

Wind turbines make bat lungs explode

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* **Catherine Brahic**

"Beware: exploding lungs" is not a sign one would expect to see at a wind farm. But a new study suggests this is the main reason bats die in large numbers around wind turbines.

The risk that wind turbines pose to birds is well known and has dogged debates over wind energy. In fact, several studies have suggested the risk to bats is greater. In May 2007, the US National Research Council published the results of a survey of US wind farms showing that two bat species accounted for 60% of winged animals killed. Migrating birds, meanwhile, appear to steer clear of the turbines.

Why bats - who echolocate moving objects - are killed by turbines has remained a mystery until now. The research council thought the high-frequency noise from the turbines' gears and blades could be disrupting the bats' echolocation systems.

In fact, a new study shows that the moving blades cause a drop in pressure that makes the delicate lungs of bats suddenly expand, bursting the tissue's blood vessels. This is known as a barotrauma, and is well-known to scuba divers.

"While searching for bat carcasses under wind turbines, we noticed that many of the carcasses had no external injuries or no visible cause of death," says Erin Baerwald of the University of Calgary in Canada.

Internal injuries

Baerwald and colleagues collected 188 dead bats from wind farms across southern Alberta, and determined their cause of death. They found that 90% of the bats had signs of internal haemorrhaging, but only half showed any signs of direct contact with the windmill blades. Only 8% had signs of external injuries but no internal injuries.

The movement of wind-turbine blades creates a vortex of lower air pressure around the blade tips similar to the vortex at the tip of aeroplane wings. Others have suggested that this could be lethal to bats, but until now no-one had carried out necropsies to verify the theory.

Baerwald and her colleagues believe that birds do not suffer the same fate as bats - the majority of birds are killed by direct contact with the blades - because their lungs are more rigid than those of bats and therefore more resistant to sudden changes in pressure.

Bats eat nocturnal insects including agricultural pests, so if wind turbines affected their population levels, this could affect the rest of the local ecosystems. And the effects could even be international. "The species being killed are migrants," says Baerwald. "If bats are killed in Canada that could have consequences for ecosystems as far away as Mexico."

Windy day

One solution could be to increase the minimum wind speed needed to set the blades in motion. Most bats are more active in low wind.

The study was funded by a number of bat conservation groups together with energy companies with a financial interest in wind energy, such as Shell Canada and Alberta Wind Energy.

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How 'secondary' sex characters can drive the origin of species

BLOOMINGTON, Ind. -- The ostentatious, sometimes bizarre qualities that improve a creature's chances of finding a mate may also drive the reproductive separation of populations and the evolution of new species, say two Indiana University Bloomington biologists.

In the September 2008 issue of *Evolution* (now online), Armin Moczek and Harald Parzer examine males from four geographically separated populations of the horned beetle species *Onthophagus taurus*. The beetles have diverged significantly in the size of the male copulatory organ, and natural selection operating on the other end of the animal -- horns atop the beetles' heads -- seems to be driving it.

"Biologists have known that in these beetles there is an investment trade-off between secondary sexual characters and primary sexual characters," Moczek said. "As horns get bigger, copulatory organs get smaller, or vice versa. What was not known was how frequently and how fast this can occur in nature, and whether this can drive the evolution of new species."

Structures directly involved in mating are known as primary sexual characters, whereas combat structures like horns -- or seductive attributes like a cardinal's vibrant plumage or a bullfrog's deeply resonant baritone -- are known as secondary sexual characters.

Evolutionary biologists believe changes in copulatory organ size and shape can spur speciation by making individuals from different populations sexually incompatible.

Native to Italy, *O. taurus* exists in other parts of the world only because of recent human activity. This means, Moczek and Parzer say, that the marked divergences they observed in *O. taurus*'s horn and copulatory organ size must have occurred over an extremely short period of time -- 50 years or less.

Despite what many of us are led to believe, variation in male copulatory organ size within species tends to be very low, humans and beetles included. Yet the four *O. taurus* populations Moczek and Parzer studied in the U.S. (North Carolina), Italy, and western and eastern Australia, exhibit substantial changes in both horn and genitalia length -- as much as 3.5 times, in terms of an "investment" index the scientists devised that takes body size into account.

The scientists examined 10 other *Onthophagus* species, and as expected, they found vast differences between the species regarding horn and male copulatory organ size. Moczek says this suggests that trade-offs between primary and secondary sexual traits continue to shape the way species diverge well after speciation has occurred.

The speed and magnitude of divergence within *O. taurus* presents something of a paradox. How is it that copulatory organ size can be so rigorously maintained within the populations of a single species, yet appear so restless to change?

"In terms of the integrity of a species, it's important for these things not to change too much," Moczek explains. "So there is a lot of evidence suggesting that within species or within the populations of species, natural selection maintains genital characters. But if these primary sex characters are linked to other characters that can change readily, then you've got what we think is a very exciting mechanism that could prime populations for reproductive isolation."

Horn length and shape can change for many reasons, Moczek says. Among densely populated species, fighting (which favors large horns) may not be an effective strategy for winning mates. As combative males fight each other, a diminutive, smaller-horned male could simply employ a sneaking strategy to gain access to unguarded females. Under these circumstances, reduced investment in horns seems to result in larger copulatory organs. Alternately, in lower density populations, most male beetles spend a great deal of time fighting. Longer, bigger horns could serve these males well -- and also lead to smaller genitalia.

"If this is all it takes to change genitalia, it may be easier to make new species than we thought," Moczek said.

The notion that genital size is related to the origin of species is not new. But how they are related has perplexed evolutionary biologists. The individuals of most species do not choose mates according to the size and shape of genitalia. Indeed, genitalia may not be relevant until the latter stages of courtship, if at all.

An early "lock and key" model of reproductive isolation was first proposed by L. Dufour in 1844 to explain why some pairs of species, outwardly identical in every way, are unable to mate.

Research discussed in the Evolution paper was supported by grants from the National Science Foundation.

Cattle shown to align north-south

By Elizabeth Mitchell Science reporter, BBC News

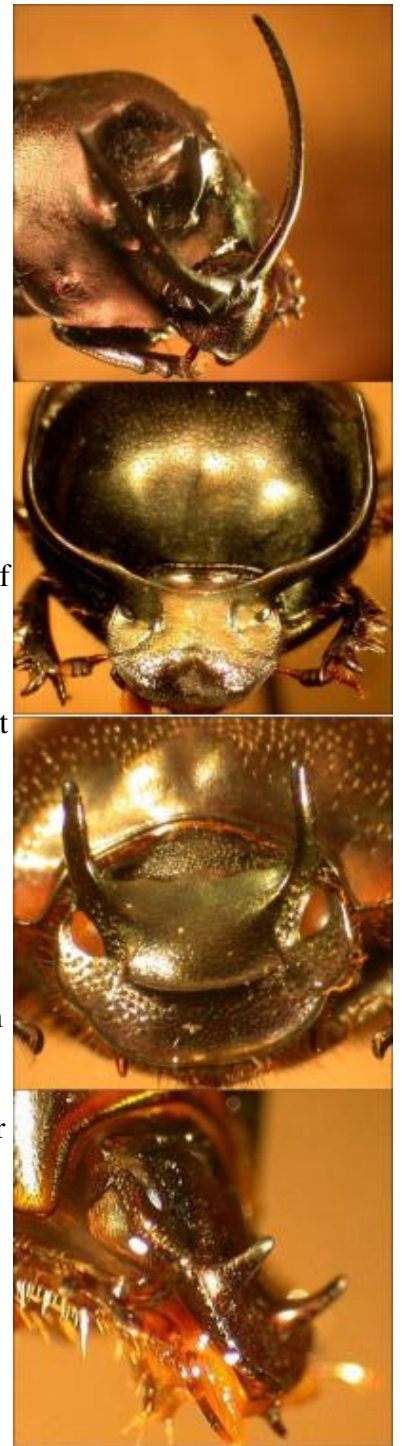
Have you ever noticed that herds of grazing animals all face the same way?

Images from Google Earth have confirmed that cattle tend to align their bodies in a north-south direction. Wild deer also display this behaviour - a phenomenon that has apparently gone unnoticed by herdsmen and hunters for thousands of years.

In the Proceedings for the National Academy of Sciences, scientists say the Earth's magnetic fields may influence the behaviour of these animals.

The Earth can be viewed as a huge magnet, with magnetic north and south situated close to the geographical poles. Many species - including birds and salmon - are known to use the Earth's magnetic fields in migration, rather like a natural GPS. A few studies have shown that some mammals - including bats - also use a "magnetic compass" to help their sense of direction.

Dr Sabine Begall, from the University of Duisburg-Essen, Germany, has mainly studied the magnetic sense of mole rats - African animals that live in underground tunnels.



"We were wondering if larger animals also have this magnetic sense," she told BBC News.

Dr Begall and colleagues first decided to study the natural behaviour of domestic cattle.

The researchers surveyed Google Earth images of 8,510 grazing and resting cattle in 308 pasture plains across the globe.



Cattle partake in some directional grazing

"Sometimes it took hours and hours to find some pictures with good resolution," said Dr Begall.

The scientists were unable to distinguish between the head and rear of the cattle, but could tell that the animals tended to face either north or south.

Their study ruled out the possibility that the Sun position or wind direction were major influences on the orientation of the cattle.

Dr Begall said: "In Africa and South America, the cattle (were) shifted slightly to a more north-eastern-south-western direction. "But it is known that the Earth's magnetic field is much weaker there," she explained. The researchers also recorded the body positions of 2,974 wild deer in 277 locations across the Czech Republic.

Their fieldwork revealed that the majority of grazing and resting deer face northward. About one-third of the deer faced southward. "That might be some kind of anti-predatory behaviour," speculated Dr Begall.

Willy Miller - a Scottish cattle farmer - remarked: "I've never noticed that my cows all face the same way."

Cows are social animals: "[They] all sit down before it rains [and] huddle together in a circle formation during blizzards. But from a cow's point of view, that's just sensible," he told BBC News.

Professor John Phillips, a sensory biologist from Virginia Tech University, US, commented that this sixth magnetic sense might be "virtually ubiquitous in the animal kingdom".

He added: "We need to think about some really fundamental things that this sensory ability provides in animals." The challenge remains for scientists to explain how the animals behave in this way - and if Scottish cattle are the exception to the rule! *Story from BBC NEWS: <http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/7575459.stm>*

New hope for stroke patients

Loyola researchers hope to reverse stroke damage by jumpstarting growth of nerve fibers

MAYWOOD, Ill. -- If a stroke patient doesn't get treatment within approximately the first three hours of symptoms, there's not much doctors can do to limit damage to the brain.

But now researchers report a technique that potentially could restore functions to patients weeks or even months after a stroke. The technique involves jumpstarting the growth of nerve fibers to compensate for brain cells destroyed by the stroke.

"In the best-case scenario, this would open up the window of time that people could recover and go back to normal functional status," said Gwendolyn Kartje, MD, Ph.D., a professor in the department of cell biology, neurobiology and anatomy and department of neurology at Loyola University Chicago Stritch School of Medicine in Maywood, Ill. and chief of neuroscience research at Edward Hines Jr. VA Hospital in Hines, Ill.

Kartje and colleagues described the experimental approach, called anti-nogo-A immunotherapy, in a recent review article in the journal *Topics in Stroke Rehabilitation*.

Anti-nogo has dramatically improved functions in lab animals that have experienced strokes. And an ongoing clinical trial in Europe and Canada is testing anti-nogo in humans who have suffered spinal cord injuries.

Most strokes are caused by clots that block blood flow to one part of the brain, killing brain cells within hours. The drug TPA can minimize damage by dissolving the clot. But TPA is safe and effective only when given within about three hours of the onset of symptoms. Most patients don't receive treatment within that brief window. Patients typically arrive at the hospital too late, or hospitals do not begin administering TPA soon enough.

Anti-nogo is among several new approaches under study that potentially could reverse stroke damage, researchers wrote. Nogo-A is a protein that inhibits the growth of nerve fibers called axons. It serves as a check on runaway nerve growth that could cause a patient to be overly sensitive to pain, or experience involuntary movements. (The protein is called nogo because it in effect says to axons: "No go.") In anti nogo immunotherapy, an antibody disables the nogo protein.

The left side of the brain controls movements on the right side of the body, and vice versa. Thus, a stroke on the left side of the brain can cause paralysis on the right side of the body. In such a patient, anti-nogo would, it's

hoped, spur the growth of axons from the healthy right side of the brain. These axons would then grow into the right side of the body and restore functions lost by the stroke.

Anti-nogo has been tried on rats that have experienced strokes in old age. As in people, strokes in rats affect one side of the body. Following strokes, the rats were unable to pick up pellets of food with the front paw on the affected side. After anti-nogo, function in this paw was almost completely restored in some rats.

The Swiss pharmaceutical company Novartis is sponsoring a phase 1 clinical trial of anti-nogo for patients paralyzed by spinal cord injuries. Kartje believes anti-nogo also has great potential for stroke patients. A clinical trial for stroke patients could begin as early as 2012, she said. Loyola is among the potential sites for such a trial.

Anti-nogo "offers the potential for stroke patients to recover, return to nearly normal functional status, and stay out of nursing homes," Kartje said. "Theoretically, there's no reason why this should not happen."

Kartje began studying the nogo protein in 1992, and has published numerous papers on the topic. Her lab at Hines is funded by the Veterans Administration, with additional funding from the National Institutes of Health, Neuroscience Institute at Loyola University Chicago Stritch School of Medicine, Falk Foundation and Illinois Regenerative Medicine Institute.

Researchers find high levels of toxic metals in herbal medicine products sold online

Boston, MA--Researchers at Boston University School of Medicine (BUSM) have found that one fifth of both U.S.-manufactured and Indian-manufactured Ayurvedic medicines purchased via the Internet contain lead, mercury or arsenic. These findings appear in the August 27th issue of the Journal of the American Medical Association (JAMA).

Ayurveda is a form of medicine that originated in India more than 2,000 years ago and relies heavily on herbal products. In India, an estimated 80 percent of the population practices Ayurveda. In the United States, Ayurvedic remedies have increased in popularity and are available from South Asian markets, health food stores, and on the Internet. Ayurvedic medicines are divided into two major types: herbal only and rasa shastra. Rasa shastra is an ancient practice of deliberately combining herbs with metals, minerals and gems. Ayurvedic experts in India believe that if Rasa Shastra medicines made with metals such as lead and mercury are properly prepared and administered, they will be safe and therapeutic.

Using an Internet search, the researchers identified 25 Web sites featuring 673 Ayurvedic medicines. They randomly selected and purchased 193 products made by 37 different manufacturers for analyses. Overall, 20.7 percent of Ayurvedic medicines contained detectable lead, mercury and/or arsenic. U.S. and Indian manufactured products were equally likely to contain toxic metals. Rasa shastra compared with non-rasa shastra medicines were more than twice as likely to contain metals and had higher concentrations of lead and mercury. Among products containing metals, 95 percent were sold by U.S. Web sites and 75 percent claimed Good Manufacturing Practices or testing for heavy metals. All metal-containing products exceeded one or more standards for acceptable daily intake of toxic metals.

"This study highlights the need for Congress to revisit the way dietary supplements are regulated in the U.S.," said lead author Robert Saper, MD, MPH, Director of Integrative Medicine in the Family Medicine Department at BUSM. Saper first published on this topic in December, 2004 (JAMA). In that study he and his colleagues found 20% of Ayurvedic medicines produced in South Asia only and available in Boston area stores contained potentially harmful levels of lead, mercury, and/or arsenic. "Our first priority must be the safety of the public. Herbs and supplements with high levels of lead, mercury, and arsenic should not be available for sale on the Internet or elsewhere," he said.

