Shackleton's Antarctic spirits saved

Three crates of Scotch whisky and two crates of brandy buried under Antarctic ice for more than 100 years have been recovered by a heritage team restoring Irish-born explorer Ernest Shackleton's hut.

New Zealand Antarctic Heritage Trust team leader Al Fastier says he believes some bottles, abandoned by Shackleton at Cape Royds when he was forced to abort his Nimrod expedition to the South Pole in 1909, are still intact.

The whisky was made by MacKinlay & Co and drinks group Whyte & Mackay has asked for a sample to carry out tests with a view to possibly re-launching the defunct brand.

The crates of whisky Sir Ernest Shackleton abandoned when he was forced to abort his Nimrod expedition to the South Pole in 1909 **Photograph: nzaht.org**

Mr Fastier said restoration workers found the crates under the hut's floorboards in 2006, but they were too deeply embedded in ice to be dislodged. It was originally thought the haul consisted only of three crates of Scotch. "The unexpected find of the brandy crates - one labelled Chas MacKinlay & Co and the other labelled The Hunter Valley Distillery Limited Allandale - is a real bonus," Mr Fastier said.

Ice has cracked some of the bottles, but the restorers are confident the five crates contain intact bottles "given liquid can be heard when the crates are moved". "The smell of whisky in the surrounding ice before excavation commenced also indicated full bottles of spirits were inside, albeit that one or more might have broken," he added.

Mr Fastier said ice had cracked some of the crates and formed inside them. This would make extracting the contents delicate, but the trust would decide how to do so in coming weeks.

Richard Paterson, master blender at Whyte & Mackay, whose company supplied the MacKinlay's whisky for Shackleton, described the find as "a gift from the heavens" for whisky lovers.

"If the contents can be confirmed, safely extracted and analysed, the original blend may be able to be replicated. Given the original recipe no longer exists, this may open a door into history," he said.

Shackleton's Nimrod expedition had travelled over 1,600 kilometres across the Antarctic wilderness, run out of rations and suffered a series of blizzards before being forced to retreat just 160 kilometres from its target. "I thought, dear, that you would rather have a live ass than a dead lion," Shackleton later wrote to his wife Emily.

No lives were lost, vindicating Shackleton's decision to turn back from the pole, which was eventually first reached in 1911 by Norwegian explorer Roald Amundsen.

It was the second time Shackleton had attempted to reach the South Pole. He first tried with British explorer Robert Scott on his ill-fated Discovery expedition in 1902 which ended some 770 kilometres short of its goal.

The excavation of the whisky follows the discovery last month of two blocks of butter in an Antarctic hut used by Scott on his doomed 1910-12 expedition. The butter had been stored in stables attached to the expedition hut at Cape Evans in Antarctica. *Additional reporting: AP/AFP © 2010 irishtimes.com*

Inhibiting serotonin in gut could cure osteoporosis

Finding, in animal model, offers proof of principle that inhibiting serotonin in the gut could become a novel treatment for 10s of millions of osteoporosis sufferers

NEW YORK – An investigational drug that inhibits serotonin synthesis in the gut, administered orally once daily, effectively cured osteoporosis in mice and rats reports an international team led by researchers from Columbia University Medical Center, in the Feb. 7 issue of Nature Medicine. Serotonin in the gut has been shown in recent research to stall bone formation. The finding could lead to new therapies that build new bone; most current drugs for osteoporosis can only prevent the breakdown of old bone.

"New therapies that inhibit the production of serotonin in the gut have the potential to become a novel class of drugs to be added to the therapeutic arsenal against osteoporosis," said Gerard Karsenty, M.D., Ph.D., chair of the Department of Genetics and Development at Columbia University College of Physicians and Surgeons, lead author of the paper. "With tens of millions of people worldwide affected by this devastating and debilitating bone loss, there is an urgent need for new treatments that not only stop bone loss, but also build new bone. Using these findings, we are working hard to develop this type of treatment for human patients."

The Nature Medicine paper follows on a major discovery: http://www.cumc.columbia.edu/news/press_releases/Karsenty-cell-serotonin-lrp5.html, also made by Dr. Gerard Karsenty's group (published in the Nov. 26, 2008 issue of Cell), that serotonin released by the gut inhibits bone formation, and that regulating the production of serotonin within the gut affects the formation of bone. Prior to this discovery, serotonin was primarily known as a neurotransmitter acting in the brain. Yet, 95

percent of the body's serotonin is found in the gut, where its major function is to inhibit bone formation (the remaining five percent is in the brain, where it regulates mood, among other critical functions). By turning off the intestine's release of serotonin, the team was able, in this new study, to cure osteoporosis in mice that had undergone menopause.

Based on their findings reported in the Cell paper, Dr. Karsenty and his team postulated that an inhibitor of serotonin synthesis should be an effective treatment for osteoporosis. Shortly thereafter, they read about an investigational drug, known as LP533401, which is able to inhibit serotonin in the gut. "When we learned of this compound, we thought that it was important to test it as proof of principle that there could be novel ways to treat osteoporosis with therapies that can be taken orally and regulate the formation of serotonin," said Dr. Karsenty.

Dr. Karsenty and his team developed a research protocol to test their theory, where they administered the compound orally, once daily, at a small dose, for up to six weeks to rodents experiencing post-menopausal osteoporosis. Results demonstrated that osteoporosis was prevented from developing, or when already present, could be fully cured. Of critical importance, levels of serotonin were normal in the brain, which indicated that the compound did not enter the general circulation and was unable to cross the blood-brain barrier, thereby avoiding many potential side effects.

Implications for the Treatment of Osteoporosis:

Most osteoporosis drugs, including those currently under clinical investigation, do not generate new bone but rather, prevent the breakdown of old bone. Only one drug currently on the market can generate new bone – but it must be taken by injection once a day, and because it may increase the risk of bone cancer, at least in rats, its use is restricted for short-term use in women with severe osteoporosis.

"There is an urgent need to identify new, safe therapies that can increase bone formation on a long term basis and to such an extent that they compensate for the increase in bone resorption caused by menopause," said Dr. Karsenty. "Furthermore, it is important to note that since this study was conducted in rodents, it will need further confirmation in human subjects."

Osteoporosis: A Disease of Bone Mass Decline…

Osteoporosis is a growing public health concern, with the aging population and the incidence of post-menopausal osteoporosis on the rise. It is a disease of low bone mass, most often caused by an increase in bone resorption not compensated by a similar increase in bone formation.

Far from being inert, bone constantly undergoes renovation, with some cells responsible for removing old material and other cells responsible for creating new bone. In humans, after age 20, the balance between bone formation and breakdown tips toward breakdown, and bone mass starts to decline. In women, the rate of decline increases after menopause, when estrogen levels drop and cells that tear down old bone become overactive. Osteoporosis is a disease in which bones become fragile and porous, increasing the risk of breaks. It is diagnosed when bone mass drops below a certain level.

This research was supported by grants from the National Institutes of Health and a Gideon and Sevgi Rodan fellowship from the International Bone and Mineral Society (IBMS).

Co-authors on this paper include Vijay K. Yadav from the Department of Genetics and Development at Columbia University Medical Center (CUMC); Santhanam Balaji and Marc Vidal, Department of Genetics, Harvard Medical School; P.S. Suresh and R. Medhamurthy, Department of Molecular Reproduction, Development and Genetics, Indian Institute of Science, India; X. Sherry Liu, Xin Lu and Edward Guo, Department of Biomedical Engineering (Columbia); Zhishan Li and Michael D. Gershon, Department of Cell Biology (CUMC); J. John Mann, Department of Psychiatry (CUMC); Anil K. Balapure, Tissue and Cell Culture Unit, Central Drug Research Institute, India; and Patricia Ducy, Department of Pathology (CUMC).

Industrial cleaner linked to increased risk of Parkinson's disease

ST. PAUL, Minn. – Workers exposed to tricholorethylene (TCE), a chemical once widely used to clean metal such as auto parts, may be at a significantly higher risk of developing Parkinson's disease, according to a study released today that will be presented at the American Academy of Neurology's 62nd Annual Meeting in Toronto April 10 to April 17, 2010.

"This is the first time a population-based study has confirmed case reports that exposure to TCE may increase a person's risk of developing Parkinson's disease," said study author Samuel Goldman, MD, with the Parkinson's Institute in Sunnyvale, California, and a member of the American Academy of Neurology. "TCE was once a popular industrial solvent used in dry cleaning and to clean grease off metal parts, but due to other health concerns the chemical is no longer widely used."

For the study, researchers obtained job histories from 99 pairs of twins in which only one of the twins had Parkinson's disease. All of the twins were men and identified from the World War II-Veterans Twins Cohort study. Scientists used twins in the study because they are genetically identical or very similar and provide an ideal population for evaluating environmental risk factors.

The study found workers who were exposed to TCE were five and a half times more likely to have Parkinson's disease than people not exposed to the chemical. Those who were exposed to TCE had job histories including work as dry cleaners, machinists, mechanics or electricians.

The study was supported by grants from the National Institute of Neurological Disorders and Stroke, The Valley Foundation and the James and Sharron Clark Family Fund.

A potent suppressor of endometrial cancer is revealed

Researchers define genetic changes that cause widespread malignant growth of cells lining the uterus

Endometrial cancer is the most common cancer of the female reproductive tract, representing 6% of all cancers. There is currently no screening method or biomarker to indicate early presence of disease. "It is a very common malignancy that affects women of all ages" comments paper author Dr. Diego Castrillon. The cancer forms from the cells that grow along the inner lining of the uterus, which is called the endometrium, and usually it is diagnosed following patient reports of abnormal bleeding.

The normal endometrium is a dynamic place, providing a thick, highly vascularized environment ready to generate a placenta if it is implanted with an embryo. The dynamic and cyclic activity of the endometrium makes it very sensitive to signaling molecules. Early changes in a number of signaling proteins are known to contribute to endometrial cancer in some patients. A major research goal is to understand how signals create cancer cells and to identify places where intervention might shut down the signals that promote cancer cell survival and growth.

Researchers learn about cancer by creating genetic changes to signaling proteins in mice that reflect changes found in human cancer patients. Animal models are produced in this way to help understand how cancer cells form and progress. One challenge is to localize genetic changes to the environment of interest. In the case of endometrial cancer, researchers need to specifically modify only those cells that are in the endometrium, so that their data is not complicated by changes in other tissues.

In a new study published in Disease Models & Mechanisms (DMM), <http://dmm.biologists.org/>, scientists report a new genetic tool that can specifically alter gene expression in the endometrium. They use this approach to remove a signaling protein gene only in endometrial cells to determine its influence on endometrial cancer formation. They found that the genetic change induced a very rapidly progressing cancer in all mice that carried the mutation. The gene they deleted, called Lkb1, is mutated in many other types of human cancers, and it regulates pathways that are known to contribute to the formation of aggressive cancer cells.

Very few genetic changes act alone to induce cancer. Most cancer cells result from multiple mutations. However, all mice deficient for just Lkb1, exhibited cancerous changes throughout their entire endometrium. "In most mouse cancer models, one creates a tumor prone condition. But additional mutations are usually required for a cell to develop a cancer" says Dr. Castrillon, "What is surprising about the Lkb1 model, is that their entire endometrium becomes malignant. It happens very early and rapidly."

The rapid development of cancer in mice without Lkb1 suggests that this gene or the molecules that its product regulates may be valuable targets for future therapy. The authors show that treating the mice with a drug that blocks a downstream target of the Lkb1 product kills tumor cells, leading to tumor shrinkage and dramatic recovery of the mice. "It is likely that this pathway is very important. We believe that Lkb1 mutations or mutations in other steps in this pathway represent some type of metabolic abnormality that we could take advantage of [for therapeutic intervention]" says Dr. Castrillon.

The report titled 'Lkb1 inactivation is sufficient to drive endometrial cancers that are aggressive yet highly responsive to mTOR inhibitor monotherapy' was written by Cristina M. Contreras, Esra A. Akbay, Teresa D. Gallardo, Marshall Haynie, Osamu Tagao, Masaya Takahashi, and Diego H. Castrillon at the Univeristy of Texas Southwestern Medical Center, and Sreenath Sharma, Nabeel Bardeesy, Jeff Settleman and Kwok-Kin Wong at Harvard Medical School. The study will be published in the March/April issue of 2010 (Vol 3/Issue 3-4) of the research journal, Disease Models & Mechanisms (DMM), published by The Company of Biologists, a non-profit based in Cambridge, UK.

UC Davis study confirms link between advanced maternal age and autism

Advanced paternal age is a risk only when the mother is younger

SACRAMENTO, Calif. - Advanced maternal age is linked to a significantly elevated risk of having a child with autism, regardless of the father's age, according to an exhaustive study of all births in California during the 1990s by UC Davis Health System researchers. Advanced paternal age is associated with elevated autism risk only when the father is older and the mother is under 30, the study found.

Published online today in the February issue of the journal Autism Research, the study, "Independent and Dependent Contributions of Advanced Maternal and Paternal Ages to Autism Risk," is one of the largest population-based studies to quantify how each parent's age - separately and together - affects the risk of having a child with autism.

The study found that the incremental risk of having a child with autism increased by 18 percent - nearly one fifth - for every five-year increase in the mother's age. A 40-year-old woman's risk of having a child later diagnosed with autism was 50 percent greater than that of a woman between 25 and 29 years old.

Advanced parental age is a known risk factor for having a child with autism. However, previous research has shown contradictory results regarding whether it is the mother, the father or both who contribute most to the increased risk of autism. For example, one study reported that fathers over 40 were six times more likely than fathers under 30 to have a child with autism.

"This study challenges a current theory in autism epidemiology that identifies the father's age as a key factor in increasing the risk of having a child with autism," said Janie Shelton, the study's lead author and a doctoral student in the UC Davis Department of Public Health Sciences. "It shows that while maternal age consistently increases the risk of autism, the father's age only contributes an increased risk when the father is older and the mother is under 30 years old. Among mothers over 30, increases in the father's age do not appear to further increase the risk of autism."

Autism is a pervasive developmental disorder of deficits in social skills and communication, as well as repetitive and restricted behaviors, with onset occurring prior to age 3. Abnormal brain development, probably beginning in the womb, is known to be fundamental to the behaviors that characterize autism. Current estimates place the incidence of autism at between 1 in 100 and 1 in 110 children in the United States.

During the 1990s, the number of California women over 40 giving birth increased by more than 300 percent. But only about 5 percent of the 600-percent increase in the number of autism cases in the state can be attributed to women waiting longer to have children, the study suggests.

To conduct their investigation, the researchers obtained the electronic records for all births in California between Jan. 1, 1990 and Dec. 31, 1999. The records incorporated detailed demographic information, including the ages of both parents. To identify which children would develop autism, the researchers obtained electronic records identifying children born during the study period who later received an autism diagnosis from state Department of Developmental Services. In this study autism was defined as a diagnosis of full-syndrome autism at a California Regional Center.

The researchers also excluded a small number of births where demographic information about parents, such as their ages and levels of education, was not available. Instances of multiple births were analyzed separately. The exclusions brought the total size of the study sample to approximately 4.9 million births and 12,159 cases of autism.

For older mothers, the step-wise progression in the risk of having a child who later would be diagnosed with autism was apparent among every age group of fathers. When the father was older and the mother was younger - under 30 - the child's risk for developing autism also was elevated. For example, among births to mothers under 25, children fathered by a man over 40 were twice as likely to develop autism as those whose father was between 25 and 29. Among mothers over 30, the increased risk associated with older fathers dissipated, the study found.

Because of the large study size, the researchers were able to show how risk for autism was affected by each parent's age by holding one parent's age constant and then comparing autism incidence across the age of the other parent across five-year increments. The subtle interaction of how each parent's age affects the risk of autism then became quantifiable even when it was reliant on the other parent's age. This methodology is more efficacious and requires fewer assumptions than the mathematical modeling used by earlier studies, the researchers said.

The researchers note that understanding the relationship between increased parental age and autism risk is critical to understanding its biological causes. Earlier studies have observed that advanced maternal age is a risk factor for a variety of other birth-related conditions, including infertility, early fetal loss, low birth-weight, chromosomal aberrations and congenital anomalies.

Irva Hertz-Picciotto, professor of public health sciences, a researcher at the UC Davis MIND Institute and the study's senior author, said the reason that having an older parent places a child at risk for autism is not known.

"We still need to figure out what it is about older parents that puts their children at greater risk for autism and other adverse outcomes, so that we can begin to design interventions," Hertz-Picciotto said.

One possible clue comes from a 2008 UC Davis study that found some mothers of children with autism had antibodies to fetal brain protein, while none of the mothers of typical children did. Advancing age has been associated with an increase in autoantibody production. Further work investigating advancing age in such findings may be useful, the study authors said. They added that some persistent environmental chemicals accumulate in the body and also may have a role to play in autism, possibly contributing to the apparent effect of parental age.

The study also suggests that epigenetic changes over time "may enable an older parent to transfer a multitude of molecular functional alterations to a child ... thus epigenetics may be involved in the risks contributed by advancing parental age as a result of changes induced by stresses from environmental chemicals, co-morbidity or assistive reproductive therapy."

Daniel Tancredi, an assistant professor in the Department of Pediatrics at UC Davis Health System, also contributed to this study. It was funded by a grant from the National Institute of Environmental Health Sciences; a United States Environmental Protection Agency Science to Achieve Results (STAR) grant; the UC Davis School of Medicine and Office of Graduate Studies.

Mediterranean diet may lower risk of brain damage that causes thinking problems

ST. PAUL, Minn. – A Mediterranean diet may help people avoid the small areas of brain damage that can lead to problems with thinking and memory, according to a study released today that will be presented at the American Academy of Neurology's 62nd Annual Meeting in Toronto April 10 to April 17, 2010. The study found that people who ate a Mediterranean-like diet were less likely to have brain infarcts, or small areas of dead tissue linked to thinking problems.

The Mediterranean diet includes high intake of vegetables, legumes, fruits, cereals, fish and monounsaturated fatty acids such as olive oil; low intake of saturated fatty acids, dairy products, meat and poultry; and mild to moderate amounts of alcohol.

For the study, researchers assessed the diets of 712 people in New York and divided them into three groups based on how closely they were following the Mediterranean diet. Then they conducted MRI brain scans of the people an average of six years later. A total of 238 people had at least one area of brain damage.

