More women choosing to remove healthy breast after cancer diagnosis

A new study of New York State data finds that the number of women opting for surgery to remove the healthy breast after a cancer diagnosis in one breast is rising, despite a lack of evidence that the surgery can improve survival. The study also finds that despite extensive press coverage of women who choose to have both breasts removed because of a strong family history of cancer, the rate of this surgery is relatively low and has changed little in the last decade. The study appears in Cancer, a peer-reviewed journal of the American Cancer Society.

Prophylactic mastectomy, the removal of a noncancerous breast, is one method for reducing a woman's risk of developing breast cancer; however, there is little information available on the prevalence of prophylactic mastectomies for preventing breast cancer among high-risk women or on the prevalence of the surgery to prevent tumors in the healthy breast among women whose cancer is limited to one breast.

Researchers led by Stephen B. Edge, M.D., FACS, of the Roswell Park Cancer Institute in Buffalo, NY, examined the frequency of prophylactic mastectomies in New York State between 1995 and 2005 using mandated statewide hospital discharge data combined with data from the state cancer registry. They identified 6,275 female New York residents who underwent prophylactic mastectomies. Eighty-one percent of the women had been diagnosed with cancer in one breast, while 19 percent had no personal history of breast cancer.

The researchers found that the number of prophylactic mastectomies increased during the time period, particularly among women with cancer in one breast. Over the 11-year study period, the prevalence of these contralateral mastectomies more than doubled. The prevalence of bilateral prophylactic mastectomies among women with no personal history of breast cancer increased only slightly.

"These data from New York are the only data on a large population of women that examine the use of bilateral prophylactic mastectomy," said Dr. Edge. "These data demonstrate that prophylactic mastectomy is an uncommon procedure that is performed most commonly on women with a personal history of breast cancer. Although the total number of prophylactic mastectomies performed per year was small, it appears that the use of the surgery is increasing." In addition, he noted that women with breast cancer should have careful counseling regarding benefits and risks before proceeding with prophylactic mastectomy of the other breast.

Article: *"Surveillance of prophylactic mastectomy: Trends in Use from 1995-2005." Colleen C. McLaughlin, Patricia P. Lillquist, and Stephen B. Edge. Cancer; Published Online: September 28, 2009 (DOI: 10.1002/cncr.24623); Print Issue Date: December 1, 2009.*

How to deliver the news? New advice for doctors diagnosing prenatal Down syndrome

BOSTON - September 28th, 2009 New prenatal tests for Down syndrome are soon to be offered to all pregnant women across the United States, yet telling an expectant couple that their child will be born with Down syndrome is a task very few physicians are trained for, claims research published in the American Journal of Medical Genetics. The study, which reviewed decades of surveys and interviews, offers several recommendations for how physicians can best deliver the news.

A 29-member research team, led by Dr. Brian Skotko from Children's Hospital Boston, supported by the National Down Syndrome Society and informed by experts from across the field, reviewed surveys and research ranging from 1960 to present day to consider how prepared physicians felt they are to deliver a diagnosis. They also studied the opinions of couples who had received the diagnosis to determine the best way of delivering the news.

"Down syndrome (DS) remains the most common chromosomal condition. It occurs in one out of every 733 live births," said Skotko. "Nearly every obstetrician can expect to have a conversation with expectant parents about the realities of life with DS, but very little research has been dedicated to understanding how physicians should communicate the news."

The team found that in a 2004 survey approximately 45% of obstetric fellows rated their training as "barely adequate or nonexistent"; a similar survey four years later found little change as 40% thought their training was "less than adequate." In 2005 a survey of 2,500 medical students showed that 81% believed they were "not getting any clinical training regarding individuals with intellectual disabilities."

To improve this scenario the team set out to answer five critical questions which every physician should consider before delivering a diagnosis: Who is the best person to communicate the news? When is the best time to share the news? Where should the news be delivered? What information should be offered? How should the diagnosis be communicated?

The team found that while many sources are available, from trained counsellors to midwives, expectant couples prefer to receive the news from the health care professional with the most knowledge, the physician.

Also, women who decided to undergo definitive prenatal testing for DS prefer to receive the diagnosis as soon as possible in the company of their husbands or partner, while women who had arranged for the diagnosis

to be delivered by a phone call were better prepared for the news then those who received the news from an unarranged call. Women who received the diagnosis through an unscheduled call expressed intense resentment towards their obstetricians and counsellors.

Regarding the amount of information a couple should be given, mothers emphasised that they should be provided with up-to-date information about DS, its causes and the expectations for a child living with DS today. This information should include descriptions of common or anticipated health conditions seen in infants and young children.

On top of this, parents found that they benefited from personal stories that demonstrate the potential and possibilities for children with DS and if possible if possible contact information for other parents who have children with DS should be made available.

Mothers emphasized that at the time of a diagnosis, physicians should discuss all options available to them, including continuing the pregnancy, offering the baby up for adoption after birth, or pursuing termination. In a survey of 71 women from the Netherlands who terminated their pregnancy after a diagnosis of DS, 34% indicated that the option of continuation was not raised.

Finally physicians should be mindful of how they communicate the news. In the largest study most mothers requested that physicians should not begin a conversation by saying "I'm sorry" or "unfortunately I have some bad news," instead they should use neutral and nondirective language.

Unsurprisingly the team also suggests that outdated and offensive language such as "mongolism" should be avoided and instead phrases such as "a fetus with Down syndrome" should be adopted.

Ultimately the research review found that mothers who received the diagnosis prenatally and continued their pregnancy were happier with the birth of their child then those who received the diagnosis after the baby had been born. Receiving the diagnosis in advance seems to allow parents the needed time to overcome the shock and initial grief of the diagnosis and begin preparing and celebrating the upcoming birth of a child.

"Of the studies reviewed nearly all mothers reported feelings of initial shock, anger and fear following the diagnosis," concluded Skotko. "Yet, these same mothers indicated that if physicians were to implement a few simple measures, as research suggests, the experience could be more sensitive to their emotions and needs."

Australia 'uranium' dust concerns

By Phil Mercer BBC News, Sydney

People across NSW and Queensland awoke last week to a Mars like scene

Environmentalists have raised concerns that another giant dust storm blowing its way across eastern Australia may contain radioactive particles.

It is argued that sediment whipped up from Australia's centre may be laced with material from a uranium mine.

Scientists have played down concerns, saying there is little to worry about.

Last Wednesday Sydney and Brisbane bore witness to their biggest dust storm in 70 years. Both were shrouded in red dust blown in from the desert outback.

The massive clouds of dust that choked heavily populated parts of Australia have caused problems for people with asthma, as well as those with heart and lung conditions.

But some environmental campaigners believe that the dry, metallic-tasting sediment could threaten the health of millions of other Australians.

David Bradbury, a renowned filmmaker and activist, claims the haze that engulfed some of the country's biggest cities in the past week contains radioactive grains - or tailings - carried on gale force winds from a mine in the South Australian desert.

"Given the dust storms... which [the] news said originated from Woomera, and which is right next door to the Olympic Dam mine at Roxby Downs, these [storms] could blow those tailings across the face of Australia," Mr Bradbury asserted.

Mining companies have stressed that dust levels are carefully monitored, while the health concerns have been dismissed by a senior environmental toxicologist.

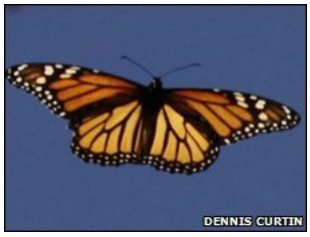
Barry Noller from the University of Queensland says that many of the particles from mines in the outback are simply too heavy to be carried by the wind over long distances.

"In a big dust storm, the dust is not going to come from one isolated site, it is going to be mixed in with dust from a [wide] area and diluted considerably," Mr Noller said.

The latest murky haze that spread over parts of Queensland at the weekend is dissipating and weather forecasters say it should soon start to move out to sea.

Butterfly 'GPS' found in antennae

By Judith Burns Science and environment reporter, BBC News



North America's Monarch butterflies use a 24-hour "clock" in their antennae to help navigate the 4,000km to overwinter in Mexico, say scientists.

Every autumn about 100 million Monarch butterflies migrate to the south. The insects navigate according to the position of the Sun, adjusting their calculations as it appears to move across the sky.

Monarch butterflies navigate using a molecular "sun compass" and "clock"

A paper in the journal Science shows the location of the clock is the antennae rather than the brain. Scientists say the finding is a surprise as it has always been thought that the butterflies used a 24-hour clock in their brains in conjunction with their "Sun compass" when they migrated. But some observations from 50 years ago indicated that when the butterflies' antennae were removed the insects no longer flew in the right direction.

A research team from University of Massachusetts Medical School, US, was also interested in studying the role of the antennae in butterfly social reactions as Monarchs are extremely gregarious when they migrate.

Flight simulator

They removed the antennae from a group of butterflies and compared the way they flew with a control population in a flight simulator. The intact butterflies all flew southwest, as normal, but the insects without antennae, although they flew strongly, headed off in random directions.

Co-author Dr Steven Reppert told BBC News: "This then perked up our interest more and set up a whole series of experiments, which essentially led us to discovering that the antennae, really we think, are the major site of the circadian clock that compensates for the movement of the Sun."

The researchers tested the molecular cycles of the circadian clock in the brains of the insects without antennae and discovered that they were still functioning normally.

Dr Reppert said: "So this suggested that: Wow! Maybe there's a clock in the antennae that's more important for the time compensated component of the insects' Sun compass orientation. It was a total surprise."

What they did next was to show that the molecular control of the clock in the antennae is identical to the way it is in the brain. They also showed that the antennal clock can sense light independently from the brain and can function independently.

Dr Reppert said: "What's so cool about what we did is it suggests that these clocks have a function that is directly related to the brain itself, that it is really regulating a central brain process."

In order to prove that the antennae contain both a light sensor and a clock, the scientists painted the antennae of one group of insects with black enamel paint and compared their behaviour with that of a group whose antennae were coated with transparent paint.

Skewed orientation

The group with the black painted antennae all flew together in the wrong direction, while those with the transparent paint were unaffected.

According to Dr Reppert: "This strongly suggested that the timing of the clocks was still apparent but since the antennae were painted black the internal clocks couldn't adjust their 24-hour oscillation to the prevailing light-dark cycle. "So that's why their orientation was skewed. This brought everything together and really pointed towards the antennae as the major source of this time compensation mechanism." "I think the take home message is that this really emphasises the importance of this appendage, the antenna of the butterfly.

"I think it's becoming more and more clear that the antennae have a number of functions that are independent from being odour detectors. They can function as ears, sensing sound and changes in barometric pressure, and now we can add to the list this function as a timepiece." The paper also suggests that other insects such as foraging honeybees and ants may use their antennae in a similar way.

UCLA study identifies 2 chemicals that could lead to new drugs for genetic disorders

Discovery could help people with cancer, muscular dystrophy, A-T

UCLA scientists have identified two chemicals that convince cells to ignore premature signals to stop producing important proteins. Published in the Sept. 28 edition of the Journal of Experimental Medicine, the findings could lead to new medications for genetic diseases, such as cancer and muscular dystrophy, that are sparked by missing proteins.

"When DNA changes, such as nonsense mutations, occur in the middle rather than the end of a protein-producing signal, they act like a stop sign that tells the cell to prematurely interrupt protein synthesis," explained Dr. Richard Gatti, professor of pathology and laboratory medicine and human genetics at the David Geffen School of Medicine at UCLA. "These nonsense mutations cause the loss of vital proteins that can lead to deadly genetic disorders."

Gatti's lab specializes in studying ataxia-telangiectasia (A-T), a progressive neurological disease that strikes young children, often killing them by their late teens or early 20s.

For four years, the UCLA Molecular Shared Screening Resources Center of the campus' California NanoSystems Institute has screened 35,000 chemicals, searching for those that ignore premature stop signals.

First author Liutao Du developed the screening technology in Gatti's laboratory.

"Of the dozens of active chemicals we discovered, only two were linked to the appearance and function of ATM, the protein missing from the cells of children with A-T," said Du. "These two chemicals also induced the production of dystrophin, a protein that is missing in the cells of mice with a nonsense mutation in the muscular dystrophy gene."

The UCLA team is optimistic that their discovery will aid pharmaceutical companies in creating drugs that correct genetic disorders caused by nonsense mutations. This could affect one in five patients with most genetic diseases, including hundreds of thousands of people suffering from incurable diseases. Because nonsense mutations can lead to cancer, such drugs may also find uses in cancer treatment.

Gatti's lab is funded by the Los Angeles-based Ataxia-Telangiectasia Medical Research Foundation, the National Institutes of Health and the New York-based Ataxia-Telangiectasia Ease Foundation.

The study's coauthors included Robert Damoiseaux, Shareef Nahas, Kun Gao, Hailiang Hu, Julianne Pollard, Jimena Goldstine, Michael Jung, Susan Henning and Carmen Bertoni, all of UCLA.

Hyenas cooperate, problem-solve better than primates

DURHAM, N.C. - Spotted hyenas may not be smarter than chimpanzees, but a new study shows that they outperform the primates on cooperative problem-solving tests.

Captive pairs of spotted hyenas (Crocuta crocuta) that needed to tug two ropes in unison to earn a food reward cooperated successfully and learned the maneuvers quickly with no training. Experienced hyenas even helped inexperienced partners do the trick. When confronted with a similar task, chimpanzees and other primates often require extensive training and cooperation between individuals may not be easy, said Christine Drea, an evolutionary anthropologist at Duke University.

Drea's research, published online in the October issue of Animal Behavior, shows that social carnivores like spotted hyenas that hunt in packs may be good models for investigating cooperative problem solving and the evolution of social intelligence. She performed these experiments in the mid-1990s but struggled to find a journal that was interested in non-primate social cognition.

"No one wanted anything but primate cognition studies back then," Drea said. "But what this study shows is that spotted hyenas are more adept at these sorts of cooperation and problem-solving studies in the lab than chimps are. There is a natural parallel of working together for food in the laboratory and group hunting in the wild."

Drea and co-author Allisa N. Carter of the Univ. of California at Berkeley, designed a series of food-reward tasks that modeled group hunting strategies in order to single out the cognitive aspects of cooperative problem solving. They selected spotted hyenas to see whether a species' performance in the tests might be linked to their feeding ecology in the wild.

Spotted hyena pairs at the Field Station for the Study of Behavior, Ecology and Reproduction in Berkeley, Calif. were brought into a large pen where they were confronted with a choice between two identical platforms 10 feet above the ground. Two ropes dangled from each platform. When both ropes on a platform were pulled down hard in unison - a similar action to bringing down large prey - a trap door opened and spilled bone chips and a sticky meatball. The double-rope design prevented a hyena from solving the task alone, and the choice between two platforms ensured that a pair would not solve either task by chance.

The first experiment sought to determine if three pairs of captive hyenas could solve the task without training. "The first pair walked in to the pen and figured it out in less than two minutes," Drea said. "My jaw literally dropped."

Drea and Carter studied the actions of 13 combinations of hyena pairs and found that they synchronized their timing on the ropes, revealing that the animals understood the ropes must be tugged in unison. They also showed that they understood both ropes had to be on the same platform. After an animal was experienced, the number of times it pulled on a rope without its partner present dropped sharply, indicating the animal understood its partner's role.

"One thing that was different about the captive hyena's behavior was that these problems were solved largely in silence," Drea said. Their non-verbal communication included matching gazes and following one another. "In the wild, they use a vocalization called a whoop when they are hunting together."

In the second and third experiments, Drea found that social factors affected the hyenas' performance in both positive and negative ways. When an audience of extra hyenas was present, experienced animals solved the task

faster. But when dominant animals were paired, they performed poorly, even if they had been successful in previous trials with a subordinate partner. "When the dominant females were paired, they didn't play nicely together," Drea said. "Their aggression toward each other led to a failure to cooperate."

When a naïve animal unfamiliar with the feeding platforms was paired with a dominant, experienced animal, the dominant animals switched social roles and submissively followed the lower-ranking, naïve animal. Once the naïve animal became experienced, they switched back.

Both the audience and the role-switching trials revealed that spotted hyenas self-adjust their behavior based upon social context.

It was not a big surprise that the animals were strongly inclined to help each other obtain food, said Kay Holekamp, a professor of zoology at Michigan State University who studies the behavioral ecology of spotted hyenas. "But I did find it somewhat surprising that the hyenas' performance was socially modulated by both party size and pair membership," Holekamp said. "And I found it particularly intriguing that the animals were sensitive to the naïveté of their potential collaborators."

Researchers have focused on primates for decades with an assumption that higher cognitive functioning in large-brained animals should enable organized teamwork. But Drea's study demonstrates that social carnivores, including dogs, may be very good at cooperative problem solving, even though their brains are comparatively smaller.

"I'm not saying that spotted hyenas are smarter than chimps," Drea said. "I'm saying that these experiments show that they are more hard-wired for social cooperation than chimpanzees."

U of T led research team uncovers evolutionary origins of prion disease gene

TORONTO, ON – A University of Toronto-led team has uncovered the evolutionary ancestry of the prion gene, which may reveal new understandings of how the prion protein causes diseases such as bovine spongiform encephalopathy (BSE), also known as "mad cow disease."

Diseased prion proteins are responsible for the fatal neurodegenerative Creutzfeldt-Jakob disease (CJD) in humans, and BSE, scrapie and chronic wasting disease (CWD) in livestock. Overall, this work holds promise for efforts to reveal the physiological function of members of the prion protein family and may provide insights into the origins and underlying constraints of the conformational changes associated with prion diseases. The study was published today, September 28, 2009, in the online journal PLoS ONE.