Saper adds, "We suggest strictly enforced, government mandated daily dose limits for toxic metals in all dietary supplements and requirements that all manufacturers demonstrate compliance through independent third-party testing."

"The medicines which are supposed to cure sickness should not promote another illness due to the presence of toxic materials such as lead," said co-author Venkatesh Thuppil, PhD, Director of the National Referral Centre for Lead Poisoning in India, as well as a Professor at St. John's Medical College in India.

History of nonmelanoma skin cancer is associated with increased risk for subsequent malignancies

Individuals with a history of nonmelanoma skin cancer (NMSC) are at increased risk for other cancers, according to a study published in the August 26 online issue of the Journal of the National Cancer Institute.

Previous studies have documented that people who have had nonmelanoma skin cancer were at increased risk for developing melanoma, but it is less well-established whether they were also at risk for cancers that do not involve the skin.

In the current study, Anthony Alberg, Ph.D., of the Medical University of South Carolina and colleagues analyzed data from a prospective cohort study called CLUE II, which was established in Washington County,

Md., in 1989. Alberg's team compared the risk of malignancies in 769 individuals who had been diagnosed with nonmelanoma skin cancer and 18,405 individuals with no history of the disease during a 16-year follow-up period.

The overall incidence of cancers was 293.5 cases per 10,000 person-years in the participants with a history of nonmelanoma skin cancer and 77.8 per 10,000 in those individuals without a history of skin cancer. After adjusting for other known variables associated with cancer risk, including age, sex, body mass index, smoking status, and education level, the researchers found that individuals with a history of nonmelanoma skin cancer had a two-fold increase in the risk of subsequent cancers compared with individuals with no skin cancer history.

The increased risk remained statistically significant when the researchers removed melanoma from the list of subsequent cancers, indicating that the elevated risk was not restricted to melanoma. The association was observed for both types of nonmelanoma skin cancer, basal cell and squamous cell carcinoma.

The strongest association between a history of skin cancer and subsequent malignancies was seen in the youngest study participants, aged 25 to 44 years. "This pattern of associations, with earlier age of [nonmelanoma skin cancer] diagnosis being linked more strongly to the risk of developing subsequent malignancies, is consistent with the pattern that one would expect for a marker of inherited predisposition to cancer," the authors write.

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Pollutants cause birds to sing tainted love songs

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* **Ewen Callaway**

Traces of a chemical once used by power plants leave birds looking fit, but singing another tune altogether. Wild chickadees exposed to permitted levels of polychlorinated biphenyls (PCBs) can't keep a tune as well as other birds.

Because females go for males with the best songs, PCB-exposed birds might lose out on mates, says Sara DeLeon, an ecologist at Cornell University in Ithaca, New York, who presented her research at a recent conference at the university.

"The birds are living, not dying, but [PCBs] are affecting some part of their life cycle," she says.

Researchers have long known that some chemicals, such as DDT, can throw off a bird's song, but none have determined whether exposure to trace amounts in the wild can influence songs and mating.

DeLeon and her team examined chickadees living along New York's Hudson River, not far from a General Electric power plant that used PCB insulators from 1907 until the 1970s, dumping some 500,000 kilograms of the toxic chemical into the river.

The US government ordered GE to clean the PCB-contaminated waters, one of the country's largest waste cleanups. Yet traces remain in many sites on the river, but below government safety levels, DeLeon says.

Blurred notes

Although numerous songbirds live along the Hudson, DeLeon's team focused on black-capped chickadees, small birds with a two-note song. The best singers mix up the notes they sing, but the ratio between the two notes tends to stay the same.

PCB-exposed birds, on the other hand, sing all over the register. Birds that attempted to sing several different "remixes" of the two-note song belted out songs with the notes too far apart. While birds that sing just one tune tend to blur the two notes together.

DeLeon's team made the discovery after analysing the songs with a computer program. The difference is only apparent to her when she can see the song as a visual spectrogram, she says.

The poorer vocal performances could arise because PCBs stunt growth and development in a part of the brain important for song, says Tim DeVoogd, a neuroscientist also from Cornell.

Population threat

"One of things they can do is mess up hormone receptors in the brain, and you need hormone receptors to develop correctly— to be either male-like or female-like," he says. "The birds might look like they are just fine, but they either can't produce a song or can't find a mate."

Yet not all chemicals make for shoddy songs. Earlier this year, a team of UK researchers discovered that oestrogen-mimicking compounds, such as bisphenol A, endow starlings with more complex songs that females prefer over chemical-free songs.

"It was kind of scary because their immune system was shot to hell," DeLeon says of the starlings. "The females were preferring males that were singing better, but [the song] wasn't an honest signal of quality."

This could steadily dilute the starling gene pool, a worrying prospect that could threaten some populations.

Yet even female choice against chemically tainted birds, as is the case with the Hudson River chickadees, can threaten local birds if males don't seem a good mating prospect and females move elsewhere in search of untainted love, DeLeon says. "Populations could end up declining and birds might not end up living there."

Bone parts don't add up to conclusion of Palauan dwarfs

University of Oregon skeletal and dental expert helps rebut recent widely publicized claims

Misinterpreted fragments of leg bones, teeth and brow ridges found in Palau appear to be an archaeologist's undoing, according to researchers at three institutions. They say that the so-called dwarfs of these Micronesian islands actually were modern, normal-sized hunters and gatherers.

In a paper published Aug. 27 in PLoS ONE, an open access journal of the Public Library of Science, scientists from the University of Oregon, North Carolina State University and the Australian National University refute the conclusion of Lee R. Berger and colleagues that Hobbit-like little people once lived there.

"Our evidence indicates the earliest inhabitants of Palau were of normal stature, and it counters the evidence that Berger, et al, presented in their paper indicating there was a reduced stature population in early Palau," said University of Oregon anthropologist Greg C. Nelson. "Our research from whole bones and whole skeletons indicates that the earliest individuals in Palau were of normal stature but gracile. In other words, they were thin."

Berger, an American-raised paleoanthropologist at the University of the Witwatersrand in Johannesburg, South Africa, stunned archaeologists in March with his claim -- based on skeletal fragments collected from two caves exposed to tidal activity -- that small-bodied humans may have lived in isolation and suffered from insular dwarfism on the islands 1,000 to 3,000 years ago. Berger initially found fragmented human remains while vacationing in Palau, and returned later for excavations under a grant from the National Geographic Society.

Nelson and NCSU anthropologist Scott M. Fitzpatrick, who earned his doctorate at the UO and based his dissertation on Palauan culture, reviewed full skeletal remains and cultural evidence dating back to almost 3,500 years ago. Their Australian co-author Geoffrey Clark also has studied multiple Palauan cultural sites dating to approximately 3,000 years ago.

They argue that Berger, an expert on much earlier humans dating to the Pleistocene, failed to review existing documentation, much of it published by Nelson or Fitzpatrick. Much of their rebuttal comes from remains unearthed by Fitzpatrick and Nelson at Chelechol ra Orrak, only miles from Berger's two sites. Among these whole remains are bone pieces that match -- some are even smaller than fragments found by Berger -- and come from much larger bodies than those claimed by Berger.

"I think Berger's primary mistakes were his not understanding the variation in the skeletal population in which he was working, using fragmentary remains again in a situation where he didn't understand variation, and stepping outside his own area of expertise, which, I think all scientists try not to do but sometimes we do," Nelson said.

In their paper, Nelson, Fitzpatrick and Clark provide detailed information on the island chain's geography, early migration patterns and cultural history based on a meta-analysis of their own research and studies done by others on the islands.

"Although we have not seen the material that Berger et al base their results on, we can speak to the diversity and normalcy of human skeletal series from throughout the archipelago that have been excavated from several burial caves over the last decade, as well as the an abundance of archaeological, linguistic and historical data indicating a general continuity of cultural traits over a period of three millennia," they wrote in the paper. "Archaeological data also do not suggest a separate isolated group evolving differently (biologically or culturally), although there are subtle differences and changes that occur through time."

Skeletal evidence, Nelson said, reveals three main areas where Berger's conclusions were flawed:

* Berger, as his primary evidence of the existence of small stature humans, pointed to fragments of femoral heads, the round balls atop the body's longest bone that connects it to the hip. Nelson concurs that these heads were often small compared to today's humans but that they connected femurs of modern-sized individuals -- with females averaging about 5-foot, 1-inch in height -- who were slightly built and subsisted off available food sources. At least two femoral heads analyzed by Nelson from full skeletons were smaller than those cited by Berger. Having an intact femur provides a usually accurate starting point for extrapolating body height.

* Berger argued that his fragmentary cranial evidence indicated brow ridges common to very ancient human foreheads (picture those of Neanderthals). Nelson and colleagues argue that all cranial measurements they analyzed point to modern-sized heads. They also noted that limestone dissolved in water -- very common to the

island chain's karst environment -- running across bodies buried at or just below the surface will create the easily misinterpreted lumpy appearance on brow ridges.

* Berger said teeth and orthodontia fragments suggested megadontism -- abnormally large teeth, a condition common in the pre-modern, small-bodied hominins that he often studies. Nelson says that large teeth were indeed common in early Palauans but simply reflected a hunter-gatherer society. Smaller teeth evolved as cultures turned to agriculture, he said. "Had [Berger's team] compared their scant dental metric data with those of other regions in the Pacific, or elsewhere in the world, they would have seen that large teeth are not uncommon in early peoples of these regions," Nelson and colleagues wrote.

"One of his biggest mistakes was rushing to publish," Nelson said of Berger. "He did not take the time to understand the area in which he was working -- its entire history, not just the skeletal stuff," he said. "Any time you work anywhere, you have to understand this history. You just can't walk in and cowboy it, pull some stuff out and draw conclusions in the absence of understanding the bigger picture."

Global survey highlights need for cancer prevention campaigns to correct misbeliefs

GENEVA, Switzerland – Many people hold mistaken beliefs about what causes cancer, tending to inflate the threat from environmental factors that have relatively little impact while minimizing the hazards of behaviours well established as cancer risk factors, according to the first global survey on the topic.

The survey, conducted by Roy Morgan Research and Gallup International on behalf of the International Union of Against Cancer (UICC), identified key areas where misconceptions could be addressed and where lives could be saved.

The survey involved interviewing 29,925 people in 29 countries across the globe during the last year. It is the first study to provide internationally comparable data on perceptions about cancer risk factors. The results, which allow for comparison between high-, middle- and low-income countries, were released Wednesday at the UICC's World Cancer Congress in Geneva.

Key findings from the survey include:

* People in high-income countries were the least likely to believe that drinking alcohol increases the risk of cancer. In that group, 42% said alcohol does not increase the risk. That compares with only 26% of respondents in middle-income countries and 15% in low-income countries saying that alcohol use does not increase the risk of cancer. In fact, cancer risk rises as alcohol intake increases.

* In high-income countries, the hazards of not eating enough fruits and vegetables scored more highly as a perceived risk (59%) than alcohol intake did (51%), even though the scientific evidence for the protective effect of fruit and vegetables is weaker than the evidence that alcohol intake is harmful.

* In rich countries, stress (57%) and air pollution (78%) scored higher as perceived risk factors for cancer than did alcohol intake. However, stress is not recognized as a cause of cancer and air pollution is a minor contributor compared with alcohol consumption.

* People in low- and middle-income countries have more pessimistic beliefs about cancer treatment than those in high-income countries. One of the more important problematic beliefs in lower-income countries concerned perceptions about the curability of cancer. The survey found that in such countries 48% said that "not much can be done" to cure cancer or that they didn't know whether anything could be done. That compares with 39% in middle-income countries and 17% in high-income countries. Such a misbelief is worrying because it might deter people from participating in cancer screening programmes, which are important for saving lives.

* In general, people in all countries are more ready to accept that things outside of their control might cause cancer (such as air pollution), than things that are within their own control (such as overweight, which is a well-established cancer risk factor).

* An astonishing 75% percent of people in low-income countries said their preference was for their doctor to make all the treatment decisions. Only 8% said the doctor and patient should decide together and 9% said the patient should decide. That compares with a preference in rich countries for a more equitable decision-making style that emphasises self-determination, with 72% saying either that the decision should be made together or rest with the patient alone.

Dr David Hill, President-Elect of UICC and director of the Cancer Council Victoria in Melbourne, Australia, whose team analyzed the survey data, said governments around the world will now have solid data to use to put in place education campaigns to address these beliefs and change them to save lives.

"The survey reveals there are some big unheard messages. These kind of data help us to quantify the differences between countries and to highlight where additional efforts are needed. Some of these countries have rarely had any population survey data to help their programme planning efforts," he said.

"We know that people need to be given a reason why they should change. They need to be shown how to change; they need to be given resources or support to change; they need to remember to change and they need

positive reinforcement for changing. Many of these principles can be applied in designing education programmes to encourage and support behaviour change," he said.

Dr Hill said the UICC would use the data to push a worldwide agenda to ensure people had more accurate knowledge of cancer as a basis for making cancer control programmes as effective as they can be.

Notes to reporters:

High-income countries included in the survey: Australia, Austria, , Canada, Czech Republic, Greece, Israel, New Zealand, Spain, UK, USA

Middle-income countries: Bolivia, China, Dominican Republic, Georgia, Guatemala, Indonesia, Lebanon, Mexico, Panama, Peru, Philippines, Romania, Serbia, Turkey, Ukraine, Venezuela, Uruguay

Low-income countries: Kenya, Nigeria

About the International Union Against Cancer (UICC): UICC is the only global non-governmental organization devoted exclusively to cancer prevention, treatment and care, with members in 100 countries.

Stick with simple antibiotics for pneumonia to avoid super bugs, says researcher
Australian hospitals should avoid prescribing expensive broad-spectrum antibiotics for pneumonia to avoid the development of more drug-resistant super bugs, according to a University of Melbourne study

Australian hospitals should avoid prescribing expensive broad-spectrum antibiotics for pneumonia to avoid the development of more drug-resistant super bugs, according to a University of Melbourne study.

The study, by PhD researcher and Austin Health Infectious Diseases consultant, Dr Patrick Charles, shows that only 5 per cent of people admitted to hospital with community-acquired pneumonia had infections caused by organisms that could not be successfully treated with penicillin combined with an "atypical" antibiotic such as doxycycline or erythromycin.

In the world's largest study of its kind, Dr Charles studied almost 900 people admitted to six Australian hospitals over 28 months from 2004 to 2006.

Dr Charles' research analysed samples of blood, urine, sputum and viral swabs of the nose and throat taken from 885 patients at the Austin, Alfred, Monash and West Gippsland hospitals in Victoria, the Royal Perth Hospital and Princess Alexandra Hospital, Brisbane.

He found that most cases of pneumonia were caused by easy to treat bacteria such as the pneumococcus or Mycoplasma, or alternatively by respiratory viruses that do not require antibiotic therapy.

Only five per cent of cases were caused by organisms that would require more expensive and broad-spectrum antibiotics, and these cases were nearly all in patients who'd had frequent hospital admissions or were residents of nursing homes.

"The study results show that current Australian guidelines for prescribing antibiotics for pneumonia are appropriate," Dr Charles said.

"It shows that Australian doctors should resist the push which is occurring in some parts of the world – particularly the US - to prescribe broad spectrum antibiotics to treat essentially all possible causes."

