicitly hidden, often for practical purposes. "Human notions of privacy which rest on ideas of location or activity are ignored in terms of animals. It doesn't matter what an animal does, or where it does it, it will be deemed fair game for the documentary," said Dr Mills.

Distinctions between the public and private are enshrined within broadcasting regulations, with privacy placed within ethical categories of human rights. Central to broadcasters' relationship with its public is that in order to be filmed, the public must first offer their consent. If they don't, broadcasters must not infringe privacy unless there is a pressing justification to do so.

"While never made explicit, such regulations assume that such ethics are applicable to humans only," said Dr Mills. "The ethical standards applying to wildlife programmes are predominately predicated on ensuring that 'audiences should never be deceived or misled by what they see or hear', that is the 'contract with the viewer' is prioritised over the rights of the animals. In doing so, an assumption is made here about the differences between humans and animals, which have been at the heart of debates over animal rights and the ethical treatment of animals for millennia.

"The environmental and educational aspects of wildlife documentaries are assumed to trump ethical concerns about animals' privacy. It is an impressive piece of ethical manipulation, whereby privacy, so

enshrined within the concepts of rights for humans, becomes merely a 'realm' which documentary makers can enter, justifying their actions as ones for the benefit of the very species whose rights are being moralised away."

Bare Discrepancies: Nude-Colored Hospital Gowns Could Help Doctors Better Detect Hard-To-See Symptoms

Though Human Eyes Have Evolved To See Other People Blush, Our Eyes Need Assistance To Spot Health-Related Changes in Skin Color Such as Cyanosis

Changing the hue of hospital gowns and bed sheets to match a patient's skin color could greatly enhance a physician's ability to detect cyanosis and other health-related skin color changes, according to a new study from Rensselaer Polytechnic Institute.

"If a doctor sees a patient, and then sees the patient again later, the doctor will have little or no idea whether the patient's skin has changed color," said neurobiologist and study leader Mark Changizi, assistant professor in the Department of Cognitive Science at Rensselaer. "Small shifts in skin color can have tremendous medical implications, and we have proposed a few simple tools – skin-colored gowns, sheets, and adhesive tabs – that could better arm physicians to make more accurate diagnoses."

Human eyes evolved to see in color largely for the purpose of detecting skin color changes such as when other people blush, Changizi said. These emotive skin color changes are extremely apparent because humans are hard-wired to notice them, and because the background skin color remains unchanged. The contrast against the nearby "baseline" skin color is what makes blushes so noticeable, he said.

Human skin also changes color as a result of hundreds of different medical conditions.

Pale skin, yellow skin, and cyanosis – a potentially serious condition of bluish discoloration of the skin, lips, nails, and mucous membranes due to lack of oxygen in the blood – are common symptoms. These color changes often go unnoticed, however, because they often involve a fairly universal shift in skin color, Changizi said. The observer in most instances will just assume the patient's current skin color is the baseline color. The challenge is that there is no color contrast against the baseline for the observer to pick up on, as the baseline skin color has changed altogether.

(To hear Changizi address the age-old question of why human veins look blue, see: http://blogger.rpi.edu/approach/2010/04/26/so-why-do-our-veins-look-blue/)

One potential solution, Changizi said, is for hospitals to outfit patients with gowns and sheets that are nude-colored and closely match their skin tone. Another solution is to develop adhesive tabs in a large palette of skin-toned colors. Physicians could then choose the tabs that most closely resemble the patient's skin tone, and place the tabs at several places on the skin of the patient. Both techniques should afford doctors and clinicians an easy and effective tool to record the skin tone of a patient, and see if it deviates – even very slightly – from its "baseline" color over time.

"If a patient's skin color shifts a small amount, the change will often be imperceptible to doctors and nurses," Changizi said. "If that patient is wearing a skin-colored gown or adhesive tab, however, and their skin uniformly changes slightly more blue, the initially 'invisible' gown or tab will appear bright and yellow to the observer."