Principal investigator Gerold Schmitt-Ulms (Centre for Research in Neurodegenerative Diseases; Department of Laboratory Medicine and Pathobiology, U of T) and his graduate student Sepehr Ehsani teamed up with Holger Wille and Joel Watts (University of California, San Francisco) and David Westaway (University of Alberta) for this project. "The prion protein was discovered over twenty years ago and has been studied intensively. Nobody, however, knew its evolutionary origin and much confusion surrounds its physiological function," says Prof. Schmitt-Ulms. The team's analysis suggests that the prion gene is descended from the more ancient ZIP family of metal ion transporters. Members of the ZIP protein family are well known for their ability to transport zinc and other metals across cell membranes.

The U of T laboratory initially demonstrated the physical proximity of two metal ion transporters, ZIP6 and ZIP10, to mammalian prion proteins in living cells. As with the normal cellular prion protein, ZIP6 and ZIP10 exhibit widespread expression in biological tissues with high transcript levels in the brain. Schmitt-Ulms then made the startling discovery that prion and ZIP proteins contain extensive stretches of similar amino acid sequence. The researchers next documented that the respective segments within ZIP and prion proteins are computationally predicted to acquire a highly similar three-dimensional structure. Finally, the team uncovered multiple additional commonalities between ZIP and prion proteins which led them to conclude these molecules are evolutionarily related.

Most proteins do not act in isolation but partner with other proteins to exert their biological roles. The relationship between ZIP-family and prion proteins may thus provide a new angle from which to study the biology of the prion protein in health and disease. The level of shared characteristics between these protein families, in addition to the presence of prion protein genes in most chordate (i.e., backboned) species, place the split from the ZIP-like ancestor gene at the base of the chordate lineage.

Although no single evidence firmly established the phylogenetic relationship between ZIP and prion genes, Schmitt-Ulms is confident that the many corroborating pieces of evidence collected and, equally important, the absence of any conflicting observations, allow no other conclusion to be drawn.

This project was funded with support from the Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, Alberta Heritage Foundation for Medical Research, National Institutes of Health and W. Garfield Weston Foundation. The PLoS ONE article, "Evolutionary Descent of Prion Genes from the ZIP Family of Metal Ion Transporters," can be downloaded at www.plosone.org.

Orgasms, sexual health and attitudes about female genitals

An Indiana University study published in the September issue of the International Journal of Sexual Health found that women who feel more positively about women's genitals find it easier to orgasm and are more likely to engage in sexual health promoting behaviors, such as having regular gynecological exams or performing vulvar self-examinations.

"These are important findings about body image," said Debby Herbenick, associate director of the Center for Sexual Health Promotion in the School of Health, Physical Education and Recreation. "Our culture often portrays women's genitals as dirty and in need of cleaning and grooming. Some women may have had greater exposure to such negative messages or may be more susceptible to their impact."

Herbenick's study created a scale for measuring men's and women's attitudes toward women's genitals. Such a scale, she wrote in the study, could be useful in sex therapy, in medical settings to help better understand decision-making that goes into gynecological care and treatment, and in health education settings involving women and their sexual health. The study also found that men had more positive attitudes about women's genitals than women.

"Women are often more critical about their own bodies - and other women's bodies - than men are," Herbenick said. "What we found in this study is that men generally feel positive about a variety of aspects of women's genitals including how they look, smell, taste and feel."

Herbenick, also a sexual health educator for The Kinsey Institute for Research in Sex, Gender and Reproduction, offers the following suggestions regarding the findings:

Body image. Parents might consider how they can help their daughters to feel more positively about their bodies, such as by teaching them accurate names for their body parts, including their genitals (e.g., "vulva" rather than "down there") and responding in supportive ways to their self-exploration. "Rather than saying, 'don't touch down there - it's dirty,' parents might let their children know that it's OK for them to touch their genitals, but in private spaces such as their own bedroom or the bathroom," Herbenick said.

Advertisements and marketing. Health educators might consider ways that they can teach women and men about their bodies in positive, sex-positive ways by openly discussing how some products or marketing campaigns make people feel about their bodies.

The survey component of the study involved 362 women and 241 men, most of whom were white/Caucasian and between the ages of 18 and 23.

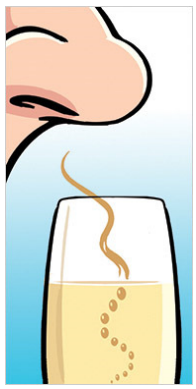
"Our study builds on previous research that demonstrates that the mind and body are highly connected in regard to sex," said Herbenick. "When women feel more positively about female genitals, they likely feel more relaxed in their own skin, more able to let go and thus more likely to experience pleasure and orgasm."

The study was supported by The Joseph Miller Foundation. For a copy of the study, visit http://www.informaworld.com/smpp/content~db=all~content=a914661190.

Observatory

Flavor and Aroma Rise in Champagne Bubbles

By HENRY FOUNTAIN



Chris Gash

A tiny bubble can do a lot of work. In the ocean, for example, rising air bubbles in the surf drag certain compounds to the surface. These compounds, called surfactants, have a water-loving end (which stays in the water) and a water-avoiding end (which stays inside the bubble); when the bubbles reach the surface and pop, the surfactants are released. The effect is to concentrate these compounds in the air in the vicinity of the surf.

A glass of Champagne, it turns out, is like a mini-ocean. When the cork is popped, bubbles of carbon dioxide form and rise to the surface. And a study by European researchers shows that these bubbles concentrate surfactants, many of which contribute to Champagne's odor and flavor, in the air above the beverage.

Gérard Liger-Belair of the University of Reims (in the Champagne region of France, naturally), Philippe Schmitt-Kopplin of the German Research Center for Environmental Health and colleagues used extremely high-resolution mass spectrometry to analyze the differences between the Champagne in the glass and in the air just above it. The researchers note in their paper, in The Proceedings of the National Academy of Sciences, that Champagne potentially produces on the order of 100 million bubbles per bottle. Given an average bubble diameter of about one-fiftieth of an inch, that means there is a total of about 100 square yards of surface area separating the bubbles from the bubbly. That is a lot of area to harbor surfactants.

The researchers first used a scattershot approach that revealed potentially hundreds of compounds that were, essentially, being dragged out of the Champagne and becoming concentrated in the air above it. More

discriminating analysis showed that several dozen of these compounds probably played a role in producing the beverage's aroma or flavor.

The researchers suggest that Champagne bubbles act like an elevator, bringing aromatic compounds up out of the liquid and into the air above it. The effect continues over and over as bubbles continue to form.

Ein, Zwei, Molson Dry? Researcher says hand gesturing to count in foreign countries can be tricky

If you are planning to do some Oktoberfesting in Germany, you may want to pay attention to how you order your beverages. The server is not giving you a three-for-the-price-of-two beer special; you're holding up the wrong fingers when you order.

This very hand-y tip is courtesy of a study by the University of Alberta's Elena Nicoladis, an experimental psychologist, and Simone Pika, a lecturer at the University of Manchester. The article, published in the Journal of Cross-Cultural Psychology, examines cultural differences in the use of hand gestures that could lead to miscommunications or misunderstandings.

Nicoladis drew her interest for the subject from her own lost-in-digital translation experience while riding on Berlin's transit system.

"I asked for directions on the U-Bahn to an older woman and she told me to get off in four stops, so I said, 'ja, vier' and held up my four fingers," she said. "She went off on a tirade saying 'nein, nein, vier' and held up the conventional gesture (using her thumb and three fingers)." The differentiation is because, in Germany for instance, the thumb is automatically counted as a numerical value. Thus, Nicoladis was showing five digits instead of four.

This important little piece of advice could have also saved the life of an unlucky British spy in Quentin Tarantino's new film Inglourious Basterds; in which a character, an English army officer posing as a German SS captain, is exposed when he orders drinks without using his thumb in the count. He and his colleagues are shot for his faux pas.

Nicoladis and colleagues studied one and two-hand counting gestures and cultural differences between Germans and French and English Canadians. While the majority of Germans use their thumb to begin to sequentially count, the majority of Canadians, both French and English, use their index finger as the numerical kick-off point when counting with their hands.

However, Nicoladis noted that some French Canadians also displayed anomalous differences from their Canadian or even their German counterparts.

"They show a lot more variation in what they are willing to use in terms of gestures, suggesting there might be some influence from the European French manner of gesturing (whose gestures are identical to the Germans'), or possibly other cultures too," she said. "This association suggests that there are some cultural artifacts left over from these older French gestures and that they have been replaced because of the cultural contact with English Canadians."

While seasoned travellers will often research local customs and social practices to acclimatize themselves to life in their destination of choice, Nicoladis urges anyone travelling to a foreign country to brush up on their hand signs for fear of possibly embarrassing cultural situations, or even an exorbitant bar tab at the end of the night.

"When people are going into a context where they don't speak a language very well, they fall back on conventional gestures or pointing," she said. "Even those that seem very transparent to use can, in fact, be very culturally embedded and could lead to possible miscommunications."

HIV's Ancestors May Have Plagued First Mammals

The remains of an ancient HIV-like virus have been discovered in the genome of the two-toed sloth. **(Credit: iStockphoto/Nancy Craft)**

ScienceDaily (Sep. 28, 2009) - The retroviruses which gave rise to HIV have been battling it out with mammal immune systems since mammals first evolved around 100 million years ago – about 85 million years earlier than previously thought, scientists now believe.

The remains of an ancient HIV-like virus have been discovered in the genome of the two-toed sloth [Choloepus hoffmanni] by a team led by Oxford University scientists who publish a report of their research in this week's Science.

'Finding the fossilised remains of such a virus in this sloth is an amazing stroke of luck,' said Dr Aris Katzourakis from Oxford's Department of Zoology and the Institute for Emergent Infections, James Martin

21st Century School. 'Because this sloth is so geographically and genetically isolated its genome gives us a window into the ancient past of mammals, their immune systems, and the types of viruses they had to contend with.'

The researchers found evidence of 'foamy viruses', a particular kind of retrovirus that resembles the complex lentiviruses, such as HIV and simian retroviruses (SIVs) – as opposed to simple retroviruses that are found throughout the genomic fossil record.

'In previous work we had found evidence for similar viruses in the genomes of rabbits and lemurs but this new research suggests that the ancestors of complex retroviruses, such as HIV, may have been with us from the very beginnings of mammal evolution,' said Dr Aris Katzourakis.

Understanding the historical conflict between complex viruses and mammal immune systems could lead to new approaches to combating existing retroviruses, such as HIV. It can also help scientists to decide which viruses that cross species are likely to cause dangerous pandemics – such as swine flu (H1N1) – and which, like bird flu (H5N1) and foamy viruses, cross this species barrier but then never cause pandemics in new mammal populations. *Adapted from materials provided by University Of Oxford.*

Obesity in middle-aged women cuts chance of a long and healthy life by almost 80 percent

Research: Adiposity and weight change in mid-life in relation to healthy survival after age 70 in women: Prospective cohort study

The more weight women gain from the age of 18 until middle age, the less likely they are to enjoy a long and healthy life, according to new research published on bmj.com today.

Compared with lean women, the results show that being obese in middle age reduces those odds by 79%, underscoring the importance of maintaining a healthy weight from early adulthood, say the authors.

Despite the evidence that overweight and obesity can significantly increase the risk of early death, little is known about how adiposity affects overall health and wellbeing among those who survive to older ages.
To address this issue, researchers in the United States investigated the theory that being overweight in mid life is associated with a reduced probability of maintaining optimal health among those who survive to older ages.

Their findings are based on comprehensive two yearly monitoring of more than 17,000 middle-aged women in the United States as part of the Nurses Health Study.

Healthy survival referred to participants who survived to age 70 years or older, were free of major chronic diseases, and had good cognitive, physical and mental health. Usual survival referred to participants who survived to age 70 years or older but did not meet these criteria.

After adjusting for several factors, increased body mass index at the start of the study was significantly associated with reduced odds of healthy survival. Every one unit increase of body mass index was associated with a 12% reduction in the odds of healthy survival.

Similarly, in comparison to women of stable weight, weight gain since the age of 18 was significantly associated with reduced odds of healthy survival. For every one kilogram increase of weight gain since age 18 years, the odds of healthy survival decreased by 5%. The worst odds of healthy survival were found among women who were overweight at 18 and gained 10kg or more by middle age.

But even among women who were lean at 18, relative to those who kept a stable weight, women who gained more than 10kg by middle age were 59% less likely to achieve healthy survival.

These data provide evidence that adiposity in mid life is strongly related to a reduced probability of healthy survival among women who live to older ages, and stress the importance of maintaining a healthy weight from early adulthood, say the authors.

"Given that more and more Americans are surviving to older ages and, at the same time, gaining weight, our results may be particularly important with respect to clinical or public health policies and deserve further investigation and confirmation in additional studies," they conclude.

Did Tyrannosaurus rex suffer from a common bird disease?

Paleontologists Ewan Wolff (University of Wisconsin-Madison), Steve Salisbury (University of Queensland), Jack Horner (Museum of the Rockies) and David Varricchio (Montana State University), published new research in the open-access, peer-reviewed scientific journal PLoS ONE that found the Tyrannosaurus rex and its close relatives suffered from a potentially life-threatening infectious disease similar to one that occurs in living birds known as trichomonosis.

The pits in Sue's jawbone probably hurt like hell (Image: The Field Museum GEO86284c)

Trichomonas gallinae infections are most prevalent in pigeons which are generally immune. Birds of prey are particularly susceptible to trichomonosis if they eat infected pigeons. Adult birds can then pass the disease to their nestlings through beak-to-beak contact.

Tell-tale symptoms of trichomonosis include swellings and holes in the back of the lower jaw. The disease is prevented from infecting the entire interior of the bone by the innate immune response that localizes infections as a result of the actions of a unique avian white blood cell called the heterophil.

Some of the world's most famous T. rex specimens, such as 'Sue' at the Field Museum in Chicago, and the holotype specimen at the Carnegie Museum of Natural History in Pittsburgh have holes like these in their lower jaw.

"The holes in tyrannosaur jaws occur in exactly the same place as in modern birds with trichomonosis. The shape of the holes and the way that they merge into the surrounding bone is very similar in both animals," Dr Wolff said. "The cause of these holes in tyrannosaurs has previously been attributed to tooth gouges from biting or bacterial infections, but we think a trichomonosis-type disease is much more likely given the position and nature of the holes."

The disease appeared to be quite common in tyrannosaurs and could have been deadly to those that were infected. "As the parasites take hold in serious infections, lesions form around the jaw and inside the throat, eventually eating away the bone. As the lesions grow, the animal has trouble swallowing food and may eventually starve to death," said Dr. Salisbury. Tyrannosaurs are thus far the only dinosaurs that appear to have had this disease. The researchers therefore faced the problem of explaining how it was spread.

In addition to other routes through which infection may have spread, tyrannosaurs might have facilitated infection by biting each other or even through cannibalism.

"Cannibalism has been tentatively suggested in other studies of theropod behaviour and this certainly could have been a route of transmission for the infection," said Wolff, but he thinks other scenarios were more frequent. “Fighting and specifically head-biting would have been an ideal mechanism for spreading the disease among tyrannosaurs," said Dr Salisbury.

"We don't think it is a coincidence that a significant number of adult tyrannosaur specimens show both face-biting marks and evidence of a trichomonosis-like disease," Dr Salisbury said. "Previous studies have shown that up to 60% of tyrannosaur specimens display evidence of face-biting."

"In our study we found evidence of face-biting in 30% of the diseased individuals," said Dr Wolff. "Bone pathology is hard to find in any specimen, and bone diseases are relatively uncommon. Finding both types of pathologies in a high proportion of individuals strongly suggests that they could be linked."

"We can see similarities with what has been happening to Tasmanian devils recently, where a debilitating oral cancer is being spread by animals fighting and biting each other's faces," Dr Salisbury said. "This disease may eventually wipe out this iconic Australian mammal." "It's ironic to think that an animal as mighty as 'Sue' probably died as a result of a parasitic infection. I'll never look at a feral pigeon the same way again." said Salisbury.

The link in disease is not surprising given the evolutionary relationship of dinosaurs to birds. But the discovery of a likely candidate for such a disease represents a major step forward in our understanding of disease origins in birds and their dinosaurian precursors.

"The discovery gives us an insight into the dinosaur immune system. The response of tyrannosaurs to this trichomonosis-like disease is almost identical to that found in living birds," Dr Wolff said. "These simple holes in tyrannosaur jaws give us a dramatic example of an avian-like defence system in action."

Funding: Gerry Ohrstrom, the Geological Society of America, Montana State University's College of Letters and Sciences (to EDSW); Carnegie Museum of Natural History and The University of Queensland (to SWS). A. Wolff and H. Wolff covered publication charges for this manuscript. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

New blood-thinning drug safer than rat poison

In an article reviewed by F1000 Medicine Faculty Members Robert Ruff, Brian Olshansky and Luis Ruilope, the blood-thinner dabigatran is shown to protect against stroke, blood clotting and major bleeding as effectively as warfarin, but with fewer side effects.

The original paper, Dabigatran versus warfarin in patients with atrial fibrillation, by Neal Devaraj and Stuart Connolly et al. in the New England Journal of Medicine, says warfarin (also commonly used in rat poison) has several drawbacks. Finding the correct dosage requires careful and laborious monitoring, and the risk of major bleeding has led to it being under-used.

With fewer side-effects and complications than warfarin, the reviewers see many potential benefits from dabigatran. According to Olshansky, it is "perhaps one of the important drug discoveries in the past decade."

Ruilope says that according to the investigators, "This oral anticoagulant prevents strokes and peripheral embolic events in patients with atrial fibrillation significantly better than that much older drug (warfarin) at different doses. It is also safer than warfarin with respect to major bleeding events."

"An immediate change of practice is not warranted but a change in standard anticoagulant therapy may be needed," Ruilope says.