Dr Charles said the trend towards broad-spectrum antibiotics was being driven by laboratory-based studies of resistance rates in bacteria sent to the labs, rather than clinical studies of patients with pneumonia.

In the laboratory-based studies, the bacterial isolates often come from highly selected patients with more difficult to treat disease.

In addition, the fear of litigation made some doctors unnecessarily opt for more aggressive treatments.

However, the more frequently these broad-spectrum antibiotics were used, the more likely it was that bacteria would be become resistant to them.

"The emergence of antibiotic-resistant bacterial pathogens is one of the biggest threats to Australian health care standards and is closely linked to the inappropriate use of antibiotics," Dr Charles said.

"By continuing to use more traditional antibiotics to treat most cases of pneumonia, Australian doctors can limit or delay the emergence of more resistant strains of bacteria.

"By using the broad-spectrum antibiotics less often, we can also prolong the effective lifespan of these drugs.

"Furthermore, in the US, Canada and some parts of Europe, they are seeing some serious complications which appear to be related to the overuse of some classes of broad-spectrum antibiotics that are frequently used there to treat respiratory infections."

Dr Charles is a physician in Infectious Disease and General Medicine at the Austin Hospital in Melbourne. He is also an Honorary Lecturer in the University of Melbourne's Department of Medicine at the Hospital.

His study was recently published in the journal Clinical Infectious Diseases and he will be conferred with a PhD for his research tomorrow (27 August) at the University of Melbourne.

He received funding from the independent 201CC Research Fund to complete the study.

Scientists unmask brain's hidden potential

New findings explain how the brain compensates for vision loss; suggests much more versatility than previously recognized

BOSTON – Previous research has found that when vision is lost, a person's senses of touch and hearing become enhanced. But exactly how this happens has been unclear.

Now a long-term study from the Berenson-Allen Center for Noninvasive Brain Stimulation at Beth Israel Deaconess Medical Center (BIDMC) demonstrates that sudden and complete loss of vision leads to profound – but rapidly reversible -- changes in the visual cortex. These findings, reported in the August 27 issue of the journal PLOS One, not only provide new insights into how the brain compensates for the loss of sight, but also suggest that the brain is more adaptable than originally thought.

"The brain's ability to reorganize itself is much greater than previously believed," explains senior author Alvaro Pascual-Leone, MD, PhD, Director of the Berenson-Allen Center and Professor of Neurology at Harvard Medical School (HMS). "In our studies [in which a group of sighted study subjects were blindfolded for five days], we have shown that even in an adult, the normally developed visual system quickly becomes engaged to process touch in response to complete loss of sight. The speed and dynamic nature of the changes we observed suggest that rather than establishing new nerve connections – which would take a long time – the visual cortex is unveiling abilities that are normally concealed when sight is intact."

Or, as first author Lotfi Merabet, OD, PhD, describes, "In a sense, by masking the eyes, we unmask the brain's compensatory potential."

The scientists had previously shown that study subjects with normal vision who are blindfolded for a five-day period performed better than non-blindfolded control subjects on Braille tests. Subsequent brain scans found that blindfolded subjects also experienced dramatic changes in the brain's visual cortex.

In this study, the authors set out to determine the origins of these outcomes: Were they the result of new nerve connections being developed? Or were latent capabilities in the brain's visual cortex being "unmasked" in response to the loss of sight?

"We recruited 47 subjects to participate in the study," explains Merabet, Assistant Professor of Ophthalmology and Neurology at HMS. "Half of the study participants remained completely blindfolded, 24 hours a day, for a total of five days under the careful watch of the staff of BIDMC's General Clinical Research Center. The other half were only blindfolded for testing, but spent the rest of the day seeing normally. During their stays, both sets of study participants underwent intensive Braille instruction for four to six hours a day from a professional instructor from the Carroll Center for the Blind."

The study participants also underwent serial brain scans (known as fMRI or functional magnetic resonance imaging) at both the beginning and end of the five-day study period.

As predicted, the researchers found that the subjects who were blindfolded were superior at learning Braille than their non-blindfolded counterparts. Furthermore, the brain scans of the blindfolded subjects showed that the brain's visual cortex had become extremely active in response to touch (in contrast to the initial scan in which there was little or no activity). Twenty-four hours after the blindfolds were removed, the subjects were re-scanned, whereby it was discovered that their visual cortices were no longer responsive to tactile stimulation – in other words, reading Braille no longer activated "sight" among the study subjects. Finally, using transcranial magnetic stimulation (TMS) to transiently block the function of the visual cortex, the scientists demonstrated that disruption of the visual cortex impaired tactile function and Braille reading after five days of blindfolding – but not a day after the blindfold was removed and never in the control subjects.

"This extremely rapid adaptation indicates that functions that are normally inhibited in the brain's visual cortex will come to the surface when they are needed," adds Merabet. "We believe that over time, if these adaptive functions are sustained and reinforced, they will eventually lead to permanent structural changes."

"Our brain captures different types of information from the world -- sounds, sights, smells or tactile sensations," adds Pascual-Leone. "The impressions we form require us to merge these various different elements, but science's traditional view of brain function is that it is organized in separate and highly specialized systems." But, he says, as the results of this research demonstrate, that is not the case.

"Our study shows that these views are incorrect and illustrate the potential for the human brain to rapidly and dynamically reorganize itself," notes Pascual-Leone. "We have shown that even in an adult, the normally developed visual system quickly becomes engaged to process touch in response to complete loss of sight. And we believe that these principles may also apply to other sensory loss, such as deafness or loss of function following brain injury."

In addition to Pascual-Leone and Merabet, study coauthors include BIDMC investigators Roy Hamilton, Gottfried Schlaug, Jascha Swisher, Elaine Kiriakopoulos, Naomi Pitskel, and Thomas Kauffman.

Friend or Foe? Crows Never Forget a Face, It Seems

By MICHELLE NIJHUIS

Crows and their relatives — among them ravens, magpies and jays — are renowned for their intelligence and for their ability to flourish in human-dominated landscapes. That ability may have to do with cross-species social skills. In the Seattle area, where rapid suburban growth has attracted a thriving crow population, researchers have found that the birds can recognize individual human faces.

John M. Marzluff, a wildlife biologist at the University of Washington, has studied crows and ravens for more than 20 years and has long wondered if the birds could identify individual researchers. Previously trapped birds seemed more wary of particular scientists, and often were harder to catch. “I thought, ‘Well, it’s an annoyance, but it’s not really hampering our work,’ ” Dr. Marzluff said. “But then I thought we should test it directly.”

To test the birds’ recognition of faces separately from that of clothing, gait and other individual human characteristics, Dr. Marzluff and two students wore rubber masks. He designated a caveman mask as “dangerous” and, in a deliberate gesture of civic generosity, a Dick Cheney mask as “neutral.” Researchers in the dangerous mask then trapped and banded seven crows on the university’s campus in Seattle.

In the months that followed, the researchers and volunteers donned the masks on campus, this time walking prescribed routes and not bothering crows.



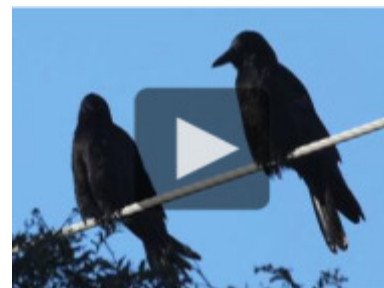
The researchers used a simple hat and masks to test the animals' abilities. Jeff Walls

The crows had not forgotten. They scolded people in the dangerous mask significantly more than they did before they were trapped, even when the mask was disguised with a hat or worn upside down. The neutral mask provoked little reaction. The effect has not only persisted, but also multiplied over the past two years. Wearing the dangerous mask on one recent walk through campus, Dr. Marzluff said, he was scolded by 47 of the 53 crows he encountered, many more than had experienced or witnessed the initial trapping. The researchers hypothesize that crows learn to recognize threatening humans from both parents and others in their flock.

After their experiments on campus, Dr. Marzluff and his students tested the effect with more realistic masks. Using a half-dozen students as models, they enlisted a professional mask maker, then wore the new masks while trapping crows at several sites in and around Seattle. The researchers then gave a mix of neutral and dangerous masks to volunteer observers who, unaware of the masks’ histories, wore them at the trapping sites and recorded the crows’ responses.

The reaction to one of the dangerous masks was “quite spectacular,” said one volunteer, Bill Pochmerski, a retired telephone company manager who lives near Snohomish, Wash. “The birds were really raucous, screaming persistently,” he said, “and it was clear they weren’t upset about something in general. They were upset with me.”

Again, crows were significantly more likely to scold observers who wore a dangerous mask, and when confronted simultaneously by observers in dangerous and neutral masks, the birds almost unerringly chose to persecute the dangerous face. In downtown Seattle, where most passersby ignore crows, angry birds nearly touched their human foes. In rural areas, where crows are more likely to be viewed as noisy “flying rats” and shot, the birds expressed their displeasure from a distance.



Though Dr. Marzluff’s is the first formal study of human face recognition in wild birds, his preliminary findings confirm the suspicions of many other researchers who have observed similar abilities in crows, ravens, gulls and other species. The pioneering animal behaviorist Konrad Lorenz was so convinced of the perceptive capacities of crows and their relatives that he wore a devil costume when handling jackdaws. Stacia Backensto, a master’s student at the University of Alaska Fairbanks who studies ravens in the oil fields on Alaska’s North Slope, has assembled an elaborate costume — including a fake beard and a potbelly made of pillows — because she believes her face and body are familiar to previously captured birds.

Kevin J. McGowan, an ornithologist at the Cornell Laboratory of Ornithology who has trapped and banded crows in upstate New York for 20 years, said he was regularly followed by birds who have benefited from his handouts of peanuts — and harassed by others he has trapped in the past.

Why crows and similar species are so closely attuned to humans is a matter of debate. Bernd Heinrich, a professor emeritus at the University of Vermont known for his books on raven behavior, suggested that crows’ apparent ability to distinguish among human faces is a “byproduct of their acuity,” an outgrowth of their unusually keen ability to recognize one another, even after many months of separation.

Dr. McGowan and Dr. Marzluff believe that this ability gives crows and their brethren an evolutionary edge. "If you can learn who to avoid and who to seek out, that's a lot easier than continually getting hurt," Dr. Marzluff said. "I think it allows these animals to survive with us — and take advantage of us — in a much safer, more effective way."

'Complexity' of Neanderthal tools

Early stone tools developed by our species Homo sapiens were no more sophisticated than those used by our extinct relatives the Neanderthals.

That is the conclusion of researchers who recreated and compared tools used by these ancient human groups.

The findings cast doubt on suggestions that more advanced stone technologies gave modern humans a competitive edge over the Neanderthals. The work by a US-British team appears in the *Journal of Human Evolution*.

The researchers recreated wide stone tools called "flakes", which were used by both Neanderthals and early modern humans. They also reconstructed "blades" - a narrower stone tool later adopted by Homo sapiens. Some archaeologists often use the development of stone blades and their assumed efficiency as evidence for the superior intellect of our species.



Neanderthal tools were just as efficient as those made by our ancestors

The team analysed the data to compare the number of tools produced, how much cutting edge was created, the efficiency in consuming raw material and how long tools lasted.

They found no statistical difference in the efficiency of the two stone technologies. In some respects, the flakes favoured by Neanderthals were even more efficient than the blades adopted by modern humans.

Pros and cons

The result casts doubt on the idea that blades were a significant technological advance, helping our ancestors out-compete, and eventually eradicate, their evolutionary cousins the Neanderthals.

The Neanderthals (*Homo neanderthalensis*) appear in the fossil record about 400,000 years ago.

At their peak, these squat, physically powerful hunters dominated a wide area spanning Britain and Iberia in the west, Israel in the south and Siberia in the east.

Meanwhile, *Homo sapiens* evolved in Africa, and displaced the Neanderthals after spreading into Europe about 40,000 years ago. The last known evidence of Neanderthals comes from Gibraltar and is dated to between 28,000 and 24,000 years ago.

Lead author Metin Eren, from the University of Exeter, UK, said: "Technologically speaking, there is no clear advantage of one tool over the other.

"When we think of Neanderthals, we need to stop thinking in terms of 'stupid' or 'less advanced' and more in terms of 'different'."

He added: "Our research disputes a major pillar holding up the long-held assumption that *Homo sapiens* was more advanced than Neanderthals.

"It is time for archaeologists to start searching for other reasons why Neanderthals became extinct while our ancestors survived."



Neanderthals (l) were different from our species (r), but not inferior

Greater variety

Professor Chris Stringer, head of human origins at London's Natural History Museum, said: "There are now very few palaeoanthropologists who consider the Neanderthals to have been 'stupid', or who consider that they died out because they made flake rather than blade tools."

Professor Stringer, who was not connected with the study, added: "We know that the Neanderthals were very capable technicians, and that their tools would have been excellent for activities such as butchery, working skins or wood.

"However, the blade tools manufactured by early modern humans in Europe were often modified for specialisation as piercers, chisels or engravers, and as parts of composite tools, such as harpoons. "With modern humans we not only find a greater variety of tools, but also much greater working of difficult materials like bone, antler and ivory."

The authors of the paper in *Journal of Human Evolution* suggest that, since they conferred no technological advantage, modern humans may have used blades because they had cultural meaning.

"For early *Homo sapiens* colonizing Ice Age Europe, a new shared and flashy-looking technology might serve as one form of social glue by which larger social networks were bonded," said Mr Eren.

Why do eyelids sag with age? UCLA study answers mystery

Many theories have sought to explain what causes the baggy lower eyelids that come with aging, but UCLA researchers have now found that fat expansion in the eye socket is the primary culprit.

As a result, researchers say, fat excision should be a component of treatment for patients seeking to address this common complaint.

The study, published in the September issue of the peer-reviewed *Journal of Plastic and Reconstructive Surgery*, is the first to examine the anatomy of multiple subjects to determine what happens to the lower eyelid with age. It is also the first to measure what happens to the face with age using high-resolution magnetic resonance imaging (MRI).



A UCLA study finds that lower baggy eyelids are caused by fat expansion in the eye socket.
American Society for Aesthetic Plastic Surgery

"A common treatment performed in the past and present is surgical excision of fat to treat a 'herniation of fat' — meaning that the amount of fat in the eye socket does not change but the cover that holds the fat in place, the orbital septum, is weakened or broken and fat slips out," said lead author Dr. Sean Darcy, a research associate in the division of plastic and reconstructive surgery at the David Geffen School of Medicine at UCLA and a plastic surgery resident at the University of California, Irvine. "This orbital septum weakening or herniation-of-fat theory is what most plastic surgeons have been taught.

"However, our study showed there is actually an increase in fat with age, and it is more likely that the fat increase causes the baggy eyelids rather than a weakened ligament," Darcy said. "There have been no studies to show that the orbital septum weakens."

The study looked at MRIs of 40 subjects (17 males and 23 females) between the ages of 12 and 80. The findings showed that the lower eyelid tissue increased with age and that the largest contributor to this size increase was fat increase.

According to a recent report by the American Society of Plastic Surgeons, nearly 241,000 Americans underwent eyelid surgery in 2007, making it one of the top four surgical cosmetic procedures performed.

Currently, many plastic surgeons performing procedures to treat baggy eyelids do not remove any fat at all. They reposition the fat or conduct more invasive tightening of the muscle that surrounds the eye, or they tighten the actual ligament that holds the eyeball in place. These procedures are performed despite there being no data indicating that these structures change with age.