Those who were most closely following a Mediterranean-like diet were 36 percent less likely to have areas of brain damage than those who were least following the diet. Those moderately following the diet were 21 percent less likely to have brain damage than the lowest group.

"The relationship between this type of brain damage and the Mediterranean diet was comparable with that of high blood pressure," said study author Nikolaos Scarmeas, MD, MSc, of Columbia University Medical Center in New York and a member of the American Academy of Neurology. "In this study, not eating a Mediterranean-like diet had about the same effect on the brain as having high blood pressure."

Previous research by Scarmeas and his colleagues showed that a Mediterranean-like diet may be associated with a lower risk of Alzheimer's disease and may lengthen survival in people with Alzheimer's disease. According to the present study, these associations may be partially explained by fewer brain infarcts.

The study was supported by the National Institutes of Health.

Research reveals link between beer and bone health

Study finds beer is a rich source of silicon, may help prevent osteoporosis

A new study suggests that beer is a significant source of dietary silicon, a key ingredient for increasing bone mineral density. Researchers from the Department of Food Science & Technology at the University of California, Davis studied commercial beer production to determine the relationship between beer production methods and the resulting silicon content, concluding that beer is a rich source of dietary silicon. Details of this study are available in the February issue of the Journal of the Science of Food and Agriculture, published by Wiley-Blackwell on behalf of the Society of Chemical Industry.

"The factors in brewing that influence silicon levels in beer have not been extensively studied" said Charles Bamforth, lead author of the study. "We have examined a wide range of beer styles for their silicon content and have also studied the impact of raw materials and the brewing process on the quantities of silicon that enter wort and beer."

Silicon is present in beer in the soluble form of orthosilicic acid (OSA), which yields 50% bioavailability, making beer a major contributor to silicon intake in the Western diet. According to the National Institutes of Health (NIH), dietary silicon (Si), as soluble OSA, may be important for the growth and development of bone and connective tissue, and beer appears to be a major contributor to Si intake. Based on these findings, some studies suggest moderate beer consumption may help fight osteoporosis, a disease of the skeletal system characterized by low bone mass and deterioration of bone tissue.

The researchers examined a variety of raw material samples and found little change in the silicon content of barley during the malting process. The majority of the silicon in barley is in the husk, which is not affected greatly during malting. The malts with the higher silicon contents are pale colored which have less heat stress during the malting process. The darker products, such as the chocolate, roasted barley and black malt, all have substantial roasting and much lower silicon contents than the other malts for reasons that are not yet known. The hop samples analyzed showed surprisingly high levels of silicon with as much as four times more silicon than is found in malt. However, hops are invariably used in a much smaller quantity than is grain. Highly hopped beers, however, would be expected to contain higher silicon levels.

No silicon was picked up from silica hydrogel used to stabilize beer, even after a period of 24 hours and neither is there pick up from diatomaceous earth filter aid.

The study also tested 100 commercial beers for silicon content and categorized the data according to beer style and source. The average silicon content of the beers sampled was 6.4 to 56.5 mg/L.

"Beers containing high levels of malted barley and hops are richest in silicon," concludes Dr. Bamforth. "Wheat contains less silicon than barley because it is the husk of the barley that is rich in this element. While most of the silicon remains in the husk during brewing, significant quantities of silicon nonetheless are extracted into wort and much of this survives into beer."

Article: "Silicon in Beer and Brewing." Troy R. Casey and Charles W. Bamforth. Journal of the Science of Food and Agriculture Published Online: February 8, 2010 (DOI: 10.1002/JSFA.3884); Print Issue Date: February 2010
This study is published in Journal of the Science of Food and Agriculture. Media wishing to receive a PDF of this article may contact physicalsciencenews@wiley.com.

Rush for iron spurred Inuit ancestors to sprint across Arctic, book contends

By Randy Boswell, Canwest News ServiceFebruary 8, 2010

One of Canada's top archeologists argues in a new book that the prehistoric ancestors of this country's 55,000 Inuit probably migrated rapidly from Alaska clear across the Canadian North in just a few years - not gradually over centuries as traditionally assumed - after they learned about a rich supply of iron from a massive meteorite strike on Greenland's west coast.

The startling theory, tentatively floated two decades ago by Canadian Museum of Civilization curator emeritus Robert McGhee, has been bolstered by recent research indicating a later and faster migration of the ancient Thule Inuit across North America's polar frontier than previously believed.

This is a handout photo of Cape York meteorite specimens outside the Geological Museum in Copenhagen.
Photograph by: Canwest News Service, Photo Handout

Now, in a just-published volume of essays by some of the world's leading Arctic archeologists, McGhee advances his theory - a 4,000-kilometre beeline quest for iron from Greenland's famous Cape York meteorite deposit - as the likeliest explanation for the sudden spread of the Thule culture across Canada around 1250 AD.

"Current evidence increasingly suggests that the concept of a relatively slow, environmentally driven Thule Inuit expansion across Arctic Canada, beginning around AD 1000, is no longer viable," McGhee writes in The Northern World: AD 900 to 1400, a newly released book he co-edited with two U.S. scholars.

Instead, he argues, new radiocarbon data and other reassessments of Eastern Arctic archeological sites suggest the Alaska-based Thule undertook an epic voyage by skin boat and dogsled - almost directly from Alaska to Greenland, and within a few summer travelling seasons - about 750 years ago.

Significantly, Thule Inuit archeological sites near the Cape York deposits are older than others in Canada closer to Alaska - further suggesting an initial dash to the northeast Arctic followed by a more gradual dispersal of population groups throughout present-day Nunavut, Northwest Territories and Yukon.

McGhee believes the Thule Inuit had learned about the valuable metal at the Cape York meteorite field from contact with Canada's aboriginal Dorset people, who were already using iron and trading it with Norse sailors from southern Greenland and Iceland. "It would seem plausible to suggest that metal - meteoric iron from the Cape York meteorites and metal goods traded from the Norse - may have been the magnet that drew ancestral Inuit eastward from Alaska," McGhee contends.

He adds that this interpretation of Inuit origins in Canada - as resulting from "commercial motives" and "mercantile exploration" - challenges the prevailing view that ancient native cultures would only migrate to new territories incrementally and in response to environmental pressures, dwindling food supplies or competition from rival peoples.

"We may have been led astray by the deeply rooted archeological tendency to ascribe different sets of motives and different cultural processes to aboriginal peoples than we apply to Europeans or other societies with a written record of individual accomplishment," McGhee concludes. "Future archeological work may indicate that ancestral Inuit may be more accurately viewed as an entrepreneurial people" driven by the same kinds of economic opportunities that prompted such explorers as Christopher Columbus, John Cabot and Jacques Cartier to sail for the New World centuries later.

McGhee, who lives near Ottawa, told Canwest News Service on Monday that the Thule Inuit used iron for weapon points but also to carve the antler and bone implements central to their technology and culture.

The apparent target of the Thule Inuit's suspected race for Arctic resources - reminiscent of the current "rush" for polar oil by Canada and the four other Arctic coastal states - was the series of enormous nickel-iron space rocks that crashed to Earth in northwestern Greenland unknown millennia ago.

The Dorset people - a "paleo-Eskimo" culture that disappeared from the Canadian Arctic when the Thule Inuit arrived - are known from archeological investigations to have used Cape York meteoric iron for centuries.

But it wasn't until the 1890s that U.S. Arctic explorer Robert Peary first documented the meteorites and arranged for the transport of several large specimens to the American Museum of Natural History in New York, where they are still on display.

Another enormous Cape York meteorite was shipped to Denmark, which governs Greenland, and can be seen today outside a geological museum in Copenhagen.

Glaucoma medications may be associated with reduced risk of death over 4-year period

Glaucoma patients who take medication for the condition appear to have a reduced likelihood of death, according to a report in the February issue of Archives of Ophthalmology, one of the JAMA/Archives journals.

Glaucoma (a common condition that consists of elevated pressure in the eye, and that can lead to loss of vision) usually affects older adults, who are at risk for co-existing medical conditions that can negatively affect their survival, according to background information in the article. "In recent years, numerous studies have assessed whether glaucoma is associated with mortality," the authors write. "Few studies, however, have considered whether the medications commonly used to treat glaucoma may affect the association between glaucoma and death."

Joshua D. Stein, M.D., M.S., and colleagues at the University of Michigan, Ann Arbor, conducted a study evaluating the relationship between glaucoma medication use and death in 21,506 individuals age 40 or older (average age 60) with glaucoma or suspected glaucoma from January 2003 to December 2007 who were enrolled in a large managed care network. Glaucoma medication use was defined as filling one or more prescriptions for a 30-day or more supply of the drug during the study period. Deaths were reported by family members, employers or health care professionals and other demographic information was noted at the beginning of the study.

More than half of the patients had suspected glaucoma, the others had one or more types of glaucoma. "During the study period, 6,049 beneficiaries (28.1 percent) filled one or more prescriptions for a glaucoma medication; 2,021 individuals (9.4 percent) underwent glaucoma surgery," the authors write.

Of the 21,506 patients, 237 (1.1 percent) died during the study. When compared to those with no glaucoma medication use, those using any class of glaucoma medication had a 74 percent reduced risk of death. "This association was observed for use of a single agent alone, such as a topical beta-antagonist or a prostaglandin analogue, and for use of different combinations of drug classes," the authors write.

"Additional studies are needed to determine whether this result is best explained by a protective effect of the medications themselves or by other confounding factors, such as access to care or providers' prescribing patterns," the authors conclude. "Future investigations should explore this association further because these findings may have important clinical implications."

(Arch Ophthalmol. 2010;128[2]:235-240. Available pre-embargo to the media at www.jamamedia.org.)

Home test for sperm count could leave men in a mess

* 08 February 2010 by Colin Barras

GENTLEMEN, ever been curious about your sperm count? If so, a home fertility test could be just the thing.

Loes Segerink and colleagues at the MESA+ Institute for Nanotechnology at the University of Twente in Enschede, the Netherlands, have developed a 10-centimetre-long "lab-on-a-chip" which could determine fertility in a matter of seconds. While undeniably useful, such kits also raise the ethical issue of whether diagnosis without the professional advice that normally accompanies it could do more harm than good.

Male fertility analysis can be embarrassing for the person in question and time consuming for medical staff. The ejaculate must be submitted for analysis within an hour - which generally precludes men from producing the sample at home - and once submitted, a lengthy manual count remains the "gold standard" for spermatozoa concentration analysis.

"With our system we overcome these problems," Segerink says. Their microfluidic chip contains a tiny channel through which the spermatozoa are drawn by pressure flow. The sample is first doped with a known concentration of polystyrene beads, and as beads and cells are drawn along the channel they pass between two electrodes, altering the electrical impedance. The chip tallies the electrical perturbations due to the beads and cells, and comparing bead concentration to that of the spermatozoa provides the sperm count (Lab on a Chip, in press).

Segerink says the chip could take just 12 seconds to determine sperm concentration with the same measurement error as a manual count. But while she stresses that the chip would be used as part of hospital-run fertility treatment, it could be adapted to produce a cheap and easy-to-use version for self-diagnosis at home.

Michael Dunn, a healthcare ethics researcher at the University of Oxford, says this is a concern. "There would be the potential for harm to be caused to patients if they were not provided with the relevant information about the impact of a positive result for infertility," he says.

As other research teams develop similar devices, this is becoming an increasingly important issue. Hywel Morgan and colleagues at the University of Southampton in the UK are developing microfluidic chips that could help diagnose conditions from viral infection to anaemia using a pinprick of blood. "Devices of this nature allow you to distribute healthcare into the community," he says. "But if you're diagnosing disease, the answers you're providing have to be handled appropriately." "Even if the technology is ready for the marketplace," says Morgan, "whether society is ready to use it is an issue."

18 and Under

When to Worry if a Child Has Too Few Words

By PERRI KLASS, M.D.

Polly Becker

There is nothing simple about speech, and there is nothing simple about speech delay - starting with the challenge of diagnosing it.

Every pediatrician knows the frustration of trying to quantify the speech and language skills of a screaming toddler. How many words can he say? Can she put two or more words together into a sentence? Can people besides you understand him when he talks? Questions like these, put to the parents, are the quick and somewhat crude yardsticks we often use.

Crude or not, the assessment is crucial: the earlier it is made, the earlier the speech-delayed child can get some help, and the earlier the help, the better the prospects.

“The physician who understands delayed speech understands child development,” said Dr. James Coplan, a neurodevelopmental pediatrician in Rosemont, Pa., who created the Early Language Milestone Scale to measure children’s language from birth to age 3.

Guidelines by age can be found on the Web site of the American Speech-Language-Hearing Association: asha.org/public/speech/development/chart.htm.

“Children within the first year start to understand much of what they hear around them,” said Diane R. Paul, the group’s director of clinical issues in speech-language pathology. One-year-olds, she continued, “start to use single words and follow simple directions and point to body parts and listen to simple stories.” By about 2, they start putting words together; by 3, they should be using sentences of three words at the very minimum.

The early utterances may be simple, but what produces them is very complex. When a child is not meeting those milestones, there can be a multitude of reasons. Dr. Coplan, who is also the author of “Making Sense of Autistic Spectrum Disorders” (Random House, 2010), says he looks at speech delay in a very broad context, from cognition to communication. Is it purely a problem with speech and language, or is there some more global delay? Has something gone awry in the child’s social connections?

The first question to ask is whether the child can hear. Nowadays, all newborns have their hearing screened before they leave the nursery, but later testing can pick up progressive or acquired hearing loss.

Next question: What about the rest of the child’s development? Speech and language delay can be one way parents and pediatricians first notice more global developmental delay.

“You’ll see delayed receptive language, delayed use of visual skills like pointing, adaptive skills like using a spoon or using a crayon,” Dr. Coplan said. “An 18-month-old not following commands, not using a spoon to dig with, now you’re looking at global delay.”

Speech and language issues can also be early clues to neurodevelopmental disorders, including the various forms of autism. Not all children with autism will have delayed speech, though often they are not using their words to communicate; such a child may have memorized the alphabet, Dr. Coplan said, but without ever learning Mama or Dada.

If the child’s hearing and development are fine, one more question to consider is environment. Is anyone talking to this baby? Is something getting in the way - maybe an exceptionally chaotic household, maybe a severely depressed parent? Speech and language development requires stimulation.

Pediatricians have been faulted in the past for dragging our feet in making speech-delay diagnoses, but times have changed; Dr. Coplan credited parent advocacy and the federally mandated early intervention program, which makes it possible for children younger than 3 to get a free evaluation.

"I think physicians, now that they have somewhere they can send children, are much more prone to do so, instead of saying, 'We'll wait and see, wait and see,' " he said. "I don't encounter the horror stories I would hear 20, 30 years ago, when parents would say, 'We came over our doctor's objections.' "

Still, as a primary care pediatrician, I have not always managed brilliantly with parents. I once took care of a little boy about whom I worried more and more. In the exam room, he seemed without normal communication skills; I was increasingly sure that he was on the autistic spectrum.

I didn't think he was really learning words, but I worried much more because as far as I could tell, he never made eye contact, never responded in any clear way to anything his parents said or did, because he seemed disconnected in some fundamental way.

His parents shrugged off my concerns and refused all referrals. When he was home with his grandmother, they insisted, he was able to communicate perfectly. He didn't need any help.

In that case, I had the diagnosis right, but my own communication skills were not up to the challenge. And then there were the parents I reassured: she may not be talking as much as her sister did at that age, but she is saying much more than the minimum for a 2-year-old, she understands everything you say to her and she can follow complex commands. Let's wait and watch, let's give her time. Did I get that one right?

Pediatricians are reminded again and again not to be casual about delays in speech and language - not to shrug and say boys just talk later than girls, or younger siblings talk later than older siblings. Such factors may contribute to normal variation, but they shouldn't be used to explain why a child doesn't meet essential milestones. And as every pediatrician knows, the real stalwarts in this story - and the real experts - are the speech and language pathologists.

Dr. Paul offered general tips to parents who want to enhance their children's speech and language skills: "Talk to your child about what they're focused on. Read to your child often. If they're in a bilingual home, speak to the child and read to the child in the language that you're most comfortable with. Speak clearly and naturally and use real words. Show excitement when the child speaks."

And listen to what your child is telling you.

Findings

Will You Be E-Mailing This Column? It's Awesome

By JOHN TIERNEY

Viktor Koen

Sociologists have developed elaborate theories of who spreads gossip and news — who tells whom, who matters most in social networks — but they've had less success measuring what kind of information travels fastest. Do people prefer to spread good news or bad news? Would we rather scandalize or enlighten? Which stories do social creatures want to share, and why?

Now some answers are emerging thanks to a rich new source of data: you, Dear Reader.

Researchers at the University of Pennsylvania have intensively studied the New York Times list of most-e-mailed articles, checking it every 15 minutes for more than six months, analyzing the content of thousands of articles and controlling for factors like the placement in the paper or on the Web home page.

The results are surprising — well, to me, anyway. I would have hypothesized that there are two basic strategies for making the most-e-mailed list. One, which I've happily employed, is to write anything about sex. The other, which I'm still working on, is to write an article headlined: "How Your Pet's Diet Threatens Your Marriage, and Why It's Bush's Fault."

But it turns out that readers have more exalted tastes, according to the Penn researchers, Jonah Berger and Katherine A. Milkman. People preferred e-mailing articles with positive rather than negative themes, and they liked to send long articles on intellectually challenging topics.

Perhaps most of all, readers wanted to share articles that inspired awe, an emotion that the researchers investigated after noticing how many science articles made the list. In general, they found, 20 percent of articles that appeared on the Times home page made the list, but the rate rose to 30 percent for science articles, including ones with headlines like "The Promise and Power of RNA." (I swear, the science staff did nothing to instigate this study, but we definitely don't mind publicizing the results.)

"Science kept doing better than we expected," said Dr. Berger, a social psychologist and a professor of marketing at Penn's Wharton School. "We anticipated that people would share articles with practical information about health or gadgets, and they did, but they also sent articles about paleontology and cosmology. You'd see articles shooting up the list that were about the optics of deer vision."

To make sense of these trends in “virality,” the Penn researchers tracked more than 7,500 articles published from August 2008 to February 2009. They assessed each article’s popularity after controlling for factors like the time of day it was published online, the section in which it appeared and how much promotion it received on the Web home page.