The full text of this article is available free for 90 days at http://www.f1000medicine.com/article/2q1vd2cfyz5qbtp/id/1163698

Oleocanthal may help prevent, treat Alzheimer's

Natural compound in extra-virgin olive oil targets toxic beta-amyloid proteins

PHILADELPHIA (September 29, 2009) - Oleocanthal, a naturally-occurring compound found in extra-virgin olive oil, alters the structure of neurotoxic proteins believed to contribute to the debilitating effects of Alzheimer's disease. This structural change impedes the proteins' ability to damage brain nerve cells.

"The findings may help identify effective preventative measures and lead to improved therapeutics in the fight against Alzheimer's disease," said study co-leader Paul A.S. Breslin, PhD, a sensory psychobiologist at the Monell Center.

Known as ADDLs, these highly toxic proteins bind within the neural synapses of the brains of Alzheimer's patients and are believed to directly disrupt nerve cell function, eventually leading to memory loss, cell death, and global disruption of brain function. Synapses are specialized junctions that allow one nerve cell to send information another.

"Binding of ADDLs to nerve cell synapses is thought to be a crucial first step in the initiation of Alzheimer's disease. Oleocanthal alters ADDL structure in a way that deters their binding to synapses," said William L. Klein, PhD, who co-led the research with Breslin. "Translational studies are needed to link these laboratory findings to clinical interventions." Klein is Professor of Neurobiology & Physiology, and a member of the Cognitive Neurology and Alzheimer's Disease Center, at Northwestern University.

Klein and his colleagues identified ADDLs in 1998, leading to a major shift in thinking about the causes, progression and treatment of Alzheimer's disease. Also known as beta-amyloid oligomers, ADDLs are structurally different from the amyloid plaques that accumulate in brains of Alzheimer's patients.

Reporting on a series of in vitro studies, the team of Monell and Northwestern researchers found that incubation with oleocanthal changed the structure of ADDLs by increasing the protein's size.

Knowing that oleocanthal changed ADDL size, the researchers next examined whether oleocanthal affected the ability of ADDLs to bind to synapses of cultured hippocampal neurons. The hippocampus, a part of the brain intimately involved in learning and memory, is one of the first areas affected by Alzheimer's disease.

Measuring ADDL binding with and without oleocanthal, they discovered that small amounts of oleocanthal effectively reduced binding of ADDLs to hippocampal synapses. Additional studies revealed that oleocanthal can protect synapses from structural damage caused by ADDLs.

An unexpected finding was that oleocanthal makes ADDLs into stronger targets for antibodies. This action establishes an opportunity for creating more effective immunotherapy treatments, which use antibodies to bind to and attack ADDLs.

Breslin commented on the implications of the findings. "If antibody treatment of Alzheimer's is enhanced by oleocanthal, the collective anti-toxic and immunological effects of this compound may lead to a successful treatment for an incurable disease. Only clinical trials will tell for sure."

In earlier work at Monell, Breslin and co-workers used the sensory properties of extra virgin olive oil to identify oleocanthal based on a similar oral irritation quality to ibuprofen. Oleocanthal and ibuprofen also have similar anti-inflammatory properties, and ibuprofen – like extra virgin olive oils presumably rich in oleocanthal – is associated with a decreased risk of Alzheimer's when used regularly.

Future studies to identify more precisely how oleocanthal changes ADDL structure may increase understanding of the pharmacological actions of oleocanthal, ibuprofen, and structurally related plant compounds. Such pharmacological insights could provide discovery pathways related to disease prevention and treatment.

The findings are reported in the October 15 issue of Toxicology and Applied Pharmacology.

First author Jason Pitt, a graduate student in Klein's lab, conducted the studies. Also contributing to the work were chemist Amos B. Smith, III, of Monell and the University of Pennsylvania, who supplied the oleocanthal; William Roth, Pascale Lacor and Pauline Velasco from Northwestern; Matthew Blankenship from Western Illinois University; and Fernanda De Felice from the Universidade Federal do Rio de Janeiro. In addition to his faculty appointment at Monell, Breslin is Professor of Nutritional Sciences in the School of Environmental and Biological Sciences at Rutgers University.

The National Institute on Aging funded the research; Dr. Breslin is funded by the National Institute on Deafness and Other Communication Disorders.

Computer detects abuse before doctors

* 13:25 30 September 2009 **by Ewen Callaway**

Victims of domestic abuse can hide the truth from doctors, but they leave clues in their medical records that a computer program has now learned to follow.

The program could save lives by acting as an early warning system for domestic violence, flagging up possible cases of abuse to doctors months or even years before they would otherwise be detected.

"You are potentially able to detect high abuse risk years ahead of time: you don't wait for a very bad thing to happen," says Ben Reis at Children's Hospital Boston and Harvard Medical School, who led the new study.

Though domestic abuse occurs in up to 16 per cent of US couples every year, it's notoriously difficult for doctors and nurses to spot, Reis says. Victims and abusers frequently make excuses for emergency room visits – saying that an injury caused by a partner's assault was due to a fall, for instance. Studies have shown that some go so far as to visit different hospitals to avoid a pattern of injuries getting noticed.

Doctors are trained – or required, in some hospitals – to be on the lookout for domestic violence, but isolated emergency room visits make it difficult for them to spot patterns that could be a sign of domestic violence.

Trails of violence

To make these patterns more apparent, Reis and his colleagues Isaac Kohane and Kenneth Mandl turned to the medical histories of 561,000 people over six years in a single US state. About 19,000 of these people were known to have been domestically abused. To protect confidentiality, the team did not identify the state where the people lived.

Their program started by searching two-thirds of the records for differences between the histories of people who were abused by their partners and those of people who were not known to have been abused.

"Unsupervised, you tell us, computer: what are the risk factors? What are the things highly associated with future diagnosis of abuse?" says Reis, summarising his approach.

New clues

The program produced a set of rules based on the differences it found. These were mainly based on patterns of injuries and bouts of mental illness – signs of abuse that doctors already look for. But the program also found new clues, including some that pick out victims of one sex but not the other. Alcoholism, for instance, is a red flag for abuse in women, but not men, because it is less common among women in general. In contrast, depression and other mood disorders are a strong predictor of abuse in men, but less so for women.

To see how useful the rules could be for detecting domestic violence, the team fed the remaining medical histories to the program. They found that on average it detected abuse earlier in people's records than their doctors had. "Sometimes doctors are blinded because they don't have access to 10 years of medical history," he says. "We're trying to empower the doctors to make the decision."

The usefulness of the program varied greatly between patients. In some, the program flagged abuse six years earlier than doctors had, but in others the warning came just before doctors noticed – or not at all.

Reis's team could also tweak the sensitivity of the software to lengthen or shorten this window. Setting the program to tolerate higher rates of "false positives" – instances where the program flags up abuse, even though none was ever detected by a doctor – meant it also caught more cases of real abuse earlier. Under one scenario, a 10 per cent false-positive rate turned up two-thirds of abuses an average of two years before being reported.

Journal reference: BMJ, DOI: 10.1136/bmj.b3677

Scientists join forces to explain HIV spread in Central and East Africa

Genetic, geographic data deliver clear picture of HIV progress

GAINESVILLE, Fla. - Scientists studying biology and geography may seem worlds apart, but together they have answered a question that has defied explanation about the spread of the HIV-1 epidemic in Africa.

Writing in the September issue of AIDS, a research team led by scientists at the University of Florida explained why two subtypes of HIV-1 - the virus that causes acquired immunodeficiency syndrome, or AIDS - held steady at relatively low levels for more than 50 years in west central Africa before erupting as an epidemic in east Africa in the 1970s.

Essentially, the explanation for the HIV explosion - obscured until now - involves the relative ease with which people can travel from city to city in east Africa as opposed to the difficulties faced by people living in the population centers of the Democratic Republic of Congo, the point where HIV emerged from west central Africa in its spread to the east.

Later, as the epidemic raged in the east, cities in the Democratic Republic of Congo - a vast country almost as big as all of Western Europe - remained disconnected and isolated, explaining why the virus affected only about 5 percent of the country's population, a level that has not changed much since the 1950s.

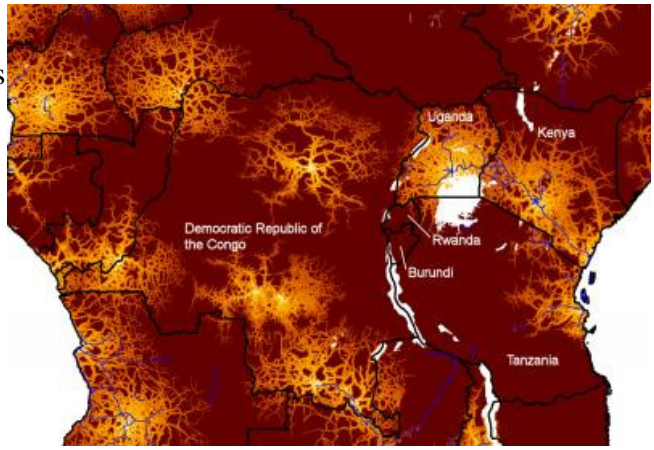
"We live in a world that is more interconnected every day, and we have all seen how pathogens such as HIV or the swine flu virus can arise in a remote area of the planet and quickly become a global threat," said Marco Salemi, an assistant professor of pathology, immunology, and laboratory medicine at the UF College of Medicine and senior author of the study. "Understanding the factors that can lead to a full-scale pandemic is essential to protect our species from emerging dangers."

Investigators used databases, including GenBank from the National Center for Biotechnology Information, as well as actual DNA samples, including samples recently collected in Uganda - the vicinity where HIV entered east Africa - to follow the virus' molecular footprints since its emergence in the 1920s.

"HIV mutates rapidly," said Rebecca Gray, a postdoctoral associate in the department of pathology, immunology and laboratory medicine. "This is a successful strategy for the virus because it evolves quickly and develops drug resistance. But we can use these changes in the genome to follow it over time and develop a history of its progress."

Researchers wanted to know why, the virus smoldered during the 1950s and `60s, before spreading like wildfire through east Africa in the 1970s.

The gradient of colors indicates the estimated travel time to the nearest city with a population of more than 500,000, with yellow at one extreme indicating short travel times and red at the other extreme indicating long travel times.



The graphic explains accessibility factors affecting the spread of HIV from central to east Africa. The virus was circulating at stable levels in the urban centers of the Democratic Republic of Congo, but these centers were isolated. Once the virus reached east Africa, connectivity between population centers combined with better quality transportation networks and higher rates of human movement caused HIV to spread exponentially. **Andrew J. Tatem/University of Florida**

A fateful piece of the puzzle came in the form of geographic information system data, which uses satellite imagery and painstakingly takes into account the availability and navigability of roads between population centers, transportation modes, elevation, climate, terrain and other factors that influence travel.

"We were able to use geographic data to interpret the genetic data," said Andrew J. Tatem, Ph.D., an assistant professor of geography in the College of Liberal Arts and Sciences and a member of UF's Emerging Pathogens Institute. "Genetic data showed once HIV moved out of the Democratic Republic of Congo, it expanded fast and moved rapidly across Uganda, Kenya and Tanzania, all while staying at low levels in the DRC. What was happening was the virus was circulating at stable levels in the urban centers of the DRC, but these centers were isolated. Once it hit east Africa, connectivity between population centers combined with better quality transportation networks, and higher rates of human movement caused HIV to spread exponentially."

HIV was prevalent in about 15 percent of the population in Kenya in 1997, although it has since dropped to about 7 percent, according to the Kaiser Family Foundation. As of 2007, an estimated 22 million people were living with HIV/AIDS in sub-Saharan Africa. About 1.1 million Americans have HIV or AIDS, and an estimated 5.1 million people in India are HIV-positive. In Eastern Europe, HIV infections more than doubled from 420,000 in 1998 to 1 million in 2001.

"If we can predict the specific routes of an epidemic, we can find the geographic regions more at risk and target these areas with medical intervention and strategies for prevention," Salemi said. "In terms of health-care applications, coupling genetic analysis with geographic information systems can give us a powerful tool to understand the spread of pathogens and contain emerging epidemics."

Working with Maureen M. Goodenow, Ph.D., the Stephany W. Holloway university chair for AIDS research at the UF College of Medicine, UF researchers collaborated with an array of scientists hailing from the National Institute of Allergy and Infectious Diseases, the Rakai Health Sciences Program and Makerere University of Uganda, and the Johns Hopkins University. They refer to the combination of techniques that led to the discovery as "landscape phylodynamics."

"It is the first study that has given us a clear picture of epidemic history of HIV in east Africa, including the geographic routes and the time scale that it occurred," said Oliver Pybus, Ph.D., a researcher in the department of zoology at Oxford University who did not participate in the study. "Genetic analysis of the HIV genome provides the family tree of the virus, combined with spatial analysis of high-resolution data of land use, topology and other factors. There is a huge potential in doing that kind of analysis, but it requires a rare combination of specialists in different fields to come together."

Sold-out products influence consumer choice

An empty store shelf tempts shoppers to buy the next best thing, according to a new study from the University of Alberta. “Sold-out products create a sense of immediacy for customers; they feel that if one product is gone, the next item could also sell out," said Paul Messinger, a professor at the U of A's School of Business who studied the sale of numerous items including ski passes and wine.

"Our research shows there's also an information cascade, where people infer that if a product is sold out, it must have been good and therefore a similar available product will also be desirable," he said.

The study, published this month in the Journal of Retailing, found 61 per cent of shoppers would buy a particular five-hour ski pass for $20, but that figure rose to 91 per cent when they thought a 10-hour ski pass for the same mountain slope for $40 had sold out.

A similar study of merlot wines found 49 per cent of consumers would buy a bottle if they had one choice, but when they thought a similar wine had sold out next to it on the shelf, nearly twice the number of shoppers would take home the available bottle. "The use of sold-out signs creates a sense of urgency," said Messinger. The annual phenomenon of a hot toy selling out at Christmas can also be attributed to the information cascade theory, he said.

"You're dealing with toys that parents don't know if their children will like, but millions of consumers are buying it, so they infer that because the item is being purchased, it must be good."

While empty shelves can be frustrating for consumers, Messinger and his co-authors note that the occasional sold-out product can also be a good thing for stores and manufacturers in order to help encourage a sale.

"A lack of stock for common items can indicate to consumers that a store is not managed properly because supply wasn't ordered properly. But for newer items, stores can use it as a message: it wasn't that they didn't order enough, it may be that the product was just selling so fast that nobody could anticipate it, so buy it while you can."

Xin Gea from the University of Northern British Columbia and Jin Li from North Dakota State University were the co-authors of the study, "Influence of sold-out products on consumer choice."

Can strep throat cause OCD, Tourette syndrome?

ST. PAUL, Minn. – New research shows that streptococcal infection does not appear to cause or trigger Tourette syndrome or obsessive-compulsive disorder (OCD). The research is published in the September 30, 2009, online issue of Neurology®, the medical journal of the American Academy of Neurology.

"These results do not confirm other, smaller studies done in the US, which found an association between strep infection and these brain disorders," said study author Anette Schrag, MD, of the University College London in the United Kingdom. "Streptococcal infection has previously also been linked to other, much rarer neuropsychiatric disorders."

OCD is an anxiety disorder characterized by unwanted thoughts or obsessions and repetitive behaviors. Tourette syndrome is a neurologic disorder characterized by repetitive, involuntary sounds and movements called tics. The study involved 255 people between the ages of two and 25 from a large, unselective population in the United Kingdom. Of those, 129 were diagnosed with OCD and 126 with Tourette syndrome or tics. Scientists compared the two groups with 4,519 people of similar ages without these disorders.

In the group with OCD, 15 percent had been exposed to a possible strep infection within two years of diagnosis. There was a similar rate among the comparative group of people without OCD. In the group with Tourette syndrome or other tic disorders, 10 percent had been exposed to a possible strep infection within two years of diagnosis, similar to people without the disorder. Researchers also looked at possible strep infections within five years of diagnosis of a strep infection.

The researchers found that people with OCD or Tourette syndrome and tics were no more likely to have had possible strep infections compared to people without these disorders at two years and five years.

The study was supported by the Tourette Syndrome Association.

Experts call for Nobel prizes to be revamped

* 30 September 2009 b**y Jim Giles**

THE Nobel prize system needs an overhaul. That's the conclusion of a group of scientists brought together by New Scientist to debate the future of the prizes.

In a letter to the Nobel Foundation, published on newscientist.com on 30 September, the group suggests that the foundation should introduce prizes for the environment and public health, and reform the existing medicine prize. "These suggestions will enable the prizes to remain influential for another hundred years," the group says.

The existing science prizes - for chemistry, physics, and medicine or physiology - are based on the categories laid out in the will of Alfred Nobel, a Swedish businessman who amassed a fortune by inventing dynamite and who died in 1896. To explore whether this century-old system could be improved, New Scientist

invited a selection of high-profile scientists to debate ideas for reform. Based on the discussions that ensued, an open letter was drafted to the Nobel Foundation (see list of signatories).

The panel says that new prizes are needed to reward findings that tackle contemporary challenges, such as biodiversity loss and HIV/AIDS. For environmental threats, the panel suggests creating a prize that covers areas such as climate change mitigation and species conservation. "There are going to be a dozen heroic figures involved in solving the problem of climate change," says panel member Larry Brilliant.

A second new prize would recognise global gains to public health, such as the reduction or eradication of disease. Landmark achievements, such as the eradication of smallpox in 1979, do not fall under the remit of the existing medicine prize. What's more, organisations as well as individuals should be eligible, as is the case with the peace prize.

The panel also says that the remit of existing science prizes needs to be widened, as key achievements are going unrecognised. Critics have long pointed to fields such evolutionary biology, which do not fit into the categories identified in Nobel's will. Charles Darwin died 19 years before the first prize was awarded, but even if he had been alive it is unlikely that he would have received a Nobel, since his work does not qualify as chemistry, physics or medicine.