"Our findings may change the way some plastic surgeons treat baggy eyes," said study co-author Dr. Timothy Miller, professor and chief of plastic surgery at the Geffen School. "Our study showed that a component of a patient's blepharoplasty procedure should almost routinely involve fat excision rather than these procedures."

Blepharoplasty refers to surgical rejuvenation of the upper or lower eyelids, or both, depending on the extent of aging or disease. The procedure is usually performed on the lower eyelid because the most common complaint patients have is that their eyes appear tired, puffy or baggy. The surgeon makes external incisions along the natural skin lines of the eyelid to remove the excess fat and improve the contour of the lower eyelid.

"Although baggy lower eyelids are a significant result of aging and fat expansion, there are other factors that can contribute too," Miller said. "We recommend that surgeons evaluate each component and address them accordingly in an individualized approach to blepharoplasty."

The next phase of research will be to perform MRIs of people with baggy eyelids.

The study was supported in part by a UCLA research-enabling grant and a U.S. Public Health Service grant.

Other study authors included Dr. Robert A. Goldberg, Dr. J. Pablo Villablanca, Dr. Joseph L. Demer and senior author Dr. George H. Rudkin, all of UCLA. None of the authors have any commercial associations or financial relationships that would pose a conflict of interest.

Really?

The Claim: Manipulating Your Neck Could Lead to a Stroke

By ANAHAD O'CONNOR

THE FACTS Manipulating your neck is supposed to relieve pain, not cause it. But years ago neurologists noticed a strange pattern of people suffering strokes shortly after seeing chiropractors, specifically for neck adjustments.

Their hypothesis was that a chiropractic technique called cervical spinal manipulation, involving a forceful twisting of the neck, could damage two major arteries that lead through the neck to the back of the brain. Strokes in people under age 45 are relatively rare, but these cervical arterial dissections are a leading cause of them.



Leif Parsons

Studies that followed suggested a link. One at Stanford that surveyed 177 neurologists found 55 patients who suffered strokes after seeing chiropractors.

Another, published in the journal *Neurologist*, said young stroke patients were five times more likely to have had neck adjustments within a week of their strokes than a control group. It estimated an incidence of 1.3 cases for every 100,000 people under 45 receiving neck adjustments.

But other studies have cast doubt. One published this year examined 818 cases of stroke linked to arterial dissections at the back of the neck. Before their strokes, younger patients who saw chiropractors were more likely to have complained beforehand of head and neck pain — symptoms often preceding a stroke — suggesting they had undiagnosed dissections and had sought out chiropractors for relief, not realizing a stroke was imminent.

THE BOTTOM LINE *Forceful neck manipulation seems to carry a small risk of arterial tears.*

Even without dementia, mental skills decline years before death

ST. PAUL, Minn. – A new study shows that older people's mental skills start declining years before death, even if they don't have dementia. The study is published in the August 27, 2008, online issue of *Neurology*®, the medical journal of the American Academy of Neurology.

"These changes are different and separate from the changes in thinking skills that occur as people get older," said study author Valgeir Thorvaldsson, M.Sc, of Göteborg University in Sweden. "We found accelerated changes in people's mental skills that indicated a terminal decline phase years before death."

The start of the decline is different for various cognitive abilities. Perceptual speed, which measures how quickly people can compare figures, begins declining nearly 15 years before death. Spatial ability starts declining nearly eight years before death. And verbal ability starts declining about six-and-a-half years before death.

The study involved 288 people with no dementia who were followed from age 70 to death, with an average age at death of 84. The participants' mental skills were measured up to 12 times over a period of 30 years, and they were evaluated to make sure they had not developed dementia.

A number of factors may explain this terminal decline in mental skills, Thorvaldsson said. "Cardiovascular conditions such as heart disease or dementia that is too early to be detected could be factors," he said.

"Increased health problems and frailty in old age often lead to inactivity, and this lack of exercise and mental stimulation could accelerate mental decline."

Thorvaldsson noted that verbal abilities declined sharply in the terminal phase and did not decline significantly due to age only. "This indicates that people remain stable in their verbal abilities unless they are experiencing disease processes that also increase their mortality risk," he said. "A change in verbal ability might therefore be considered a critical marker for degeneration in health in older people."

The study was supported by the Swedish Brain Power and the Swedish Council for Working Life and Social Research.

Common treatment to delay labor decreases pre-term infants' risk for cerebral palsy

Preterm infants born to mothers receiving intravenous magnesium sulfate—a common treatment to delay labor—are less likely to develop cerebral palsy than are preterm infants whose mothers do not receive it, report researchers in a large National Institutes of Health research network. The study results appear in the August 28, 2008 *New England Journal of Medicine*.

"A third of all cases of cerebral palsy are associated with preterm birth," said NIH Director Elias A. Zerhouni, M.D. "This study shows a significant reduction in cerebral palsy among preterm infants whose mothers were given magnesium sulfate." The researchers theorized that magnesium sulfate protects against cerebral palsy because it can stabilize blood vessels, protect against damage from oxygen depletion, and protects against injury from swelling and inflammation.

Cerebral palsy refers to a group of neurological disorders affecting control of movement and posture and which limit activity. The brain may be injured or develop abnormally during pregnancy, birth or in early childhood. The causes of cerebral palsy are not well understood.

The research was conducted by investigators in 20 participating research centers of the Maternal Fetal Medicine Units Network of NIH's Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD). The study's first author was Dwight J. Rouse, M.D., of the University of Alabama at Birmingham. Major funding was provided by NIH's National Institute of Neurological Disorders and Stroke (NINDS).

A 1995 study by NINDS researcher Karin Nelson, M.D., and a researcher at the California Department of Health Services found that mothers of preterm infants who did not have cerebral palsy were more likely to have received magnesium sulfate than were mothers of infants who had cerebral palsy. Two larger randomized

studies that subsequently were undertaken suggested that magnesium sulfate given to pregnant women delivering prematurely might protect their infants against cerebral palsy, but their results were inconclusive.

"Our study is the largest, most comprehensive effort to date that looked at using this inexpensive and commonly used treatment to reduce the occurrence of cerebral palsy after preterm birth," said Deborah Hirtz, M.D., a pediatric neurologist at NINDS, and an author of the study. "Cerebral palsy can't always be prevented, but the data from our study and its predecessors will help obstetricians make informed treatment decisions for the women under their care."

Women at the 20 participating NICHD Maternal Fetal Medicine Unit Network sites were eligible to participate. The women were from 24 to 31 weeks pregnant and at risk for preterm delivery. When the women went into labor, they were assigned at random to receive intravenously a solution of either magnesium sulfate or a placebo. The women in the treatment group were given 6 grams of magnesium sulfate intravenously over 20 to 30 minutes, followed by 2 grams of magnesium sulfate every hour after that until either 12 hours had passed, labor had subsided, or they had given birth. If the women in either group did not deliver within 12 hours, they were treated again if they went into labor by the 34th week of pregnancy.

For purposes of their statistical analysis, the researchers calculated the rates of moderate cerebral palsy, severe cerebral palsy, and death among the infants in the study. The study authors did not include mild cerebral palsy in this calculation, as mild cerebral palsy will often disappear with time.

When the researchers considered only moderate and severe cerebral palsy together, cerebral palsy occurred less frequently in the magnesium sulfate group (1.9 percent) as compared to the placebo group (3.5 percent).

For their primary calculation, the researchers grouped the proportions of infants with moderate and severe cerebral palsy together with the proportion of infants who died. The researchers included the death rate in this primary calculation, because mortality among preterm infants is very high. The researchers found that a total of 11.3 percent of infants in the magnesium sulfate group had either moderate or severe cerebral palsy, or had died at birth or were stillborn. In contrast, a total of 11.7 percent of the infants in the placebo group had moderate to severe cerebral palsy or had died.

The proportion of deaths occurring in the magnesium sulfate group (9.5 percent) did not differ significantly from those in the placebo group (8.5 percent).

There was no difference in the average gestational age between the two groups of infants.

Cerebral palsy was diagnosed in 41 children from 942 magnesium sulfate-treated pregnancies, as compared to 74 children from 1,002 placebo-treated pregnancies. Of the children in the magnesium sulfate group, 2.2 percent had cerebral palsy classified as mild, 1.5 percent as moderate, and 0.5 percent as severe. A higher proportion of children in the placebo group than in the magnesium sulfate group had cerebral palsy. Of the children in the placebo group, 3.7 percent had mild cases of cerebral palsy, 2.0 percent had moderate cases, and 1.6 percent had severe cases.

"This is a major advance," said Catherine Y. Spong, M.D., Chief of NICHD's Pregnancy and Perinatology Branch and an author of the study. "Our results show that obstetricians can use magnesium sulfate, which they have experience prescribing, to reduce the risk of a devastating condition, cerebral palsy, in preterm infants."

NINDS (<http://www.ninds.nih.gov>) is the nation's primary supporter of biomedical research on the brain and nervous system. Information from the NINDS about cerebral palsy is available at

http://www.ninds.nih.gov/disorders/cerebral_palsy/cerebral_palsy.htm.

The NICHD sponsors research on development, before and after birth; maternal, child, and family health; reproductive biology and population issues; and medical rehabilitation. For more information, visit the Institute's Web site at

<http://www.nichd.nih.gov/>.

Why is Greenland covered in ice?

Only changes in carbon dioxide levels are able to explain the transition from the mostly ice-free Greenland of three million years ago, to the ice-covered Greenland of today

There have been many reports in the media about the effects of global warming on the Greenland ice-sheet, but there is still great uncertainty as to why there is an ice-sheet there at all.

Reporting today (28 August) in the journal *Nature*, scientists at the University of Bristol and the University of Leeds show that only changes in atmospheric carbon dioxide are able to explain the transition from the mostly ice-free Greenland of three million years ago, to the ice-covered Greenland of today.

Understanding why the ice formed on Greenland three million years ago will help understand the possible response of the ice sheet to future climate change.

Dr Dan Lunt from the University of Bristol and funded by the British Antarctic Survey, explained: "Evidence shows that around three million years ago there was an increase in the amount of rock and debris deposited on the ocean floor around Greenland. These rocks could not have got there until icebergs started to form and could transport them, indicating that large amounts of ice on Greenland only began to form about three million years ago.

"Prior to that, Greenland was largely ice-free and probably covered in grass and forest. Furthermore, atmospheric carbon dioxide levels were relatively high. So the question we wanted to answer was why did Greenland become covered in an ice-sheet?"

There are several competing theories, ranging from changes in ocean circulation, the increasing height of the Rocky Mountains, changes in the Earth's orbit, and natural changes in atmospheric greenhouse gas concentrations. Using state-of-the-art computer climate and ice-sheet models, Lunt and colleagues decided to test which, if any, of these theories was the most credible.

While the results suggest that climatic shifts associated with changes in ocean circulation and tectonic uplift did affect the amount of ice cover, and that the ice waxed and waned with changes in the Earth's orbit, none of these changes were large enough to contribute significantly to the long-term growth of the Greenland ice sheet.

Computer models show that while (tectonic) uplift of the Rocky Mountains may have contributed to increased ice cover on Greenland, this change was small in comparison with the ice sheet caused by a decrease in carbon dioxide.

Instead, the new research suggests that the dominant cause of the Greenland glaciation was the fall from high atmospheric carbon dioxide levels to levels closer to that of pre-industrial times. Today concentrations are approaching the levels that existed while Greenland was mostly ice-free.

Dr Alan Haywood from the University of Leeds added: "So why did elevated atmospheric carbon dioxide concentrations fall to levels similar to the pre-industrial era? That is the million dollar question which researchers will no doubt be trying to answer during the next few years."

Notes to Editors:

The paper: 'Late Pliocene Greenland glaciation controlled by a decline in atmospheric CO2 levels', by Daniel J. Lunt, Gavin L. Foster, Alan M. Haywood, and Emma J. Stone. Nature, 28 August 2008, doi:10.1038/nature07223.

This work was carried out in the framework of the British Antarctic Survey Greenhouse to ice-house: Evolution of the Antarctic Cryosphere and Palaeoenvironment programme. Dan J.Lunt is funded by British Antarctic Survey and Research Councils UK fellowships. Gavin L. Foster is funded by a NERC research fellowship. Emma J Stone is funded by a NERC studentship.

Ancient mother spawns new insight on reptile reproduction

Researchers discover first prehistoric pregnant turtle and nest of eggs in badlands of Alberta, Canada

A 75-million-year-old fossil of a pregnant turtle and a nest of fossilized eggs that were discovered in the badlands of southeastern Alberta by scientists and staff from the University of Calgary and the Royal Tyrrell Museum of Palaeontology are yielding new ideas on the evolution of egg-laying and reproduction in turtles and tortoises.

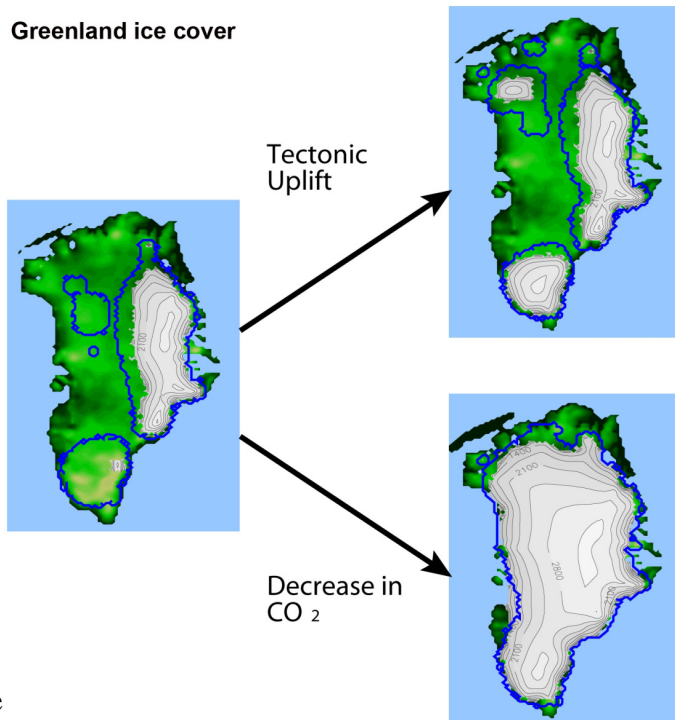
It is the first time the fossil of a pregnant turtle has been found and the description of this discovery was published today in the British journal *Biology Letters*.

The mother carrying the eggs was found in 1999 by Tyrrell staff while the nest of eggs was discovered in 2005 by U of C scientist Darla Zelenitsky, the lead author of the article and an expert on fossil nest sites, and her field assistant. Both were found about 85 km south of Medicine Hat in the Manyberries area.

"Although it is relatively rare to find the eggs and babies of extinct animals, it is even rarer to find them inside the body of the mother," says Darla Zelenitsky, who was also involved in the first discovery of a dinosaur with eggs inside its body.

It was almost by accident that scientists realized that the fossil turtle was pregnant.

"The turtle specimen was partly broken when it was first discovered. It is this fortuitous break that revealed that the fossil was a mother," says François Therrien, a co-investigator of the study and curator of dinosaur palaeoecology at the Royal Tyrrell Museum.



The remains of at least five crushed eggs were visible within the body of the fossil female and a CT scan exposed more eggs hidden under its shell. The turtle, estimated to be about 40 cm long, could have produced around 20 eggs. The nest, which was laid by a different female, contained 26 eggs, each approximately 4 cm in diameter.