While there are devices for specifically measuring the oxygen content of blood to help detect the onset of cyanosis, Changizi said the color recognition offered by the color-matched adhesive tabs and hospital gowns would be another tool to tip off the clinician that there is even a need to measure blood oxygen content. The color-matched tabs and gowns would also benefit many hospital departments, as well as international hospitals, which lack equipment to measure blood oxygen content, he said.

Changizi's findings are detailed in the paper "Harnessing color vision for visual oximetry in central cyanosis," published in the journal *Medical Hypotheses*. The complete paper may be viewed online at Changizi's Web site at: http://www.changizi.com/colorclinical.pdf.

Last year, Changizi's eye-opening book, *The Vision Revolution: How the Latest Research Overturns Everything We Thought We Knew About Human Vision*, hit store shelves. Published by BenBella Books, *The Vision Revolution* investigates why vision has evolved as it has over millions of years, and challenges theories that have dominated the scientific literature for decades.

For more information on Changizi's research, visit his Web site and read a recent magazine story on his work. See Rensselaer's news release for more information on *The Vision Revolution*.

Moon fountains could answer astronauts' watery wishes

20:46 29 April 2010 by **Stephen Battersby**

Fountains on the moon may answer a few astronaut wishes. Dust plumes lofted from craters could aid the future search for water and other resources.

The idea of flying dust goes back to astronaut Gene Cernan on the Apollo 17 mission, who sketched an extended glow above the moon's surface that scientists thought might be due to light scattering off dust. And an

experiment deployed by the same mission detected a flurry of high-speed dust particles around sunrise and sunset.

Researchers suspect that the solar wind is involved. This tenuous plasma of positive ions and electrons blows constantly past the moon, and at the moment of sunrise or sunset it is blowing almost horizontally across the surface.

Tracking ions

On reaching an obstruction, light electrons and heavy ions in the wind should spread apart at different rates, producing a negatively charged "electron cloud" that charges up the surface to create repulsive electrostatic forces, which in turn could loft dust.

However, the process is not fully understood, because the ions will also feel the forces of the electrical imbalance, spreading out to compensate and so neutralising the electron clouds.

"Scientists didn't know where the ions would go," says William Farrell of NASA's Goddard Space Flight Center in Greenbelt, Maryland.

Now a team led by Farrell has analysed how the solar wind ions will move in craters near the lunar poles, where the wind blows nearly horizontally.

Special delivery

Using computer simulations of plasma expansion and models of the wake of the space shuttle, they calculated that electrical forces will drag some ions down over the rim, but there will still be regions where electrons dominate, creating electrostatic forces powerful enough to levitate dust.

It is not yet clear how much material will be thrown up in these polar fountains, however, because that depends on the size of the dust grains and other surface properties. A lunar orbiter due for launch in 2013 called LADEE is designed to sample lunar dust and gases and could settle the question.

Analysing crater dust fountains could reveal the presence of frozen water and other resources stored below. "Why go down to prospect for gold if the surface is throwing gold up in the air for you?" says Farrell.

Journal reference: *Journal of Geophysical Research* (vol 115, p E03004)

Purple Pokeberries hold secret to affordable solar power worldwide

Pokeberries – the weeds that children smash to stain their cheeks purple-red and that Civil War soldiers used to write letters home – could be the key to spreading solar power across the globe, according to researchers at Wake Forest University's Center for Nanotechnology and Molecular Materials.

Nanotech Center scientists have used the red dye made from pokeberries to coat their efficient and inexpensive fiber-based solar cells. The dye acts as an absorber, helping the cell's tiny fibers trap more sunlight to convert into power.

Pokeberries proliferate even during drought and in rocky, infertile soil. That means residents of rural Africa, for instance, could raise the plants for pennies. Then they could make the dye absorber for the extremely efficient fiber cells and provide energy where power lines don't run, said David Carroll, Ph.D., the center's director. "They're weeds," Carroll said. "They grow on every continent but Antarctica."