Much modern science also falls between the cracks. For example, breakthroughs in neuroscience have only been recognised twice in the last 30 years, and yet "understanding the brain is one of the great frontiers of science", says panel member Peter Raven.

Other areas, such as plant science, are also excluded. There was anger in 2006, for example, when the medicine prize was awarded for the development of RNA silencing, a technique used to turn off genes. Much of the initial work was done by plant scientists, but the prize went to Andrew Fire of Stanford University, California, and Craig Mello of the University of Massachusetts in Worcester, who had studied the process in worms.

The panel says these problems could be remedied by expanding the medicine prize to include all of the life sciences, or by leaving the prize as it is and creating new awards for fundamental biology and neuroscience.

They may, however, have a tough time convincing the Nobel Foundation to change. "The foundation guards with all its might the image of being impervious to outside influence," says Robert Marc Friedman, a science historian at the University of Oslo in Norway. "Still, the foundation is sensitive to the reputation of the prize and to insightful criticism."

The prizes, and the statutes for each, are governed by Nobel's will. But the foundation, which manages the endowment used to fund the prizes, and the subject committees, which select the winners, have both shown flexibility in the past. In 1968, for example, the economics prize was established using a donation from the Riksbank, Sweden's central bank. The prize is not officially a Nobel, but its association with the foundation has earned it the international recognition and prestige associated with the other awards.

The group's letter is addressed to Michael Sohlman, executive director of the foundation. He says that he will circulate it to the rest of the board, but says the board is opposed to the introduction of new prizes. During his 17 years at the foundation, proposals for change have only twice reached the board and on neither occasion were they discussed at a board meeting. It would be time-consuming and expensive to establish new prizes, he adds: each of this year's Nobels is worth 10 million kronor (US$1.4 million). Brilliant argues that many philanthropic organisations would be willing to contribute to the new prizes.

Sohlman also notes that the Nobel peace prize has been used to honour the kind of achievements that the panel says should be recognised by new prizes. In 2007, for example, the peace prize went to former US vice-president Al Gore and the Intergovernmental Panel on Climate Change for their work on disseminating knowledge about global warming. The same prize was used in 1999 to recognise the humanitarian organisation Médecins Sans Frontières.

The panel argues that these decisions often fit uncomfortably with the peace prize's definition and have sometimes been seen as political. "If malaria were ever eradicated it would only be eligible for a peace prize," says Brilliant. "It is wonderful to eradicate disease, but it's not peace."

Despite these problems, some scientists argue that it might be best to leave the Nobel prizes alone. Al Teich, director of Science and Policy Programs at the American Association for the Advancement of Science in Washington DC, acknowledges the shortcomings of the prize categories, but is wary of adding new ones. "It cuts both ways," he says. "Maybe the Nobels are such a powerful brand that you don't want to tinker with them."

Teich adds that other awards have been created to fill the gaps between the Nobels, such as the $190,000 Volvo environment prize, which is celebrating its 20th anniversary. There is also the Crafoord prize, which has recognised achievements in geosciences and other disciplines since 1982. Still, compared with the Nobels these

have had limited success. "Yes, other prizes exist," says Friedman. "But none come even close to the level of prestige. Basically, there is only the Nobel." **Read the full letter**
Editorial: Nobel prizes for the 21st century

Portable pain weapon may end up in police hands

* 30 September 2009 **by Paul Marks**

THE Pentagon's efforts to develop a beam weapon that can deter an adversary by causing a burning sensation on their skin has taken a step forward with the development of a small, potentially hand-held, version. The weapon, which is claimed to cause no permanent harm, could also end up being used by police to control civilians. The idea of the weapon is to "create a heating sensation that repels individual adversaries", according to the Joint Non-Lethal Weapons Directorate (JNLWD) in Quantico, Virginia, which develops less-lethal weapons for the US military and coastguard.

Tests with a rifle-mounted infrared laser, carried out at a US air force lab near Dayton, Ohio, have determined a combination of laser pulse power and wavelength that causes an alarming, hot sensation on the skin, but which stops short of causing a burn, says JNLWD project engineer Wesley Burgei.

"We have established the minimum irradiance to cause a sensation and have characterised where thermal injury begins," he says. "But the exact operating irradiance which balances a useful military effect with a conservative margin of safety has not been nailed down yet."

That's something that will have to be done before the weapon is deployed, as too powerful a laser beam could permanently blind someone if fired at their eyes. Weapons that do this are banned under the UN Protocol on Blinding Laser Weapons.

Burgei says it is possible to create a beam that will affect the skin without damaging the cornea, and do so at a wavelength that does not penetrate to the retina "and would therefore be retina safe".

The JNLWD says that tests at the Air Force Research Laboratory's human effectiveness lab have established that the skin heating effect causes no permanent damage - suggesting it may have "military utility". The tests also highlighted areas in need of improvement before troops can use it, says lab manager Semih Kumru - though what those features are has not been revealed.

The proposed system is rifle mounted, with a sight above it and a visible low-power laser beam that the soldier uses to aim the invisible infrared laser. The solid-state laser system is battery-powered, and could become hand-held "in the near future", Burgei says.

The weapon, which has been evolving since 2005, is officially known at the Pentagon as the Thermal Laser System. The US National Institute of Justice, which is also funding the weapon's development in the hope that it may prove useful for the police, refers to it as the IR-Lesslethal device.

The Pentagon already has a large crowd control weapon called the Active Denial System that can heat whole groups of people, causing them to flee. It uses a flat-plate antenna mounted on a truck or aircraft to aim a 2-metre-wide microwave beam at the crowd.

Like all supposedly non-lethal weapons that could be used to control civilians, the Pentagon's new portable weapon is raising concerns. "I'd like to know why they want another advanced pain compliance weapon like this," says Steve Wright, non-lethal weapons analyst at Leeds Metropolitan University in the UK. "Persuading by pain rather than brain - through conversation - has led to push-button torture in the past. If it leaves no mark on the skin how will anyone prove it's been abused?"

Prenatal exposure to flu pandemic increased chances of heart disease

Men exposed to H1N1 strain while in utero also shorter than peers born months before or months after 1918 pandemic, study finds

People exposed to a H1NI strain of influenza A while in utero were significantly more likely to have cardiovascular disease later in life, reveals a new study to be published in Journal of Developmental Origins of Health and Disease on Oct. 1.

"Our point is that during pregnancy, even mild sickness from flu could affect development with longer consequences," said senior author Caleb Finch, USC professor of gerontology and biological sciences.

Finch, Eileen Crimmins (USC Davis School of Gerontology), lead author Bhashkar Mazumder (Federal Reserve Bank of Chicago), Douglas Almond (University of Chicago) and Kyung Park (Columbia University) looked at more than 100,000 individuals born during and around the time of the 1918 influenza pandemic in the United States.

After first appearing in the spring and all but disappearing in the summer, the 1918 flu pandemic "resurged to an unprecedentedly virulent October-December peak," the researchers write. The outbreak of influenza A,

H1N1 subtype killed two percent of the total population. Most people experienced mild "three-day fever" with full recovery.

"[The] 1918 flu was far more lethal than any since. Nonetheless, there is particular concern for the current swine flu which seems to target pregnant women," said Finch, director of the Gerontology Research Institute at USC. "Prospective moms should reduce risk of influenza by vaccination."

The researchers found that men born in the first few months of 1919 - second or third trimester during the height of the epidemic - had a 23.1 percent greater chance of having heart disease after the age of 60 than the overall population. Heart disease is the leading cause of death in the United States.

For women, those born in the first few months of 1919 were not significantly more likely to have cardiovascular disease than their peers, pointing to possible gender differences in effects of flu exposure. But women born in the second quarter of 1919 - first trimester during the height of the epidemic - were 17 percent more likely to have heart disease than the general population in later life, according to the study.

In addition, the researchers examined height at World War II enrollment for 2.7 million men born between 1915 and 1922 and found that average height increased every successive year except for the period coinciding with in utero exposure to the flu pandemic.

Men who were exposed to the H1N1 flu in the womb were slightly shorter on average than those born just a year later or a year before, according to the study. The researchers controlled for known season-of-birth effects and maternal malnutrition.

"Prenatal exposure to even uncomplicated maternal influenza can have lasting consequences later in life," said Crimmins, professor of gerontology and sociology at USC. "The lingering influences from the 1918-1919 influenza pandemic extend the hypothesized roles of inflammation and infections in cardiovascular disease from our prior Science and PNAS articles to prenatal infection by influenza."

The research was supported by the National Institute on Aging, the Ellison Medical Foundation and the Ruth Ziegler Fund. Finch et al., "Lingering Prenatal Effects of the 1918 Influenza Pandemic on Cardiovascular Disease." Journal of Developmental Origins of Health and Disease. DOI: 10.1017/S2040174409990031

Sexually satisfied women have better general well-being and more vitality

Older women have higher well-being scores than younger women

Pre- and post-menopausal women who self-rated themselves as being sexually satisfied had a higher overall psychological well-being score and scores for "positive well-being" and "vitality," compared with sexually dissatisfied women in a study of 295 women sexually active more than twice a month. The study, published today in The Journal of Sexual Medicine, also uncovered a positive association between age and well-being, but a negative association for general health.

The most commonly reported sexual problems in the area of consensual sexuality in women relate to sexual desire and interest, pleasure and satisfaction, and for most women these are part of the overall sexual experience, and are inextricably related. In contrast to studies of interventions for male erectile dysfunction, benefit of treatment in women with sexual dysfunction cannot be measured simply by the frequency of sexual events, as women frequently continue to be sexually active despite a high level of sexual dissatisfaction. Thus the frequency of self-reported satisfactory sexual events has been used as the primary outcome in recent studies.

To assess whether there was a correlation between sexual satisfaction and well-being, the team of Australian researchers recruited women from the community aged 20-65 who self-identified as being satisfied or dissatisfied with their sexual function. Participants were also asked questions which identified whether they were pre- or post menopausal, with recruitment closed when there was an equal number of women in each of the four subgroups.

"We wanted to explore the links between sexual satisfaction and wellbeing in women from the community, and to see if there was any difference between pre- and postmenopausal women," said lead author Dr Sonia Davison, of the Women's Health Program at Monash University, Australia. "We found that women who were sexually dissatisfied had lower well-being and lower vitality. This finding highlights the importance of addressing these areas as an essential part of women's healthcare, because women may be uncomfortable discussing these issues with their doctor."

"The problem with interpreting this finding is that it is impossible to determine if dissatisfied women had lower well-being because they were sexually dissatisfied, or if the reverse is true, such that women who started with lower well-being tended to secondarily have sexual dissatisfaction," added Davison. "As such, pharmacotherapies aimed to treat sexual dysfunction may have secondary effects on well-being, and the reverse may be true."

As over 90% of women in this study reported their sexual activity involved a partner, and was initiated by the partner at least 50% of the time, the sexual activity of the women may have been affected by partner

presence (or absence), partner health, and sexual function, which were not addressed in this study. "The fact that women who self-identified as being dissatisfied maintained the level of sexual activity reported most likely represents established behaviour and partner expectation," said Professor Susan Davis, senior author of this study, also based at the Women's Health Program at Monash University, Australia. "It also reinforces the fact that frequency of sexual activity in women cannot be employed as a reliable indicator of sexual well-being."

"We are proud to publish this extremely important study in women's sexual health" said Dr. Irwin Goldstein, Editor-in-Chief of The Journal of Sexual Medicine. "This large study performed in the community emphasizes the role and importance of women's sexual health in women's overall health and well-being. Previous criticism equated physicians' efforts to improve a woman's satisfaction with her sexual life as medicalization. Dr. Davison's and co-workers' research will help health care professionals appreciate the need for overall women's healthcare to include women's sexual health care."

Increase in 'academic doping' could spark routine urine tests for exam students

Smart drugs for cognitive enhancement: Ethical and pragmatic considerations in the era of cosmetic neurology

The increasing use of smart drugs or "nootropics," to boost academic performance, could mean that exam students will face routine doping tests in future, suggests an article in the Journal of Medical Ethics.

Despite raising many dilemmas about the legitimacy of chemically enhanced academic performance, these drugs will be near impossible to ban, says Vince Cakic of the Department of Psychology, University of Sydney.

He draws several parallels with doping in competitive sports, where it is suggested that "95%" of elite athletes have used performance enhancing drugs.

"It is apparent that the failures and inconsistencies inherent in anti doping policy in sport will be mirrored in academia unless a reasonable and realistic approach to the issue of nootropics is adopted," he claims.

But what this should be is far from clear, especially given the ready availability of these types drugs for therapeutic use, says Mr Cakic, conjuring up the prospect of urine tests for exam students.

"As laughable as it may seem, it is possible that scenarios such as this could very well come to fruition in the future. However, given that the benefits of nootropics could also be derived from periods of study at any time leading up to examinations, this would also require drug testing during non-exam periods," he writes.

"If the current situation in competitive sport is anything to go by, any attempt to prohibit the use of nootropics will probably be difficult or inordinately expensive to police effectively," he warns.

Nootropics were designed to help people with cognitive problems, such as dementia and attention deficit disorder, but students with a looming deadline have several options: modafinil (Provigil), methylphenidate (Ritalin), and amphetamine (Dexedrine).

The non-medical use of methylphenidate and amphetamine is as high as 25% on some US college campuses, particularly in colleges with more competitive admission criteria, says Mr Cakic.

For boosting memory retention, there's brahmi, piracetam (Nootropil), donepezil (Aricept) and galantamine (Reminyl). And for a bit more get up and go, there's selegiline (Deprenyl).

The impact of these drugs is as yet "modest," says Mr Cakic, but more potent versions are in the pipeline. "The possibility of purchasing 'smartness in a bottle' is likely to have broad appeal to students" seeking to gain an advantage in an increasingly competitive world, says Mr Cakic.

But the argument that these drugs should be banned for non-medical use because they confer unfair advantage is rather like suggesting private tuition be banned, contends Mr Cakic. These drugs might even level the playing field for those who have been disadvantaged, he suggests.

The long term safety of smart drugs in healthy people is unknown, and this might prove a good, and perhaps the only, reason to attempt to restrict their use. Mr Cakic points to the use of caffeine, which is known to enhance sporting performance. It is a form of 'cheating' that is tolerated, he says, because it is relatively harmless.

A potential new imaging agent for early diagnosis of most serious skin cancer

Scientists in Australia are reporting development and testing in laboratory animals of a potential new material for diagnosing malignant melanoma, the most serious form of skin cancer. Their study is scheduled for the September 10 issue of the ACS' Journal of the Medicinal Chemistry, a bi-weekly publication.

Ivan Greguric and colleagues working within the Cooperative Research Consortium for Biomedical Imaging Develop, an Australian Government funded research group, note that about 130,000 new cases of malignant melanoma occur each year worldwide. Patients do best with early diagnosis and prompt treatment. The positron emission tomography (PET) scans sometimes used for diagnosis sometimes miss small cancers, delaying diagnosis and treatment.

The scientists' search for better ways of diagnosis led them to a new group of radioactive imaging agents, called fluoronicotinamides, which they tested in laboratory mice that had melanoma. The most promising substance revealed melanoma cells with greater accuracy than imaging agents now in use, the scientists note. As a result, this substance could become a "superior" PET imaging agent for improving the diagnosis and monitoring the effectiveness of treatment of melanoma, they say. Clinical trials with this new agent are now scheduled for 2010.

Scientists are reporting development and testing of a potential new material for diagnosing malignant melanoma, the most serious form of skin cancer. Shown is an image of melanoma on a patient's skin. **Credit: Wikimedia Commons**

FOR IMMEDIATE RELEASE *"Discovery of [18F]N-(2-(Diethylamino)ethyl)-6-fluoronicotinamide: A Melanoma Positron Emission Tomography Imaging Radiotracer with High Tumor to Body Contrast Ratio and Rapid Renal Clearance"*
FULL TEXT ARTICLE http://pubs.acs.org/stoken/presspac/presspac/full/10.1021/jm9008423

San Andreas affected by 2004 Sumatran quake

Study: Largest quakes can weaken fault zones worldwide

HOUSTON - (Sept. 30, 2009) - U.S. seismologists have found evidence that the massive 2004 earthquake that triggered killer tsunamis throughout the Indian Ocean weakened at least a portion of California's famed San Andreas Fault. The results, which appear this week in the journal Nature, suggest that the Earth's largest earthquakes can weaken fault zones worldwide and may trigger periods of increased global seismic activity.

"An unusually high number of magnitude 8 earthquakes occurred worldwide in 2005 and 2006," said study co-author Fenglin Niu, associate professor of Earth science at Rice University. "There has been speculation that these were somehow triggered by the Sumatran-Andaman earthquake that occurred on Dec. 26, 2004, but this is the first direct evidence that the quake could change fault strength of a fault remotely."

Earthquakes are caused when a fault fails, either because of the buildup of stress or because of the weakening of the fault. The latter is more difficult to measure.

The magnitude 9 earthquake in 2004 occurred beneath the ocean west of Sumatra and was the second-largest quake ever measured by seismograph. The temblor spawned tsunamis as large as 100 feet that killed an estimated 230,000, mostly in Indonesia, Sri Lanka, India and Thailand.

In the new study, Niu and co-authors Taka'aki Taira and Paul Silver, both of the Carnegie Institution of Science in Washington, D.C., and Robert Nadeau of the University of California, Berkeley, examined more than 20 years of seismic records from Parkfield, Calif., which sits astride the San Andreas Fault.

The team zeroed in on a set of repeating microearthquakes that occurred near Parkfield over two decades. Each of these tiny quakes originated in almost exactly the same location. By closely comparing seismic readings from these quakes, the team was able to determine the "fault strength" - the shear stress level required to cause the fault to slip - at Parkfield between 1987 and 2008.