Both specimens belong to an extinct turtle called *Adocus*, a large river turtle that lived with the dinosaurs and resembles today's slider and cooter turtles.

The eggs of *Adocus* are extremely thick and hard, whereas those of most modern turtles are either thinner or soft-shelled. The thick eggshell may have evolved to protect the eggs from desiccation in dry environments or to protect them from voracious predators during the time of the dinosaurs.

Zelenitsky says the pregnant turtle specimen and the nest shed light on the evolution of reproductive traits of modern turtles, specifically those traits related to their eggs and nests.

"Based on these fossils, we have determined that the ancestor of living hidden-necked turtles, which are most of today's turtles and tortoises, laid a large number of eggs and had hard, rigid shells," says Therrien.

Cocaine 'flush' could be first anti-overdose drug

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BY TWEAKING a naturally occurring enzyme, chemists have created a molecule that could flush a cocaine overdose out of the body before it can cause irreparable damage to the central nervous system.

If the enzyme works in humans, it would be the first therapy to remove the drug from a user's body. Currently, doctors can only relieve the symptoms of a cocaine overdose, by lowering the patient's temperature and reducing their heart rate.

"When patients go to the emergency room, the doctors really can't help a lot," says Chang-Guo Zhan at the University of Kentucky in Lexington. "The cocaine is still in their system."

Enzymes in the body combine cocaine with water and then, over a sequence of reaction steps, break it down into two harmless products. But this process is very slow - it takes up to 90 minutes to dispose of even a tiny dose, and much longer for a large overdose.

Now Zhan and his colleagues say they have a way to speed up the natural process. By modifying one of the enzymes, they have created a molecule that can break down cocaine much faster.

The team started by calculating the energy required to perform each reaction step, enabling them to identify the most energetic step, known as the energy barrier. Only if molecules have energy greater than this can they successfully react, so the energy barrier determines the rate of cocaine breakdown.

Using computer simulations that systematically tweak the structure of the enzyme and predict the effect of these tweaks on the energy barrier, Zhan's team arrived at a candidate molecule that promised to speed up the reaction by 2000 times (Journal of the American Chemical Society, DOI: 10.1021/ja803646t).

The team synthesised the molecule and tested whether it might work in the body. Sure enough, when they gave 18 mice a highly toxic dose of cocaine, the 12 that they also injected with the modified enzyme all survived, with only two suffering seizures. The six controls, which did not receive the enzyme, died.

Because only five of the 574 amino acids that make up the naturally occurring enzyme are changed in the modified enzyme, the team suggests that their overdose therapy should have few side effects in humans.

Pharmacologist Stewart Paterson of King's College London describes the therapy as "promising", but points out that its effectiveness would depend on how quickly it was taken after the overdose. He says the team also need to be sure that it does not also break down beneficial compounds in the patient's body.

Dark matter and normal matter 'divorce' in cosmic clash

* 23:07 27 August 2008

* NewScientist.com news service

* **Rachel Courtland**

Dark matter seems to have separated from normal matter in a mammoth collision between two galaxy clusters.

The results bolster observations of a similar separation in the Bullet Cluster and put rough upper limits on how strongly dark matter interacts with other matter and itself. But so far they cannot rule out any of the leading dark matter candidates.

Dark matter, mysterious stuff that exerts a gravitational force on other matter, was originally proposed to explain what holds spinning galaxies, like the Milky Way, together. Observations suggest it outweighs ordinary matter by a factor of about 6 to 1.

But no one knows what it is made of, and normally dark matter and ordinary matter are too well mixed to observe the dark matter independently.

Now, isolated clouds of dark matter have been observed in a collision between two massive clusters of galaxies lying 5.7 billion light years away.

Collectively known as MACS J0025, the clusters crashed head-on while moving at millions of kilometres per hour. Hot gas within the clusters slowed down in the collision.

But observations with the Hubble Space Telescope showed that MACS J0025 acts as a gravitational lens, distorting the light from galaxies behind it. This allowed researchers to pinpoint the location of the clusters' unseen dark matter, which had passed through the wreck unimpeded and separated from the clusters' gas.

The separation is thought to have occurred because dark matter does not experience the same drag as the clusters' gas. Drag is caused by electromagnetic forces between atoms, and dark matter seems to interact with other matter and itself only through the force of gravity.



Hot gas (shown in pink) in two merging galaxy clusters slowed down after impact, but their dark matter (blue) continued on unimpeded. Astronomers made this map of the clusters' matter distribution by studying how their mass gravitationally distorted light from background galaxies (Image: NASA/ESA/CXC/M Bradac/UCSB/S Allen/Stanford)

Special case?

A similar phenomenon was seen in 2006 in a collision resulting in the Bullet Cluster. There, dark matter also seemed to have separated from ordinary matter as the clusters entangled, suggesting dark matter interacts only weakly with other matter, and potentially only through gravity.

But some were not sure that the Bullet Cluster collision clinched the case. "When the first paper came out, a lot of people were saying maybe this was a special case, maybe this is a little weird," says Marusa Bradac of the University of California, Santa Barbara, an astronomer who worked on both the Bullet Cluster and this second find.

Finding this second cluster, Bradac says, provides an 'unambiguous' confirmation of the weak interaction.

MACS J0025 was originally imaged in a survey of massive clusters made by the ROSAT satellite, which finished observing in 1999.

But it was not clear that the object was the result of a merger. Bradac and colleagues realised it was when they studied the shape of its hot gas, which glows brightly in X-rays, with NASA's Chandra space telescope.

While the team can use the clusters to get a rough upper limit on how strongly dark matter interacts, they cannot eliminate any of the dark matter candidates currently being considered by particle physicists, such as weakly interacting massive particles (WIMPS).

The Large Hadron Collider, a powerful particle smasher set to start up on 10 September, could help measure the properties of WIMPS and help determine if any of them are viable dark matter candidates.

Journal reference: The Astrophysical Journal (forthcoming)

Black Raspberries Slow Cancer By Altering Hundreds Of Genes

COLUMBUS, Ohio – New research strongly suggests that a mix of preventative agents, such as those found in concentrated black raspberries, may more effectively inhibit cancer development than single agents aimed at shutting down a particular gene.

Researchers at the Ohio State University Comprehensive Cancer Center examined the effect of freeze-dried black raspberries on genes altered by a chemical carcinogen in an animal model of esophageal cancer.

The carcinogen affected the activity of some 2,200 genes in the animals' esophagus in only one week, but 460 of those genes were restored to normal activity in animals that consumed freeze-dried black raspberry powder as part of their diet during the exposure.

These findings, published in recent issue of the journal *Cancer Research*, also helped identify 53 genes that may play a fundamental role in early cancer development and may therefore be important targets for chemoprevention agents.

"We have clearly shown that berries, which contain a variety of anticancer compounds, have a genome-wide effect on the expression of genes involved in cancer development," says principal investigator Gary D. Stoner, a professor of pathology, human nutrition and medicine who studies dietary agents for the prevention of esophageal cancer.

"This suggests to us that a mixture of preventative agents, which berries provide, may more effectively prevent cancer than a single agent that targets only one or a few genes."

Stoner notes that black raspberries have vitamins, minerals, phenols and phytosterols, many of which individually are known to prevent cancer in animals.

“Freeze drying the berries concentrates these elements about ten times, giving us a power pack of chemoprevention agents that can influence the different signaling pathways that are deregulated in cancer,” he says.

“What’s emerging from studies in cancer chemoprevention is that using single compounds alone is not enough. And berries are not enough. We never get 100 percent tumor inhibition with berries, so we need to think about another food that we can add.”

To conduct this study, Stoner and his colleagues fed rats either a normal diet or a diet containing 5 percent black-raspberry powder. During the third week, half the animals in each diet group were injected three times with a chemical carcinogen, N-nitrosomethylbenzylamine. The animals continued consuming the diets during the week of carcinogen treatment.

After the third week, the researchers examined the animals’ esophageal tissue, thereby capturing gene changes that occur early during carcinogen exposure. Their analyses included measuring the activity, or expression levels, of 41,000 genes. In the carcinogen-treated animals, 2,261 of these genes showed changes in activity of 50 percent or higher.

“These changes in gene expression correlated with changes in the tissue that included greater cell proliferation, marked inflammation, and increased apoptosis,” Stoner says.

In the animals fed berry powder, however, a fifth of the carcinogen affected genes – exactly 462 of them – showed near-normal levels of activity, when compared with controls. Most of these genes are associated with cell proliferation and death, cell attachment and movement, the growth of new blood vessels and other processes that contribute to cancer development. The tissue also appeared more normal and healthy.

Lastly, of the 462 genes restored to normal by the berries, 53 of them were also returned to normal by a second chemoprevention agent tested during a companion study.

“Because both berries and the second agent maintain near-normal levels of expression of these 53 genes, we believe their early deregulation may be especially important in the development of esophageal cancer,” Stoner says.

“What’s emerging from studies in cancer chemoprevention is that using single compounds alone is not enough,” Stoner says. “And berries are not enough. We never get 100 percent tumor inhibition with berries. So we need to think about another food that we can add to them that will boost the chemopreventive activities of berries alone.” *Funding from the National Cancer Institute supported this research.*

Heart attack patients who stop statin risk death, say McGill researchers ***Study finds doubled mortality risk if treatment is discontinued***

Patients discontinuing statin medication following an acute myocardial infarction (AMI) increase their risk of dying over the next year, say researchers at McGill University and the McGill University Health Centre (MUHC). Their study was published in a recent issue of the *European Heart Journal*.

Using data on British patients who survived an AMI and were still alive three months later, Dr. Stella Daskalopoulou and colleagues found that those who discontinued their statin medication were 88% more likely to die during the following year compared to those who had never been on the medication.

"Statins were found to be beneficial drugs," said Dr. Daskalopoulou, of McGill's Faculty of Medicine and the Department of Medicine and the Division of Clinical Epidemiology at the MUHC. "Patients who used statins before an AMI and continued to take them after were 16% less likely to die over the next year than those who never used them. So even if it appears that the statins failed to prevent your AMI, it is beneficial to continue taking them and potentially quite harmful to stop."

The large, population-based cohort study was conducted using UK data to take advantage of the medical records kept in the General Practice Research Database (GPRD), which collects information on the health of more than three million patients across the UK.

"In the general population the statin discontinuation rate within the first year of prescription is 30 percent. That's very high," Dr. Daskalopoulou continued. "Because statins are preventative drugs, patients may not feel the immediate benefit of taking them and sometimes stop. However, it looks like this might be quite a dangerous practice after an AMI."

The harmful effects of statin discontinuation may be the result of many different mechanisms, including individual patient characteristics, the researchers explained. "Regardless of the mechanism or explanation, physicians should be careful when assessing each patient's medication needs," Dr. Daskalopoulou said. "Patients also need to take their medications exactly as prescribed after an AMI. Statins in particular should only be withdrawn after an AMI under close clinical supervision."

How viruses short-circuit the deep sea food chain

* 18:20 27 August 2008 NewScientist.com news service

* **Catherine Brahic**

One of the greatest mysteries of the ocean floor is why there are so few animals down there, yet so much food. Trillions of deep sea viruses that control the world's deepest food chain could be to blame, say marine biologists.

Roberto Danovaro of the Polytechnic University of Marche in Italy says the viruses keep the inhabitants of the sea bed very small – nothing bigger than a microbe. This also keeps carbon and nutrients trapped at the bottom of the seas.

Danovaro's team collected dozens of samples of sediment from sites around the world. Everywhere they looked the top centimetre of sediment contained large quantities of viruses. The average gram of sediment contained 1 billion viruses, which is the equivalent of 8 trillion viruses per square metre of ocean floor. This was true whether the sediment had been sampled from relatively shallow continental shelf, just a few hundred metres beneath the surface, or from the deep abyss up to 6 kilometres down.

What's more the sediment viruses were busily infecting tiny microbes. These simple life forms, known as prokaryotes, are one of the lowest rungs in the food chain.

Usually the nutrients and carbon contained in prokaryotes are used by the larger organisms that eat them, but something very different happens when prokaryotes are infected by viruses: the viruses burst the prokaryotes open and release their carbon and nutrients into the water column.

This is known as the "viral shunt". Nutrients are shunted back down the food chain to be taken up by the remaining, as yet uninfected microbes – allowing them to produce more microbes and host more viruses. Danovaro found that the deeper he sampled sediment, the more active the viruses were.

Unsolved paradox

The researchers say that their results shed light on an unsolved paradox of the deep ocean.

In 1998, a study showed that between 30% and 45% of the carbon contained in microbes on Earth is found in the top 10 centimetres of deep-sea sediments (Proceedings of the National Academy of Sciences, vol 95, p 6578). Yet other studies have shown that this resource is hardly used by the animals that inhabit the abyss.

"The huge nitrogen and phosphorus-rich prokaryotic biomass represents a potentially enormous and high quality food source for benthic consumers in deep-sea ecosystems," write Danovaro and colleagues.

The new study found that for all the samples, the more prokaryotes in the sediment, the more viruses there were. The team concludes that the viruses and the prokaryotes effectively feed off each other, at the expense of larger organisms that have to make do with other sources of energy.

Jed Fuhrman of the University of Southern California, one of the fathers of marine virology, says Danovaro's study is impressive and the findings are important for understanding how carbon and nutrients are cycled in the oceans. "It is surprising that viral activity directly impacts such a large fraction of the flow of material and energy at the sea floor," he told New Scientist. *Journal reference: Nature (DOI: 10.1038/nature07268)*

Purdue, Citing Research Misconduct, Punishes Scientist

By KENNETH CHANG

An appeals committee at Purdue University has upheld findings of misconduct on the part of a professor who claims to have created energy-generating fusion in a tabletop experiment, the university announced on Wednesday.

With the findings, William R. Woodson, the university's provost, has imposed punishment on the professor, Rusi P. Taleyarkhan. Dr. Taleyarkhan remains on the Purdue faculty, but his distinction as a "named professor" has been removed, along with an annual allotment of \$25,000 that accompanied it. In addition, he is prohibited from serving as a thesis adviser to graduate students for at least the next three years.

John Lewis, a lawyer for him, said Dr. Taleyarkhan was considering his options, among them challenging the sanctions in court.

Beginning with a paper published in the journal Science in 2002, Dr. Taleyarkhan, who then worked at Oak Ridge National Laboratory, has claimed that the force of sound waves can collapse bubbles in a liquid violently enough to generate conditions that fuse together hydrogen atoms, releasing energy. Scientists working in other laboratories have not been able to reproduce the experiments.

In July, an investigatory committee at Purdue, though coming to no conclusions about that finding itself, determined that Dr. Taleyarkhan had later falsely claimed independent confirmation of the work. Actually, the committee said, he had been involved in supervising the follow-up experiment, which was conducted by a postdoctoral researcher in his laboratory, and in writing the resulting scientific papers.


The committee also found that a graduate student in his laboratory whom Dr. Taleyarkhan added as an author to those follow-up papers had made no substantial contributions.

Dr. Taleyarkhan appealed the decision. The rejection of that appeal, by a three-member panel appointed by Dr. Woodson, the provost, was unanimous.

Responding to a request for comment, Dr. Taleyarkhan referred in an e-mail message to the investigatory committee's dismissal of 10 other accusations of misconduct, including improper presentation of data.

"The immense three-year-long investigation," he wrote, "has thrown out all allegations related to fraud and fabrication and therefore represents a success for the science."