A random sample of 3,000 of these articles was rated by independent readers for qualities like providing practical value or being surprising. The researchers also used computer algorithms to track the ratio of emotional words in an article and to assess the relative positivity or negativity.

The computer textual analysis could identify “affect-laden” articles like “Redefining Depression as Mere Sadness” or “When All Else Fails, Blaming the Patient Often Comes Next.” It distinguished positive articles like “Wide-Eyed New Arrivals Falling in Love With the City” from downers like “Germany: Baby Polar Bear’s Feeder Dies.”

More emotional stories were more likely to be e-mailed, the researchers found, and positive articles were shared more than negative ones. Longer articles generally did better than shorter articles, although Dr. Berger said that might just be because the longer articles were about more engaging topics. (The best way to test that, he said, would be for The Times to run shorter and longer versions of the same article that would be seen by different readers.)

Surprising articles, like one about free-range chickens on the streets of New York, were also more likely to be e-mailed — which was a hardly a surprising discovery, of course. But the researchers also kept finding popular articles with a quality that went beyond surprise.

“If I went into my classroom dressed up like a pirate, that would be surprising, but it wouldn’t be awe-inspiring,” Dr. Berger said. “An article about square watermelons is surprising, but it doesn’t inspire that awed feeling that the world is a broad place and I’m so small.”

Building on prior research, the Penn researchers defined the quality as an “emotion of self-transcendence, a feeling of admiration and elevation in the face of something greater than the self.”

They used two criteria for an awe-inspiring story: Its scale is large, and it requires “mental accommodation” by forcing the reader to view the world in a different way.

“It involves the opening and broadening of the mind,” write Dr. Berger and Dr. Milkman, who is a behavioral economist at Wharton.

“Seeing the Grand Canyon, standing in front of a beautiful piece of art, hearing a grand theory or listening to a beautiful symphony may all inspire awe. So may the revelation of something profound and important in something you may have once seen as ordinary or routine, or seeing a causal connection between important things and seemingly remote causes.”

The motivation for mailing these awe-inspiring articles is not as immediately obvious as with other kinds of articles, Dr. Berger said. Sharing recipes or financial tips or medical advice makes sense according to classic economic utility theory: I give you something of practical value in the hope that you’ll someday return the favor. There can also be self-interested reasons for sharing surprising articles: I get to show off how well informed I am by sending news that will shock you.

But why send someone an exposition on quantum mechanics? In some cases, it, too, could be a way of showing off, particularly if you accompanied the article with a note like, “Perhaps this will amuse, although of course it’s a superficial treatment. Why can’t they use Schrödinger’s full equation?”

But in general, people who share this kind of article seem to have loftier motives than trying to impress their friends. They’re seeking emotional communion, Dr. Berger said.

“Emotion in general leads to transmission, and awe is quite a strong emotion,” he said. “If I’ve just read this story that changes the way I understand the world and myself, I want to talk to others about what it means. I want to proselytize and share the feeling of awe. If you read the article and feel the same emotion, it will bring us closer together.” (Go to nytimes.com/tierneylab to discuss your motives for e-mailing articles.)

The Penn researchers found evidence of readers’ sharing other emotions, too, like anxiety — which, based on the old “fear sells” theory of journalism, might be expected to be the most influential emotion on readers. But of all the variables studied, Dr. Berger said, awe had the strongest relationship with an article making the most-e-mailed list, and that finding strikes me as a high compliment to the Times audience.

In fact, Dear Reader, you could consider this new study to be firm scientific evidence of your own awesomeness. And if you want to share that feeling with anyone, you know what to do next.

Molecular pathways linked to sex, age affect outcomes in lung cancer

DURHAM, N.C. – The biology of lung cancer differs from one patient to the next, depending on age and sex, according to scientists at Duke University Medical Center. The findings may help explain why certain groups of patients do better than others, even though they appear to have the same disease.

"Our study supports two key findings: First, the biology of lung cancer in women is dramatically different from what we see in men. Women, in general, have a less complex disease, at least in terms of the numbers of molecular pathways involved. We also discovered that there is a subset of elderly patients would probably benefit from treatments that we've normally reserved for younger patients," says Anil Potti, M.D., an oncologist in the Duke Institute for Genome Sciences & Policy (IGSP) and the senior author of the study.

Potti says that in the past, physicians have had to rely on very rough measures to categorize patients' lung cancers, factors such as the size of the tumor, the tissue type and the degree to which the cancer had spread. "But this new information tells us that we can analyze patients' disease much more discretely," says Potti. He says the information could also be used to enrich the selection process in clinical trials designed to evaluate new drugs aimed at specific molecular targets.

Physicians have long observed that over time, women with lung cancer tend to do a little better than men, and that younger patients do better than older ones. Potti found that women tend to have only a few cancer-promoting pathways activated in their tumors, where men may have twice as many.

Potti and a team of researchers in the IGSP studied clinical data and accompanying genomic information obtained from tumors of 787 patients with predominantly early stage non-small cell lung cancer (NSCLC), the most common form of the disease. They gathered tumor samples and corresponding microarray data showing which genes were activated in the tumors, then selected twelve of the most common molecular pathways that become dysregulated in NSCLC. The goal was to identify any patterns linking the pathways to age, sex and time to recurrence. They sorted the patients by age and sex and then again into low- and high-risk groups, based on five-year, recurrence-free survival.

They found that certain molecular pathways were more frequently activated in some groups than others and that certain pathway patterns were associated with better long-term survival in patients with lung cancer. Specifically, they found that:

* High-risk patients – those with the shortest time to recurrence – were significantly more likely to have increased activation of the pathways responsible for tumor metastasis and necrosis, when compared with low-risk patients.

* High-risk patients 70 or older were found to have higher activation of pathways regulating blood supply and invasiveness.

* In comparing high-risk women to high-risk men, they found that men were more likely to have a much more complex pattern of multiple pathways being activated than women with the same type of lung cancer.

The study also identified a subset of patients over age 70 who had a low-risk profile, meaning the molecular pathways activated in their tumors would likely give them a better chance at long-term survival. Potti says that's important because people over age 70 are generally not included in many clinical trials and physicians often hesitate to offer them the option of conventional chemotherapy. "The thinking has been that they may not withstand the treatment or benefit from it much. But now we know that it probably makes sense to consider treating this population, by risk-stratifying the disease," says Potti.

Potti says it is likely that there are additional cancer-promoting pathways that are involved in the development and progression of NSCLC and adds that these findings must be validated in other studies. But he said the set of 12 known oncogenic pathways they chose to study are significant "because we already have drugs that can regulate many of them."

"People still don't realize how bad a disease this is," says Jeffrey Crawford, M.D., a study co-author and the chief of medical oncology at Duke. "Lung cancer kills more than 150,000 patients each year in the U.S. – more than breast, prostate, colon and ovarian cancer combined. Unfortunately, there is a patient dying from lung cancer every three minutes in this country. So being able to better understand the disease and stratify patients by their individual molecular profiles means we can do a much better job pairing the right drug with the right patient."

The study was funded by grants from the Emilene Brown Cancer Research Fund, the Harold and Linda Chapman Lung Cancer Fund, the Jimmy V Foundation, the American Cancer Society and the National Cancer Institute.

Duke colleagues who contributed to the study include lead authors William Mostertz, Marvaretta Stevenson, Chaitanya Acharya, Isaac Chan, Kelli Walters, Wisut Lamlertthon, William Barry, Jeffrey Crawford and Joseph Nevins.

A new 3D map of the interstellar gas within 300 parsecs from the Sun

Based on the article: "New 3D gas density maps of NaI and CaII interstellar absorption within 300 pc" by B. Y. Welsh et al.

Astronomy & Astrophysics is publishing new 3D maps of the interstellar gas in the local area around our Sun. A French-American team of astronomers presents new absorption measurements towards more than 1800 stars. They were able to characterize the properties of the interstellar gas within each sight line.
This week, Astronomy & Astrophysics publishes new 3D maps of the interstellar gas situated in an area 300 parsecs around the Sun. A French-American team of astronomers presents new measurements of the absorption by the interstellar gas in the Sun's local area. Knowledge of the interstellar medium properties, including the spatial distribution, dynamics, and the chemical and physical characteristics, allow astronomers to better understand the interplay between the evolution of stars and their exchange of matter with the ambient interstellar medium. The local area around our Sun has been studied with many surveys at various wavelengths, but the whole picture is still far from being either complete or fully understood.

The team, led by Barry Y. Welsh and his colleagues R. Lallement and J.-L. Vergely, presents new, high spectral resolution measurements of the calcium (CaII) K line (at 3933 Å) and the sodium doublet (at 5889 and 5895 Å). These absorption lines have long been used to study the interstellar medium. The CaII K lines were first observed in 1904 by German astronomer J. Hartmann, in the spectrum of the star δ Orionis. This first detection of interstellar gas set the stage for the early studies of interstellar medium. The sodium (NaI) doublet was later discovered in 1919 toward δ Orionis and β Scorpii. The CaII K line and the NaI doublet are complementary: the first one is sensitive to partially ionized gas, and the second one traces cold and neutral interstellar gas.

The team combined their new data (mostly recorded at the European Southern Observatory in Chile) with previously published results. The new paper represents a catalog of absorption measurements towards 1857 stars located 800 parsecs from the Sun. Figure 1 shows the NaI map of the interstellar gas density within 300 parsecs. The white area surrounding the Sun (i.e., at the center of the map) corresponds to a very low-density area of neutral gas, known as the Local Cavity. It is about 80 parsecs in radius in most directions and is surrounded by a highly fragmented "wall" of dense neutral gas. The various gaps in the wall are termed "interstellar tunnels" and represent rarefied pathways into other surrounding interstellar cavities. Maps of the distribution of CaII have never been made before, and they reveal that the Local Cavity contains numerous filamentary structures of partially ionized gas that appear to form in a honeycomb-like pattern of small interstellar cells.

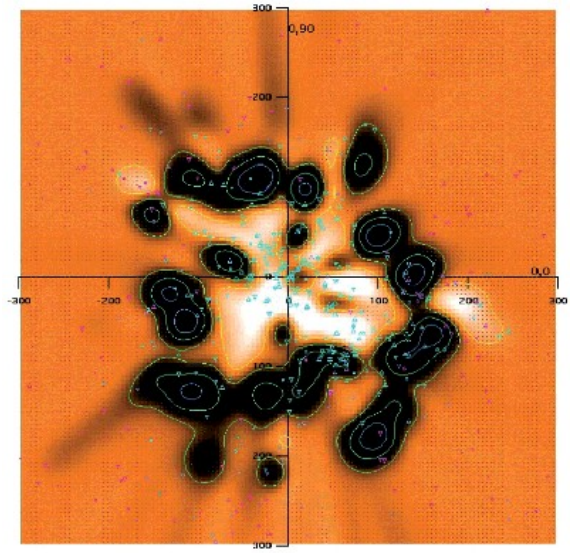


Fig. 1 - Map of partially ionized interstellar gas within 300 parsecs around the Sun, as viewed in the Galactic plane. Triangles represent the sight-line positions of the stars used to produce the map. White to dark shading represents the low to high values of the gas density, and orange shading is for areas with no reliable measurement. The Local Cavity is shown as the white area of low density gas that surrounds the Sun at about 80 parsecs.

Theories of the general interstellar medium require that large rarefied cavities exist, having been formed by the combined action of energetic supernova events and the outflowing winds of clusters of hot and young stars. The history of our Local Cavity, within which the Sun resides, is still speculative, but many believe that it was created about 15 million years ago by a series of supernova outbursts, with the last re-heating happening about 3 million years ago.

[1] The team includes B. Y. Welsh (UCL Berkeley, USA), R. Lallement, S. Raimond (Université Versailles-St Quentin/CNRS, France), and J.-L. Vergely (ACRI-ST, France).

New 3D gas density maps of NaI and CaII interstellar absorption within 300 pc, by B. Y. Welsh, R. Lallement, J.-L. Vergely, and S. Raimond.

IQ among strongest predictors of CVD -- second only to cigarette smoking in large population study

While lower intelligence scores - as reflected by low results on written or oral tests of IQ - have been associated with a raised risk of cardiovascular disease, no study has so far compared the relative strength of this association with other established risk factors such as obesity, smoking and high blood pressure. Now, a large study funded by Britain's Medical Research Council, which set out to gauge the relative importance of IQ

alongside other risk factors, has found that lower intelligence scores were associated with higher rates of cardiovascular disease and total mortality at a greater level of magnitude than found with any other risk factor except smoking.(1)

The findings, published in the February issue of the European Journal of Cardiovascular Prevention and Rehabilitation, are derived from the West of Scotland Twenty-07 Study, a population study designed to investigate the influence of social factors on health. The present analysis was based on data collected in 1987 in a cohort of 1145 men and women aged around 55 and followed up for 20 years. Data were collected for height, weight, blood pressure, smoking habits, physical activity, education and occupation; cognitive ability (IQ) was assessed using a standard test of general intelligence.

When the data were applied to a statistical model to quantify the associations of nine risk factors with cardiovascular mortality, results showed that the most important was cigarette smoking, followed by low IQ. Similar results were apparent when the health outcome was total mortality.

The relative strengths of the association were measured by an "index of inequality", which summarised the relative risk of a health outcome (cardiovascular death) in the most disadvantaged (high risk) people relative to the most advantaged (low risk). This relative index of inequality for the top five risk factors was found to be 5.58 for cigarette smoking, 3.76 for IQ, 3.20 for low income, 2.61 for high systolic blood pressure, and 2.06 for low physical activity.

The investigators note "a number of plausible mechanisms" whereby lower IQ scores could elevate cardiovascular disease risk, notably the application of intelligence to healthy behaviour (such as smoking or exercise) and its correlates (obesity, blood pressure). A further possibility, they add, "is that IQ denotes 'a record' of environmental insults" (eg, illness, sub-optimal nutrition) accumulated throughout life.

Commenting on the public health implications of the findings, the study's principal investigator Dr David Batty said that the individual skills reflected in a person's IQ may be important in the management of personal cardiovascular risk.(2)

"From a public health perspective, there is the possibility that IQ can be increased, with some mixed results from trials of early learning and school readiness programmes," said Dr Batty. "It may also be worthwhile for health promotion campaigns to be planned with consideration of individual cognition levels."

He also noted that IQ may well be one important factor behind the place of social class as a fundamental determinant of inequalities in health. So far, said Dr Batty, explanations for such socio-economic gradients in health have traditionally focused on access to resources (such as education and income), physical exposures at home and at work (such as housing conditions and toxins), and health related behaviours (such as smoking and diet). But studies show that such factors do not fully explain class-based differentials in health. A low IQ, he explained, as suggested in this study, may be a further independent explanation.

Notes for editors

1. Batty GD, Deary IJ, Benzeval M, Der G. Does IQ predict cardiovascular disease mortality as strongly as established risk factors? Comparison of effect estimates using the West of Scotland 'Twenty-07' cohort study. Eur J Cardiovasc Prev Rehabil 2010, 17:24; DOI: 10.1097/HJR.0b013e328321311b

2. Dr David Batty is a Wellcome Trust-Funded Research Fellow from the Medical Research Council Social & Public Health Science Unit in Glasgow and the University of Edinburgh Centre for Cognitive Ageing and Cognitive Epidemiology.

** The West of Scotland Twenty-07 Study is funded by the UK Medical Research Council.*

** The European Journal of Cardiovascular Prevention and Rehabilitation is a journal of the European Society of Cardiology. The European Society of Cardiology (ESC) represents more than 62,000 cardiology professionals across Europe and the Mediterranean. Its mission is to reduce the burden of cardiovascular disease in Europe.*

** Cardiovascular disease, and particularly coronary heart disease, is the leading cause of death in Europe, accounting for 38% of all deaths in men and 45% in women.*

More information on this press release and a PDF of the paper is available from the ESC's press office: press@escardio.org

New research reveals burglars have changed their 'shopping list'

Research being undertaken at the University of Leicester highlights a career change for criminals from the more traditional household burglaries to personal muggings

Globalisation, and particularly cheaper electronic goods from China and the Far East, has altered behaviour among Britain's burglars according research in progress at the University of Leicester.

James Treadwell, a lecturer in Criminology from the University of Leicester's Department of Criminology suggests that the incredible rise of the new superpower has made burglars 'redundant' due to the decline in cost of household goods traditionally targeted by thieves.

Treadwell is currently researching how crime has changed over time. He commented:

"The last decade has been a remarkable one where crime is concerned, with massive changes and shifts. If we look back to the 1980s and 1990s, the type of staple crimes would be, for example, very often burglary and

car crime and those crimes worked because they followed a business model and it was possible to break into a house and steal a video recorder and sell that at a profit.

"Cheap labour in China has had an impact on the type of crime that's committed in the UK and the type of goods that are stolen today. Gradually, the prices of such goods has fallen so low as to they almost have no resale value. If you can buy a DVD player for £19.99, it's simply not worth stealing."

Treadwell will be presenting his findings of the changes in criminal trends at the British Society of Criminology conference that will be held at the University of Leicester in July. The theme of the conference is 'Human Rights, Human Wrongs: Dilemmas and Diversity in Criminology' and Treadwell will be discussing the changes in criminal practices over the last decade.

He comments:

"While we might have seen a decline in some types of crime, we have seen a rise in other forms of criminal activity, particularly young people who seem to be mugging one another.

"While DVD players for example, got cheaper, certain consumer items became smaller and were very, very expensive and sought after and so the latest mobile phone, or the latest ipod, which people carry about them, have become targets for robbers."

It is these expensive, personal items, which are the most attractive to thieves today as they still retain value and can therefore be sold on, igniting a career change for criminals from the more traditional household burglaries to personal muggings.

Note to Newsdesks: *The British Crime Survey (BCS) for 2008/9 estimated that there were 1.28 million domestic burglaries in England and Wales in 1999, almost one in ten of the crimes recorded by the survey. By 2008/9 that number had fallen and there were some 744,000 burglaries. The survey also stated that that burglary had dropped 58% between 1995 and 2008/9. For more information, please contact James Treadwell via jt146@le.ac.uk or 0116 252 3747.*

Steak Dinners Go Back 2.5 Million Years

A new fossil skull of a bull confirms that beef has been "what's for dinner" since the dawn of humans.