The team found fault strength changed markedly at three times during the 20-year period. The authors surmised that the 1992 Landers earthquake, a magnitude 7 quake north of Palm Springs, Calif. - about 200 miles from Parkfield - caused the first of these changes. The study found the Landers quake destabilized the fault near Parkfield, causing a series of magnitude 4 quakes and a notable "aseismic" event - a movement of the fault that played out over several months - in 1993.

The second change in fault strength occurred in conjunction with a magnitude 6 earthquake at Parkfield in September 2004. The team found another change at Parkfield later that year that could not be accounted for by the September quake alone. Eventually, they were able to narrow the onset of this third shift to a five-day window in late December during which the Sumatran quake occurred.

"The long-range influence of the 2004 Sumatran-Andaman earthquake on this patch of the San Andreas suggests that the quake may have affected other faults, bringing a significant fraction of them closer to failure," said Taira. "This hypothesis appears to be borne out by the unusually high number of large earthquakes that occurred in the three years after the Sumatran-Andaman quake."

The research was supported by the National Science Foundation, the Carnegie Institution of Washington, the University of California, Berkeley, and the U.S. Geological Survey.

Simulation suggests rocky exoplanet has bizarre atmosphere

Cloudy with a chance of pebble showers

By Diana Lutz

So accustomed are we to the sunshine, rain, fog and snow of our home planet that we find it next to impossible to imagine a different atmosphere and other forms of precipitation.

To be sure, Dr. Seuss came up with a green gluey substance called oobleck that fell from the skies and gummed up the Kingdom of Didd, but it had to be conjured up by wizards and was clearly a thing of magic.

Not so the atmosphere of COROT-7b, an exoplanet discovered last February by the COROT space telescope launched by the French and European space agencies.

According to models by scientists at Washington University in St. Louis, COROT-7b's atmosphere is made up of the ingredients of rocks and when "a front moves in," pebbles condense out of the air and rain into lakes of molten lava below.

The work, by Laura Schaefer, research assistant in the Planetary Chemistry Laboratory, and Bruce Fegley Jr., Ph.D., professor of earth and planetary sciences in Arts & Sciences, appears in the Oct. 1 issue of The Astrophysical Journal.

Astronomers have found nearly 400 extra-solar planets, or exoplanets, in the past 20 years. But because of the limitations of the indirect means by which they are discovered, most are Hot Jupiters, chubby gas giants orbiting close to their parent stars. (More than 1,300 Earths could be packed inside Jupiter, which has 300 times the mass of Earth.)

COROT-7b, on the other hand, is less than twice the size of Earth and only five times its mass.

The exoplanet COROT-7b is close enough to its star that its "day-face" is hot enough to melt rock. Theoretical models suggest the planet has an atmosphere of the components of rock in gaseous form and lava or boiling oceans on its surface. **Image by ESO/L. Calcada.**

It was the first planet found orbiting the star COROT-7, an orange dwarf in the constellation Monoceros, or the Unicorn. (This priority is designated by the letter b.)

Solid as a Rock

In August 2009 a consortium of European observatories led by the Swiss reported the discovery of COROT-7c, a second planet orbiting COROT-7.

Using the data from both planets, they were able to calculate that COROT-7b has an average density about the same as Earth's. This means it is almost certainly a rocky planet made up of silicate rocks like those in Earth's crust, says Fegley.

Not that anyone would call it Earth-like, much less hospitable to life. The planet and its star are separated by only 1.6 million miles, 23 times less than the distance between the parboiled planet Mercury and our Sun.

Because the planet is so close to the star, it is gravitationally locked to it in the same way the Moon is locked to Earth. One side of the planet always faces its star, just as one side of the Moon always faces Earth.

This star-facing side has a temperature of about 2600 Kelvin (4220 degrees Fahrenheit). That's infernally hot - hot enough to vaporize rocks. The global average temperature of Earth's surface, in contrast, is only about 288 Kelvin (59 degrees Fahrenheit).

The side in perpetual shadow, on the other hand, is positively chilly at 50 Kelvin (-369 degrees Fahrenheit).

Perhaps because they were cooked off, COROT-7b's atmosphere has none of the volatile elements or compounds that make up Earth's atmosphere, such as water, nitrogen and carbon dioxide.

"The only atmosphere this object has is produced from vapor arising from hot molten silicates in a lava lake or lava ocean," Fegley says.

What might that atmosphere be like? To find out Schaefer and Fegley have used thermochemical equilibrium calculations to model COROT-7b's atmosphere. The calculations, which reveal which mineral assemblages are stable under different conditions, were carried out with MAGMA, a computer program Fegley developed in 1986 with the late A. G. W. Cameron, a professor of astrophysics at Harvard University.

Schaefer and Fegley modified the MAGMA program in 2004 in order to study high-temperature volcanism on Io, Jupiter's innermost Galilean satellite. This modified version was used in their present work.

Raining Rocks

Because the scientists didn't know the exact composition of the planet, they ran the program with four different starting compositions. "We got essentially the same result in all four cases," says Fegley.

"Sodium, potassium, silicon monoxide and then oxygen - either atomic or molecular oxygen - make up most of the atmosphere." But there are also smaller amounts of the other elements found in silicate rock, such as magnesium, aluminum, calcium and iron.

Why is there oxygen on a dead planet, when it didn't show up in Earth's atmosphere until 2.4 billion years ago, when plants started to produce it?

"Oxygen is the most abundant element in rock," says Fegley, "so when you vaporize rock what you end up doing is producing a lot of oxygen."

The peculiar atmosphere has its own singular weather. "As you go higher the atmosphere gets cooler and eventually you get saturated with different types of 'rock' the way you get saturated with water in the atmosphere of Earth," explains Fegley. "But instead of a water cloud forming and then raining water droplets, you get a 'rock cloud' forming and it starts raining out little pebbles of different types of rock."

Even more strangely, the kind of rock condensing out of the cloud depends on the altitude. The atmosphere works the same way as fractionating columns, the tall knobby columns that make petrochemical plants recognizable from afar. In a fractionating column, crude oil is boiled and its components condense out on a series of trays, with the heaviest one (with the highest boiling point) sulking at the bottom, and the lightest (and most volatile) rising to the top.

Instead of condensing out hydrocarbons such as asphalt, petroleum jelly, kerosene and gasoline, the exoplanet's atmosphere condenses out minerals such as enstatite, corundum, spinel, and wollastonite. In both cases the fractions fall out in order of boiling point.

Elemental sodium and potassium, which have very low boiling points in comparison with rocks, do not rain out but would instead stay in the atmosphere, where they would form high gas clouds buffeted by the stellar wind from COROT-7. These large clouds may be detectable by Earth-based telescopes. The sodium, for example, should glow in the orange part of the spectrum, like a giant but very faint sodium vapor streetlamp.

Observers have recently spotted sodium in the atmospheres of two other exoplanets.

The atmosphere of COROT-7b may not be breathable, but it is certainly amusing.

Oxidized form of a common vitamin may bring relief for ulcerative colitis

New research published in the Journal of Leukocyte Biology finds retinoic acid may alleviate ulcerative colitis and similar irritable bowel diseases

Here's another reason why you should take your vitamins. A new research report appearing in the October 2009 print issue of the Journal of Leukocyte Biology (http://www.jleukbio.org) suggests that retinoic acid, the oxidized form of vitamin A, could be a beneficial treatment for people suffering from ulcerative colitis and other irritable bowel diseases. Specifically they found that retinoic acid helps suppress out-of-control inflammation, which is a hallmark of active ulcerative colitis.

"Pharmaceutical strategies based on this research may offer a promising alternative to our current approaches of managing immune diseases including, IBD, arthritis, multiple sclerosis, and so on," Aiping Bai, a researcher involved in the work from Nanchang University in Nanchang City, China.

To make this discovery, Bai and colleagues conducted in vitro studies with human tissue and in vivo studies in mice. Both studies ultimately found that treatment with retinoic acid reduced the inflammation in the colon by increasing the expression of FOXP3, a gene involved with immune system responses, as well as decreasing the expression of IL-17, a cytokine believed to cause inflammation. Because many experts believe that IL-17 directly relates to the uncontrolled inflammation seen in ulcerative colitis and irritable bowel disease, the discovery that retinoic acid reduces IL-17's ability to cause inflammation could accelerate the development of treatments for these chronic diseases.

"Runaway inflammation is serious problem, no matter where it occurs in the body, but in many instances, the root cause is a mystery," said John Wherry, Ph.D., Deputy Editor of the Journal of Leukocyte Biology. "This research helps scientists better understand what causes and controls inflammation in the colon, which in turn, helps lay the groundwork for new classes of drugs to treat this devastating condition."

Details: *Aiping Bai, Nonghua Lu, Yuan Guo, Zhanju Liu, Jiang Chen, and Zhikang Peng. All-trans retinoic acid down-regulates inflammatory responses by shifting the Treg/Th17 profile in human ulcerative and murine colitis. J Leukoc Biol 2009 86: 959‐ doi: doi:10.1189/jlb.0109006 ; http://www.jleukbio.org/cgi/content/abstract/86/4/959*

Breast milk should be drunk at the same time of day that it is expressed

The levels of the components in breast milk change every 24 hours in response to the needs of the baby. A new study published in the journal Nutritional Neuroscience shows, for example, how this milk could help newborn babies to sleep.

Breast milk contains various ingredients, such as nucleotides, which perform a very important role in regulating babies' sleep. The new study, published recently in the journal Nutritional Neuroscience, confirms that the composition of breast milk changes quite markedly throughout the day.

The scientists looked for three nucleotides in breast milk (adenosine, guanosine and uridine), which excite or relax the central nervous system, promoting restfulness and sleep, and observed how these varied throughout a 24-hour period.

The milk, collected from 30 women living in Extremadura, was expressed over a 24-hour period, with six to eight daily samples. The highest nucleotide concentrations were found in the night-time samples (8pm to 8am).

"This made us realise that milk induces sleep in babies", Cristina L. Sánchez, lead author of the article and a researcher at the Chrononutrition Laboratory at the University of Extremadura, tells SINC.
"You wouldn't give anyone a coffee at night, and the same is true of milk – it has day-specific ingredients that stimulate activity in the infant, and other night-time components that help the baby to rest", explains Sánchez.

In order to ensure correct nutrition, the baby should be given milk at the same time of day that it was expressed from the mother's breast. "It is a mistake for the mother to express the milk at a certain time and then store it and feed it to the baby at a different time", points out the researcher. .

The benefits of breast milk

The World Health Organisation (WHO) says breast milk is the best food for the newborn, and should not be substituted, since it meets all the child's physiological requirements during the first six months of life. It not only protects the baby against many illnesses such as colds, diarrhoea and sudden infant death syndrome, but can also prevent future diseases such as asthma, allergies and obesity, and promotes intellectual development.

The benefits of breastfeeding also extend to the mother. Women who breastfeed lose the weight gained during pregnancy more quickly, and it also helps prevent against anaemia, high blood pressure and postnatal depression. Osteoporosis and breast cancer are also less common among women who breastfeed their children.

References: *Sánchez, Cristina L.; Cubero, Javier; Sánchez, Javier; Chanclón, Belén; Rivero, Montserrat; Rodríguez, Ana B.; Barriga, Carmen. "The possible role of human milk nucleotides as sleep inducers". Nutritional Neuroscience Vol. 12(1):2-8. 2009.*

Fossil Skeleton From Africa Predates Lucy

By JOHN NOBLE WILFORD

Lucy, meet Ardi.

Ardi, short for Ardipithecus ramidus, is the newest fossil skeleton out of Africa to take its place in the gallery of human origins. At an age of 4.4 million years, it lived well before and was much more primitive than the famous 3.2-million-year-old Lucy, of the species Australopithecus afarensis.

Since finding fragments of the older hominid in 1992, an international team of scientists has been searching for more specimens and on Thursday presented a fairly complete skeleton and their first full analysis. By replacing Lucy as the earliest known skeleton from the human branch of the primate family tree, the scientists said, Ardi opened a window to “the early evolutionary steps that our ancestors took after we diverged from our common ancestor with chimpanzees.”

The older hominid was already so different from chimps that it suggested “no modern ape is a realistic proxy for characterizing early hominid evolution,” they wrote.

The Ardipithecus specimen, an adult female, probably stood four feet tall and weighed about 120 pounds, almost a foot taller and twice the weight of Lucy. Its brain was no larger than a modern chimp’s. It retained an agility for tree-climbing but already walked upright on two legs, a transforming innovation in hominids, though not as efficiently as Lucy’s kin. Ardi’s feet had yet to develop the arch-like structure that came later with Lucy and on to humans. The hands were more like those of extinct apes. And its very long arms and short legs resembled the proportions of extinct apes, or even monkeys.

Tim D. White of the University of California, Berkeley, a leader of the team, said in an interview this week that the genus Ardipithecus appeared to resolve many uncertainties about “the initial stage of evolutionary adaptation” after the hominid lineage split from that of the chimpanzees. No fossil trace of the last common ancestor, which lived some time before six million years ago, according to genetic studies, has yet come to light.

The other two significant stages occurred with the rise of Australopithecus, which lived from about four million to one million years ago, and then the emergence of Homo, our own genus, before two million years ago. The ancestral relationship of Ardipithecus to Australopithecus has not been determined, but Lucy’s australopithecine kin are generally recognized as the ancestral group from which Homo evolved.

Scientists not involved in the new research hailed its importance, placing the Ardi skeleton on a pedestal alongside notable figures of hominid evolution like Lucy and the 1.6-million-year-old Turkana Boy from Kenya, an almost complete specimen of Homo erectus with anatomy remarkably similar to modern Homo sapiens.

David Pilbeam, a professor of human evolution at Harvard University who had no role in the discovery, said in an e-mail message that the Ardi skeleton represented “a genus plausibly ancestral to Australopithecus” and began “to fill in the temporal and structural ‘space’ between the apelike common ancestor and Australopithecus.”

Andrew Hill, a paleoanthropologist at Yale University who was also not involved in the research, noted that Dr. White had kept “this skeleton in his closet for the last 15 years or so, but I think it has been worth the wait.”

In some ways the specimen's features are surprising, Dr. Hill added, "but it makes a very satisfactory animal for understanding the changes that have taken place along the human lineage."

The first comprehensive reports describing the skeleton and related findings, the result of 17 years of study, are being published Friday in the journal Science. Eleven papers by 47 authors from 10 countries describe the analysis of more than 110 Ardipithecus specimens from a minimum of 36 different individuals, including Ardi.

The paleoanthropologists wrote in one of the articles that Ardipithecus was "so rife with anatomical surprises that no one could have imagined it without direct fossil evidence." A bounty of animal and plant material - "every seed, every piece of fossil wood, every scrap of bone," Dr. White said - was gathered to set the scene of the cooler, more humid woodland habitat in which these hominids had lived.

This was one of the first surprises, said Giday WoldeGabriel, a geologist at Los Alamos National Laboratory, because it upset the hypothesis that upright walking had evolved as an adaptation to life on grassy savanna.

The discovery site, on what is now an arid floodplain along the middle stretch of the Awash River in Ethiopia, is 140 miles northeast of Addis Ababa and 45 miles south of Hadar, where Lucy was found in 1974 by Donald Johanson, with whom Dr. White collaborated in analyzing those fossils.

Gen Suwa, a paleoanthropologist now at the University of Tokyo, made the first discovery in 1992: a single upper molar. Yohannes Haile-Selassie, an Ethiopian curator of anthropology at the Cleveland Museum of Natural History, uncovered the first skeletal bones. A preliminary report on the new species was published in 1994.

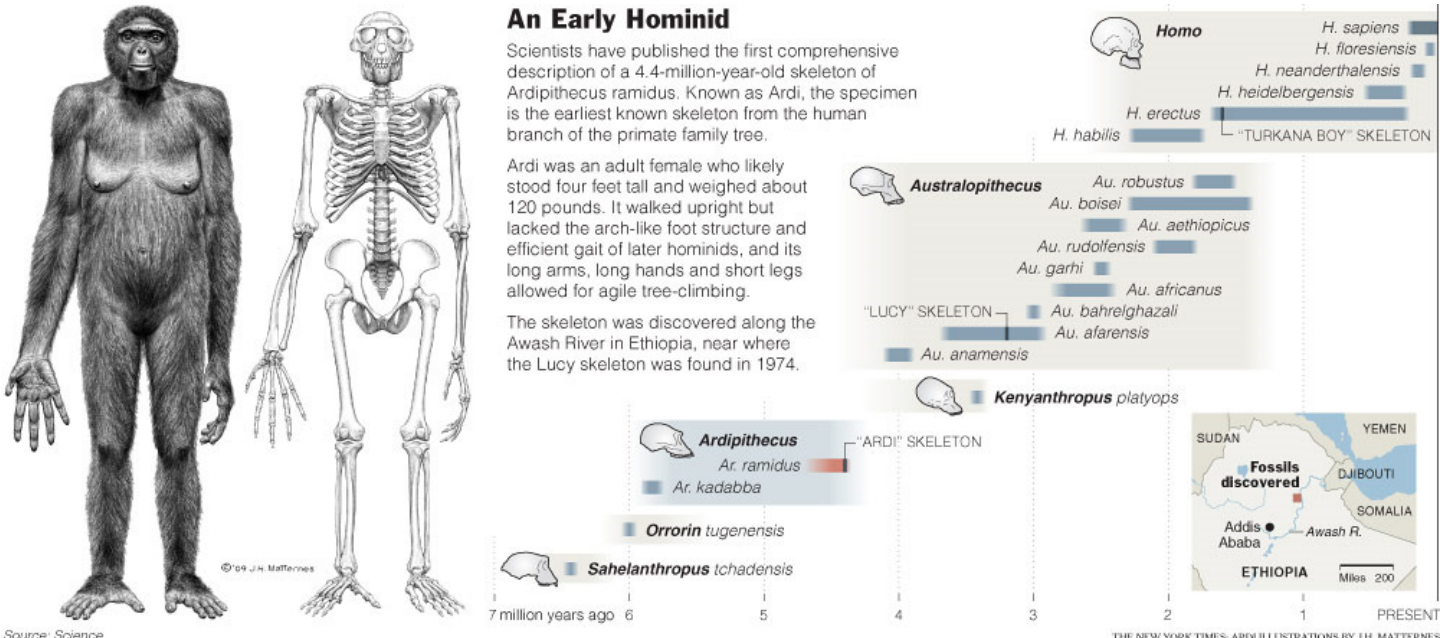
But the fossils, which are housed at the anthropology museum in Addis Ababa, were so plentiful, fragmentary and potentially significant that Dr. White held back from further public discussion of the research, even while discoveries of older fossils were being made. One discovery was of an earlier species of Ardipithecus from elsewhere in Ethiopia. Other finds, perhaps from more than six million years ago and given other species names, were excavated in Chad and Kenya. Their bones indicate that they also walked upright, scientists say, but the fossils are too few to draw any definitive conclusions.