Related Timeline: Bubble Fusion

March 8, 2002	November 7, 2003
<p>Scientists led by Rusi P. Taleyarkhan, a senior scientist at Oak Ridge National Laboratory, publish a paper in the journal <i>Science</i> saying that a table-top experiment can create nuclear fusion. The process, called bubble fusion or sonofusion, bombards a solvent with powerful sound waves, causing bubbles to collapse and generating temperatures high enough to fuse together hydrogen.</p> <p>"Evidence for Nuclear Emissions During Acoustic Cavitation" (<i>Science Magazine</i>)</p>	<p>Purdue University announces the hiring of Dr. Taleyarkhan as a professor in its nuclear engineering school.</p>
<p>Science 8 March 2002: Vol. 295. no. 5561, pp. 1868 - 1873 DOI: 10.1126/science.1067589 Prev Table of Contents Next Research Articles</p> <p>Evidence for Nuclear Emissions During Acoustic Cavitation</p> <p>R. P. Taleyarkhan,^{1*} C. D. West,¹ dagger J. S. Cho,² R. T. Lahey Jr.,³ R. I. Nigmatulin,⁴ R. C.</p> <p>In cavitation experiments with deuterated acetone, tritium decay activity above background levels was detected. In addition, evidence for neutron emission near 2.5 million electron volts was also observed, as would be expected for deuterium-deuterium fusion. Control experiments with normal acetone did not result in tritium activity or neutron emissions. Hydrodynamic shock code simulations supported the observed data and indicated highly compressed, hot (106 to 107 kelvin) bubble implosion conditions, as required for nuclear fusion reactions.</p> <p>1 Oak Ridge National Laboratory, Oak Ridge, TN 37831, USA. 2 Oak Ridge Associated Universities, Oak Ridge, TN 37830, USA. 3 Rensselaer Polytechnic Institute, Troy, NY 12180, USA. 4 Institute of Mechanics of Ufa-Bashkortostan Branch of the Russian Academy of Sciences, 6 Karl Marx Street, Ufa, 450 000, Russia. * To whom correspondence should be addressed. E-mail: zrt@ornl.gov Retired.</p>	<p>Prior to coming to Purdue, Taleyarkhan held the title of distinguished scientist/engineer at Oak Ridge National Laboratory in Oak Ridge, Tenn. He was previously a group leader/senior engineer and senior engineer/program manager at Oak Ridge. He was a senior engineer at Westinghouse Electric Corp. and a research associate at Rensselaer Polytechnic Institute. He received his doctorate in nuclear engineering and science from Rensselaer Polytechnic Institute, where he also earned an MBA and a master's degree in nuclear engineering. He earned a bachelor's degree in mechanical engineering from the Indian Institute of Technology. He is widely cited in technology journals, has more than 20 international patents and invention awards, and has given more than 30 invited keynote lectures at worldwide institutions. He is an international nuclear energy consultant and a member of numerous professional societies and committees.</p> <p>Taleyarkhan recently led research aimed at discovering a method that has the potential for developing a new energy source using simple mechanical energy to initiate and control nuclear fusion forces in a tabletop experiment. The discovery was published in <i>Science</i> (3/8/2002) and has been publicized on television, radio and in scientific journals.</p> 

Queen's researchers provide solution to world's worst mass poisoning case

A solution to the world's worst case of ongoing mass poisoning, linked to rising cancer rates in Southern Asia, has been developed by researchers from Queen's University Belfast.

Currently over 70 million people in Eastern India and Bangladesh, experience involuntary arsenic exposure from consuming water and rice; the main staple food in the region. This includes farmers who have to use contaminated groundwater from minor irrigation schemes.

It is estimated that for every random sample of 100 people in the Bengal Delta, at least one person will be near death as a result of arsenic poisoning, while five in 100 will be experiencing other symptoms.

Now, researchers at the Belfast-based University have created new low-cost technology to provide arsenic-free water to millions of people in South Asia currently exposed to high levels of the poison in groundwater.

Leading an international team, Queen's researchers have developed a trial plant in Kasimpore, near Calcutta, which offers chemical-free groundwater treatment technology to rural communities for all their drinking and farming needs.

The technology is based on recharging a part of the groundwater, after aeration, into a subterranean aquifer (permeable rock) able to hold water. Increased levels of oxygen in the groundwater slow down the arsenic release from the soil. At higher dissolved oxygen levels, soil micro organisms, as well as iron and manganese, reduce the dissolved arsenic level significantly.

Dr Bhaskar Sen Gupta of Queen's, co-ordinator of the project said: "Arsenic poisoning is behind many instances of ill-health in Southern Asia, including a rising number of cancer cases. Developing a low cost method of decontaminating ground water that is laced with high levels of arsenic is a key challenge for sustainable agriculture there.

"While there are some techniques available for treating relatively small quantities of water, there has, until now, been no viable technology available for decontaminating groundwater on a large scale that can ensure safe irrigation and potable water supply.

"This project developed by Queen's is the only method which is eco-friendly, easy to use and deliverable to the rural community user at an affordable cost."

The project is part of the EU-funded Asia Pro Eco Programme which is dedicated to the improvement of environmental performance in Asian economic sectors. Known as TiPOT (Technology for in-situ treatment of groundwater for potable and irrigation purposes), a key part of the project is the establishment of sustainable technology partnerships.

Explaining further, Dr Sen Gupta said: "From its inception we have had the vital support of Indian-based stakeholders, such as village councils and local financial institutions. This has been vital as they are the authorities who monitor the water supply and distribution in rural areas and provide micro-credit to the local farmers.

"With their help, we now have a solution which is transferable to many areas in need across Asia."

The new plant will be maintained and operated by local village technicians. To help apply the technology to other areas in the South Asian region, the World Bank has given a grant of \$200,000 to the TIPOT consortium to set up six more subterranean water treatment plants in the Gangetic plains of West Bengal.

In June 2008, Queen's along with the Indian partners BESU and IEMS won the prestigious DELPHE award of the British Council (www.britishcouncil.org/delphe.htm) to set up another treatment plant and run awareness programmes for arsenic poisoning in India.

Further information on the project can be found at <http://www.qub.ac.uk/sites/TiPOT/>

For media enquiries please contact: Lisa Mitchell, Press Officer, +44 (0)28 9097 5384, Mob: 07814 422 572, lisa.mitchell@qub.ac.uk

Notes to editors

Dr Sen Gupta is available for interview. Please telephone Lisa Mitchell, Senior Press Officer on +44 (0)28 90 97 5384 m+44(0)7814422572 or email lisa.mitchell@qub.ac.uk.

* Images and captions to accompany this story can be found by clicking on 'Link to pictures' in the original email containing this release.

* The World Health Organisation (WHO) has cited the scale of this environmental disaster as greater than any seen before: "It is beyond the accidents at Bhopal, India, in 1984 and Chernobyl, Ukraine, in 1986."

* In its report *Arsenic in Drinking Water and resulting Arsenic Toxicity in India and Bangladesh*, the WHO stated "Arsenic in drinking water is a major public health hazard and should be dealt with as an emergency."

* Arsenic is a semi-metallic naturally-occurring chemical. It is present in the environment and we are regularly exposed to small doses. It is difficult to detect as it is generally odourless and flavourless.

* Other partners in the project include National Metallurgic Laboratory (NML), Jamshedpur, India; Institut für Siedlungswasserbau, Wassergüte- und Abfallwirtschaft (USWA) Stuttgart, Germany; Universitas Miguel Hernandez (UMH) Alicante, Spain; Institute of Environmental Sciences (CML) Leiden University, The Netherlands and the Institute of Environmental Management and Studies (IEMS), Jamshedpur, India.

Study says eyes evolved for X-Ray vision

Forward-facing eyes allow animals to 'see through' the clutter in the world

Troy, N.Y. – The advantage of using two eyes to see the world around us has long been associated solely with our capacity to see in 3-D. Now, a new study from a scientist at Rensselaer Polytechnic Institute has uncovered a truly eye-opening advantage to binocular vision: our ability to see through things.

Most animals — fish, insects, reptiles, birds, rabbits, and horses, for example — exist in non-cluttered environments like fields or plains, and they have eyes located on either side of their head. These sideways-facing eyes allow an animal to see in front of and behind itself, an ability also known as panoramic vision.

Humans and other large mammals — primates and large carnivores like tigers, for example — exist in cluttered environments like forests or jungles, and their eyes have evolved to point in the same direction. While animals with forward-facing eyes lose the ability to see what's behind them, they gain X-ray vision, according to Mark Changizi, assistant professor of cognitive science at Rensselaer, who says eyes facing the same direction have been selected for maximizing our ability to see in leafy environments like forests.



The eyes of some mammals have evolved to point in the same direction. While animals with forward facing eyes lose the ability to see what's behind them, they gain X-ray vision, which makes it possible for them to see through the clutter in the world. Rensselaer/Changizi

All animals have a binocular region — parts of the world that both eyes can see simultaneously — which allows for X-ray vision and grows as eyes become more forward facing.

Demonstrating our X-ray ability is fairly simple: hold a pen vertically and look at something far beyond it. If you first close one eye, and then the other, you'll see that in each case the pen blocks your view. If you open both eyes, however, you can see through the pen to the world behind it.

To demonstrate how our eyes allow us to see through clutter, hold up all of your fingers in random directions, and note how much of the world you can see beyond them when only one eye is open compared to both. You miss out on a lot with only one eye open, but can see nearly everything behind the clutter with both.

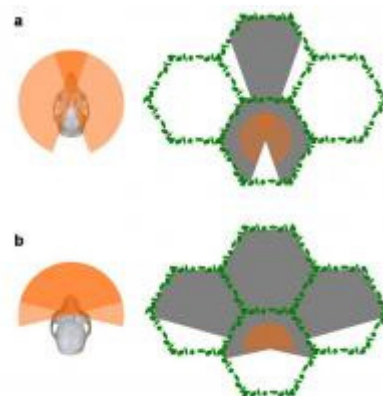


Image A: the diagram on the left illustrates the skull of an animal with nearly sideways-facing eyes. The two orange semicircles show the visual fields of each eye, and the darker orange triangle indicates the small binocular region in front. The diagram on the right illustrates the regions within which the animal is capable of recognizing objects in a cluttered environment. Image B represents the visual field and binocular region for an animal with nearly forward-facing eyes. Rensselaer/Changizi

"Our binocular region is a kind of 'spotlight' shining through the clutter, allowing us to visually sweep out a cluttered region to recognize the objects beyond it," says Changizi, who is principal investigator on the project. "As long as the separation between our eyes is wider than the width of the objects causing clutter — as is the case with our fingers, or would be the case with the leaves in the forest — then we can tend to see through it."

To identify which animals have this impressive power, Changizi studied 319 species across 17 mammalian orders and discovered that eye position depends on two variables: the clutter, or lack thereof in an animal's environment, and the animal's body size relative to the objects creating the clutter.

Changizi discovered that animals in non-cluttered environments — which he described as either "non-leafy surroundings, or surroundings where the cluttering objects are bigger in size than the separation between the animal's eyes" (think a tiny mouse trying to see through 6-inch wide leaves in the forest) — tended to have sideways-facing eyes.

"Animals outside of leafy environments do not have to deal with clutter no matter how big or small they are, so there is never any X-ray advantage to forward-facing eyes for them," says Changizi. "Because binocular vision does not help them see any better than monocular vision, they are able to survey a much greater region with sideways-facing eyes."

However, in cluttered environments — which Changizi defined as leafy surroundings where the cluttering objects are smaller than the separation between an animal's eyes — animals tend to have a wide field of binocular vision, and thus forward-facing eyes, in order to see past leaf walls.

Most animals have sideways-facing eyes that allow for a panoramic view of nearly all that's around them, both in front and behind. Rensselaer/Changizi



"This X-ray vision makes it possible for animals with forward-facing eyes to visually survey a much greater region around themselves than sideways-facing eyes would allow," says Changizi. "Additionally, the larger the animal in a cluttered environment, the more forward facing its eyes will be to allow for the greatest X-ray vision possible, in order to aid in hunting, running from predators, and maneuvering through dense forest or jungle."

Changizi says human eyes have evolved to be forward facing, but that we now live in a non-cluttered environment where we might actually benefit more from sideways-facing eyes.

"In today's world, humans have more in common visually with tiny mice in a forest than with a large animal in the jungle. We aren't faced with a great deal of small clutter, and the things that do clutter our visual field — cars and skyscrapers — are much wider than the separation between our eyes, so we can't use our X-ray power to see through them," Changizi says. "If we froze ourselves today and woke up a million years from now, it's possible that it might be difficult for us to look the new human population in the eyes, because by then they might be facing sideways."

Changizi's research was completed in collaboration with Shinsuke Shimojo at the California Institute of Technology, and is published online in the Journal of Theoretical Biology. It was funded by the National Institutes of Health.

*Changizi's X-ray vision research, along with his research about our future-seeing powers, color telepathy, and eye computation abilities, will appear in his book *The Vision Revolution* (BenBella Books), due out in stores this spring.*

Ceramic material revs up microwaving

Quicker microwave meals that use less energy may soon be possible with new ceramic microwave dishes and, according to the material scientists responsible, this same material could help with organic waste remediation.

"Currently, food heated in a microwave loses heat to the cold dish because the dishes are transparent to microwaves," says Sridhar Komarneni, distinguished professor of clay mineralogy, College of Agricultural Sciences at Penn State. "The plates are still cool when the cooking is completed."

Materials are transparent to microwaves because the microwaves do not interact with the molecules in standard tableware. With liquids like water, the microwaves cause the molecules to move back and forth creating heat.

Komarneni, working with Hiroaki Katsuki and Nobuaki Kamochi, Saga Ceramic Research Laboratory, Saga, Japan, developed a ceramic from petalite and magnetite sintered together that heats up in the microwave without causing equipment problems the way most metals do.

They report their material in a recent issue of *Chemistry of Materials*.

Petalite is a commonly occurring mineral that contains lithium, aluminum and silicon and is often used to make thermal shock resistant ceramics because it expands very little when heated. Ceramic sintering uses powdered minerals pressed together hard to form green bodies. These green objects are fired first at low and then high temperatures.

When the petalite and magnetite are fired together, the magnetite converts to an iron oxide that heats up when placed in a microwave.

A rice cooker made of this material cooked rice in half the time it normally takes in a non-heating microwave rice cooker.

"Rice cooks very well with these dishes," says Komarneni who is also a member of Penn State's Materials Research Institute. "Dishes heated by themselves or with food could keep the food hot of up to 15 minutes. One might even cook a pizza on a plate and then deliver it hot."

However, those accustomed to cooking in a microwave will need to remember that the plates are hot and will burn bare hands. Potholders are again necessary.

Food preparation applications abound. A company in Arita, Japan -- long a locus of ceramic manufacturing -- called Asahi Ceramics Research Company is manufacturing microwave ware.

The material's microwave heating properties suggest another use. Because the material expands very little when heated, the petalite magnetite material does not shatter under rapid microwave heating and cooling as other materials might. The researchers created a plate of the petalite magnetite ceramic and coated the solid plate structure with cooking oil. After heating for 120 seconds, 98 percent of the oil was gone, decomposed into its components.

"We used cooking oil because it is an innocuous substance," says Komarneni. "We could, perhaps, use this material in a closed system to decompose organic contaminants in soil or dirt."

The researchers believe that once optimized, the material could be used for a variety of remediation applications at a lower energy cost and with less residue than many current methods.

Researchers Report Advances in Cell Conversion Technique

By NICHOLAS WADE

Biologists at Harvard have converted cells from a mouse's pancreas into the insulin-producing cells that are destroyed in diabetes, suggesting that the natural barriers between the body's cell types may not be as immutable as supposed.