By Larry O'Hanlon Tue Feb 9, 2010 04:05 AM ET

THE GIST:

** A new early bull species shows that cattle and humans evolved side-by-side.*

** The fossil skull is a missing link between modern cattle and their African ancestors.*

** Early humans didn't herd cattle, but they most definitely hunted them and ate them.*

The discovery of a new "missing link" species of bull dating to a million years ago in Eritrea pushes back the beef steak dinner to the very dawn of humans and cattle.

Although there is no evidence that early humans were actually herding early cattle 2.5 million years ago, the early humans and early cattle certainly shared the same landscape and beef was definitely on the menu all along, say researchers.

The telltale fossil is a skull with enormous horns that belongs to the cattle genus Bos. It has been reassembled from over a hundred shards found at a dig that also contains early human remains, said paleontologist Bienvenido Martinez-Navarro of the Universitat Rovira i Virgili in Tarragona, Spain. Martinez is the lead author of a paper reporting the discovery in the February issue of the journal Quaternary International.

"This means that the humans have been eating Bos since the beginnings of the genus Homo," said Martinez, referring to the genus to which humans belong.

The million-year-old skull of the new Bos species, dubbed Bos buiaensis, has features of both earlier and later forms of Bos, which make it essentially a missing link between more modern cow-like species found in Eurasia and the earlier African cattle ancestors found alongside hominids and dating back 2.5 million years.

"The most important point is that this Bos connects the African Bos with Eurasian bulls," and so confirms the long, uninterrupted coexistence of humans and cattle from the earliest times, he told Discovery News.

There are some researchers who might take issue with some of the details of the cattle family tree as Martinez and his colleagues have described it, but the overall conclusion seems sound, commented Sandra Olsen, curator of anthropology at the Carnegie Museum of Natural History in Pittsburgh.

"One way or the other, hominids are associated with these creatures," Olsen told Discovery News.

The distinctive horns of the new Bos also broach some other interesting matters, said Olsen. For one thing, this was an animal that had to live out in open areas, just like early humans. It's very hard to imagine any animal with such long horns surviving in a forest, she said.

Then there is also a tantalizing resemblance between the newfound Bos and depictions of bulls in ancient petroglyphs found in western Saudi Arabia -- along the route once taken by humans out of Africa. The rock art

shows exceptionally long-horned cattle being hunted by humans with bows, arrows and dogs, Olsen said. The petroglyphs are at least 5,000 years old, she said, but very hard to date exactly.

"(The new Bos species) look so much like the pictures in Saudi Arabia," said Olsen, "which people have thought were exaggerations." The ancient pictures also include depictions of some of the other animals known to have left Africa by the same route: lions, cheetahs and hyena, she said.

The message from the new fossil echoes those being discovered about the prehistory of other domesticated animals, including horses, which Olsen has studied, in particular.

"We've seen over and over again," she said: "These are very long relationships."

Research could lead to way to halt deadly immune response

Scientists report further progress in study of complement reaction

Researchers have teased out the molecular process that can shut down a marauding, often deadly immune response that kills thousands each year who suffer battlefield casualties, heart attacks, strokes, automobile accidents and oxygen deprivation, according to an article published in the January edition of Molecular Immunology.

The article provides additional detail about the enormously complex biomechanics of a reaction first observed in the lab by Neel Krishna, Ph.D., and Kenji Cunnion, M.D., while conducting pediatric research at Children's Hospital of The King's Daughters (CHKD) and Eastern Virginia Medical School (EVMS) in Norfolk, Va.

"Military medics and ER doctors know that one of the most common killers is an out-of-control immune system that destroys organs after a patient who has suffered a trauma is ostensibly stabilized," said Krishna, a pediatric virologist at CHKD and assistant professor of microbiology and molecular cell biology at EVMS.

The January publication comes almost four years after the two researchers made a serendipitous and unexpected finding when they inserted a shell of a virus that causes childhood diarrhea into a Petri dish primed to measure the response of primordial immune system. The complement reaction completely stopped.

"Stopping this reaction pharmacologically could save lives on the battlefield, in hospital emergency rooms and in neonatal intensive care centers, where doctors struggle to save oxygen-deprived newborns," said Krishna. "Temporarily stopping the response could have a huge impact in trauma and save many lives."

Over the last four years, Krishna and Cunnion have successfully teased out the precise biological mechanism behind this unexpected response and identified the specific molecular region of the viral shell that stops the complement process.

One of the oldest biological mechanisms in the evolution of life, the complement system is so complex that research scientists spend entire careers studying it, publishing in journals devoted solely to the study of this primordial defense mechanism.

The complement system exists in almost identical form in everything from seagulls to starfish. Its job is to launch a massive, multi-pronged attack against any foreign body that could threaten the life or health of an organism. Each method of attack is instigated by molecular changes involving as many as 30 substances that result in the same effect, a component designed to destroy the membrane encasing offending cells.

In the case of trauma that leaves cells without oxygen for too long, the complement system kicks in when the re-oxygenation occurs and lays waste to partially damaged cells that might otherwise survive. This is known as a reperfusion injury. This process kills slowly, often over several days. In heart attacks, the death of heart cells, cardiomyocytes, during reperfusion is irreversible and lethal. In cases of trauma and hypoxia, the progressive death of brain cells often results in catastrophic, irreversible brain injury or death. Multiple organ dysfunction syndrome caused by reperfusion injury is the leading cause of death in surgical patients and in trauma patients who survive the first 24 hours.

For decades, researchers have worked to develop medications and treatments to mitigate the effects of reperfusion injury.

Stopping the complement cascade could eliminate the major cause. In earlier published research, authors showed that the introduction of the harmless membrane of the coat of human astrovirus, which causes pediatric diarrhea, shuts down the main pathway leading to activation of an often lethal complement cascade. The research published in January's Molecular Immunology, demonstrates that the introduction of the astrovirus shell also shuts down a second major trigger, dubbed the lectin pathway.

"This research explains the almost complete cessation of complement activity," Krishna said. "This rapid cessation can virtually eliminate most reperfusion injuries."

This research expands upon findings presented in September 2009 at the 12th European Meeting on Complement in Human Disease. That presentation drew enthusiastic response from a number of renowned complementologists who sought samples of the astrovirus shard used by Krishna and who intend to launch additional research into the phenomenon."We're rapidly moving toward therapeutic application," Krishna said.

Cells can read damaged DNA without missing a beat

Scientists have shown that cells' DNA-reading machinery can skim through certain kinds of damaged DNA without skipping any letters in the genetic "text." The studies, performed in bacteria, suggest a new mechanism that can allow bacteria to develop resistance to antibiotics.

The results were published online this week in the Proceedings of the National Academy of Sciences. The senior author is Paul Doetsch, PhD, professor of biochemistry and radiation oncology at Emory University School of Medicine and associate director for basic research at Winship Cancer Institute of Emory University.

Working with Doetsch, graduate student Cheryl Clauson examined the ability of RNA polymerase (the enzyme that transcribes, or makes RNA from DNA) to handle damaged DNA templates.

RNA polymerase reads one strand of the double helix and assembles RNA that is complementary to that strand. In test tube experiments, when the enzyme comes to a gap or a blank space, it keeps reading but leaves out letters across from the damaged stretch. In contrast, in cells, RNA polymerase puts a random letter (preferring A) across from the gap.

"We were surprised to find that the transcription machinery rolls right over the damaged portion," Doetsch says. "This shows that if the cell initiates, but doesn't complete repair, it still can lead to mutagenesis."

Clauson says a challenge in planning her experiments was finding a way to sensitively detect when RNA polymerase reads through DNA damage. She loaded damaged DNA into a gene that encodes an enzyme from fireflies, which generates light-emitting chemicals, and then introduced that gene into bacteria. A full working enzyme is produced only if RNA polymerase bypasses the DNA damage without skipping any letters.

DNA in every type of cell, whether bacterial, plant or animal, is constantly being damaged by heat, oxygen and radiation. In addition, all cells make RNA from some of their genes to produce proteins and carry out their normal functions. Cells periodically copy their DNA before dividing, but only if conditions are right for them to grow.

The experiments were performed in bacteria with mutations disabling some forms of DNA repair, Clauson says.

"This situation may resemble one where something like radiation or a mutagenic chemical has overwhelmed the normal repair mechanisms," she says.

In addition, Clauson used an antibiotic called novobiocin to shut down DNA replication in the bacteria. She says this simulates a more challenging environment when cells are not growing quickly.

"Our ability to see transcriptional mutagenesis in growth-limiting conditions is important," Doetsch says. "Out in the environment, bacteria are not constantly surrounded by the rich mix of nutrients we give them in the lab."

"Because this work hints at a simple mechanism by which bacteria could escape from growth-restricted environments, it has important implications for how pathogenic microorganisms may acquire resistance to antibiotics," he adds. The next phase of these studies for Doetsch and colleagues will be to test whether transcriptional mutagenesis can lead directly to antibiotic resistance in bacteria and other microorganisms.

The research was supported by the National Institutes of Health.

Reference: *C.L. Clauson, K.J. Oestreich, J.W. Austin and P.W. Doetsch. Abasic sites and strand breaks in DNA cause transcriptional mutagenesis in Escherichia coli. PNAS Early Edition (2010)*

ISU multi-center study finds little effect of soy isoflavones on bone loss in postmenopausal women

AMES, Iowa -- A previous six-month study by Iowa State University researchers had indicated that consuming modest amounts of soy protein, rich in isoflavones, lessened lumbar spine bone loss in midlife, perimenopausal women. But now an expanded three-year study by some of those same researchers does not show a bone-sparing effect in postmenopausal women who ingested soy isoflavone tablets, except for a modest effect at the femoral (hip) neck among those who took the highest dosage.

The multi-center clinical trial of 224 postmenopausal women -- led by D. Lee Alekel, professor of nutrition and interim associate director of the Nutrition and Wellness Research Center (NWRC) at Iowa State, and supported by the National Institute of Arthritis, Musculoskeletal and Skin Diseases, one of the research institutes of the National Institutes of Health (NIH) -- was the longest ever conducted on the effects of soy isoflavones on bone mineral density (BMD). It compared the effects of either ingesting daily 80-mg daily or 120-mg soy isoflavone tablets, compared to placebo tablets on BMD and other health outcomes.

Iowa State NWRC researchers collaborated with research physiologist Marta D. Van Loan and her colleagues at the USDA Agricultural Research Service's Western Human Nutrition Research Center, located at the University of California, Davis. The primary results of their study were published in the January issue of The American Journal of Clinical Nutrition.

New study expands upon earlier research

"Our six-month preliminary study, published in 2000, indicated that soy protein, rich in isoflavones, exerted the greatest impact in slowing the loss of bone mineral density in the lumbar spine," Alekel said. "But we believed that we needed to replicate these results in a study with a greater sample size and longer duration, which is what we did with this three-year intervention.

"In this longer study, we had sufficient power to detect change," she continued. "We monitored adverse events, had excellent compliance throughout, and accounted for potential confounding factors."

NWRC research staff members Laura Hanson, Jeanne Stewart and Kathy Hanson also joined Kenneth Koehler and C. Ted Peterson from statistics as part of the eight-member ISU team that conducted the research.

The researchers ran statistical analyses to determine change in BMD at the lumbar spine, total proximal femur (hip), femoral neck and whole body. They accounted for treatment, age, whole body fat mass and bone removal (using a biochemical marker).

While the 120-mg dose soy isoflavones did reveal a small protective effect on femoral neck bone BMD, researchers found no significant effect of treatment on lumbar spine, total hip, or whole-body BMD.

"This trial used isoflavones extracted from soy protein, compressed into tablet form, consumed over the course of three years, which is very different than either providing soy protein or soy foods," Alekel said. "In our recent study, we did not demonstrate an important biological effect on BMD or bone turnover."

Research questions bone loss value of soy isoflavones

The new study calls into question the value of postmenopausal women consuming soy isoflavone tablets to help lessen bone loss and minimize the effect of osteoporosis.

"The preponderance of studies that have been published -- particularly the longer term, more carefully conducted studies, like our own -- have shown little to no biological effects of soy isoflavones on BMD," she said. "This field of research has attracted 'believers,' making it difficult to convince them otherwise. They may continue to believe what they want to believe, rather than what the evidence shows."

And when it comes to minimizing the consequences of osteoporosis in postmenopausal women, Alekel urges a more holistic approach.

"People, in general, would like an easy fix. We would all like soy isoflavones to be that magic pill, but this study has found that they are not," she said.

Results from other health outcomes from this research have been published in six manuscripts to date, with six additional manuscripts underway. The NWRC research team will continue to study factors that influence bone mineral density and health outcomes in postmenopausal women.

Young Patients with Chronic Illnesses Find Relief in Acupuncture

CHICAGO – Doctors at Rush University Medical Center are offering pediatric patients diagnosed with chronic illnesses acupuncture therapy to help ease the pain and negative side effects like nausea, fatigue, and vomiting caused by chronic health conditions and intensive treatments. The confluence of Chinese and Western medicine at Rush Children's Hospital is part of a study to analyze and document how acupuncture might help in reducing pain in children and increase quality of life.

"Treating children with acupuncture is a new frontier," said Dr. Paul Kent, pediatric hematology and oncology expert, Rush Children's Hospital. "We are looking to see if there is an effective pain management therapy we can offer that does not have the serious side effects that can be caused by narcotics and other serious pain medications."

The lack of options for pain management in children has been reported as one of the most difficult aspects of providing care to pediatric patients. Research indicates that up to 70 percent of pediatric patients experience pain and those with chronic illnesses often do not have adequate relief or prevention of pain.

"Acupuncture could be a potential solution to this dilemma of controlling pain in pediatric patients," said Angela Johnson, Chinese medicine practitioner at Rush.

Acupuncture is the use of tiny, hair-thin needles which are gently inserted along various parts of the body. The therapy is based on the premise that patterns of energy flowing through the body are essential for health. This energy, called Qi, flows along certain pathways. It is believed that placing the tiny needles at points along the pathways reduce pain and improve the healing process.

The National Institute of Health (NIH) has published a statement concluding that acupuncture is effective for treating adults for nausea following chemotherapy and for pain after dental surgery. The agency also said that the therapy might be useful in treating other health issues such as addiction, migraines, headaches, menstrual cramps, abdominal pain, tennis elbow, fibromyalgia, arthritis, low-back pain, carpal tunnel syndrome and

asthma. In some pediatric studies, both patients and parents have stated that acupuncture treatments were both helpful and relaxing.

Rush will be offering acupuncture therapy to pediatric patients between the ages of 5-20 years of age, who are experiencing pain. A practitioner who is licensed in acupuncture by the State of Illinois and certified by the National Certification Commission for Acupuncture and Oriental Medicine will be giving the treatments. Study participants will receive eight acupuncture treatments at no charge.

"Many children with chronic or acute health issues turn to complementary or integrative approaches after all other conventional treatment options are exhausted," said Johnson. "Parents should be aware that integrative therapies like acupuncture can be helpful from the onset of disease and can have a tremendously positive influence on a child's quality of life."

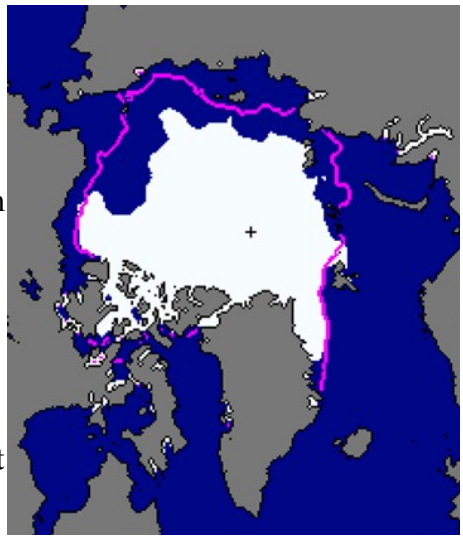
For more information about the acupuncture study for pediatric patients at Rush, contact Angela Johnson at 312-563-2531.

Climate 'Tipping Points' May Arrive Without Warning, Says Top Forecaster

A new University of California, Davis, study by a top ecological forecaster says it is harder than experts thought to predict when sudden shifts in Earth's natural systems will occur -- a worrisome finding for scientists trying to identify the tipping points that could push climate change into an irreparable global disaster.

"Many scientists are looking for the warning signs that herald sudden changes in natural systems, in hopes of forestalling those changes, or improving our preparations for them," said UC Davis theoretical ecologist Alan Hastings. "Our new study found, unfortunately, that regime shifts with potentially large consequences can happen without warning - systems can 'tip' precipitously.

"This means that some effects of global climate change on ecosystems can be seen only once the effects are dramatic. By that point returning the system to a desirable state will be difficult, if not impossible."



This graphic shows the extent of Arctic sea ice in September 2009 (in white) compared with the median ice extent for September from 1979 to 2000 (in magenta). **(U.S. National Snow and Ice Data Center/map)**

The current study focuses on models from ecology, but its findings may be applicable to other complex systems, especially ones involving human dynamics such as harvesting of fish stocks or financial markets.

Hastings, a professor in the UC Davis Department of Environmental Science and Policy, is one of the world's top experts in using mathematical models (sets of equations) to understand natural systems. His current studies range from researching the dynamics of salmon and cod populations to modeling plant and animal species' response to global climate change.

In 2006, Hastings received the Robert H. MacArthur Award, the highest honor given by the Ecological Society of America. Hastings' collaborator and co-author on the new study, Derin Wysham, was previously a postdoctoral scholar at UC Davis and is now a research scientist in the Department of Computational and Systems Biology at the John Innes Center in Norwich, England.

Scientists widely agree that global climate change is already causing major environmental effects, such as changes in the frequency and intensity of precipitation, droughts, heat waves and wildfires; rising sea level; water shortages in arid regions; new and larger pest outbreaks afflicting crops and forests; and expanding ranges for tropical pathogens that cause human illness.

And they fear that worse is in store. As U.S. presidential science adviser John Holdren (not an author of the new UC Davis study) recently told a congressional committee: "Climate scientists worry about 'tipping points' ... thresholds beyond which a small additional increase in average temperature or some associated climate variable results in major changes to the affected system."