Wake Forest University holds the first patent for fiber-based photovoltaic, or solar, cells, granted by the European Patent Office in November. A spinoff company called FiberCell Inc. has received the license to develop manufacturing methods for the new solar cell.

The fiber cells can produce as much as twice the power that current flat-cell technology can produce. That's because they are composed of millions of tiny, plastic "cans" that trap light until most of it is absorbed. Since the fibers create much more surface area, the fiber solar cells can collect light at any angle – from the time the sun rises until it sets.

To make the cells, the plastic fibers are stamped onto plastic sheets, with the same technology used to attach the tops of soft-drink cans. The absorber – either a polymer or a less-expensive dye – is sprayed on. The plastic makes the cells lightweight and flexible, so a manufacturer could roll them up and ship them cheaply to developing countries – to power a medical clinic, for instance.

Once the primary manufacturer ships the cells, workers at local plants would spray them with the dye and prepare them for installation. Carroll estimates it would cost about $5 million to set up a finishing plant – about $15 million less than it could cost to set up a similar plant for flat cells.

"We could provide the substrate," he said. "If Africa grows the pokeberries, they could take it home.

"It's a low-cost solar cell that can be made to work with local, low-cost agricultural crops like pokeberries and with a means of production that emerging economies can afford."

Wake Forest University's Center for Nanotechnology and Molecular Materials uses revolutionary science to address the pressing needs of human society, from health care to green technologies. It is a shared resource serving academic, industrial and governmental researchers across the region.

Sign Language Study Shows Multiple Brain Regions Wired for Language

A new study from the University of Rochester finds that there is no single advanced area of the human brain that gives it language capabilities above and beyond those of any other animal species.

Instead, humans rely on several regions of the brain, each designed to accomplish different primitive tasks, in order to make sense of a sentence. Depending on the type of grammar used in forming a given sentence, the brain will activate a certain set of regions to process it, like a carpenter digging through a toolbox to pick a group of tools to accomplish the various basic components that comprise a complex task.

"We're using and adapting the machinery we already have in our brains," said study coauthor Aaron Newman. "Obviously we're doing something different [from other animals], because we're able to learn language unlike any other species. But it's not because some little black box evolved specially in our brain that does only language, and nothing else."

The team of brain and cognitive scientists – comprised of Newman (now at Dalhousie University after beginning the work as a postdoctoral fellow at the University of Rochester), Elissa Newport (University of Rochester), Ted Supalla (University of Rochester), Daphne Bavelier (University of Rochester), and Peter Hauser (Rochester Institute of Technology) - published their findings in the latest edition of the journal *Proceedings of the National Academies of Science*.

To determine whether different brain regions were used to decipher sentences with different types of grammar, the scientists turned to American Sign Language for a rare quality it has.

Some languages (English, for example) rely on the order of words in a sentence to convey the relationships between the sentence elements. When an English speaker hears the sentence "Sally greets Bob," it's clear from the word order that Sally is the subject doing the greeting and Bob is the object being greeted, not vice versa.

Other languages (Spanish, for example) rely on inflections, such as suffixes tacked on to the ends of words, to convey subject-object relationships, and the word order can be interchangeable.

American Sign Language has the helpful characteristic that subject-object relationships can be expressed in either of the two ways – using word order or inflection. Either a signer can sign the word "Sally" followed by the words "greets" and "Bob" (a construction in which word order dictates meaning), or the signer can use physical inflections such as moving hands through space or signing on one side of the body to convey the relationship between elements. For the study, the team formed 24 sentences and expressed each of those sentences using both methods.

Videos of the sentences being signed were then played for the subjects of the experiment, native signers who were lying on their backs in MRI (magnetic resonance imaging) machines with coils around their heads to monitor which areas of the brain were activated when processing the different types of sentences.

The study found that there are, in fact, distinct regions of the brain that are used to process the two types of sentences: those in which word order determined the relationships between the sentence elements, and those in which inflection was providing the information.