This and other recent experiments raise the possibility that a patient's healthy cells might be transformed into the type lost to a disease far more simply and cheaply than in the cumbersome proposals involving stem cells.

The new field depends on capturing master proteins called transcription factors that control which sets of genes are active in a cell and thus what properties the cell will possess. Each type of cell is thought to have a special set of transcription factors.

Last year a Japanese biologist, Shinya Yamanaka, showed that by inserting four transcription factors into an adult cell he could return it to its embryonic state.

In a variation of this technique, a team led by Qiao Zhou and Douglas A. Melton at Harvard has now identified three transcription factors active in the insulin-producing beta cells of the pancreas.

They hitched the genes for these three factors onto a virus that infects another type of pancreatic cell, known as an exocrine cell. In mice made diabetic by a drug that kills beta cells, the transformed exocrine cells generated insulin, allowing the mice to enjoy “a significant and long-lasting improvement” in their diabetic state, the researchers are reporting Thursday in the journal *Nature*.

Many steps remain before the technique could be considered for human use.

Besides producing insulin, the transformed exocrine cells looked like beta cells and ceased making proteins typical of exocrine cells. But they did not organize themselves into the pancreatic structures known as islets where beta cells usually cluster. The researchers claim only to have made “cells that closely resemble beta cells.”

Even so, Robert Blelloch, a cell biologist at the University of California, San Francisco, said, the Harvard experiment was “a very nice story — it’s pretty impressive that you can make such a switch just by adding three factors to a quite different cell type.”

Last month Patrick Seale and Bruce Spiegelman of the Dana-Farber Cancer Institute in Boston showed how with a single transcription factor they could make white fat cells generate brown fat cells, a very different type of cell.

The Harvard work “is not occurring in a vacuum, but it’s a very important piece of work,” Dr. Blelloch said.

Class of diabetes drugs carries significant cardiovascular risks

WINSTON-SALEM, N.C. —A class of oral drugs used to treat type 2 diabetes may make heart failure worse, according to an editorial published online in *Heart* Wednesday by two Wake Forest University School of Medicine faculty members.

“We strongly recommend restrictions in the use of thiazolidinediones (the class of drugs) and question the rationale for leaving rosiglitazone on the market,” write Sonal Singh, M.D., M.P.H., assistant professor of internal medicine, and Curt D. Furberg, M.D., Ph.D., professor of public health sciences. Rosiglitazone and pioglitazone are the two major thiazolidinediones.

In the editorial Singh and Furberg say, “At this time, justification for use of thiazolidinediones is very weak to non-existent.”

Oral drugs are given to control diabetes by lowering blood sugar.

But diabetics also experience elevated rates of high blood pressure and high levels of cholesterol and triglyceride, which “further compound their already increased risk of developing ischemic heart disease,” Singh and Furberg say. Heart disease and high blood pressure “represent conditions that are major precursors of congestive heart failure.”

About 22 percent of diabetics have heart disease. Among elderly patients with diabetes, more than half will develop congestive heart failure over a 10-year period, the editorial says.

The thiazolidinediones were approved for use based on the ability to reduce blood sugar.

In contrast, “we reported [in the journal *Diabetes Care*] in June 2007 that thiazolidinediones doubled the risk of congestive heart failure in patients with type 2 diabetes,” is says. “The increased heart failure appears to be a class effect.”

Singh and Furberg reported in *The Journal of the American Medical Association* in 2007 after an analysis of four long-term trials that use of rosiglitazone was associated both with increased heart attacks and a doubling of heart failure.

They said that results from three large randomized clinical trials published this past June all failed to demonstrate that intensive control of blood sugar reduces mortality or events from cardiovascular disease in patients with type 2 diabetes.

The three trials were ACCORD, ADVANCE, and the Veterans Affairs Diabetes study. In ACCORD, the patients who received intensive treatment to control blood sugar actually had more cardiovascular disease mortality than patients receiving standard treatment.

In ADVANCE, intensive control of blood sugar produced no benefit; there was no effect on cardiovascular events or deaths from cardiovascular causes compared to standard oral diabetes agents.

In the VA Diabetes trial, when intensive blood sugar control produced levels of blood sugar that were too low and led to loss of consciousness, that was a strong predictor of future cardiovascular events.

"The unfavorable findings from the three trials have not been fully realized by the medical community," Singh and Furberg say.

They say that at a recent U.S. Food and Drug Administration advisory committee meeting, there was "overwhelming support for requiring reductions" of heart disease and heart failure "before approval of new oral hypoglycemic agents."

Singh said in an interview, "Safer, cheaper and more effective treatment alternatives are available that do not carry these negative cardiovascular risks in patients with diabetes. The rationale for the use of the thiazolidinediones is unclear."

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Rains revive prehistoric shrimp

Heavy summer rains have helped one of the UK's most ancient creatures to flourish in south west Scotland.

Specimens of the tadpole shrimp were recorded at least 220 million years ago.

It is now almost extinct in the UK but recent heavy downpours have seen the creature flourish at the Caerlaverock reserve in Dumfries and Galloway.

Wildfowl and Wetlands Trust researcher Larry Griffin said that three-times the average rainfall for August created "ideal conditions" for the species.

The creature had been thought to be extinct in Scotland until it was found at Caerlaverock on the Solway Firth four years ago.

Mr Griffin, who spotted the tiny species in the same location in 2004, was "very excited" to see it return.



The tadpole shrimp has been in existence for 220 million years

Flushed away

"We have had up to three-times the average rainfall this month," he said.

"So the ponds that dried out in early summer killing the fish and other invertebrates will have been drenched in August, flushing away the salt water to make the ponds much fresher.

"This will have created ideal conditions for the re-emergence of species such as the tadpole shrimp, like it did in 2004."

The tadpole shrimp lives in seasonal pools which dry out in the summer, killing predators and competitors.

It has evolved to produce two types of eggs, one which hatches soon after production if the conditions are right and the other which can lie dormant in dried-out pools for decades.

The shrimp, which resembles a small horseshoe crab, has a fast lifecycle - developing from an egg to an adult in several weeks with the right temperatures and living for just four to six weeks.

It had been previously found in nearby Preston Merse, Kirkcudbrightshire, in 1907, but the population was thought to have been wiped out when the ponds were lost to the sea in 1948.

The only other known UK population before the Caerlaverock discovery in 2004 was at the New Forest in England.

Fossilised remains prove tadpole shrimps were around 220 million years ago in the Triassic period - pre-dating the dinosaurs. Experts say they do not appear to have changed in appearance since that time.

National guidelines released for earwax removal

New recommendations from ENT doctors on the treatment of impacted cerumen for adults and children

Alexandria, Va. - The American Academy of Otolaryngology – Head and Neck Surgery Foundation (AAO-HNSF) will issue the first comprehensive clinical guidelines to help health care practitioners identify patients with cerumen (commonly referred to as earwax) impaction. The guidelines emphasize evidence-based management of cerumen impaction by clinicians, and inform patients of the purpose of ear wax in hearing health.

"Approximately 12 million people a year in the U.S. seek medical care for impacted or excessive cerumen," said Richard Rosenfeld, MD, MPH, Chair of the AAO-HNSF Guideline Development Task Force. "This leads to nearly 8 million cerumen removal procedures by health care professionals. Developing practical clinical guidelines for physicians to understand the harm vs. benefit profile of the intervention was essential."

Cerumen, commonly called "earwax," is not really a "wax" but a water-soluble mixture of secretions (produced in the outer third of the ear canal), plus hair and dead skin, that serves a protective function for the ear. Cerumen is a natural product that should not be routinely removed unless impacted.

Cerumen impaction occurs when enough earwax accumulates to cause symptoms (pain, fullness, itching, odor, tinnitus, discharge, cough, or hearing loss), or to prevent needed assessment of the ear. The problem affects 1 in 10 children, 1 in 20 adults, and greater than one-third of the elderly and cognitively impaired.

"Unfortunately, many people feel the need to manually 'remove' cerumen from the ears," said Peter Roland, MD, Chair of the Cerumen Impaction Guideline Panel. "This can result in further impaction and other complications to the ear canal."

Any excessive cerumen normally migrates out of the ear canal automatically, assisted by motion of the jaw (e.g., chewing), and carries with it dirt, dust, and other small particles in the ear canal.

Recognizing that patients may seek care from many different types of health care providers, the guidelines are intended for all clinicians who are likely to diagnose and manage patients with cerumen impaction.

Key features of the new guidelines include:

- * Cerumen is a beneficial, self-cleaning agent, with protective, lubricating (emollient), and antibacterial properties.
- * Clinicians should examine patients with hearing aids for cerumen impaction because it may cause feedback, reduce sound intensity, or damage the hearing aid.
- * Cerumen may cause reversible hearing loss when it blocks 80 percent or more of the ear canal diameter.
- * Appropriate options for cerumen impaction are (1) cerumenolytic (wax-dissolving) agents, which include water, saline, and other agents of comparable efficacy, (2) irrigation or ear syringing, which is most effective when a cerumenolytic is instilled 15-30 minutes prior, and (3) manual removal with special instruments or a suction device, which is preferred for patients with narrow ear canals, eardrum perforation or tube, or immune deficiency.
- * Inappropriate or harmful interventions are cotton-tipped swabs, oral jet irrigators, and ear candling.
- * Clinicians should assess patients at the conclusion of in-office treatment for cerumen impaction and document resolution of the impaction.
- * There are no proven ways to prevent cerumen impaction, but not inserting cotton-tipped swabs or other objects in the ear canal is strongly advised; individuals at high risk (e.g., hearing aid users) should consider seeing a clinician every 6-12 months for routine cleaning.

"The complications from cerumen impaction can be painful and ongoing, including infections and hearing loss," says Dr. Roland. "It is hoped that these guidelines will give clinicians the tools they need to spot an issue early and avoid serious outcomes."

The guidelines were created by a multidisciplinary panel of clinicians representing the fields of otolaryngology, audiology, family medicine, geriatrics, internal medicine, nursing, and pediatrics.

"Clinical Practice Guideline on Cerumen Impaction" will appear as a supplement to the September 2008 issue of Otolaryngology – Head and Neck Surgery, the peer-reviewed scientific journal of the American Academy of Otolaryngology – Head and Neck Surgery Foundation (AAO-HNSF) and the American Academy of Otolaryngic Allergy. The guidelines will also be presented in a seminar during the 2008 AAO-HNSF Annual Meeting & OTO EXPO in Chicago, September 21 – 24, 2008.

Ancient Urban Network Mapped in Amazon Forests

John Roach for National Geographic News August 28, 2008

Dozens of densely packed, pre-Columbian towns, villages, and hamlets arranged in an organized pattern have been mapped in the Brazilian Amazon, anthropologists announced today.

The finding suggests that vast swathes of "pristine" rain forest may actually have been sophisticated urban landscapes prior to the arrival of European colonists.

"It is very different from what we might expect using certain classic models of urbanism," noted study co-author Michael Heckenberger, an anthropologist at the University of Florida in Gainesville.

Nevertheless, he said, the repeated patterns within and among settlements across the landscape suggest a highly ordered and planned society on par with any medieval European town.



The settlements show an advanced level of planning

The finding supports a controversial theory that the Amazon River Basin teemed with large societies that were all but obliterated by disease when European colonists arrived in the 15th and 16th centuries.

The isolated tribes that remain in the Amazon today are the last survivors of these once-great societies, according to the theory. (Related story: "'Uncontacted' Amazon Tribe Actually Known for Decades" [June 19, 2008])

If this theory is correct, the networked structure of the ancient settlements may lend insight to better protect and manage the indigenous populations and forests that remain in the Amazon today, scientists said.

Heckenberger and his colleagues from the U.S. and Brazil—including a member of the Kuikuro, an indigenous Amazonian tribe—report their finding today in the journal *Science*.

Urban Plan

In 1993, Heckenberger lived with the Kuikuro near the headwaters of the Xingu River. Within two weeks of his stay, he learned about the ancient settlements and began a 15-year effort to study and map them in detail.

So far he has identified at least two major clusters—or polities—of towns, villages, and hamlets. Each cluster contains a central seat of ritualistic power with wide roads radiating out to other communities.

Each settlement is organized around a central plaza and linked to others via precisely placed roads. In their heyday, some of the settlements were home to perhaps thousands of people and were about 150 acres (61 hectares) in size.



Concentrations of pottery and earthworks were found at the site

A major road aligned with the summer solstice intersects each central plaza.

The larger towns, placed at cardinal points from the central seat of power, were walled much like a medieval town, noted Heckenberger. Smaller villages and hamlets were less well defined.

Between the settlements, which today are almost completely overgrown, was a patchwork of agricultural fields for crops such as manioc along with dams and ponds likely used for fish farms.

"The whole landscape is almost like a latticework, the way it is gridded off," Heckenberger said. "The individual centers themselves are much less constructed. It is more patterned at the regional level."

At their height between A.D. 1250 and 1650, the clusters may have housed around 50,000 people, the scientists noted.

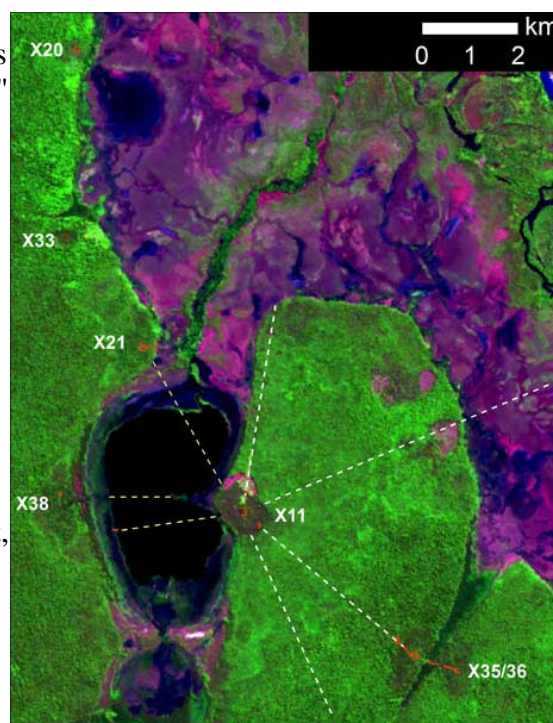
According to Heckenberger, the planned structure of these settlements is indicative of the regional planning and political organization that are hallmarks of urban society.

"These are far more planned at the regional level than your average medieval town," he said, noting that rural landscapes in medieval settlements were randomly oriented.

"Here things are oriented at the same angles and distances across the entire landscape."

"Garden Cities"

The research "raises huge and important questions," Susan Hecht, an Amazon specialist at the University of California, Los Angeles, was quoted saying in a related *Science* news piece written by Charles Mann. Mann is the author of the 2005 book *1491: New Revelations of the Americas Before Columbus*, which describes theories of urban planning in the Amazon.



Lines mapped from village earthworks radiate outward from the central power seat in the southernmost of two recently identified clusters of ancient Amazon towns. Dozens of densely packed, pre-Columbian towns, villages, and hamlets arranged in an organized pattern have been mapped in the Brazilian Amazon, anthropologists announced in late August 2008. Map courtesy Science/AAAS

For one, Hecht was quoted as saying, the research adds further weight to the idea that the Amazon Basin once supported large and complex societies.

Other scientists, notably archaeologist Betty Meggers at the Smithsonian Institution in Washington, D.C., have argued that Amazonian soils were too poor to support large human populations for extended periods.