Ardi's skull, Dr. Pilbeam said, appears to be more similar to the older Chad hominid than to younger australopithecines. This indicates that the fossils from Chad and Ethiopia possibly represent species of the Ardipithecus genus, or closely related genera.

From the new research, scientists inferred that Ardi was female, based on its small and lightly built skull and its canine teeth, which are small compared with other individuals at the site.

Dr. Suwa, a specialist in fossil teeth, said the more than 145 teeth collected at the site were of the size and shape and had wear patterns showing that the individuals were omnivorous eaters of plants and nuts, as well as small mammals, but were not as big consumers of fruits as are living chimps and gorillas. Ardi probably fed in trees and on the ground. Dr. Suwa also noted that males had stubby canine teeth, more like those of modern humans, in contrast to the projecting tusklike upper canines of chimps and gorillas, suggesting that Ardipithecus teeth no longer functioned as weapons or displays in male-male or male-female conflicts. In fact, the male and female upper canines are similar.

This was seen as further evidence that the species had already evolved a distinctive trait of early prehumans. C. Owen Lovejoy, an anatomist at Kent State University and lead author of two of the journal reports, speculated that these hominids had a social system that involved less competition among males and that this



suggested the beginning of pair bonding between males and females.

Dr. Pilbeam disputed this conjecture, saying, “This is a restatement of Owen Lovejoy’s ideas going back almost three decades, which I found unpersuasive then and still do.”

In his articles and an interview, Dr. Lovejoy described the five years he spent analyzing the Ardipithecus pelvis, which appeared to be in transition between a structure originally suited for life in trees and one modified for early upright walking. By contrast, the pelvis of the Lucy species had already evolved nearly all of the adaptations for bipedality.

Asked at a news conference in Washington what Lucy might have said to her new-found “sister,” Dr. Lovejoy replied, “She would have challenged her to a race, and Lucy would have won handily.” Although the lower pelvis is still primitive, Dr. Lovejoy found, changes in the upper pelvis enabled the species to walk on two legs with a straightened hip, “but probably with less speed and efficiency than humans.” A few scientists think this walking evidence to be only circumstantial. The lower part of the pelvis, “still almost entirely apelike,” indicates retention of powerful hamstring muscles for climbing.

Dr. White, Berhane Asfaw of the Rift Valley Research Service in Ethiopia and other team members concluded that “despite the genetic similarities of living humans and chimpanzees, the ancestor we last shared probably differed substantially from any extant African ape.”

As Dr. Hill of Yale said, “It is always new specimens, particularly those from little known time periods or geographic areas, that provoke the greatest changes in our ideas.”

Looking ahead, Dr. White lamented that there were so few sites in Africa known to have fossil deposits six million to seven million years old. “We are getting so close to that common ancestor of hominids and chimps, and we’d love to find an earlier skeleton,” he said.

Gas mask bra traps Ig Nobel prize

By Victoria Gill Science reporter, BBC News

Designers of a bra that turns into gas masks and a team who found that named cows produce more milk were among the winners of the 2009 Ig Nobel prizes.

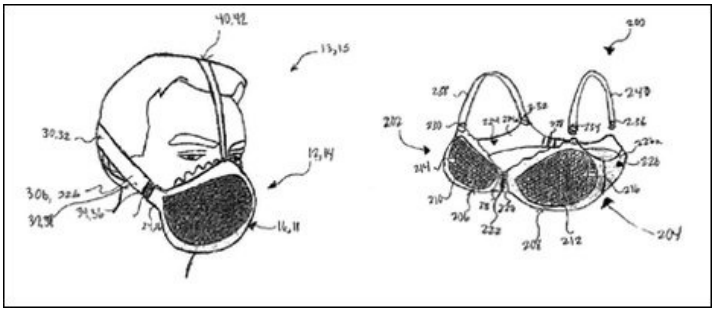
The aim of the awards is to honour achievements that "first make people laugh and then make them think".

The peace prize went to a Swiss research team who determined whether it is better to be hit over the head with a full or empty bottle of beer.

The ceremony was organised by the magazine Annals of Improbable Research.

Catherine Douglas and Peter Rowlinson from the agriculture, food and rural development department of Newcastle University were the only UK recipients. Dr Douglas, who was unable to attend the ceremony held at Harvard University in Cambridge, US, told BBC News that she was "thrilled" to have been selected and was a "big fan of the Ig Nobel awards". She said that discovering cows with names were more prolific milk-producers emerged during research into improving dairy cow welfare.

The overall aim of the study was to reduce stress and fear by improving "the human-animal relationship". "[This research] showed that the majority of UK dairy farmers are caring individuals who respect and love their herd," she said. Dr Douglas dedicated the award to Purslane, Wendy and Tina - "the nicest cows I have ever known".



The bra converts into a mask for the wearer and one for a needy bystander

Risky celebrations

The Ig Nobel Prizes were presented to the winners by genuine Nobel laureates.

Dr Elena Bodnar won the public health prize for the bra that, in an emergency, can be converted into two gas masks. She demonstrated her invention and gave one to each of the Nobel laureates as a gift.

Professor Martin Chalfie, who won the Nobel prize for chemistry in 2008, was this year's prize in the "win a date with a Nobel laureate" contest.

Past winners also returned to take part in the celebrations. They included Kees Moeliker, the discoverer of homosexual necrophilia in the mallard duck, and Dr Francis Fesmire, who devised the digital rectal massage as cure for intractable hiccups.

Each new winner was permitted a maximum of 60 seconds to deliver an acceptance speech. The time limit was enforced by an intractable eight-year-old girl. The evening also featured numerous tributes to the evening's theme of "Risk". A 15-minute risk cabaret concert by the Penny-Wise Guys preceded the ceremony, during which the band paid special tribute to fraudster Bernie Madoff.

Appropriately, the prize for economics went to the executives of four Icelandic banks.

The governor of Zimbabwe's Reserve Bank received the prize for mathematics for printing bank notes with such a wide range of denominations.

The full list of winners:

Veterinary medicine: Catherine Douglas and Peter Rowlinson of Newcastle University, UK, for showing that cows with names give more milk than cows that are nameless.

Peace: Stephan Bolliger, Steffen Ross, Lars Oesterhelweg, Michael Thali and Beat Kneubuehl of the University of Bern, Switzerland, for determining whether it is better to be smashed over the head with a full bottle of beer or with an empty bottle.

Biology: Fumiaki Taguchi, Song Guofu and Zhang Guanglei of Kitasato University Graduate School of Medical Sciences in Sagamihara, Japan, for demonstrating that kitchen refuse can be reduced more than 90% in mass by using bacteria extracted from the faeces of giant pandas.

Medicine: Donald L Unger of Thousand Oaks, California, US, for investigating a possible cause of arthritis of the fingers, by diligently cracking the knuckles of his left hand but not his right hand every day for more than 60 years.

The prize for mathematics went to the governor of Zimbabwe's Reserve Bank

Economics: The directors, executives, and auditors of four Icelandic banks for demonstrating that tiny banks can be rapidly transformed into huge banks, and vice versa (and for demonstrating that similar things can be done to an entire national economy).

Physics: Katherine K Whitcome of the University of Cincinnati, Daniel E Lieberman of Harvard University and Liza J Shapiro of the University of Texas, all in the US, for analytically determining why pregnant women do not tip over.

Chemistry: Javier Morales, Miguel Apatiga and Victor M Castano of Universidad Nacional Autonoma in Mexico, for creating diamonds from tequila.

Literature: Ireland's police service for writing and presenting more than 50 traffic tickets to the most frequent driving offender in the country - Prawo Jazdy - whose name in Polish means "Driving Licence".

Public Health: Elena N Bodnar, Raphael C Lee, and Sandra Marijan of Chicago, US, for inventing a bra that can be quickly converted into a pair of gas masks - one for the wearer and one to be given to a needy bystander.

Mathematics: Gideon Gono, governor of Zimbabwe's Reserve Bank, for giving people a simple, everyday way to cope with a wide range of numbers by having his bank print notes with denominations ranging from one cent to one hundred trillion dollars.

Surgical masks vs. N95 respirators for preventing influenza among health-care workers

Surgical masks appear to be no worse than, and nearly as effective as N95 respirators in preventing influenza in health care workers, according to a study released early online today by JAMA. The study was posted online ahead of print because of its public health implications. It will be published in the November 4 issue of JAMA.

Influenza is the most important cause of medically attended acute respiratory illness worldwide and the authors write there is heightened concern this year because of the influenza pandemic due to the H1N1 virus. "Data about the effectiveness of the surgical mask compared with the N95 respirator for protecting health care workers against influenza are sparse," the authors provide as background information in the article. "Given the likelihood that N95 respirators will be in short supply during a pandemic and not available in many countries, knowing the effectiveness of the surgical mask is of public health importance."

Mark Loeb, M.D., M.Sc., from McMaster University, Hamilton, Ontario, Canada, and colleagues conducted a randomized controlled trial of 446 nurses in eight Ontario hospitals to compare the surgical mask with the N95 respirator in protecting health care workers against influenza. The nurses were randomized into two groups: 225 were assigned to receive surgical masks and 221 were assigned to receive the fitted N95 respirator which they were to wear when caring for patients with febrile (fever) respiratory illness. The primary outcome of the study was laboratory-confirmed influenza. Effectiveness of the surgical mask was assessed as non-inferiority of the surgical mask compared with the N95 respirator.

Between September 23, 2008 and December 8, 2008, "influenza infection occurred in 50 nurses (23.6 percent) in the surgical mask group and in 48 (22.9 percent) in the N95 respirator group (absolute risk difference -0.73 percent)," indicating non-inferiority of the surgical mask the authors report. Even among those

nurses who had an increased level of the circulating pandemic 2009 H1N1 influenza strain, non-inferiority was demonstrated between the surgical mask group and the N95 respirator group for the 2009 influenza A(H1N1).

"Our data show that the incidence of laboratory-confirmed influenza was similar in nurses wearing the surgical mask and those wearing the N95 respirator. Surgical masks had an estimated efficacy within 1 percent of N95 respirators," the authors write. "That is, surgical masks appeared to be no worse, within a prespecified margin, than N95 respirators in preventing influenza."

In conclusion the authors state: "Our findings apply to routine care in the health care setting. They should not be generalized to settings where there is a high risk for aerosolization, such as intubation or bronchoscopy, where use of an N95 respirator would be prudent. In routine health care settings, particularly where the availability of N95 respirators is limited, surgical masks appear to be non-inferior to N95 respirators for protecting health care workers against influenza."

(JAMA. 2009;302[17]: (doi:10.1001/jama.2009.1466. Available online at www.jamamedia.org)

Editor's Note: *This study was supported by the Public Health Agency of Canada. Please see the article for additional information, including other authors, author contributions and affiliations, financial disclosures, funding and support, etc.*

Editorial: Respiratory Protection Against Influenza

In an accompanying editorial, Arjun Srinivasan, M.D., from the Centers for Disease Control and Prevention (CDC), Atlanta, and Trish M. Perl, M.D., M.Sc., from the School of Medicine and Bloomberg School of Public Health, Johns Hopkins University, Baltimore, write: "The 2009 influenza A(H1N1) pandemic has revived debate about the role of respiratory protection in preventing the transmission of influenza to health care personnel." The "N95 particulate respirators protect wearers from small particles when appropriately designed and worn." The World Health Organization and Society for Healthcare Epidemiology of America recommend the use of medical masks for most patient care. The CDC and Institute of Medicine recommend the use of N95 respirators during care of patients infected with the H1N1 influenza.

"That this study is, to our knowledge, the first and only published randomized trial assessing respiratory protection for preventing influenza transmission is a sad commentary on the state of research in this area. Uncovering the truth and identifying the most appropriate way to protect health care personnel will require that other investigators build on this study ...," they write. "Ultimately, accumulating a body of evidence on this topic will provide much-needed answers."

(JAMA. 2009; 302[17]:(doi:10.1001/jama.2009. 1494. Available at www.jamamedia.org)

Loss of top predators causing surge in smaller predators, ecosystem collapse

CORVALLIS, Ore. – The catastrophic decline around the world of "apex" predators such as wolves, cougars, lions or sharks has led to a huge increase in smaller "mesopredators" that are causing major economic and ecological disruptions, a new study concludes.

The findings, published today in the journal Bioscience, found that in North America all of the largest terrestrial predators have been in decline during the past 200 years while the ranges of 60 percent of mesopredators have expanded. The problem is global, growing and severe, scientists say, with few solutions in sight.

An example: in parts of Sub-Saharan Africa, lion and leopard populations have been decimated, allowing a surge in the "mesopredator" population next down the line, baboons. In some cases children are now being kept home from school to guard family gardens from brazen packs of crop-raiding baboons.

"This issue is very complex, and a lot of the consequences are not known," said William Ripple, a professor of forest ecosystems and society at Oregon State University. "But there's evidence that the explosion of mesopredator populations is very severe and has both ecological and economic repercussions."

In case after case around the world, the researchers said, primary predators such as wolves, lions or sharks have been dramatically reduced if not eliminated, usually on purpose and sometimes by forces such as habitat disruption, hunting or fishing. Many times this has been viewed positively by humans, fearful of personal attack, loss of livestock or other concerns. But the new picture that's emerging is a range of problems, including ecosystem and economic disruption that may dwarf any problems presented by the original primary predators.

"I've done a lot of work on wildlife in Africa, and people everywhere are asking some of the same questions, what do we do?" said Clinton Epps, an assistant professor at OSU who is studying the interactions between humans and wildlife. "Most important to understand is that these issues are complex, the issue is not as simple as getting rid of wolves or lions and thinking you've solved some problem. We have to be more careful about taking what appears to be the easy solution."

The elimination of wolves is often favored by ranchers, for instance, who fear attacks on their livestock. However, that has led to a huge surge in the number of coyotes, a "mesopredator" once kept in check by the wolves. The coyotes attack pronghorn antelope and domestic sheep, and attempts to control them have been hugely expensive, costing hundreds of millions of dollars.

"The economic impacts of mesopredators should be expected to exceed those of apex predators in any scenario in which mesopredators contribute to the same or to new conflict with humans," the researchers wrote in their report. "Mesopredators occur at higher densities than apex predators and exhibit greater resiliency to control efforts."

The problems are not confined to terrestrial ecosystems. Sharks, for instance, are in serious decline due to overfishing. In some places that has led to an explosion in the populations of rays, which in turn caused the collapse of a bay scallop fishery and both ecological an economic losses.

Among the findings of the study:

Primary or apex predators can actually benefit prey populations by suppressing smaller predators, and failure to consider this mechanism has triggered collapses of entire ecosystems.

Cascading negative effects of surging mesopredator populations have been documented for birds, sea turtles, lizards, rodents, marsupials, rabbits, fish, scallops, insects and ungulates.

The economic cost of controlling mesopredators may be very high, and sometimes could be accomplished more effectively at less cost by returning apex predators to the ecosystem.

Human intervention cannot easily replace the role of apex predators, in part because the constant fear of predation alters not only populations but behavior of mesopredators.

Large predators are usually carnivores, but mesopredators are often omnivores and can cause significant plant and crop damage.

The effects of exploding mesopredator populations can be found in oceans, rivers, forests and grasslands around the world.

Reversing and preventing mesopredator release is becoming increasingly difficult and expensive as the world's top predators continue to edge toward obliteration.

"These problems resist simple solutions," Ripple said. "I've read that when Gen. George Armstrong Custer came into the Black Hills in 1874, he noticed a scarcity of coyotes and the abundance of wolves. Now the wolves are gone in many places and coyotes are killing thousands of sheep all over the West."

"We are just barely beginning to appreciate the impact of losing our top predators," he said.

At OSU, Ripple and colleague Robert Beschta have done extensive research and multiple publications on the effect that loss of predators such as wolves and cougars have on ecosystem disruption, not only by allowing increased numbers of grazing animals such as deer and elk, but also losing the fear of predation that changes the behavior of these animals. They have documented ecosystem recovery in Yellowstone National Park after wolves were reintroduced there.

Collaborators on this study included researchers from OSU, the University of California at Berkeley and New Mexico State University at Las Cruces. It was supported by the U.S. Department of Agriculture and the National Science Foundation.

Sedatives may slow recovery from trauma

* 01 October 2009 **by Linda Geddes**

GIVING sleeping pills to soldiers and earthquake victims is common practice, yet it could be doing more harm than good. That's the suggestion from a study of traumatised rats, which seemed to show that the drugs suppressed the rodent's natural mechanisms for coping with trauma.