In fact, Newman said, in trying to understand different types of grammar, humans draw on regions of the brain that are designed to accomplish primitive tasks that relate to the type of sentence they are trying to interpret. For instance, a word order sentence draws on parts of the frontal cortex that give humans the ability to put information into sequences, while an inflectional sentence draws on parts of the temporal lobe that specialize in dividing information into its constituent parts, the study demonstrated.

"These results show that people really ought to think of language and the brain in a different way, in terms of how the brain capitalizes on some perhaps preexisting computational structures to interpret language," Newport said.

Aside from providing perspective on how language abilities might have evolved in humans, the scientists' findings could perhaps eventually find applications in medicine, according to Newport. For instance, it could prove valuable in assessing how best to teach language to a person with brain damage in certain areas but not others, such as a stroke victim.

Study: Roller coasters linked to common ear injury

LAS VEGAS – The sharp turns, ups and downs, and high speeds of today's roller coasters bring a lot of thrills, but if you're not careful, the ride could also cause damage to your ears, say physicians at Henry Ford Hospital in Detroit.

Their case study offers the first reported link between the force of acceleration in roller coasters and a common ear injury – ear barotrauma – that occurs when there is a relatively quick change in pressure between the external environment, the ear drum and the pressure in the middle ear space.

In its extreme, ear barotrauma can lead to temporary hearing loss, and most commonly causes dizziness, ear discomfort or pain, or a sensation of having the ears "pop." Since barotrauma from a roller coaster happens suddenly, it very difficult for the patient to equalize ear pressure by simply yawning or chewing gum.

"As roller coasters continue to push the envelope of speed, otolaryngologists need to be aware of this new cause of barotrauma to the ear," says study senior author Kathleen L. Yaremchuk, M.D., Chair, Department of Otolaryngology at Henry Ford Hospital. "Based on our research, we recommend that passengers remain facing forward for the duration of the ride to not let the full impact of acceleration hit the ear."

Previously, ear barotrauma has been linked to air travel and scuba diving, and most recently to the improvised explosive devices or IEDs being used in Iraq and Afghanistan.

Results from the study will be presented April 30 at the Triologocial Society's 113th Annual Meeting, part of the Combined Otolaryngology Spring Meetings in Las Vegas.

Henry Ford's study into roller coaster-induced ear barotrauma is centered on a 24-year-old male who experienced pain and fullness in his right ear about 36 hours after riding a roller coaster at a local amusement park.

As the ride began to accelerate, the patient's head was turned to the left to speak with his girlfriend, causing his right ear to sustain full impact of the forward throttle. The roller coaster he was riding reaches a maximum speed of 120 mph within 4 seconds.

When examined by Henry Ford otolaryngologists, the patient's left ear was normal; however, the right ear canal was swollen and the ear drum inflamed.

Upon further examination, Dr. Yaremchuk and co-author Samer Al-khudari, M.D., estimated that the patient's right ear was exposed to about 0.6 PSI (pound per square inch, used to measure pressure) when the roller coaster accelerated. While not enough to perforate the ear drum, the pressure was enough to cause barotrauma to the ear.

External pressure or compression can cause inflammation in the ear, leading to increased swelling and redness. For example, approximately 0.62 PSI is required to cause capillary closure in arterioles (the small thin-walled arteries that end in capillaries) of human fingers.

For the patient in this study, his symptoms improved, with observation, within 72 hours. With most cases of barotrauma, otolaryngologists typically recommend patients take decongestants to relive symptoms, and that they not put themselves in the same situation that caused the barotrauma until the inner/middle ear swelling has decreased.

But roller coaster enthusiasts should not let the risk of ear barotrauma prevent them from enjoying the ride.

"This was an unusual situation, where the rider turned his head at just the right time to experience the full force of acceleration against his ear drum. It would be highly unlikely to do this multiple times in a row, but roller coaster riders should be aware of what they can do to prevent barotrauma from occurring," says Dr. Yaremchuk.