Among the tipping points Holdren listed were: the complete disappearance of Arctic sea ice in summer, leading to drastic changes in ocean circulation and climate patterns across the whole Northern Hemisphere; acceleration of ice loss from the Greenland and Antarctic ice sheets, driving rates of sea-level increase to 6 feet or more per century; and ocean acidification from carbon dioxide absorption, causing massive disruption in ocean food webs.

The new UC Davis study, "Regime shifts in ecological systems can occur with no warning," was supported by the Advancing Theory in Biology program at the U.S. National Science Foundation and was published online today by the journal Ecology Letters, in its Early View feature: http://www3.interscience.wiley.com/journal/123276879/abstract.

Researchers discover new way to kill pediatric brain tumors

By Michael C. Purdy

Researchers at Washington University School of Medicine in St. Louis have shown once again that "ready, fire, aim," nonsensical though it may sound, can be an essential approach to research.

The scientists robotically "fired" 2,000 compounds into culture plates containing tumor cells to see if the compounds had any effect. When the robotic screener found one substance had scored a hit by inhibiting growth of the tumor cells in its plate, researchers analyzed what that compound acted against. Follow-up studies showed that the drug slowed tumor growth in mice by inhibiting the function of a protein called STAT3.

As a result, researchers now have a previously unrecognized target, STAT3, at which they can "aim" new drugs for the treatment of cancer in neurofibromatosis-1 (NF1), a genetic condition that causes increased risk of benign and malignant brain tumors.

"We were excited to find that the slowed tumor growth we observed following treatment resulted from increased tumor cell death — an effect we hadn't seen before when we blocked other NF1 growth control molecules," says senior author David H. Gutmann, M.D., Ph.D., the Donald O. Schnuck Family Professor of Neurology. "Now we can identify the genes that STAT3 influences to fine-tune our treatments and ensure that we kill cancer cells with minimal harm to normal cells."

Gutmann is director of the Neurofibromatosis Center at Washington University, a national referral center for patients with all forms of neurofibromatosis. The center is active both in clinical trials and in basic research to help develop innovative new approaches for treating patients with NF. Gutmann is also co-director of the neuro-oncology program at the Siteman Cancer Center at Washington University School of Medicine and Barnes-Jewish Hospital.

Gutmann collaborated on this project with David Piwnica-Worms, M.D., Ph.D., professor of radiology and of developmental biology and director of the Molecular Imaging Center at Washington University. The results appear this month in the journal Cancer Research.

Cucurbitacin-I, the compound that led scientists to STAT3, is a plant steroid. It belongs to a family of bitter-tasting compounds previously identified as inhibitors of STAT3. Gutmann says cucurbitacin-I is likely too toxic to be suitable for use in clinical trials at this time.

After the successful robotic test of cucurbitacin-I, researchers showed that STAT3, which turns on and off the activity of a number of genes, is unusually active in NF1 tumor cells. Further investigation revealed that STAT3 activity is regulated by another gene very familiar to Gutmann: the mammalian target of rapamycin (mTOR).

Gutmann's laboratory linked mTOR and the processes it controls to NF1 years ago. The new connection between STAT3 and the mTOR pathway makes STAT3 the last link in a chain of molecules that take growth-promoting signals from the cell membrane to the nucleus. Gutmann says he is encouraged by the possibility that scientists might be able to decipher the genetic program controlled by STAT3 in order to develop more refined treatments for tumors in patients with NF1.

"We went in with a 'we don't know enough' approach, let's try 'ready, fire, aim,' and it paid off," he says.

Banerjee S, Byrd JN, Gianino SM, Harpstrite SE, Rodriguez FJ, Tuskan RG, Reilly KM, Piwnica-Worms DR, Gutmann DH. Neurofibromin controls cell growth by regulating signal transducer and activator of transcription 3 activity in vitro and in vivo. Cancer Research, Feb. 15, 2010.

Funding from the Department of Defense, the National Institutes of Health and the Siteman Cancer Center supported this research.

Study finds surprising new branches on arthropod family tree

DURHAM, N.C. – Any way you look at it -- by sheer weight, species diversity or population -- the hard-shelled, joint-legged creepy crawlies called arthropods dominate planet Earth. Because of their success and importance, scientists have been trying for decades to figure out the family relationships that link lobsters to millipedes and cockroaches to tarantulas and find which might have come first.

In a scientific and technological tour de force that was nearly a decade in the making, a team of scientists from Duke University, the University of Maryland and the Natural History Museum of Los Angeles County have compared genetic sequences from 75 different species to draw a new family tree that includes every major arthropod lineage. Some of the relationships are so surprising that new names had to be coined for five newly-discovered groupings. The work, which was supported by the National Science Foundation, appears early online Wednesday in the journal Nature.

A big surprise to tumble out of the new tree is that the closest living relatives of insects include a small and obscure group of creatures called remipedes that were only discovered in the late 1970s living in a watery cave in the Bahamas. With linear bodies like centipedes, simple legs and no eyes, it was thought that this small group

-- now placed with cephalocarids in the newly-named Xenocarida or "strange shrimp" -- would be found at the base of the crustacean family tree.

Now, after analyzing 62 shared genetic sequences across all the arthropods, the researchers are putting the strange shrimp together with the six-legged insects, Hexapoda, to form a new group they dubbed Miracrustacea, or "surprising crustaceans." As a "sister clade" to hexapods, the Xenocarida likely represent the sort of creature that came onto land to start the spectacular flowering of the insect lineage, said Cliff Cunningham, a professor of biology at Duke who led the study.

Triops, a 2-inch crustacean that looks like a cross between a horseshoe crab and a mayfly, had also been thought of as an early crustacean, but it too was shown to have a relatively modern origin in the new analysis, Cunningham said.

"Taxonomists have been arguing about these things for decades, and people kept coming at this with one data set after another," Cunningham said. This latest study has created a fuller picture of the arthropod family tree by using more species and more genes, he said.

Beginning in 2001, Jeffrey Shultz, an associate professor of entomology at Maryland, led the efforts to figure out which species needed to be sequenced for a robust comparison, and then to round up suitable specimens of each. The study included nematodes, scorpions, dragonflies, barnacles, copepods and centipedes.

Remipedes, one of the two species of Xenocarida in the study, had to be fetched from partially submerged limestone caves in the Yucatan Peninsula and preserved just so. Bitty creatures called mystacocarids that live between grains of sand were captured by the Natural History Museum's Regina Wetzer, using a microscope on a Massachusetts beach.

Once assembled, the 75 species were then stripped down to their DNA for a painstaking search to find genetic sequences that would appear across all arthropods, enabling statistical comparisons.

The lab of Jerome Regier at Maryland's Center for Biosystems Research combed through 2,500 different combinations of PCR primers to find 62 protein-coding gene sequences that could be compared across all 75 species. Regier was an early proponent of using protein coding genes to sort out the arthropod tree, while most other researchers were using relatively less complex analyses from the DNA found in ribosomes and mitochondria.

The researchers ran four different statistical approaches, including two new ones invented at Maryland, "and they all came up with the same answer," Cunningham said. Earlier studies had not used as many genes or as many species, making this study about four times larger than anything done previously.

The spiders, ticks and scorpions of the subgroup Chelicerata are shown to have split from the line leading to insects and crustaceans even before the millipedes and centipedes of the subphylum Myriapoda. Most recent molecular studies had grouped these arachnids in Chelicerata together with millipedes and centipedes of the Myriapoda. But the new analysis puts millipedes and centipedes together with crustaceans and insects in a group taxonomists had long ago named Mandibulata.

"The only thing people thought they knew before molecular data was available was that the Myriapods were with the insects," Shultz said. But that turned out to be wrong. Even the grouping Crustacea is no longer correct, since it includes the six-legged insects.

Within the insect group Hexapoda, the good news for taxonomists who have grouped insects according to body shape and features is that they were pretty much on the mark, Shultz added.

There are still many holes that need to be filled in, Cunningham said, but at least the shape of the tree seems right. "Now the developmental biologists can really piece things together."

Self-control impaired in type 2 diabetics

Type-2 diabetes, an increasingly common complication of obesity, is associated with poor impulse control. Researchers writing in BioMed Central's open access journal BioPsychoSocial Medicine suggest that neurological changes result in this inability to resist temptation, which may in turn exacerbate diabetes.

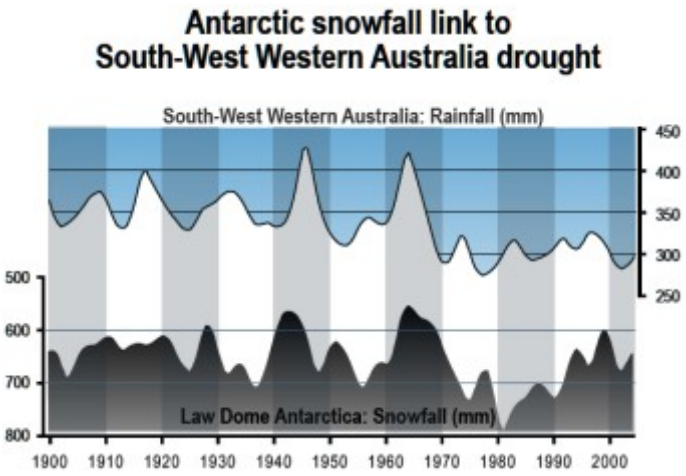
Hiroaki Kumano, from Waseda University, Japan, worked with a team of researchers to assess response inhibition, a measure of self-control, in 27 patients with type-2 diabetes and 27 healthy controls. He said, "Patients with type 2 diabetes are required to make strict daily decisions; for example, they should resist the temptation of high-fat, high-calorie food, which is frequently cued by specific people, places and events. Appropriate behavior modification thus depends on the patient's ability to inhibit impulsive thoughts and actions cued by these environmental stimuli".

In order to gauge the patients' ability to resist such impulsive behavior, the researchers used a test in which participants had to quickly press a button in response to the correct signal on a computer screen, while pressing the button in response to the wrong symbol counted against their score. They found that patients with diabetes performed significantly worse at the test, suggesting that they struggled to control the impulse to press the

button. Other results showed that the inhibitory failure observed in diabetic patients was mainly explained by cognitive impairment of impulsivity control, rather than by deficits in motor performance, error monitoring and adjustment. According to Kumano, "This suggests the possibility that the neuropsychological deficits in response inhibition may contribute to the behavioral problems leading to chronic lifestyle-related diseases, such as type 2 diabetes".

Notes to Editors *1. Decreased response inhibition in middle-aged male patients with type 2 diabetes*
Kaya T Ishizawa, Hiroaki Kumano, Atsushi Sato, Hiroshi Sakura and Yasuhiko Iwamoto BioPsychoSocial Medicine (in press)
During embargo, article available here: http://www.bpsmedicine.com/imedia/3045456233062421_article.pdf?random=494302
After the embargo, article available at journal website: http://www.bpsmedicine.com/

Antarctic snowfall linked to West Australian drought



An Antarctic ice core has revealed a link between drought conditions in south-west Western Australia and increased snowfall in Antarctica. Australian Antarctic Division glaciologist, Dr Tas van Ommen, has analysed a 750 year old ice core from Law Dome in East Antarctica. The results of his research are published today in the prestigious international scientific journal, Nature Geoscience.

"The ice core shows how much snow fell at Law Dome each year, and we have compared the modern portion of that with meteorological records from Australia," Dr van Ommen said. "What we found was amazing. While we were noticing extra moisture in east Antarctica and increasing snowfall, we were seeing dry conditions over south-west Western Australia," he said.

Since the late 1960s there has been a 15-20% decline in winter rainfall in south-west Western Australia, and at the same time there has been a 10% increase in snowfall at Law Dome.

This study, co-authored by honorary research fellow Vin Morgan, indicates that a change in atmospheric circulation patterns off southern Australia is responsible.

"In the past three decades the strength of persistent high and low pressure systems off southern Australia have increased, directing more warm, moist air south towards the coast of Antarctica and dry, cold air north in winter," Dr van Ommen said.

"This does not appear to be in the range of natural variability: we can see from the ice core that an event like the increased snowfall at Law Dome would only come along once every 38,000 years without some change in climate patterns and, given the connection we see with Western Australia, it would suggest that the drought is also not a natural event."

Dr van Ommen believes the change in climate pattern may be due to human-induced atmospheric changes; from reductions in ozone and increased levels of carbon dioxide in the atmosphere. It's hoped the research will lead to improved projections of future change that can be used to shape land-use policy.

Are bees also addicted to caffeine and nicotine?

Bees prefer nectar with small amounts of nicotine and caffeine over nectar that does not comprise these substances at all, a study from the University of Haifa reveals. “This could be an evolutionary development intended, as in humans, to make the bee addicted,” states Prof. Ido Izhaki, one of the researchers who conducted the study.

Flower nectar is primarily comprised of sugars, which provide energy for the potential pollinators. But the floral nectar of some plant species also includes small quantities of substances known to be toxic, such as caffeine and nicotine. The present study, carried out by researchers at the Department of Environmental and Evolutionary Biology and the Department of Science Education at the University of Haifa-Oranim, headed by Prof. Ido Izhaki along with Prof. Gidi Ne’eman, Prof. Moshe Inbar and Dr. Natarajan Singaravelan, examined whether these substances are intended to “entice” the bees or whether they are byproducts that are not necessarily linked to any such objective.

Nicotine is found naturally in floral nectar at a concentration of up to 2.5 milligrams per liter, primarily in various types of tobacco tree (Nicotiana glauca). Caffeine is found at concentration levels of 11-17.5 milligrams per liter, mostly in citrus flowers. In the nectar of grapefruit flowers, however, caffeine is present in much higher concentrations, reaching 94.2 milligrams per liter. In order to examine whether bees prefer the nectar containing caffeine and nicotine, the researchers offered artificial nectar that comprised various natural sugar levels and various levels of caffeine and nicotine, alongside “clean” nectar that comprised sugar alone. The

caffeine and nicotine concentrations ranged from the natural levels in floral nectar up to much higher concentrations than found in nature.

The results showed that bees clearly prefer nectar containing nicotine and caffeine over the “clean” nectar. The preferred nicotine concentration was 1 milligram per liter, similar to that found in nature. Given a choice of higher levels of nicotine versus “clean” nectar, the bees preferred the latter.

According to the researchers, it is difficult to determine for sure whether the addictive substances in the nectar became present in an evolutionary process in order to make pollination more efficient. It can be assumed, however, based on the results of the study, that the plants that survived natural selection are those that developed “correct” levels of these addictive substances, enabling them to attract and not repel bees, thereby giving them a significant advantage over other plants. The researchers emphasized that this study has proved a preference, not addiction, and they are currently examining whether the bees do indeed become addicted to nicotine and caffeine.

Stinky flower is kept warm by yeast partner

*** 10 February 2010 by Shanta Barley**

SYMBIOSIS comes in many flavours. Lots of animals trade protection or food in a mutually beneficial relationship. Now there is a flower that offers yeast its sugary nectar in exchange for warmth.

A European herb, the stinking hellebore, is the only plant discovered so far that relies on another organism to generate heat for it. Other plants, like the famous "corpse flower" whose blooms smell of rotting flesh, warm up by breaking down salicylic acid, or by tracking the sun's movement. The stinking hellebore is the only plant discovered so far that relies on another organism for heat

Keep me warm **(Image: Hemant Jariwala/Getty)**

Yeasts are common in a wide range of flower nectars, says Carlos Herrera of the Doñana Biological Station in Seville, Spain. It is deposited there by pollinating bumblebees, who pick it up from other flowers. Herrera and his colleagues took a sample of yeast from a local bumblebee in the Spanish mountains of Sierra de Cazorla. They injected the yeast into 37 "virginal" specimens of Helleborus foetidus, which had been covered in netting to keep pollinators away.

The team then compared the temperature of these flowers to the temperature of flowers with yeast-free nectaries. Flowers with yeasty nectar turned out to be 2 °C warmer on average, and up to 7 °C warmer when yeast densities were high. (Proceedings of the Royal Society B, DOI: 10.1098/rspb.2009.2252).

It's a significant spike in temperature for the plant, says Herrera. "But unless you have ultrasensitive fingertips, you won't notice it by touch." The yeast generates heat when it breaks down nectar sugars to grow.

What is in it for the plant? "The temperature rise may cause the flower to release a volatile which attracts more pollinators to the flower," says Sarah Gurr of the department of plant sciences at the University of Oxford. That is certainly what happens in another hot flower. The voodoo lily, a cousin of the corpse flower, has a temperature spike the day it blooms. As with the corpse flower, "this releases putrid amines, which smell like dead carcasses and attract pollinators to the flower, boosting its reproductive success", says Gurr.

Ferroelectrics without the twist

Phillip Broadwith

Japanese chemists have developed a new ferroelectric material based on small hydrogen-bonded molecular crystals of croconic acid. The material has superior electronic performance and functions at high temperatures, so could pave the way for new, easily processed materials for use in electronics.

Ferroelectric materials have a spontaneous electrical polarisation, which can be reversed by applying an electric field. This makes them useful for electronic components such as capacitors. Most commercial ferroelectrics are inorganic ceramics of the perovskite family such as barium titanate ($BaTiO_3$) and lead zirconate titanate ($Pb\{Zr_xTi_{1-x}\}O_3$; PZT).

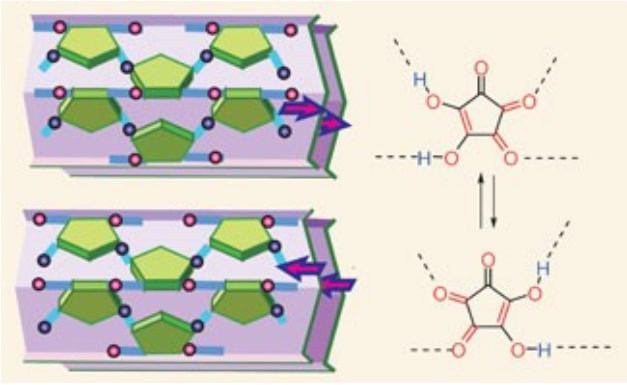
However, Sachio Horiuchi from the National Institute of Advanced Industrial Science and Technology (AIST) in Tsukuba explains that ferroelectric polymers and organic molecular materials are highly desirable - they can be soluble in organic solvents, amenable to low temperature fabrication techniques like inkjet printing, and avoid use of toxic and expensive heavy metals.