The US Department of Veterans Affairs says it will consider this and other studies when preparing new guidelines on treatments for post-traumatic stress disorder (PTSD). If their results are strong enough, it may recommend withholding sedatives in the aftermath of traumatic events. The findings are also throwing up new possibilities for preventing PTSD (see "Fight stress with stress").

PTSD arises after a person has had a traumatic experience: symptoms include involuntary, often debilitating, flashbacks of the experience, which can keep happening for years. Not everyone develops it, though, and it seems that what happens directly after the event, as the brain lays down the memory, helps determine whether they do.

Benzodiazepines, a class of sedative that includes diazepam (Valium), are prescribed following a traumatic event because they reduce anxiety and aid sleep. However, some studies have suggested that they may hamper long-term recovery. For example, a 2002 study of 22 volunteers who had experienced traumas such as traffic accidents found that those given a benzodiazepine for the following seven nights showed slightly more symptoms of PTSD six weeks later compared with those given a placebo.

To investigate further, Joseph Zohar and colleagues at Ben-Gurion University of the Negev in Beer Sheva, Israel, put rats in a confined space with well-soiled cat litter - a highly stressful experience used to gain insights into PTSD. Some were given the benzodiazepine alprazolam, while others were left untreated.

Despite a short-term reduction in anxiety, 30 days later the treated rats displayed more PTSD-like symptoms, such as freezing in response to unused cat litter, increased anxiety and less time exploring a maze, something

they usually enjoy. As well as this, treated rats had lower blood levels of corticosterone, the rat equivalent of the human stress hormone cortisol, compared with untreated rats (European Neuropsychopharmacology, vol 19, p 283).

Cortisol release is part of the natural response to stress in people, and activation of the brain receptors it binds to is known to be involved in the consolidation of traumatic memories. Zohar suggests that alprazolam interferes with the rats' ability to consolidate memories, leading to PTSD-like symptoms. He says that something similar may happen in traumatised people who are given benzodiazepines. He presented the findings at the 22nd European College of Neuropsychopharmacology congress in Istanbul, Turkey, last week.

Areih Shalev of the Hadassah University Medical Center in Ein-Karem, Israel, who studies benzodiazepines and trauma recovery, suggests another way that sedatives may exacerbate PTSD - by interfering with the brain's ability to learn. In order to avoid flashbacks, Shalev says, the brain needs to learn that stimuli reminiscent of a particular trauma, such as sounds and smells, are not always dangerous. As cortisol is known to be involved in learning in animals and people, benzodiazepines may interfere with this process.

However, David Nutt of Imperial College London warns that we still don't know whether Zohar's findings can be directly applied to people. "I'm not sure we can say [giving benzodiazepines] is wrong yet," he says.

Fight stress with stress

Perverse as it seems, boosting levels of a stress hormone might be just the thing to deal with trauma.

In the wake of a traumatic event, lowered levels of cortisol, caused by taking some sedatives, may raise the risk of post-traumatic stress disorder (see main story). So does boosting cortisol reduce the risk?

In one study, Joseph Zohar and colleagues at Ben-Gurion University of the Negev in Beer Sheva, Israel, found that rats injected with extra corticosterone, the rat equivalent of cortisol, following a traumatic event were less likely to develop PTSD-like symptoms (Biological Psychiatry, vol 64, p708). "Intervention in the 'golden hours' [after trauma] might be a key element," says Zohar. He is now investigating whether injecting cortisol within 6 hours of a trauma can prevent PTSD in people.

Meanwhile Gustav Schelling of Ludwig Maximilian University in Munich, Germany, has shown that people who underwent major surgery were less likely to develop PTSD if injected with cortisol while recovering (Annals of the New York Academy of Sciences, vol 1071, p 46). However, he warns that these people were suffering from physical as well as mental trauma, so while promising, the results may not apply to all cases of PTSD.

Sports jocks are oh-so predictable

* 20:09 01 October 2009 **by Macgregor Campbell**

A clever athlete knows how to keep an opponent guessing, but professionals act more predictably than they should. So says a study based on game theory, which shows that baseball pitchers throw too many fastballs and American football teams don't pass the ball enough. The finding could give savvy teams an extra victory or two over the course of a season.

The game theory concept of "minimax" says that players in a head-to-head match should follow two basic rules: first, play in a way that minimises your opponent's possible gain; second, be unpredictable.

Lab trials have shown that humans seldom play games according to these simple rules. This might be because the players were not playing for meaningful stakes, however, and did not have a detailed working knowledge of the game (PDF). In other words, they were amateurs, not professionals.

Studies of sports professionals at work – such as tennis players serving the ball (PDF) and soccer players taking penalty kicks (PDF) – have shown that skilled individuals in high-stakes situations may indeed play the ideal minimax strategy. These study groups were small, however, without the statistical power to allow conclusions to be drawn with certainty.

Fastballs bat better

To get a better sense of whether professional athletes play as game theory recommends, Steven Levitt of the University of Chicago – co-author of the bestseller Freakonomics – and Ken Kovash of open-source software organisation Mozilla looked at two large sets of baseball and American football statistics.

They first analysed over 3 million pitches thrown in major-league baseball games between 2002 and 2006. For each type of pitch, they measured the batter's "OPS" – a number that represents how likely a batter is to reach a base or to make a big hit. They found, on average, that fastballs tended to give batters 20 per cent higher OPS than curveballs. If pitchers played according to minimax, the OPS for curveballs and fastballs should be the same, but in fact pitchers gave batters a slight edge by throwing too many fastballs.

Levitt and Kovash then looked at whether or not pitchers chose their pitches as unpredictably as minimax theory says they should. They found that when a pitcher threw a fastball, his next pitch was 4 per cent less likely to be a fastball as well. If pitchers played truly rationally, there would be no such bias towards switching

the type of pitch. "Pitchers are being just a little too cute on the mound when they're switching back and forth so often," says Kovash.

Onto the gridiron

The authors then turned their attention to American football, analysing 125,000 plays from the 2001 to 2005 seasons. They boiled down each play to the decision either to run the ball on the ground or to pass it through the air, and looked at the decision's payoff in terms both of field position and of yards gained.

As with the baseball analysis, Levitt and Kovash found that one option – running – tended to have worse results than the other, but was used more often than it should be. They also found that, like pitchers, teams were slightly predictable in that after a run, the next play was more likely to be a pass.

What about intangibles?

John Wooders of the University of Arizona in Tucson calls the finding "interesting" but questions whether it is a true test of the minimax theory. In particular, he points to the way that Levitt and Kovash measure the payoffs for each sport. "The objective of a team is to win the game," he says. "At the end of the day, they don't care if they win by five points or 10 points," he continues.

Wooders, who was not involved with the study, has concerns that using OPS as a measure of a batter's payoff doesn't adequately capture his contribution to his team's win or loss. "There are a lot of ways that a player can help his team that don't show up in numbers," says Wooders.

Levitt and Kovash talked to major-league baseball executives to estimate the effect of a batter's OPS on the overall team performance. They concluded that if pitchers threw fewer fastballs, they could save their team between 10 to 15 runs per year. Likewise, if batters exploited pitchers' slight predictability, they would gain 10 to 15 runs a year. The authors estimate that this would translate into up to two extra victories per year.

In the case of football, the authors claim that the team that exploits its opponent's tendencies to run too much and switch plays too often could earn up to 10 extra points per season, or half a win per year.

Risk of abnormally slow heart rate twice as high in those taking drugs to slow Alzheimer's

New study finds that older people hospitalized for bradycardia are more likely to be taking cholinesterase-inhibiting drugs such as donepezil

TORONTO, Ont., - People taking one of several drugs commonly prescribed to treat Alzheimer's disease are more likely to be hospitalized for a potentially serious condition called bradycardia than patients not taking these medications.

Researchers from St. Michael's Hospital and Ontario's Institute for Clinical Evaluative Sciences (ICES) analyzed data from 1.4 million people aged 67 and older to see whether the risk for bradycardia was higher for those taking drugs called cholinesterase inhibitors.

Bradycardia is defined as an abnormally slow resting heart rate (under 60 beats per minute). Although it can be asymptomatic, it can also cause fainting, palpitations, shortness of breath, or even death.

"We wanted to see if there was a link between initiation of a cholinesterase inhibitor and subsequent hospitalization for bradycardia," explains lead author Laura Y. Park-Wyllie, a researcher at St. Michael's Hospital .

The three cholinesterase-inhibiting drugs currently approved for use in Canada are donepezil (brand name Aricept); rivastigmine (marketed as Exelon and Exelon Patch); and galantamine (branded Reminyl).

Most of the patients whose records were analyzed for the study had been prescribed donepezil.

The results of the study showed that older patients hospitalized with bradycardia were more than twice as likely to have recently started on a cholinesterase inhibitor such as donepezil for Alzheimer's disease compared to those without bradycardia.

The findings appear in the September 2009 issue of PLoS Medicine, an open-access online medical journal.

The researchers say that as the prevalence of Alzheimer's disease and other forms of dementia increases, more people aged 65 years and older will be treated with a cholinesterase inhibitor.

"It will be increasingly more important to prescribe these drugs judiciously as they carry a risk of serious adverse events," Park-Wyllie says. "A careful clinical evaluation is required before and after initiating these drugs, and they should only be continued when there is a definite positive response."

The potential cardiovascular toxicity of these dementia drugs may be underappreciated by clinicians, Park-Wyllie adds. More than half of the patients who had been hospitalized with bradycardia resumed taking their cholinesterase inhibitor after being discharged.

"Our study provides evidence of the potential adverse effect of cholinesterase inhibitors on heart rate. Health professionals need to reassess the merits of continued therapy in patients who develop bradycardia while taking these drugs," she says.

About cholinesterase inhibitors and dementia

Cholinesterase inhibitors are commonly prescribed to delay the progression of symptoms such as confusion and long-term memory loss in people with mild to moderate Alzheimer's disease.

It's known that people with dementia tend to have lower levels of a brain chemical called acetylcholine; the drugs work by boosting these levels. Reported side effects - including diarrhea, muscle cramps and abnormally slow heartbeat—may be related to increasing levels of acetylcholine in the body.

The benefits of cholinesterase inhibitors for people with Alzheimer's disease are generally small. The drugs do not reverse the effects of dementia. Other research suggests that in about half of patients, the drugs delay the worsening of symptoms for between six months to a year, although a minority of patients may benefit more.

Dr. Park-Wyllie is a researcher in the department of family and community medicine at St. Michael's Hospital, a visiting fellow at the Keenan Research Centre in the Li Ka Shing Knowledge Institute of St. Michael's Hospital, and a research fellow at ICES.

Iowa State University researcher uncovers potential key to curing tuberculosis

AMES, Iowa - Researchers at Iowa State University have identified an enzyme that helps make tuberculosis resistant to a human's natural defense system. Researchers have also found a method to possibly neutralize that enzyme, which may someday lead to a cure for tuberculosis.

Tuberculosis is caused by Mycobacterium tuberculosis and is a contagious disease that is on the rise, killing 1.5 to 2 million people worldwide annually.

Reuben Peters, associate professor in the department of biochemistry, biophysics and molecular biology, is leading the team of scientists from Iowa State; the University of Illinois, Urbana-Champaign; and Cornell University, Ithaca, New York, that is attempting to find ways to minimize the disease. The group had their research published in the Aug. 28 issue of the Journal of Biological Chemistry, and their research is also scheduled to be the cover article in an upcoming issue of the Journal of the American Chemical Society.

When most infections are introduced into humans, the body defends itself with certain cells -- called macrophage cells -- that kill the invading micro-organisms. The macrophage cells engulf and destroy these microbes, such as the Mycobacterium tuberculosis.

Peters found that the mycobacterium tuberculosis produces a defensive molecule that prevents the macrophage cells from destroying them. Peters and his team named the defensive molecule edaxadiene.

Peters' next step was to try to find molecules that bind with the edaxadiene-producing enzymes from tuberculosis and neutralize them. This makes the tuberculosis cells unable to produce edaxadiene. Without edaxadiene, tuberculosis cells would have a reduced ability to resist being killed by the macrophage cells.

Peters thinks he may have already found one.

"We have inhibitors that bind tightly to one of the enzymes that make edaxadiene in a test tube," said Peters.

Finding an inhibitor that works outside of the test tube, and in humans, and is stable, and can be ingested safely by humans, and can help kill tuberculosis is a process that may take a decade.

But Peters sees a huge reward at the end of the process. “This is the project where I tell my students, 'If we can make even just a 1 percent impact, we can save 15,000 - 20,000 lives a year.' That is really a significant contribution towards alleviating human suffering," said Peters.

Peters' group found the molecule by comparing the genetic makeup of tuberculosis - which kills humans - to the type that kills cattle but doesn't seem to have any effect on humans - Mycobacterium bovis. “Their genetic sequences are more than 99.9 percent identical," said Peters. "However, whereas, tuberculosis causes disease in humans, the bovis variety is much less infectious in humans, although it does cause disease in cattle."

One of the small differences in the genetic information between the two mycobacteria may hold the key to why one infects humans while the other does not.

"The bovis mycobacterium is missing only one nucleotide in the gene for one of the edaxadiene-producing enzymes, but that turns out to be very important as it prevents that enzyme from functioning," he said. “The critical piece for this idea is that Mycobacterium bovis doesn't make edaxadiene, and doesn't affect humans much, whereas Mycobacterium tuberculosis does make edaxadiene and is infectious in humans," Peters said.

"We think this is the big difference between the two mycobacterium, mainly because this is the only difference I know of that seems to affect their infection process," he added.

"This work presents tantalizing evidence that edaxadiene helps the tuberculosis bacterium evade the body's defenses," said Warren Jones, who oversees enzymology grants at the National Institutes of Health's National Institute of General Medical Sciences, which funded the research. "By exploring ways to block the production of this molecule, Dr. Peters is pioneering a new approach for combating this deadly pathogen."

One of the hurdles that will confront Peters in finding human cures is that the effect of edaxadiene may be specific to humans, so the normal testing process may be difficult. The normal testing sequence involves testing in the laboratory, then on smaller animals, then larger animals, and then to humans.

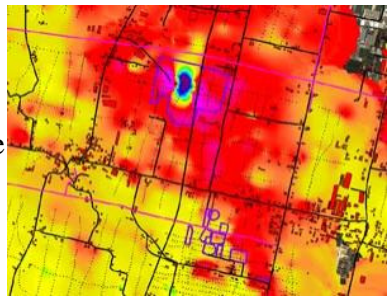
Since edaxadiene may be important for the ability of tuberculosis to infect humans, rather than animals, preventing production of edaxadiene by tuberculosis may not have much effect in animals, which will be challenging for the process of bringing a cure to drugstore shelves, according to Peters.

Peters added that he is eager to take on the next challenge in the fight against tuberculosis.

Peters' research team includes Francis Mann, doctoral student; Meimei Xu, associate scientist, both in ISU's department of biochemistry, biophysics and molecular biology; Sladjana Prisic, formerly a doctoral student in ISU's department of biochemistry, biophysics and molecular biology; Huayou Hu and Robert Coates, both from the University of Illinois; and David Russell from Cornell.

Illegal toxic waste spotted from space

* 02 October 2009 **by Shanta Barley**



No hiding place **(Image: S. Silvestri et al.)**

MOVE over Erin Brockovich. Today's environmental detectives can use radar, helicopters and even satellite images to help them spot illegal toxic waste dumps and help catch those responsible.

Ironically, the tightening of restrictions on waste disposal and the enforcement of new recycling laws have made illegal dumping more likely, turning it into big business for the criminals involved.

The trouble is digging up suspect dumps to investigate their contents can release toxins into local water supplies. But with new remote-sensing techniques, such as ground-penetrating radar (GPR), you can find toxic trash without disturbing the soil. Instead, you bounce microwaves off buried materials and the strength of returning signals provides clues to what they are.

Alastair Ruffell, a forensic geologist at Queen's University, Belfast in the UK, has used GPR in 17 cases for the environment agencies of Scotland, the Republic of Ireland and Northern Ireland. Most are ongoing, however three have resulted in the culprits being jailed and fined.

Ruffell's latest research shows that geophysical techniques can be used to characterise the waste (Environmental Forensics, DOI: 10.1080/15275920903130230). GPR surveys suggested the presence of a highly conductive waste such as farmyard slurry in a peat bog in Northern Ireland, simply because the suspect pocket in the bog reflected no microwaves. "Soft, diggable, scented peat bogs make an attractive place to bury waste, but geophysical surveys can see right through them," Ruffell says. His method requires investigators to walk over the ground above the suspect site, but landowners can refuse to grant them access.

Soft, diggable peat bogs make an attractive place to bury waste but our surveys see right through them

Sonia Silvestri of the Italian construction firm consortium, Consorzio Venezia Nuova in Venice, has used the transient electromagnetic method to get around such difficulties. TEM is a form of GPR in which electric and magnetic fields are induced in the ground by an electric current pulsing through a coil. It can be carried out from a helicopter hovering 10 metres above the ground. Silvestri recently used the method to identify pollution leaking from a large landfill into groundwater to the north of Padua in north-east Italy. She will present her TEM results at the Twelfth International Waste Management and Landfill Symposium in Sardinia next week.

Her research has also shown that it is possible to detect waste from space using satellite images (International Journal of Geographical Information Science, DOI: 10.1080/13658810802112128).

As illegally buried waste sites tend to be located near industrial sites, landfills and roads, she drew up a map of potential illegal waste sites in a region of north-east Italy. Her team narrowed down the search by scrutinising IKONOS satellite images for patches of disturbed vegetation.

Of 34 sites identified from space as potential illegal dumps, chemical analyses have shown contamination at 17. Police investigations to track down those responsible have begun.

A new day dawned fast

Recovery from marine mass extinction happened much faster than thought, high-resolution research finds

David L. Chandler, MIT News Office

In 1980, Luis Alvarez and his collaborators stunned the world with their discovery that an asteroid impact 65 million years ago probably killed off the dinosaurs and much of the world's living organisms. But ever since, there has been an ongoing debate about how long it took for life to return to the devastated planet and for ecosystems to bounce back.