Rare Mutation That Causes Mirror Movements Reflects Nervous System's Complexity

The genetic cause of mirror movements reveals how the nervous system is wired during development

By Katie Moisse

Andrée Marion, a 47-year-old accountant from St. Sauveur, Quebec, has mirror movements—involuntary motions on one side of her body that mirror voluntary ones on the other. When she does things that require fine movements, like brushing her hair, reaching for change in her pocket or holding her coffee with her right hand, her left hand strokes, dips or grips in synchrony. She can't help it; it just happens. It also happens to her 19-year-old son. In fact, of Marion's 23 blood relatives spanning four generations, about half have mirror movements. It turns out they also have a rare gene defect, giving scientists new insight into how our bodies are wired.

"The right side of the brain controls the left side of the body," says Guy Rouleau, a neurologist and geneticist at the University of Montreal and senior author of a study published April 30 in *Science* that uncovered a mutation associated with the mirroring condition in Marion and her relatives. That's because the wires of our nervous system cross: axons from motor neurons originating in the brain sweep over the midline of the body before connecting to other motor neurons in the spinal cord, and those spinal motor neurons then connect to the muscles. "In humans, we don't know how or why that happens," Rouleau says.

Mirror movements are extremely rare and are usually only seen in people with disorders of nervous system crossing, such as Klippel-Feil and Kallmann syndrome. So the abnormal wiring of Marion and her relatives in the absence of these disorders gave Rouleau and colleagues a unique opportunity to study how the wiring process can go wrong. Using transcranial magnetic stimulation, the researchers excited neurons in the brain that would normally connect to spinal motor neurons on the opposite side of the body. "The right side of the brain

controlled the left hand but also the right hand," says Rouleau. "It's a curious thing—some axons crossed over and some didn't cross. The ones that didn't cross went to the exact same [spinal motor neurons] on the opposite side of the spinal cord. There was a perfect organization that was bilateral as opposed to unilateral."

Because the mirror movements and unusual wiring were hereditary, Rouleau and colleagues looked for gene mutations that might be causing them. It took them a year and a half to collect DNA from all Marion's relatives, but only three months to find the faulty gene: *deleted in colorectal cancer* (*DCC*). The mutation interferes with DCC's interaction with netrin—a diffusible extracellular protein that helps guide axons across the body ' s midline during development.

"[DCC] is expressed in the midline of the nervous system, and when the axons sense this protein they move toward it," Rouleau says. But the mutation cuts the level of functional DCC dramatically in Marion and her relatives. "They don't have enough of the protein, and the message isn't strong enough to get all the nerves to cross over," Rouleau says.

Mice with *DCC* deletions, called Kanga mice, also exhibit mirror movements, which result in a "distinctive hopping gait," the researchers report. But DCC's role in humans was previously unclear. "This basically tells us, not why the [axons] cross, but how," says Rouleau. "It really shows a level of organization that's amazing."

Marion and her relatives had never seen a doctor about the mirror movements. Rather, a neurologist examining one of the family members for another reason happened to observe the involuntary movements, prompting the study. "From when I was a child, I noticed them. But it never really concerned me because I was able to do whatever I wanted to do," says Marion, who can type and even drive without any difficulty. "The only thing I'm really not good at is playing pool," she jokes, "and I have to be careful when I'm cooking and cutting food." Marion's mirror movements are more pronounced than her son's, she says. "His are more in his hands. For me it’s even my biceps and my toes."

"The movements are noticeable but not flagrant," says lead author Myriam Srour, a pediatric neurologist at Montreal Children's Hospital. "It's quite amazing; they function very well. …Several said they are a bit on the clumsy side…but it's more their fine movements that are affected."

The same gene defect was identified in an Iranian family, previously reported to have similar hereditary mirror movements. Knowing that their mirror movements might give doctors more insight into how the nervous system develops and how movements are controlled, Marion and her relatives were happy to participate in the study. "If it could help people with another, more important sickness, that would be great," Marion says.