Horiuchi explains that the main obstacle to developing such organic ferroelectrics has been getting sufficiently high polarisation, which can be switched using a low voltage applied field, and maintaining the ferroelectric properties at useful working temperatures. 'Some polymer materials can operate at high

temperatures, but they require a very high voltage for operation and have low spontaneous polarisation,' he points out, 'or they have good polarisation but only work at very low temperatures.'

The team found that crystals of croconic acid - a five-membered carbon ring with an oxygen atom attached each carbon - had high polarisation density (comparable to $BaTiO_3$), requires only a low operating voltage and retains its ferroelectricity up to 130°C.

One reason for this is the way the ferroelectric effect is produced, which involves movement of atoms or ions. In ionic perovskite materials, the metal ions move relative to the coordinating anions to create the polarisation, and in ferroelectric polymers, the polymer chains have to physically twist around. 'In the hydrogen-bonded croconic acid crystal, hydrogens simply hop between two oxygen atoms within a hydrogen bond,' says Horiuchi, 'moving a small hydrogen atom within a hydrogen bond needs a very low voltage compared to rotating bulk polymer molecules.'



Ferroelectric material based on small hydrogen-bonded molecular crystals of croconic acid Hydrogens (balls) hop between oxygen atoms of croconic acid molecules (hexagons) within hydrogen bonds (in blue), changing the arrangement of double bonds and switching the polarisation of the material

Steve Ducharme from the University of Nebraska-Lincoln in the US says that the operating temperature of the team's material is remarkable. However, he points out that the polarisation switching time is relatively slow - about a second compared to a few nanoseconds for perovskites and some polymer materials. 'For some applications that is adequate, but for others like computer memory it's a bit slow, but there doesn't appear to be any fundamental reason why it couldn't be made faster.'

Horiuchi admits that croconic acid itself is not really stable enough to be used directly in devices, but is a stepping stone to new research into organic ferroelectric materials. 'Ferroelectricity is not a familiar issue for most organic materials chemists,' he adds, 'I hope that these findings will accelerate development of related materials.'

People with anxiety disorder less able to regulate response to negative emotions, study shows

STANFORD, Calif. - People with generalized anxiety disorder, or GAD, have abnormalities in the way their brain unconsciously controls emotions. That's the conclusion of a new Stanford University School of Medicine study, and the study authors say the findings could open up new avenues for treatments and change our understanding of how emotion is regulated in everyday life. The work is published online in this month's American Journal of Psychiatry.

According to the National Institute of Mental Health, 18 percent of Americans have an anxiety disorder. GAD in particular is marked by extreme feelings of fear and uncertainty; people with the disorder live in a state of non-stop worry and often struggle getting through their daily lives. "Patients experience anxiety and worry and respond excessively to emotionally negative stimuli, but it's never been clear really why," said Amit Etkin, MD, PhD, acting assistant professor of psychiatry and behavioral sciences and first author of the study.

Etkin said clinical data have suggested that adult GAD patients initially register negative stimuli in a largely normal way, but have deficits in how they then control negative emotions. He and his colleagues conducted their research to better understand these potential abnormalities and to shed light on two theories dating back to Sigmund Freud: that most emotion regulation is done unconsciously, and that a disturbance in unconscious emotion regulation leads to psychiatric symptoms.

For the study, Etkin recruited 17 people with GAD and 24 healthy participants and used functional magnetic resonance imaging and a behavioral marker to compare what happened when the two groups performed an emotion-based task. The task involved viewing images of happy or fearful faces, overlaid with the words "fear" or "happy," and using a button box to identify the expression of each face. Not all the words matched up - some happy faces featured the word "fear," and vice versa - which created an emotional conflict for participants.

The authors' previous work involving the task has shown that it takes study subjects longer to identify the correct expression when the expression and word contradict one another. But the slowdown in reaction time is lessened if the previous image was also incongruent, demonstrating that an emotion regulatory process kicked in to help the brain react faster to the conflicting emotional information. "We can see through the reaction-time effect that people are adapting their emotional processing" from image to image, Etkin explained.

In the current study, Etkin and his colleagues found that both healthy participants and GAD patients were able to identify the expressions. Healthy participants, as was expected, reacted more quickly to incongruent

images when the previous image was also incongruent. When later asked if they were aware of any pattern that might have helped or hindered their performance, the volunteers said they were not; Etkin said this demonstrated that this process was carried out unconsciously.

However, the researchers found that in the GAD patients, the reaction-time effect seen in healthy patients was absent - and in the most anxious patients, reaction time actually worsened when there were two incongruent images in a row. "GAD patients had decreased ability to use emotional content from previous stimuli to help them with the task," said Etkin.

He said the differences between the two groups were striking. "By looking at reaction times alone, we could classify who was a patient and who was a control," he said, adding that this represented the first solid demonstration that a psychiatric population has a deficit in a form of unconscious emotion regulation.

Earlier work from Etkin and colleagues had shown that when healthy subjects encountered the emotional conflict during this task, the pregenual anterior cingulate, a part of the brain's prefrontal cortex, was activated. That part of the brain then inhibited the amygdala, which acts to dampen or regulate negative emotion.

During this study, the brains of health participants reacted as expected. But for patients with GAD, the pregenual anterior cingulate failed to light up and to inhibit the amygdala, showing something went awry with this circuit. This has never been shown before, Etkin noted.

Understanding that the prefrontal cortex is an important site of abnormality could potentially lead to advances in more accurate diagnosis and effective treatment. By targeting this region more directly, clinicians might be able to improve regulation function in GAD patients. Etkin also suspects that a faulty pregenual cingulate-amygdala circuit during unconscious emotion regulation is involved in other psychiatric disorders, such as post-traumatic stress disorder, so the work could lead to a better understanding of those conditions.

Senior study author Alan Schatzberg, MD, the Kenneth T. Norris, Jr. Professor and chair of psychiatry and behavioral sciences, noted that the findings bring new insight into the biology of psychopathology, as well as potentially the mechanisms underlying the response to psychotherapy. They could, he said, provide a new way also to gauge the efficacy of therapy.

Etkin said he'll continue his investigations in this area, and use these findings to identify brain signatures that differ among psychiatric disorders, as well as to track the effects of psychotherapy. A grant from the national stimulus package, which was signed into law last year and included $8.2 billion in extramural funding for the National Institutes of Health, will help him continue and expand this work.

The study was funded by the NIH and the residency-research program of the Veterans Affairs Palo Alto Health Care System. Co-authors include research assistant Katherine Prater; Fumiko Hoeft, MD, PhD; and Vinod Menon, PhD, associate professor of psychiatry and behavioral sciences.

Ancient Man in Greenland Has Genome Decoded

By NICHOLAS WADE

Artists Impression of 'Inuk' **Nuka Godfredsen**

The genome of a man who lived on the western coast of Greenland some 4,000 years ago has been decoded, thanks to the surprisingly good preservation of DNA in a swatch of his hair so thick it was originally thought to be from a bear.

This is the first time the whole genome of an ancient human has been analyzed, and it joins the list of just eight whole genomes of living people that have been decoded so far. It also sheds new light on the settlement of North America by showing there was a hitherto unsuspected migration of people across the continent, from Siberia to Greenland, some 5,500 years ago.

The Greenlander belonged to a Paleo-Eskimo culture called the Saqqaq by archaeologists. Using his genome as a basis, a team of researchers from the University of Copenhagen determined that the Saqqaq man's closest living relatives were the Chukchis, people who live at the easternmost tip of Siberia. His ancestors split apart from Chukchis some 5,500 years ago, according to genetic calculations, implying that the Saqqaq people's ancestors must have traveled across the northern edges of North America until they reached Greenland.

The team, led by Morten Rasmussen and Eske Willerslev of the University of Copenhagen, decoded the genome from four tufts of hair dug out of the permafrost at Qeqertasussuk, on the west coast of Greenland. The hair was excavated in 1986 and kept in a plastic bag in the National Museum of Denmark. It was found with other waste, and the scientists speculate that it was the result of a haircut.

There it moldered, unfrozen, until discovered by Dr. Willerslev, an expert on ancient DNA. Having spent two months digging for ancient human DNA in Greenland without finding any human remains, he concluded

that ancient Greenlanders must have disposed of their dead by laying them on the sea ice. Only on complaining of his bad luck to a friend did he learn that the friend's father had found the hair sample 20 years earlier.

No traces of the Saqqaq people have been found in North America, said Michael H. Crawford, an expert on circumpolar populations at the University of Kansas and a co-author of the report. Because the land bridge that once connected Siberia and Alaska had long since foundered, the Saqqaq people might have crossed to Alaska on the winter ice or could have used the boats on which they hunted fish and seals. They evidently kept to Arctic latitudes, perhaps because more southerly regions were already occupied by the Inuit, or because they were better adapted to life in the Arctic, Dr. Rasmussen said.

The Saqqaq man's genome is so complete that the Danish researchers have been able to reconstruct his probable appearance and susceptibility to disease from the genetic information in his genome. They conclude that he would have had brown eyes because of variations, at four positions along his DNA, that are associated with brown eye color in East Asians.

He has the East Asian version of a gene known as EDAR, which endows people with hair that is thicker than that of most Europeans and Africans. Another gene suggests that he would have had dry earwax, as do Asians and Native Americans, not the wet earwax of other ethnic groups.

Perhaps reflecting the so far somewhat limited reach of personal genomics, the researchers note that the ancient Greenlander was at risk for baldness, a surprising assessment given that all that remains of him is his hair. Dr. Rasmussen said he assumed the man died young.

Biologists used to think that DNA would be found only in the cells at the roots of the hair, not in the keratin of which the hair shaft is made. But it now seems that the cells become incorporated into the growing shaft and their DNA is sealed in by the keratin, protecting it from attack by bacteria and fungi.

The Danish researchers, using an advanced DNA sequencing technology developed by Illumina of San Diego, reported that they were able to decode 80 percent of the ancient Greenlander's genome to a high degree of accuracy. Their findings appear in the journal Nature.

An ever present danger in analyzing ancient human DNA is contamination, particularly from modern human DNA from all the archeologists and curators who have touched the samples. The Danish researchers said they took precautions to exclude this and other contaminants, and they seem to have succeeded.

Restrictions on female plasma may not be warranted

DURHAM, N.C. — Three years after the U.S. blood banking industry issued recommendations that discourage transfusing plasma from female donors because of a potential antibody reaction, Duke University Medical Center researchers discovered that female plasma actually may have advantages.

The Duke team conducted a retrospective study of Red Cross donor and hospital data from a period when female plasma wasn't restricted. They examined heart surgery outcomes for lung problems, and prolonged length of hospital stay or death. Cardiac surgery patients use about one-fifth of all transfused blood products.

They found that patients receiving female-donor plasma did significantly better than similar patients receiving male-donor plasma.

"Our findings raise the possibility of unanticipated effects of restricting female donor plasma use," said Mark Stafford-Smith, M.D., a Duke professor of anesthesiology and senior author of a study appearing in the Journal of Thoracic and Cardiovascular Surgery on Feb. 11.

Blood products, such as red cells and plasma, are manufactured from blood collected from volunteer donors, and both male and female donors are still encouraged to donate whole blood, which is then separated into different components.

The recommendations to restrict plasma transfusions were based on evidence tying female-donor plasma to a serious lung injury called transfusion-related acute lung injury (TRALI). Antibodies that may cause TRALI are more common in women who have been pregnant, and the antibodies may form as a reaction to their fetus. The more pregnancies a woman has had, the greater the chance that she has these antibodies.

The AABB (formerly the American Association of Blood Banks) recommended in late 2006 that blood banks adopt measures to reduce the risk of TRALI, such as avoiding use of female donor plasma for transfusion due to the higher risk antibodies associated with TRALI.

"We were very surprised by the results, because when we began the study, we expected to see data that supported the idea that female-donor plasma would be riskier," said Mark Stafford-Smith. "In fact, we found just the opposite. At first, we thought we might have switched our data somehow, but careful re-examination confirmed that recipients of male-donor plasma had worse outcomes."

The study identified 1,069 patients who had received plasma exclusively from female donors or male donors, and put them into pairs for comparison that were matched for the number of units transfused and surgery date.

Recipients of female-donor plasma had a lower incidence of pulmonary dysfunction (5.9 percent vs. 10.8 percent) and death within 30 days of surgery or hospitalization longer than 10 days (9 percent vs. 16.4 percent). The two groups had similar long-term survival rates.

Co-author Nicholas Bandarenko, M.D., medical director of Duke Transfusion Services and associate professor of pathology, said the blood banking community has been focused locally and nationally on reducing the significant morbidity and mortality from TRALI. However, TRALI is a relatively rare event that happens in roughly every 1 in 3,000 transfusions.

"This study suggests more subtle but still clinically significant outcomes and morbidity may be occurring," Bandarenko said. "As required, regulatory policies are now in place to minimize the risk of severe TRALI, but there appears to be a spectrum of pulmonary (lung) injuries that may be associated with blood transfusion and these may not all be impacted by the policies that restrict plasma collection to male donors exclusively."

The study did not specifically address the catastrophic lung problem. "It may be true that with enough patients we would have observed fewer TRALI incidents in the male-donor plasma recipients, but our data suggests that any gain from avoiding a small number of catastrophic occurrences may require subjecting patients to other potentially worrisome effects of male-donor plasma," Stafford-Smith said.

He stressed that the Duke study findings need to be re-evaluated in prospective studies. There isn't enough data yet to support or refute the policy to exclude female-donor plasma as a way to avoid catastrophic TRALI.

The finding cannot be generalized across all types of patients getting plasma transfusions either, he said. "We studied cardiac surgery patients, because this is the subset of patients that we care for. This study provides one more tool to aid in policy decisions, and more studies, including prospective studies, will be needed to improve our understanding of the male- versus female-donor question."

Other members of the team were lead author Ian Welsby, Barbara Philips-Bute and Joseph P. Mathew of the Duke Department of Anesthesiology, and Marla Troughton of the University of Alabama Department of Pathology. Mary Lee Campbell and Rebecca Ramsey from the Carolinas region of the American Red Cross and Duke Perioperative Services were also a part of the research analysis.

Genes behind stammering uncovered

Stammering has long been recognised to run in families, but scientists now say they have identified three genes which may cause the problem in some people.

They believe that mutations which have already been tied to metabolic disorders may also affect the way in which parts of the brain function. The study involving cases in Pakistan, the US and England appears in the New England Journal of Medicine. Stammering affects about 1% of all adults worldwide.

Those affected repeat or prolong sounds, syllables or words, disrupting the normal flow of speech.

With early intervention children who stammer can overcome the problem, while for adults therapies are based on reducing anxiety and regulating breathing to improve speech. But the team from the National Institute on Deafness and Other Communication Disorders (NIDCD) hopes its discovery may pave the way for new treatments. Nearly one in ten of the sufferers examined were found to have a mutation in one of three genes.

Metabolic problems

Two of these, GNPTAB and GNPTG, have already been linked to two serious metabolic diseases in which components of cells are not effectively recycled. These disorders, known as lyposomal storage disorders, lead to a build-up of a potentially dangerous substance which can cause problems in almost every area of the body, including the brain.

People with this defective gene need two copies to develop the metabolic disorder, but one copy appears to be associated with stammering. A third defective gene, which is closely related to the other two, was also found among stammerers but not among the controls.

“For hundreds of years, the cause of stuttering has remained a mystery for researchers and health care professionals alike, not to mention people who stutter and their families," said James Battey, head of the NIDCD. "This is the first study to pinpoint specific gene mutations as the potential cause of stuttering, and by doing so, might lead to a dramatic expansion in our options for treatment."

The metabolic disorders pinpointed can be treated by injecting a manufactured enzyme into a person's bloodstream to take the place of the enzyme the body fails to produce. It is possible stammering, if confirmed to be caused by the same defect, would respond to the same treatment.

The British Stammering Association welcomed the findings. "It is just the latest in a string of recent discoveries highlighting the fact that the cause of stammering is physiological - a symptom that, for whatever reason, the brain's neural circuits for speech are not being wired normally," said its director Norbert Lieckfeldt.

"This puts into sharp relief the bullying and ridicule people who stammer often experience, as opposed to people experiencing, for instance, mobility disabilities. “In addition to finding new forms of treatment, we hope

this may help us identifying those children at risk of persistent stammering as it is only through early intervention that they have a chance of recovering fluent speech."

Less is more in cancer imaging

Rice grad student's technique helps scanners pinpoint tumors

When one diagnoses a cancer patient, it's important to gather as much information about that person as possible. But who would have thought an accurate diagnosis would depend on throwing some of that information away?

That's key to the technique employed by researchers at Rice University and the University of Texas M.D. Anderson Cancer Center as they bolster the efficiency of scanners that find and track lung and thoracic tumors.

In a paper published last month in The Journal of Nuclear Medicine, a team led by fifth-year Rice graduate student Guoping Chang (shown at right--Credit: Jeff Fitlow/Rice U) described an amplitude gating technique that gives physicians a clearer picture of how tumors are responding to treatment.

Chang's technique works in conjunction with PET/CT scanners, commonly used devices that combine two technologies into a single unit.

CT (computed tomography) scanners capture a three-dimensional image of the inside of the body. PET (positron emission tomography) scanners look for a radioactive signature. Before a PET scan, a patient is injected with slightly radioactive molecules tagged to track and adhere to particular cancer cells. As the molecules gather at those cells and decay, they give off a signal that the PET scanner can read.

Together, the scanners give physicians a good idea of a tumor's location and whether it's malignant or benign. Subsequent scans can show how it's responding to treatment.

But there's a problem. While CT scans take relatively quick snapshots, PET scanners need as long as three minutes to capture an image from a single section of the body. Because patients have to breathe, the images don't always correlate well.

"Patients might have lesions located in organs that move due to respiratory motion," said Chang's technical adviser, Osama Mawlawi, an associate professor in the Department of Imaging Physics at M.D. Anderson and an adjunct lecturer in electrical and computer engineering at Rice. "When patients breathe, these lesions will be blurred."

Since physicians can't ask patients to stop breathing for three minutes, Chang found a way to turn a patient's respiratory motion – the amplitude – into a waveform that serves as a kind of time code.