Now, researchers from MIT and their collaborators have found that at least some forms of microscopic marine life - the so called "primary producers," or photosynthetic organisms such as algae and cyanobacteria in the ocean - recovered within about a century after the mass extinction. Previous research had indicated the process might have taken millions of years.

It has taken so long to uncover the quick recovery because previous studies looked mostly at fossils in the layers of sediment from that period, and apparently the initial recovery was dominated by tiny, soft-bodied organisms such as cyanobacteria, which do not have shells or other hard body parts that leave fossil traces. The new research looked instead for "chemical fossils" - traces of organic molecules (compounds composed of mostly carbon and hydrogen) that can reveal the presence of specific types of organisms, even though all other parts of the organisms themselves are long gone.

The new research, published in the Oct. 2 issue of Science, was led by Julio Sepúlveda, an MIT postdoc who carried out part of the work while still a graduate student at the University of Bremen, Germany, and MIT Professor of Geobiology Roger Summons, among others.

The team had two major advantages that helped to make the new findings possible. One was a section of the well-known cliff face at Stevns Klint, Denmark, that happens to have an unusually thick layer of sediment from the period of the mass extinction — about 40 centimeters thick, compared to the few cm thickness of the layers that Alvarez originally studied from that period at Gubbio (Italy) and Stevns Klint (Denmark). And team members tapped one of the most powerful Gas Chromatograph-Mass Spectrometers (GC-MS) in the world, a device that can measure minute quantities of different molecules in the rock. MIT's advanced GC-MS is one of only a few such powerful instruments currently available at U.S. universities.

When people look at microfossils in the sediments from the period but are unable to detect the chemical biomarkers with the level of sensitivity the MIT team was able to achieve, they "miss a big part of the picture," Sepúlveda says. "Many of these microorganisms" that were detected through molecular signatures "are at the base of the food chain, but if you don't look with biochemical techniques you miss them."

The analysis clarified the sequence of events after the big impact. Immediately after the impact, certain areas of the ocean were devoid of oxygen and hostile to most algae, but close to the continent, microbial life was inhibited for only a relatively short period: in probably less than 100 years, algal productivity showed the first signs of recovery. In the open ocean, however, this recovery took much longer: previous studies have estimated that the global ocean ecosystem did not return to its former state until 1 to 3 million years following the impact.

Because of the rebound of primary producers, Sepúlveda says "very soon after the impact, the food supply was not likely a limitation" for other organisms, and yet "the whole ecology of the system remained disrupted" and took much longer to recover.

The findings provide observational evidence supporting models suggesting that global darkness after the impact was rather short. "Primary productivity came back quickly, at least in the environment we were studying," says Summons, referring to the near-shore environment represented by the Danish sediments.

"The atmosphere must have cleared up rapidly," he says. "People will have to rethink the recovery of the ecosystems. It can't be just the lack of food supply" that made it take so long to recover.

The team hopes to be able to study other locations with relatively thick deposits from the extinction aftermath, to determine whether the quick recovery really was a widespread phenomenon after the mass extinction.

These findings seem to rule out one theory about how the global ecosystem responded to the impact, which held that for more than a million years there was a "Strangelove ocean" - a reference to the post-apocalyptic scenario in the movie Dr. Strangelove - in which all the primary producers remained absent for a prolonged period, Summons says.

In addition to Sepúlveda and Summons, the work was carried out by Jens Wendler of the Friedrich-Schiller University in Jena, Germany, and Kai-Uwe Hinrichs of the University of Bremen. The work was funded by the DFG, European Graduate College Europrox and the NASA Astrobiology and Exobiology Programs.

Aspirin Misuse May Have Made 1918 Flu Pandemic Worse

The devastation of the 1918-1919 influenza pandemic is well known, but a new article suggests a surprising factor in the high death toll: the misuse of aspirin. Appearing in the November 1 issue of Clinical Infectious Diseases and available online now, the article sounds a cautionary note as present day concerns about the novel H1N1 virus run high.

High aspirin dosing levels used to treat patients during the 1918-1919 pandemic are now known to cause, in some cases, toxicity and a dangerous build up of fluid in the lungs, which may have contributed to the incidence and severity of symptoms, bacterial infections, and mortality. Additionally, autopsy reports from 1918 are consistent with what we know today about the dangers of aspirin toxicity, as well as the expected viral causes of death.

The motivation behind the improper use of aspirin is a cautionary tale, said author Karen Starko, MD. In 1918, physicians did not fully understand either the dosing or pharmacology of aspirin, yet they were willing to recommend it. Its use was promoted by the drug industry, endorsed by doctors wanting to “do something,” and accepted by families and institutions desperate for hope.

"Understanding these natural forces is important when considering choices in the future," Dr. Starko said. "Interventions cut both ways. Medicines can save and improve our lives. Yet we must be ever mindful of the importance of dose, of balancing benefits and risks, and of the limitations of our studies."

Physicists observe magnetism in gas for the first time

TORONTO, ON – An international team of physicists has for the first time observed magnetic behaviour in an atomic gas, addressing a decades-old debate as to whether it is possible for a gas or liquid to become ferromagnetic and exhibit magnetic properties. "Magnets are all around us - holding postcards on the refrigerator, pointing to magnetic north on a compass, and in speakers and headphones - yet some mysteries remain," says Joseph H. Thywissen, a professor of physics at the University of Toronto and a visiting member of the Massachusetts Institute of Technology-based team leading the research. "We have perhaps found the simplest situation in which permanent magnetism can exist."

The scientists observed the behaviour in a gas of lithium atoms trapped in the focus of an infrared laser beam. The gas was cooled to 150 nK, less than a millionth of a degree above absolute zero, which is at -273 C. When repulsive forces between the atoms were gradually increased, several features indicated that the gas had become ferromagnetic. The cloud first became bigger and then suddenly shrunk, and when the atoms were released from the trap, they suddenly expanded faster. These observations were reported in the 18 Sept 2009 issue of Science, in a paper titled "Itinerant Ferromagnetism in a Fermi Gas of Ultracold Atoms".

This and other observations agreed with theoretical predictions for a transition to a ferromagnetic state. Ferromagnetic materials are those that, below a specific temperature, become magnetized even in the absence of a strong magnetic field. In common magnets, such as iron and nickel that consist of a repeating crystal structure, ferromagnetism occurs when unpaired electrons within the material spontaneously align in the same direction.

"Magnetism only occurs in a strongly interacting regime, where calculations – even using today's fastest computers – are difficult," says Thywissen. "Since naturally occurring gases do not have strong enough interactions to address the question, we turned to ultra-cold gases for answers."

If confirmed, these results may enter textbooks on magnetism, showing that a gas of fermions does not need a crystalline structure to exhibit magnetic properties. "The evidence is pretty strong, but it is not yet a slam dunk," says MIT physics professor and co-principal investigator David E. Pritchard. "We were not able to observe regions where the atoms all point in the same direction. They started to form molecules and may not have had enough time to align themselves."

Thywissen's interest in the topic of ultra-cold ferromagnetism originated in theoretical work at Toronto led by Professor Arun Paramekanti in the physics department, along with graduate student Lindsay LeBlanc. "We assumed that ferromagnetism did exist for a gas, and then asked what its properties would be," explains LeBlanc. "Surprisingly, we found there were simple energetic signatures of ferromagnetism – that were eventually observed at MIT."

At MIT, the team was led by principal investigator Wolfgang Ketterle, and included graduate students Gyu-

Boong Jo, Ye-Ryoung Lee and Caleb A. Christensen, post-doctoral associate Jae-Hoon Choi, and undergraduate student Tony H. Kim. Thywissen is affiliated with the University of Toronto's Centre of Quantum Information and Quantum Control, and is a Senior Fellow at Massey College.

Canadian funding agencies include the National Science and Engineering Research Council (NSERC) and the Canadian Institute for Advanced Research (CIfAR). US funding included the National Science Foundation, the Office of Naval Research, through a Multidisciplinary University Research Initiative (MURI) program, and by the Army Research Office with funds from the Defense Advanced Research Projects Agency (DARPA) Optical Lattice Emulator (OLE) program.

Vital Signs

Researchers Look at Deaths After Surgery

By RONI CARYN RABIN

Patients are much more likely to die after surgery in some hospitals than in others, and conventional medical wisdom has long attributed the excess deaths to a higher rate of postoperative complications. But a new study contradicts that notion.

Researchers looked at 84,730 people who underwent inpatient surgery at 186 hospitals from 2005 to 2007. They found that death rates varied widely from hospital to hospital, from 3.5 percent to 6.9 percent.

But complication rates did not vary significantly: 24.6 percent of patients at the high-death hospitals experienced complications after surgery, compared with 26.9 percent of the patients at the hospitals with the lowest death rates.

The apparent discrepancy suggests that how a hospital responds to complications may be even more important than the frequency of complications, said the study's lead author, Dr. Amir A. Ghaferi. The report, prepared by the Michigan Surgical Collaborative for Outcomes Research and Evaluation at the University of Michigan, appears in The New England Journal of Medicine.

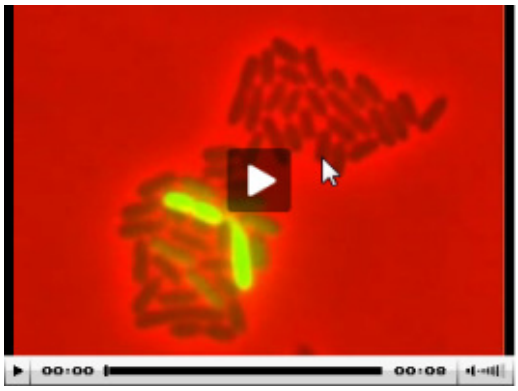
A lot of current policies are focused on minimizing complications, and that's helpful," Dr. Ghaferi said, but added, "It really behooves us to look at what hospitals are doing once they encounter a complication with a patient in a postsurgical setting."

Understanding a cell's split personality aids synthetic circuits

DURHAM, N.C. -- As scientists work toward making genetically altered bacteria create living "circuits" to produce a myriad of useful proteins and chemicals, they have logically assumed that the single-celled organisms would always respond to an external command in the same way.

Alas, some bacteria apparently have an individualistic streak that makes them zig when the others zag.

A new set of experiments by Duke University bioengineers has uncovered the existence of "bistability," in which an individual cell has the potential to live in either of two states, depending on which state it was in when stimulated.



In this colony, the bacteria lighting up in green are those being "turned on," while those in red remain "off."

Credit: Lingchong You

Taking into account the effects of this phenomenon should greatly enhance the future efficiency of synthetic circuits, said biomedical engineer Lingchong You of Duke's Pratt School of Engineering and the Duke Institute for Genome Sciences & Policy.

In principle, re-programmed bacteria in a synthetic circuit can be useful for producing proteins, enzymes or chemicals in a coordinated way, or even delivering different types of drugs or selectively killing cancer cells, the scientists said.

Researchers in this new field of synthetic biology "program" populations of genetically altered bacteria to direct their actions in much the same way that a computer program directs a computer. In this analogy, the genetic alteration is the software, the cell the computer. The Duke researchers found that not only does the software drive the computer's actions, but the computer in turn influences the running of the software.

"In the past, synthetic biologists have often assumed that the components of the circuit would act in a predictable fashion every time and that the cells carrying the circuit would just serve as a passive reactor," You said. "In essence, they have taken a circuit-centric view for the design and optimization process. This notion is helpful in making the design process more convenient."

But it's not that simple, say You and his graduate student Cheemeng Tan, who published the results of their latest experiments early online in the journal Nature Chemical Biology.

"We found that there can be unintended consequences that haven't been appreciated before," said You. "In a population of identical cells, some can act one way while others act in another. However, this process appears to occur in a predictable manner, which allows us to take into account this effect when we design circuits."

Bistability is not unique to biology. In electrical engineering, for example, bistability describes the functioning of a toggle switch, a hinged switch that can assume either one of two positions – on or off.

"The prevailing wisdom underestimated the complexity of these synthetic circuits by assuming that the genetic changes would not affect the operation of the cell itself, as if the cell were a passive chassis," said Tan. "The expression of the genetic alteration can drastically impact the cell, and therefore the circuit.

"We now know that when the circuit is activated, it affects the cell, which in turn acts as an additional feedback loop influencing the circuit," Tan said. "The consequences of this interplay have been theorized but not demonstrated experimentally."

The scientists conducted their experiments using a genetically altered colony of the bacteria Escherichia coli (E.coli) in a simple synthetic circuit. When the colony of bacteria was stimulated by external cues, some of the cells went to the "on" position and grew more slowly, while the rest went to the "off" position and grew faster.

"It is as if the colony received the command not to expand too fast when the circuit is on," Tan explained. "Now that we know that this occurs, we used computer modeling to predict how many of the cells will go to the 'on' or 'off' state, which turns out to be consistent with experimental measurements"

The experiments were supported by the National Science Foundation, the National Institutes of Health and a David and Lucille Packard Fellowship. Duke's Philippe Marguet was also a member of the research team.

Graphite mimics iron's magnetism

Researchers of Eindhoven University of Technology and the Radboud University Nijmegen in The Netherlands show for the first time why ordinary graphite is a permanent magnet at room temperature. The results are promising for new applications in nanotechnology, such as sensors and detectors. In particular

graphite could be a promising candidate for a biosensor material. The results will appear online on 4 October in Nature Physics.
Graphite is a well-known lubricant and forms the basis for pencils. It is a layered compound with a weak inter-layer interaction between the individual carbon (graphene) sheets. Hence, this makes graphite a good lubricant.

Unexpected

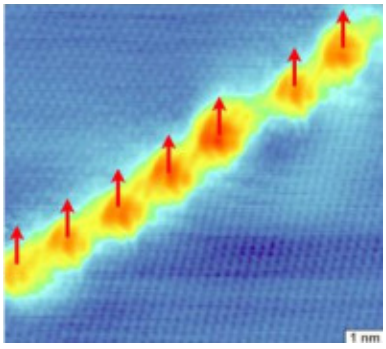
It is unexpected that graphite is ferromagnetic. The researchers Jiri Cervenka and Kees Flipse (Eindhoven University of Technology) and Mikhail Katsnelson (Radboud University Nijmegen) demonstrated direct evidence for ferromagnetic order and explain the underlying mechanism. In graphite well ordered areas of carbon atoms are separated by 2 nanometer wide boundaries of defects. The electrons in the defect regions (the red/yellow area in picture 1) behave differently compared to the ordered areas (blue in picture 1), showing similarities with the electron behaviour of ferromagnetic materials like iron and cobalt.

Debate settled

The researchers found that the grain boundary regions in the individual carbon sheets are magnetically coupled, forming 2-dimensional networks (picture 2). This interlayer coupling was found to explain the permanent magnetic behaviour of graphite. The researchers also show experimental evidence for excluding magnetic impurities to be the origin of ferromagnetism, ending ten years of debate.

Carbon in spintronics

Surprisingly, a material containing only carbon atoms can be a weak ferromagnet. This opens new routes for spintronics in carbon-based materials. Spins can travel over relative long distances without spin-flip scattering and they can be flipped by small magnetic fields. Both are important for applications in spintronics. Carbon is biocompatible and the explored magnetic behaviour is therefore particularly promising for the development of biosensors.



The electron density of states on a grain boundary of defects. The arrows (pointing in the reader's direction) indicate the direction of the magnetic moments. **Kees Flipse, Eindhoven University of Technology**

Publication Nature Physics *The paper in Nature Physics " Room-temperature ferromagnetism in graphite driven by 2D networks of point defects" by Jiri Cervenka, Mikhail Katsnelson and Kees Flipse will appear online Sunday 4 October, 7:00 pm CET. The paper can be found under DOI 10.1038/NPHYS1399. The research was funded by Nanoned and FOM.*

Breast cancer deaths drop over past two decades

By Katherine Harmon

The number of women who die from breast cancer has decreased slowly (about 2 percent per year) but steadily since 1990, according to a new report by the American Cancer Society (ACS), released to mark the start of Breast Cancer Awareness Month. Breast cancer is the most common cancer—other than skin cancer—for women in the U.S., and it is second only to lung cancer as the most deadly. More than 40,000 women will die from breast cancer this year, the ACS reports.

"Breast cancer remains a major fear for women living in the U.S. and a major cause of cancer death," Otis Brawley, ACS's chief medical officer said in a prepared statement. But, he added, "We've now identified major risk factors for breast cancer, many of which are modifiable."

One of the major contributors to the drop, the report authors note, has been a decrease in the use of post-menopausal hormone treatments. Other risk factors that can help to stave off the disease, according to current medical research, include exercise, maintaining a healthy weight and consuming less than two alcoholic beverages per day.

Despite the encouraging news, the rates of breast cancer diagnosis and death, however, are still unequal among races. Although white women are more likely to be diagnosed with the disease, black women have a 40 percent higher death rate, a statistic the ACS attributes in part to a lack of access in some minority communities to crucial early detection measures, such as frequent mammograms.

"The steady drop in the breast cancer death rate means that this year alone, about 15,000 breast cancer deaths were avoided," John Seffrin, C.E.O. of ACS, said in a prepared statement. Part of the decline may be due in part to the massive awareness campaigns that have brought fundraising walks to towns nationwide and even pink equipment to football players in the National Football League, as The New York Times recently reported.

As many note, however, it will likely take more than pink rubber wrist bands to continue to improve the numbers. It will be important to increase the rate of early detection, especially in underserved populations, and to reduce the incidence of avoidable risk factors, such as ever-increasing obesity, Bloomberg News reported. "We have a tremendous opportunity to improve the numbers," Ahmedin Jemal, a co-author on the report and epidemiologist told Bloomberg.