Hecht said the research also challenges the idea that urbanism means a central, dominant, and powerful city. Smaller, but highly connected settlements may also have been common.

According to study co-author Heckenberger, the clusters of towns in the pre-Columbian Amazon were similar to the system envisioned by British planner Ebenezer Howard in his 1902 book, *Garden Cities of Tomorrow*.

Howard argued for a system of tightly linked smaller cities instead of large megacities that are an eyesore on the natural world. "If [he] knew about Xingu, it would have been a chapter in his book," Heckenberger said.

And now that the Amazonian "garden cities" have been found, Heckenberger added, scientists and planners ought to study them closely for alternatives to the modern system that is destroying vast reaches of the Amazon and displacing the last of the region's indigenous tribes.

"We know that we have to come up with alternatives," he said, "so here is a place we may want to look."

Blood vessel cells are instructed to form tube-like structures

How do blood vessel cells understand that they should organise themselves in tubes and not in layers? A research group from Uppsala University shows for the first time that a special type of "instructor" molecule is needed to accomplish this. These findings, published in the scientific journal *Blood*, might be an important step towards using stem cells to build new organs.

In order for a body to develop and function the cells in the body must be able to organise themselves in relation to each other. The way in which cells are arranged depends on the organ where they are located. Blood vessel cells need to form three-dimensional, tube-like structures that can transport blood. But how do blood vessel cells know that they should do that? An important part of the communication between cells and their environment is the use of growth factors. These are proteins that bind to receptors on the surface of the cell that receives the information. When the receptor in turn forms a complex with other proteins, on the inside of the cell, the read-out from the DNA can be altered. The information has "arrived".

VEGF (vascular endothelial growth factor) is a family of closely related growth factors that control blood vessel cells throughout life. Blood vessel development in the foetus as well as later in life, for example during wound healing, is regulated by VEGF. In the present study the research group has examined how VEGF can instruct blood vessel cells to arrange themselves into a tube. The answer is that some variants of VEGF have the ability to attract another protein, an instructor molecule, which is joined together with VEGF and its receptor. The combination of instructor molecule, VEGF and receptor results in that a specific signal is sent inside the blood vessel cells, making them form a tube. Without the instructor molecule the cells line up next to each other, in a layer.

These results may become very useful. Today stem cells are used to create new cells, organs and even tissues, that in the future might be used to for transplantation instead of donated organs. If a patient's own stem cells are used the problem with organ rejection is avoided. But so far there has been a challenge to create three-dimensional structures from stem cells.

Our contribution can make it possible to create blood vessels from stem cells and to direct them to form a tube instead of a layer. Perhaps this knowledge can be transferred to the formation of other tube-like structures in the body, such as the lung and intestines. The perspectives for the future are very exciting, says Lena Claesson-Welsh, who has led the study.

Fly's brain 'senses swat threat'

By Matt McGrath BBC World Service science reporter

Researchers in the US say that they have solved the mystery of why flies are so hard to swat. They think the fly's ability to dodge being hit is due to its fast acting brain and an ability to plan ahead.

High speed, high resolution video recordings revealed the insects quickly work out where a threat is coming from and prepare an escape route. The research suggests that the best way of swatting a fly is to creep up slowly and aim ahead of its location. The study has been published in the journal *Current Biology*.

Most people will have experienced the curiously frustrating sensation of carefully attempting to swat a fly, only to swing and miss while the intrepid insect buzzes off to safety.

Over the years there have been different theories put forward to explain the fly's uncanny ability to outwit our whacking endeavours. But scientists at the California Institute of Technology (Caltech) say it is down to quick-fire intelligence and good planning.

They filmed a series of experiments with fruit flies and a looming swatter. The researchers discovered that long before the fly leaps it calculates the location of the threat and comes up with an escape plan.

Flies put their bodies into pre-flight mode very rapidly - Within 100 milliseconds of spotting the swatter they can position their centre of mass in the right way so that a simple extension of their legs propels them away from any threat.

The scientists found that flies were able to put themselves into this rapid reaction position no matter whether they were grooming, feeding or simply walking.

According to Caltech's Professor Michael Dickinson this illustrates the speed and complexity of the fly's brain.

Threat perception

"We've found that when the fly makes planning movements prior to take-off, it takes into account its body position at the time it first sees the threat," he explained. "Our experiments showed that the fly somehow 'knows' whether it needs to make large or small postural changes.

"This means the fly must integrate visual information from its eyes which tell it where the threat is approaching from, with mechano-sensory information from its legs, which tells it how to move to reach the proper pre-flight pose."

So can this data make us more efficient swatters? Possibly. It is best to creep up on a fly with stealth, as they are unable to register slow movements.

When it comes to striking the blow, Professor Dickinson said it was a good idea not to aim at the fly's starting position. "It's best to aim a bit forward of its location and try and anticipate where the fly will jump when it first sees your swatter," he explained.

Study Points To One Cause Of Higher Rates Of Transplanted Kidney Rejection In Blacks

Johns Hopkins Medicine Media Relations and Public Affairs

Media Contact: Eric Vohr 410-955-8665; evohr1@jhmi.edu August 29, 2008

A Johns Hopkins research team reports it may have an explanation for at least some of the higher organ rejection rates seen among black - as compared to white - kidney transplant recipients.

In a study of 50 healthy adult men, 25 black and 25 white, significantly different amounts of certain immune system cells were found between the races.

These cells, known as human leukocyte antigen-specific, or HLA-specific B cells, when "sensitized" produce antibodies linked to transplanted kidney rejection, says Andrea Zachary, professor of medicine at Johns Hopkins and lead researcher of the study.

It's been long known that HLA-reactive antibodies produced by B cells are one of the ways that transplanted organs are rejected. Zachary developed a novel method for counting HLA-specific B cells more accurately, leading to the hypothesis that B cell numbers make a difference in transplant retention and rejection.

"Now that we have an accurate way to count these cells, we are able to confirm what we long suspected, that blacks might have a bigger army of HLA-specific B cells," says Zachary who presented her findings at the Congress of the International Transplant Society in Sydney, Australia on Aug. 12.

Zachary says that patients become sensitized when exposed to HLA in blood or tissue that is not their own. Sensitized HLA-specific B cells then produce antibodies that attack transplanted organs containing foreign HLA. Patients can become sensitized from a blood transfusion, transplantation or pregnancy.

"If the recipient is not sensitized, B cells represent only a patient's potential for making antibodies," says Zachary. "However about a third of patients in need of a kidney are sensitized since they're often on their second or third transplantation and may have undergone transfusions. In the study, Zachary and her team gathered blood samples from 25 adult black males and 25 adult white males. They were all healthy and all non-sensitized. They also gathered blood samples from 10 sensitized adult black males and 25 sensitized white males.

Results showed that the black non-sensitized males tested had an average of 17.2 percent more HLA-sensitive B cells than the white non-sensitized males tested. Among the sensitized group, black males had an average of 22.9 percent more HLA-sensitive B cells than white males.

HLA antigens are proteins that sit on the surface of blood and tissue cells. Each person has a specific set, similar to a fingerprint. Rejection of a transplant occurs when the recipient's immune system sees the donor's HLA antigens as foreign and attacks those antigens with cells or antibodies. The amount of antibody made depends on the number of B cells a recipient has.

"Knowing that blacks have an increased number of HLA-specific B cells - which increases their opportunity for antibody-mediated rejection - we may be able to customize treatments for black recipients to account for these differences and lessen the likelihood that the organ will be rejected," says Zachary.

Additional Johns Hopkins researchers who worked on this study are Mary S. Leffell, Ph.D.; and Dessislava Kopchaliifka, Ph.D., of the Department of Medicine and J. Keith Melancon, M.D., of the Department of Surgery.

Landmark study opens door to new cancer, aging treatments

Wistar Institute researchers decipher telomerase structure

PHILADELPHIA - Researchers at The Wistar Institute have deciphered the structure of the active region of telomerase, an enzyme that plays a major role in the development of nearly all human cancers. The landmark achievement opens the door to the creation of new, broadly effective cancer drugs, as well as anti-aging therapies.

Researchers have attempted for more than a decade to find drugs that shut down telomerase—widely considered the No. 1 target for the development of new cancer treatments—but have been hampered in large part by a lack of knowledge of the enzyme's structure.

The findings, published online August 31 in *Nature*, should help researchers in their efforts to design effective telomerase inhibitors, says Emmanuel Skordalakes, Ph.D., assistant professor in Wistar's Gene Expression and Regulation Program, who led the study.

"Telomerase is an ideal target for chemotherapy because it is active in almost all human tumors, but inactive in most normal cells," Skordalakes says. "That means a drug that deactivates telomerase would likely work against all cancers, with few side effects."

The study elucidates the active region of telomerase and provides the first full-length view of the telomerase molecule's critical protein component. It reveals surprising details, at the atomic level, of the enzyme's configuration and how it works to replicate the ends of chromosomes—a process critical to both tumor development and the aging process.

Achieving immortality

In humans, telomerase adds multiple repeats of a short DNA sequence to the ends of chromosomes, known as telomeres, thus preventing damage and the loss of genetic information during cell division.

When telomerase is dormant, telomeres shorten each time a cell divides, leading eventually to genetic instability and cell death. By preserving chromosomes' integrity, telomerase allows cells to continue living and dividing. The enzyme is active in cells that multiply frequently, such as embryonic stem cells, but is switched off almost entirely in normal adult cells to prevent the dangers of runaway cell proliferation.

Cancer cells, however, often regain the ability to activate telomerase, which has been implicated in 90 percent of human tumors. The enzyme permits cells to replicate indefinitely and achieve the cellular "immortality" that is the hallmark of cancer. Deactivating telomerase would stop tumor growth.

In addition to its role in cancer, telomerase holds significant implications for the development of therapies to combat aging and other age-related diseases. Finding ways to activate telomerase under controlled conditions and allow some cells to begin dividing again could result in healthier, younger-looking tissue that lives longer.

An elusive enzyme

Telomerase is a complex structure made up of multiple protein domains and a stretch of RNA, which contains the template the enzyme uses to synthesize telomeres.

Last year, Skordalakes and his team solved the structure of a key segment of the molecule - the so-called TRBD domain, where RNA binding occurs. However, the complexity of telomerase has proved a roadblock to determining the enzyme's overall architecture - a goal pursued by researchers worldwide for more than 15 years.

To perform the necessary studies, scientists first must gather large quantities of the enzyme in a specific conformation. Because the complex structure of telomerase most likely allows it to change configuration, that process has been challenging, Skordalakes says.

To find sufficient quantities of the enzyme for the study, Skordalakes and his team looked beyond commonly relied-on sources such as humans and yeast. By screening a wide variety of organisms, including protozoa and insects, they discovered that a gene from the red flour beetle could produce telomerase in copious amounts, and a stable form.

"That was really the breakthrough," Skordalakes says. "Once we found that the gene from this organism expressed the protein in the quantities we needed, we were able to move quickly."

The researchers used X-ray crystallography, a technique that analyzes the diffraction patterns of X-rays beamed at crystals of a molecule, to determine the three-dimensional structure of the enzyme's active region—the catalytic component called telomerase reverse transcriptase protein, or TERT.

The study revealed surprising features, including the fact that the molecule's three domains are organized into a doughnut shape, an unexpected configuration. Knowledge of the structure allowed the researchers to create a model of the enzyme's function.

"It's extremely exciting," Skordalakes says. "For the first time, we can see how telomerase assembles at the end of chromosomes to initiate telomere replication."

Looking ahead

Skordalakes plans to further study TERT and search for new telomerase inhibitors that could become cancer therapies. He also will look at modifying existing drugs. Previous attempts to target telomerase have fallen flat, but knowledge of the enzyme's structure will help researchers to determine the limitations of existing agents and make them more effective.

Skordalakes began his studies of telomerase when he joined The Wistar Institute in 2006 and established his first laboratory. "I've always been interested in understanding, on a molecular level, the function of protein nucleic acid assemblies and using that information in the treatment of human disease," he says. "Telomerase, because of its important role in cancer and aging, was an obvious target for me."

He says though the process was frustrating at times, his team was determined to solve the structure. "It required a lot of perseverance and effort, but we really wanted to do this," he says.

Wistar's Andrew J. Gillis and Anthony P. Schuller assisted with the study.

'Superbug' breast infections controllable in nursing mothers, UT Southwestern researchers find

DALLAS – Aug. 31, 2008 – Many nursing mothers who have been hospitalized for breast abscesses are afflicted with the "superbug" methicillin-resistant *Staphylococcus aureus*, or MRSA, but according to new research by UT Southwestern Medical Center physicians, conservative treatment can deal with the problem.

The study focused on hospitalized women with mastitis, and showed that MRSA was much more likely to be found in those who had both mastitis (an inflammation of the milk glands) and abscesses (pockets of infection).

"The take-home message is that a patient with mastitis does not necessarily need an antibiotic against MRSA," said Dr. George Wendel, professor of obstetrics and gynecology and senior author of the study, which appears in the September issue of the journal *Obstetrics and Gynecology*. "She will improve with a less specific antibiotic as long as she also empties her breasts, either through feeding or pumping, and if there's an abscess, gets it treated."

The study also showed that if a nursing mother has an abscess, she does not immediately need antibiotics against MRSA, but can be switched to them if tests reveal she has MRSA.

The study was designed to determine which antibiotic treatment is best for severe cases of mastitis, which can be caused by clogged milk ducts with or without infection, and breast abscesses, which are caused by bacterial infections, generally by *aureus*. There are many strains of staph, one of which is MRSA.

Treating mastitis or breast abscesses immediately with powerful drugs that fight MRSA carries a risk of creating even more antibiotic-resistant strains of staph, Dr. Wendel said.

"The physician can take the time to test the patient to determine what kind of bacteria she has," Dr. Wendel said. "We found that you're not going to put the patient at a disadvantage if you start her on antibiotics while you wait for culture results, then switch her to more powerful medication if she has MRSA."

The study involved 136,459 women who delivered at Parkland Memorial Hospital between 1997 and 2005. Of those, 127 were hospitalized with mastitis, which tends to strike younger women having their first child.

The researchers found that about 59 percent of the women with both mastitis and abscesses had MRSA, while only 2 percent of women with mastitis alone had MRSA. Because the study tracked women who had been hospitalized, there is no way to know whether this proportion is the same in women treated for mastitis on an outpatient basis, Dr. Wendel said.

MRSA is resistant to many antibiotics, but the researchers found that even in cases when the exact cause of the mastitis or abscess had not yet been determined, and the women initially received antibiotics that don't affect MRSA, all eventually recovered completely.

During the study, when tests showed that a woman had MRSA, she was switched to vancomycin, an antibiotic effective against it.

About 2 percent to 10 percent of all nursing mothers develop some sort of breast inflammation such as mastitis, the researchers said. Symptoms of mastitis include unexplained fever and deep soreness or swelling in one breast but not the other.

In contrast to mastitis, an abscess is caused by a localized infection, which causes pain in a specific area that can feel hot to the touch and appear red on the skin.

"Women should seek medical care if they have any symptoms or concerns for breast infections," said Dr. Irene Stafford, resident in obstetrics and gynecology and lead author of the study.

Other UT Southwestern researchers involved in the study were Drs. Jennifer Hernandez and Vanessa Laibl Rogers, both assistant professors of obstetrics and gynecology; and Drs. Jeanne Sheffield and Scott Roberts, both associate professors of obstetrics and gynecology.