In the new method, patients are fitted with a flexible band around the chest that records their breathing cycles during the CT scan -- the three-dimensional X-ray taken as the patient slides through the ring-shaped device.

During the subsequent, much longer PET scan, the program creates a "gate," which allows data for specific points in the breathing cycle to pass through and throws away the rest. The program automatically correlates that data to the CT images. A patient may take 40 breaths during those three minutes. Combining 40 images from a specific point in the breathing cycle – say, mid-breath – makes for a much sharper image because the tumor will be in pretty much the same spot.

Even better, Mawlawi said, the radiological signal captured by the "gated" PET scan is more coherent. "One of the important aspects of PET imaging is that it can tell us how malignant a lesion is," he said. "The scan gives us a specific number which is correlated with the measured signal intensity; the more accurate this number is, the better the physician's assessment is of a lesion's malignancy and response to treatment." When someone undergoing therapy is scanned again, he said, "the change in signal intensity - not just the size of the lesion - tells us whether the patient is responding or not. This is equally important to the quality of the image."

In tests on 13 volunteer patients at M.D. Anderson, information gathered using the technique on 21 tumors was significantly better with Chang's gated technique than without, the paper shows. Patients were not required to modify their breathing in any way, Chang said; this enabled them to be as comfortable as possible during the scan.

Chang, who earned his bachelor's degree in space physics at Beijing University in his native China, expects to defend his dissertation based on his imaging work in March. He became interested in the project shortly after joining Rice's Department of Electrical and Computer Engineering, where Professor John Clark is his academic adviser. "Being able to image with good resolution means you might be able to catch a small tumor very early," Clark said. "It's a good piece of work." "It can save people's lives," Chang said. "That's what I want."

Mawlawi credited Behnaam Aazhang, the J.S. Abercrombie Professor in and chair of Electrical and Computer Engineering at Rice, for his help in supporting the collaborative work between Rice and M.D. Anderson. The research was supported in part by a grant from GE Healthcare. Chang, Mawlawi and Clark co-authored the paper with Tingting Chang, a Rice graduate student, and Tinsu Pan, an associate professor in the Department of Imaging Physics at M.D. Anderson. Chang won a Young Investigator Award for his presentation on the topic during the 56th annual Society of Nuclear Medicine meeting in Toronto last June.

Related materials: *The paper is available online here. For more details, see the M.D. Anderson blog.*

Mass Extinctions: 'Giant' Fossils Are Revolutionizing Current Thinking

ScienceDaily - Large-sized gastropods (1) (up to 7 cm) dating from only 1 million years after the greatest mass extinction of all time, the Permian-Triassic extinction (2), have been discovered by an international team including a French researcher from the Laboratoire Biogéosciences (CNRS/Université de Bourgogne), working with German, American and Swiss colleagues. These specimens call into question the existence of a "Lilliput effect," the reduction in the size of organisms inhabiting postcrisis biota, normally spanning several million years.

The team's results, published in the February 2010 issue of the journal Geology, have drastically changed paleontologists' current thinking regarding evolutionary dynamics and the way the biosphere functions in the aftermath of a mass extinction event.

The history of life on Earth has been punctuated by numerous mass extinctions, brief periods during which biodiversity is considerably reduced, followed by phases of re-conquest of the biosphere, corresponding to the diversification of those species that survived. Over the last 540 million years, around twenty mass extinctions, of greater or lesser intensity, have succeeded one another. The most devastating of these, the Permian-Triassic (P-T) mass extinction, which decimated more than 90% of the marine species existing at the time, occurred 252.6 million years ago with a violence that is still unequaled today.

Large-sized gastropods found in marine sediments in Utah dating from only ~1 million years after the P-T mass extinction. The scale bar represents 1 cm. **(Credit: Copyright A. Brayard/J. Thomas)**

In the aftermath of such events, environmental conditions are severely disrupted: the oceans become less oxygenated, water becomes poisonous, there is increased competition, collapse of food chains, etc. Until now, it has generally been accepted that certain marine organisms, such as gastropods or bivalves, were affected by a drastic reduction in size in response to major disruptions of this nature, both during and after the event. It took several million years for such organisms to return to sizes comparable to those that existed prior to the crisis. This is what scientists call the "Lilliput effect," in reference to the travels of Gulliver (3) who was shipwrecked on the island of the same name, inhabited by very small Lilliputians.

An international team of French, German, American and Swiss paleontologists has recently discovered large gastropod fossils dating from only 1 million years after the P-T mass extinction. The researchers have spent several years studying the re-conquest phase that followed the P-T crisis. By focusing their efforts on fossil-bearing outcrops in Utah dating from the Early Triassic, which have not yet been studied in detail, they have uncovered some outstanding specimens of gastropods, up to 7 cm, which can be termed as "giants" in comparison to those generally found, normally no bigger than 1 cm.

Complementary studies of these new gastropod fauna also indicate that they are not any smaller than older or present-day fauna. This discovery therefore refutes the existence of a Lilliput effect on gastropods during the major part of the Early Triassic or, at the very least, suggests that its importance has been overestimated. Quite surprisingly, the presence of these large gastropods also coincides with an explosive re-conquest of the ocean by organisms such as ammonites (4, 5). Taken together, these events therefore suggest that restructuring of marine ecosystems was already well underway only one million years after the P-T crisis, a very short time after a mass extinction of such magnitude.

The researchers plan to continue to study the fossils discovered in this locality in Utah while searching for other species and groups, such as bivalves, to confirm this new data. However, these findings already suggest that paleontologists are going to have to re-think the immediate and long term impact of mass extinctions on species. ***Journal Reference:*** *1. Brayard A., Nützel A., Stephen D.A., Bylund K.G., Jenks J. and Bucher H. Gastropod evidence against the Early Triassic Lilliput effect. Geology, 2010; 38 (2): 147 DOI: 10.1130/G30553.1*

Low levels of antibiotics cause multidrug resistance in 'superbugs'

Boston University bioengineers detail process

BOSTON – For years, doctors have warned patients to finish their antibiotic prescriptions or risk a renewed infection by a "superbug" that can mount a more powerful defense against the same drug. But a new study by Boston University biomedical engineers indicates that treating bacteria with levels of antibiotics insufficient to kill them produces germs that are cross-resistant to a wide range of antibiotics.

In the Feb. 12 issue of Molecular Cell, research led by Boston University Professor James J. Collins details for the first time the biomolecular process that produces superbugs. When administered in lethal levels, antibiotics trigger a fatal chain reaction within the bacteria that shreds the cell's DNA. But, when the level of

antibiotic is less than lethal the same reaction causes DNA mutations that are not only survivable, but actually protect the bacteria from numerous antibiotics beyond the one it was exposed to.

"In effect, what doesn't kill them makes them stronger," said Collins, who is also a Howard Hughes Medical Institute investigator. "These findings drive home the need for tighter regulations on the use of antibiotics, especially in agriculture; for doctors to be more disciplined in their prescription of antibiotics; and for patients to be more disciplined in following their prescriptions."

Two years ago, Collins – together with graduate student Michael Kohanski and post-doctoral fellow Mark DePristo -- proved that when applied in lethal doses, antibiotics stimulate the production of reactive oxygen species (ROS) molecules, or free radicals that damage DNA, protein and lipids in bacterial cells, contributing to their demise. In the new study, the same co-authors demonstrated that the free radicals produced by a sub-lethal dose of an antibiotic accelerate mutations that protect against a variety of antibiotics other than the administered drug.

"We know free radicals damage DNA, and when that happens, DNA repair systems get called into play that are known to introduce mistakes, or mutations," said Collins. "We arrived at the hypothesis that sub-lethal levels of antibiotics could bump up the mutation rate via the production of free radicals, and lead to the dramatic emergence of multi-drug resistance."

Testing their hypothesis on strains of E. coli and Staphylococcus, the researchers administered sub-lethal levels of five kinds of antibiotics and showed that each boosted levels of ROS and mutations in the bacterial DNA. They next conducted a series of experiments to show that bacteria initially subjected to a sub-lethal dose of one of the antibiotics exhibited cross-resistance to a number of the other antibiotics. Finally, they sequenced the genes known to cause resistance to each antibiotic and pinpointed the mutations that protected the bacteria. Ironically, the researchers discovered that in some cases the bacteria were still be susceptible to the original antibiotic.

"The sub-lethal levels dramatically drove up the mutation levels, and produced a wide array of mutations," Collins observed. "Because you're not killing with the antibiotics, you're allowing many different types of mutants to survive. We discovered that in this zoo of mutants, you can actually have a mutant that could be killed by the antibiotic that produced the mutation but, as a result of its mutation, be resistant to other antibiotics."

The group's findings underscore the potentially serious consequences to public health of administering antibiotics in low or incomplete doses. This is common practice among farmers who apply low levels of antibiotics to livestock feed; doctors who prescribe low levels of antibiotics as placebos for people with viral infections; and patients who don't follow the full course of antibiotic treatment.

The study's findings may ultimately lead to the development of new antibiotic treatments enhanced with compounds designed to prevent the emergence of multi-drug resistance. For example, one potential treatment might inhibit the DNA damage repair systems that lead to the problematic mutations, while another might boost production of cell-destroying free radicals so that a low dose of antibiotic is sufficient to kill targeted bacterial cells.

An abstract of the article appeared Thursday, Feb. 10 on the Molecular Cell website (http://www.cell.com/molecular-cell/home).

UNH chemists create molecule with promising semiconductor properties

DURHAM, N.H. – A team of chemists from the University of New Hampshire has synthesized the first-ever stable derivative of nonacene, creating a compound that holds significant promise in the manufacture of flexible organic electronics such as large displays, solar cells and radio frequency identification tags. The team, led by professor of organic chemistry and materials science Glen Miller and including two UNH undergraduates, published their findings in January 2010 in the Journal of the American Chemical Society.

Nonacene, a compound with nine rings of benzene fused in a linear fashion, belongs to a class of organic semiconductors called acenes, widely recognized to be among the very best in terms of electronic performance. Yet they are highly unstable – they oxidize rapidly. ” We have known that nonacene would have very desirable electronic properties, but it was just a tease, because you couldn't make it, you couldn't use it," says Miller, who has been working to prepare large acenes since 2007.

Miller and his team – research scientist Irvinder Kaur, postdoctoral fellow Mikael Jazdzyk, and UNH seniors Polina Prusevich and Nathan Stein – built the large nonacene derivative from smaller pieces, the way one might build a Lego structure. The key to the molecule's stability is the addition of arylthio functional groups, stable collections of atoms that contain sulfur.

"The skeleton of the molecule is still there, but it's got additional functional groups attached to the skeleton," says Miller. This not only made the derivative stable, it also made it soluble, further enhancing its usefulness.

Nonacenes hold promise for further development of flexible organic electronic devices: computer displays so thin they could be rolled up or even worn. Miller notes that the military is interested in the technology that would allow for chameleon-like camouflage clothing that could change with the environment. Organic solar cells are another potential application of nonacenes; such cells could cut the cost of solar power by making use of inexpensive organic molecules rather than the expensive crystalline silicon that is used in most solar cells.

While Miller notes that his team's work is but a first step toward creating stable nonacene devices, "these compounds push all of these technologies further, Before our work, the thought of preparing flexible organic electronic devices using nonacene or a nonacene derivative was just a dream," he adds. "With this major step forward, we are much closer to realizing the dream."

The complete paper, "Design, Synthesis, and Characterization of a Persistent Nonacene Derivative", is available at the Journal of the American Chemical Society Web site: http://pubs.acs.org/doi/full/10.1021/ja9095472. Funding was provided by the National Science Foundation through the Nanoscale Science & Engineering Center for High-Rate Nanomanufacturing.

Parents often wait too long to treat children's asthma symptoms

Parents of young children with asthma often recognize signs that their child is about to have an asthma attack but delay home treatment until the attack occurs, researchers at Washington University School of Medicine in St. Louis report. Results of the study, published in the Annals of Allergy, Asthma and Immunology, show there are missed opportunities to intervene early and thus relieve a child's symptoms, possibly reduce the extent of the attack and prevent visits to the emergency room.

The study stems from comments received by two lay asthma coaches employed by Washington University School of Medicine. The coaches are trained to help educate families dealing with asthma by offering information and social support. They also have asthma themselves or a family member who has it.

While talking to parents of children with asthma, the coaches noticed that parents were often unsure of exactly how to use albuterol, a bronchodilator that relaxes muscles in the airways and increases airflow to the lungs, when they noticed signs that their child's asthma symptoms were worsening. The study followed up on those observations to determine if they are true among a larger group.

Asthma is one of the most common childhood diseases in the United States. Every year, two of every three children with asthma have at least one attack, or exacerbation. These exacerbations often result in missed school days, visits to the emergency room and hospitalizations. But researchers at the School of Medicine say some of these exacerbations could be prevented with early home treatment with albuterol.

For the study, the coaches telephoned 101 parents of children ages 2-12 who had recent visits to the emergency department at St. Louis Children's Hospital with an asthma exacerbation or who had called the hospital's After Hours Call Center. More than 60 percent of the families had Medicaid insurance. The coaches surveyed the parents about how they detected that their child was about to have an asthma attack and what they did to prevent or treat it.

Parents reported noticing signs such as coughing, wheezing, shortness of breath, chest tightness or pain, cold or allergy symptoms, or even behavioral signs such as becoming quiet or more temperamental.

"Every time the child had an exacerbation, many parents noticed the same medley of signs preceding it," says Jane Garbutt, M.B., Ch.B., associate professor of medicine and of pediatrics. "But even though they noticed the signs consistently, they often didn't do anything about it. If parents had known to give albuterol earlier, they may have been able to manage things at home and avoid a trip to the emergency room," says Garbutt, also director of the Washington University Pediatric and Adolescent Ambulatory Research Consortium.

Garbutt says one of the reasons parents may not begin treatment is that they believe they are following doctor's instructions. "The asthma plan from the doctor often says to start using albuterol when parents notice the child is wheezing or coughing or short of breath, but the doctor may have a different definition for those symptoms than the parent," Garbutt says.

Another problem the researchers found was that parents may not notice some of the early signs that predict an exacerbation. One in four parents who was interviewed reported seeing late signs of an exacerbation in the child, including gasping for breath or sucking in the rib muscles when breathing.

"Those kids have to go to the emergency department because they are too far along in their exacerbation to do anything at home," Garbutt says. "If we can talk to parents and find out that's the issue, we can teach them to take action sooner."

In some instances, parents knew they needed to give their child albuterol, but weren't sure how much or how often. "Parents varied in terms of how often they used it, if they used it with a nebulizer, how often they repeated it and how they determined if it was working," Garbutt says. "A careful assessment of exactly which medicines are used and how they are administered and dosed could identify problems. We think that is something that can be addressed with education."

Prednisone is a corticosteroid that prevents the release of inflammatory-causing substances in the body. Many parents said they kept the drug on hand at home in case of an asthma attack, but few parents in this study used it, instead calling the doctor's office or going to the emergency room.

Garbutt and fellow researchers are conducting a follow-up study in which the asthma coaches are working with physicians to promote earlier use of albuterol as well as other effective self-management behaviors. In addition, the coaches are working with parents to help them identify the early signs of an asthma exacerbation by giving parents a symptom diary to help parents see symptom patterns.

Garbutt J, Highstein G, Nelson K, Rivera-Spoljaric K, Strunk, R. Detection and home management of worsening asthma symptoms. Annals of Allergy, Asthma & Immunology, December 2009, pp. 469-473

Funding for this study was provided by the National Heart, Lung, and Blood Institute

Rootbeer-Smelling Roses? Pick Your Scent

Just in time for Valentine's day, scientists genetically engineer roses that can produce custom-made aromas.

By Eric Bland Fri Feb 12, 2010 04:06 AM ET

THE GIST:

* *Scientists find genes that could restore fragrances to flowers.*
* *Even custom-scented flowers could soon be available.*
* *The genetic research may also be applied to restore flavors to fruits and vegetables.*

Root beer-scented roses could soon be available at your local florist, according to scientists from Florida who are developing newly fragrant flowers. The research could lead to custom-designed flower fragrances and even to better-smelling, and better-tasting, fruits and vegetables.

"We are very excited about the idea of putting these flowers in front of consumers and figuring out which fragrance excites people the most," said David Clark, a scientist at the University of Florida in Gainesville developing the new flowers. "Then we can use that information to assist breeders in developing flowers that people want to smell more, or even breed fruits that smell and taste better."

The key to a flower's aroma is in its genes. Over the last 50 years plant breeders consciously selected for bigger and prettier flowers and fruits. Along the way the genes that make flowers smell nicer have been lost. Clark and his colleagues have discovered those genes, albeit by accident.

The scientists were studying petunias, trying to increase the lifespan of petals. The researchers had no particular interest in petunias as objects of beauty or symbols of desire; petunias are a model system for tomatoes, as well as potatoes, tobacco and other edible crops. One way to get more tomatoes is by pollinating more flowers.

This is not as easy as it sounds. A pollinated flower releases ethylene gas. Ethylene makes the petals fall off unpollinated flowers. If the scientists could find a gene that stopped ethylene production or ethylene detection, then the likelihood of an unpollinated flower becoming pollinated, and becoming a tomato, increases.

To find genes linked with ethylene, the Florida scientists sequenced the petunia's genome. They found the ethylene genes, but they also found an unexpected blank spot on the petunia's genetic map; 12 to 13 new genes that encoded for molecules of unknown use.

Through a variety of genetic techniques, the scientists knocked out, amplified, and otherwise tweaked each of these genes until they found their function. Those 12 to 13 genes tell the plant to produce rose oil, clove oil, wintergreen, the smell of root beer, and other chemicals that, when whiffed together, give a petunia its distinctive aroma. These genes identified, scientists can now create flowers with never-before- smelled scents, including roses that smell like root beer or petunias that smell like wintergreen.

On Monday, the Florida scientists planted the first petunia seeds designed to smell like roses. When the flowers ripen this summer, Clark and his colleagues will hold them under the blind-folded noses of potential consumers and see if they can correctly identify the smell as petunia or rose. Other combinations of flowers and smells will be coming soon.

The research isn't just about making new and unusual fragrance combinations, say Clark and other scientists. It's about restoring flavors and smells that have been lost over the last 50 years.

"We've selected for size, shape, and color but not for more subtle but equally important things like smell and nutritional value, which is why people complain about tasteless tomatoes," said Jim Gionannoni, a scientist at the U.S. Department of Agriculture. "The volatiles that contribute to aroma are often derived from necessary nutrients. Aroma is a way to signal the nutritional value of the plant."

"It's great that we can ship a strawberry from California to the Midwest, but the flavor and fragrance of that strawberry are drastically reduced," said Ryan Warner, a scientist at Michigan State University. "People are starting to look for fruit that not only looks like a strawberry, but also tastes and smells like one."

Don't expect to start looking for super-fragrant flowers and fruits in your grocery store anytime soon, however. Clark says the research is proof of concept. Years, and perhaps Food and Drug Administration approval in the case of any genetically engineered plants, are required before these blooms open their petals.

And when they do, you can expect to pay a premium for nature's fragrance; Clark estimates an extra fragrant flower will cost an extra 10 cents. "We solved the quantity issue with the baby boomers," said Clark. "Now people are going back and asking, what about the quality?"

Finally, Good-Looking Nontoxic Paint?

By STEPHEN TREFFINGER

The Process

I tested 10 brands of environmentally friendly indoor paints, which are very low in, or free of, volatile organic compounds, or V.O.C.'s - toxic chemicals like benzene and formaldehyde found in traditional paints, which can be released into the air for years after the paint has dried and have been linked to a number of health problems, including asthma and cancer. The test was conducted in three parts: First, I applied each paint with a roller to a section of primed wall, observing how well it went on and taking note of its odor. Next, I painted two coats on a 2-by-2-foot square of wall, let the paint dry for six weeks - the amount of time recommended by most manufacturers - and then smudged it with newspaper-stained fingers to see how hard it was to clean with a sponge. Finally, I drew on a primed board with red and black permanent markers and then applied several coats of each paint, to see how much it took to cover up the markings.

FARROW & BALL ESTATE EMULSION ($80 A GALLON)
It went on easily and smelled of wet cement but would be best for low-traffic areas, as it did not clean especially well; farrowandball.com.

YOLO COLORHOUSE INTERIOR ZERO-V.O.C. PAINT ($44.95 A GALLON)
One of the easiest paints to clean, it had a slightly sour odor that dissipated quickly and a chalky finish; yolocolorhouse.com.

SAFECOAT ZERO-V.O.C. FLAT ($49.95 A GALLON)
It was thicker than most, but went on smoothly, had a pleasant smell and cleaned up well; afmsafecoat.com.

BENJAMIN MOORE NATURA ($49.99 A GALLON)
It can be tinted 3,000 shades, went on smoothly and was relatively easy to clean; store.benjaminmoore.com.

MYTHIC INTERIOR FLAT LATEX ($49.99 A GALLON)
This paint comes in dynamic colors, has a nicely flat finish and a mild ammonia smell and was easy to clean; mythicpaint.com.

STARK PAINT VELVET EMULSION ($76.70 A GALLON)
A creamy paint that went on smoothly and smelled of mild ammonia; (212) 752-9000.

For the most part, I used shades of white, but I also tried out a few other colors, since I am looking for the perfect shade of pale bluish-gray for my dining room. For the cleaning test, I used flat finishes to really challenge the paint. (For high-traffic or child-friendly areas, I'd recommend a semi-gloss, eggshell or glossy finish, since they are easier to clean.) Most brands don't advise that you scrub the paint with the force I used, especially not if it has a matte finish, but I wanted to see which ones would hold up to punishment. The six brands here are those that performed the best across the board.

WHEN zero-V.O.C. paints started gaining in popularity about five years ago, their quality was still unreliable - they often went on unevenly - and the selection of colors was limited to pastels and a few chalky earth tones. Since then, manufacturers claim to have made vast improvements. V.O.C.-free paints are now on par with regular paints in terms of quality, they say, and can be tinted almost any color (just make sure that the tint is zero-V.O.C. as well).

Farrow & Ball, a British company, has long been a favorite of interior decorators for its sophisticated colors, which now come in low-V.O.C. versions. The paint went on smoothly, the brush strokes quickly disappearing on the wall. It had a mild odor, smelling vaguely of wet cement. Dirty fingerprints didn't go away when I wiped them with the soft side of a scrubber sponge, but they disappeared when I scrubbed them with the rough side. This paint covered the permanent ink more easily than the other paints did, but only incrementally.

Stark, the furniture and rug company, has teamed up with David Oliver, a British color specialist, to produce a new line of zero-V.O.C. paint, which applied beautifully, with a creaminess that was neither too thick nor too thin. The matte finish was a bit shinier than that of the Farrow & Ball paints; the smell, which resembled mild ammonia, was one of the worst. The paint held up very well in the scrub test, though; most of the fingerprints came off, although not all. And it covered the permanent marker almost as easily as the Farrow & Ball paint did.

Benjamin Moore's Natura zero-V.O.C. paint can be tinted more than 3,000 shades — the most of any paint here - and it went on the smoothest. Its smell was mild and a bit fruity, the most paint-like of any here, and it had a soft sheen, slightly less matte than the two above. It cleaned up better than the more expensive brands (although the fingerprints never completely disappeared), and it easily covered the ink marks.

Safecoat's paint had the best smell - a milky, fruity odor like that of peach yogurt. It was quite thick but still easy to apply, and had a slight sheen. The fingerprints came off completely, even without excess wiping, though the paint held up when scrubbed with the rough side of the sponge, too. It covered the ink marks pretty well, although not as easily as the other paints.

Yolo Colorhouse was the easiest to clean - the dirty fingerprints wiped away quickly. Its finish was chalky, just off-flat. My only complaint is that it had a slightly sour smell, but it wasn't that strong. It did an average job of covering up the ink.

Mythic's new line of zero-V.O.C. paints, produced in collaboration with David Bromstad, a host of the HGTV show "Color Splash," has bright, bold colors with names like Heart Throb and Caught Red Handed, as well as many lovely pastels. The paint had a mild wet-stone smell and was easy to apply, although it was a little thinner than the others. Its finish was very flat, and it was almost as easy to clean as the Safecoat and Yolo Colorhouse paints, although traces of the fingerprints remained. It covered the ink as well as Safecoat, but not as easily as some of the others.

While none of these paints was completely odor free, in most cases the smell disappeared in an hour or so. That means you no longer need to leave the house as soon as you finish painting. You'll need another excuse for a weekend getaway.

Yale Scientists Synthesize Unique Family of Anti-Cancer Compounds

New Haven, Conn. — Yale University scientists have streamlined the process for synthesizing a family of compounds with the potential to kill cancer and other diseased cells, and have found that they represent a unique category of anti-cancer agents. Their discovery appears in this week's online edition of the Journal of the American Chemical Society.

The team studied a family of compounds known as the kinamycins, which are naturally produced by bacteria during metabolism and are known for their potent toxicity. For years scientists have guessed that a core structure common to the different compounds within the group was responsible for this toxicity. Until now, chemists could not study the core structure because there was no simple way to create it in the laboratory.

Now the Yale team has developed a new method to recreate this structure that allows them to synthesize the kinamycins with much greater efficiency than previously possible. While scientists have produced kinamycins in the laboratory in the past, the Yale team was able to halve the number of steps required to go from simple, easily obtainable precursors to the complete molecule—from 24 down to 12.

"By shortening the synthesis we can now prepare these molecules in the quantities required for further studies, including animal studies and even clinical trials," said Seth Herzon, assistant professor of chemistry and lead author of the study.

Working with researchers at the Yale School of *Medicine* and the Yale Chemical Genomics Screening Facility, the team has begun testing several of the compounds against cancer cells, with promising preliminary results. Next, they will work to understand the exact mechanism that makes the compounds—which are benign on their own—highly toxic once they penetrate cells.

“The key to success will be whether we can develop selectivity—whether we can kill cancer cells in the presence of non-cancerous tissue,” Herzon said. “Based on what we already know about the chemical reactivity of these molecules, I’m optimistic we can do this.”

The reactive core of the kinamycins also plays a key role in another compound the team is studying, called lomaiviticin A, which is even more toxic and could prove even more effective in destroying cancer cells. “Lomaiviticin A is the big fish. It’s more potent than the kinamycins, but it’s also much harder to synthesize,” Herzon said. Both the kinamycins and lomaiviticin A are unique in their toxicity profiles, Herzon said, representing a new category of anti-cancer agents.

“There’s no close analogy to draw from to predict how these molecules will behave, which will make it especially interesting to see where this research takes us,” Herzon said. “This research involves a lot of exciting chemistry, but it also has real applications in biology and human medicine.”

Other authors of the study include Christina Woo, Liang Lu, Shivajirao Gholap and Devin Smith, all of Yale University. Funding for this research was provided by Yale University and Eli Lilly.

ebruary 12, 2010 11:55 AM

Why whooping cough's making a comeback

Wendy Zukerman, Asia Pacific reporter

Whooping cough is on the rise in industrialised countries, despite long-standing vaccination programmes. Now researchers from the University of New South Wales in Sydney, Australia, have an explanation for why: at least two strains of the bacteria that cause the infection have evolved to evade today's vaccines.

According to The Daily Telegraph of Sydney, "the research team analysed more than 200 samples of the bacterium collected over the past 40 years in Australia and compared them with samples from Japan, Canada, USA and Finland". They found that there are at least two strains that the vaccine may not protect against - known as MT27 and MT70.

At least in rich countries, many people may think that whooping cough - also known as pertussis - is a killer from a pre-vaccination era. The new study, which is published in this month's edition of the journal Emerging Infectious Diseases, emphasises that incidence rates have been recently increasing in many industrialised countries. Prior to this study, scientists were unsure why.

Now it seems an upgrade to a new type of vaccine may be to blame. Up until 1997, a "whole-cell" vaccine was used before it was phased out over two years because of concerns about side effects. Since 1999, a new "acellular" vaccine has been used. One of the authors of the study, Ruiting Lan, told The Advertiser of Adelaide, South Australia:

"A key issue is that the whole-cell vaccine contained hundreds of antigens, which gave broad protection against many strains of pertussis. But the acellular vaccine contains only three to five antigens. Our findings suggest that the use of the acellular vaccine may be one factor contributing to these genetic changes."

To confirm their suspicions, the researchers also analysed particular genes in the bacteria's DNA that make the three to five antigens which interact with the new vaccine. "The new strains have a new copy of the gene and so will make a slightly different antigen," said Lan, which means the mutated strains are unlikely to react to an immune response arising from the vaccine.

According to Pharmacy News of Australia, Lan is warning that vaccination is still very important because it offers protection from many strains.

The cost of being on your toes

Walking heels-first is less work than walking on your toes or balls of the feet

SALT LAKE CITY - Humans, other great apes and bears are among the few animals that step first on the heel when walking, and then roll onto the ball of the foot and toes. Now, a University of Utah study shows the advantage: Compared with heel-first walking, it takes 53 percent more energy to walk on the balls of your feet, and 83 percent more energy to walk on your toes.

"Our heel touches the ground at the start of each step. In most mammals, the heel remains elevated during walking and running," says biology Professor David Carrier, senior author of the new study being published online Friday, Feb. 12 and in the March 1 print issue of The Journal of Experimental Biology.

"Most mammals – dogs, cats, raccoons – walk and run around on the balls of their feet. Ungulates like horses and deer run and walk on their tiptoes," he adds. "Few species land on their heel: bears and humans and other great apes – chimps, gorillas, orangutans."

"Our study shows that the heel-down posture increases the economy of walking but not the economy of running," says Carrier. "You consume more energy when you walk on the balls of your feet or your toes than when you walk heels first."

Economical walking would have helped early human hunter-gatherers find food, he says. Yet, because other great apes also are heel-first walkers, it means the trait evolved before our common ancestors descended from the trees, he adds. "We [human ancestors] had this foot posture when we were up in the trees," Carrier says. "Heel-first walking was there in the great apes, but great apes don't walk long distances. So economy of walking probably doesn't explain this foot posture [and why it evolved], even though it helps us to walk economically."

Carrier speculates that a heel-first foot posture "may be advantageous during fighting by increasing stability and applying more torque to the ground to twist, push and shove. And it increases agility in rapid turning maneuvers during aggressive encounters."

The study concludes: "Relative to other mammals, humans are economical walkers but not economical runners. Given the great distances hunter-gatherers travel, it is not surprising that humans retained a foot posture, inherited from our more arboreal [tree-dwelling] great ape ancestors, that facilitates economical walking."

Measuring the Costs of Different Modes of Walking and Running

Carrier conducted the study with Christopher Cunningham, a doctoral student in biology at the University of Utah; Nadja Schilling, a zoologist at Friedrich Schiller University of Jena, Germany; and Christoph Anders, a physician at University Hospital Jena. The study was funded by the National Science Foundation, Friedrich Schiller University of Jena and a German food industry insurance group interested in back pain.

The study involved 27 volunteers, mostly athletes in their 20s, 30s and 40s. Each subject walked or ran three different ways, with each step either heel-first, ball-of-foot first with the heel a bit elevated or toes first with the heel even more elevated. In his lab, Carrier and colleagues measured oxygen consumption – and thus energy use – as 11 volunteers wore face masks while walking or running on a treadmill. They also walked on a "force plate" to measure forces exerted on the ground.

Part of the study was conducted at Anders' lab in Germany, where 16 people walked or ran on a treadmill as scientists monitored activity of muscles that help the ankles, knees, hips and back do work during walking and running.

Findings of the experiments included:

* "You consume more energy when you walk on the balls of your feet or your toes than when you walk heels-first," Carrier says. Compared with heels-first walkers, those stepping first on the balls of their feet used 53 percent more energy, and those stepping toes-first expended 83 percent more energy.

* "The activity of the major muscles of the ankle, knee, hip and back all increase if you walk on the balls of your feet or your toes as opposed to landing on your heels," says Carrier. "That tells us the muscles increase the amount of work they are producing if you walk on the balls of your feet."

* "When we walk on the balls of our feet, we take shorter, more frequent strides," Carrier says. "But this did not make walking less economical." Putting the heel down first and pivoting onto the ball of the foot makes the stride longer because the full length of the foot is added to the length of the step. But that has no effect on energy use.

* The researchers wondered if stepping first on the balls of the feet took more energy than walking heel-first because people are less stable on their toes or balls of the feet. But increased stability did not explain why heel-first walking uses less energy.

* Stepping heel-first reduced the up-and-down motion of the body's center of mass during walking and required less work by the hips, knees and ankles. Stepping first onto the balls of the feet slows the body more and requires more re-acceleration.

* Heels-first steps also made walking more economical by increasing the transfer of movement or "kinetic" energy to stored or "potential" energy and back again. As a person starts to step forward and downward, stored energy is changed to motion or kinetic energy. Then, as weight shifts onto the foot and the person moved forward and upward, their speed slows down, so the kinetic energy of motion is converted back into stored or potential energy. The study found that stepping first onto the balls of the feet made this energy exchange less efficient that walking heels-first.

* Heel-first walking also reduced the "ground reaction force moment" at the ankle. That means stepping first onto the ball of the foot "decreases the leverage, decreases the mechanical advantage" compared with walking heel-first, Carrier says.

In sum, walking heel-first is not more economical because it is more stable or involves fewer, longer strides, but because when we land on our heels, less energy is lost to the ground, we have more leverage, and kinetic and potential energy are converted more efficiently.

Form and Function of the Foot

If heel-first walking is so economical, why do so many animals walk other ways?

"They are adapted for running," Carrier says. "They've compromised their economy of walking for the economy of running. Humans are very good at running long distances. We are physiologically and anatomically specialized for running long distances. But the anatomy of our feet is not consistent with economical running. Think of all the animals that are the best runners – gazelles, deer, horses, dogs – they all run on the ball of their feet or the tips of their toes."

When people run, why is there no difference in the amount of energy they expend when stepping first onto their heels versus the balls of their feet or toes?

The answer is unknown, but "if you land on your heel when you run, the force underneath the foot shoots very quickly to the ball of your foot," Carrier says. "Even when we run with a heel plant, most of the step our weight is supported by the ball of our foot. Lots of elite athletes, whether sprinters or distance runners, don't land on their heel. Many of them run on the balls of their feet," as do people who run barefoot. That appears to be the natural ancestral condition for early human runners, he adds.

"The important thing is we are remarkable economical walkers," Carrier says. "We are not efficient runners. In fact, we consume more energy to run than the typical mammal our size. But we are exceptionally economical walkers."

"This study suggests that one of the things that may explain such economy is the unusual structure of our foot," he adds. "The whole foot contacts the ground when we walk. We have a big heel. Our big toe is as long as our other toes and is much more robust. Our big toe also is parallel to and right next to the second toe."

"These features are distinct among apes, and provide the mechanical basis for economical walking. No other primate or mammal could fit into human shoes."

Texas Children's discharges history-making patient

Heart-assist device helped ready 16-year-old for successful surgery

HOUSTON - The wait is over for 16-year-old Francesco "Frank" De Santiago. On January 29, De Santiago received a donor heart in a nine-hour transplant operation at Texas Children's Heart Center De Santiago made news last October as the first child ever discharged from a pediatric hospital with an implanted mechanical heart pump, or ventricular assist device (VAD). Until then, pediatric patients with VADs remained in the hospital, often in ICU, while awaiting a donor heart.

"Frank's surgery went extremely well; he was a much better candidate for a heart transplant now than eight months ago when his heart was failing," said Dr. David L.D. Morales, pediatric cardiovascular surgeon at Texas Children's Heart Center who implanted Frank's device last May and performed his recent heart transplant. "The device improved his physical health and allowed him be discharged so he could enjoy some normal teen activity during the wait for a donor heart. Texas Children's is leading the way in using five different types of VAD technology to help pediatric patients enhance their quality of life and outlook so they are better prepared for their transplant surgery."

De Santiago will continue to reside in Houston and undergo rehabilitation and follow-up check-ups for three months before returning to his home in south Texas. He calls his heart "a gift" and is learning how to care for himself and his new organ.

Morales said about 450 pediatric heart transplants occur annually in the United State; yet the number of pediatric heart failure cases diagnosed annually continues to rise. He believes that the future of pediatric heart care resides in VAD technology and Texas Children's Heart Center uses the most of any pediatric hospital in the country.

"Heart failure in children is now being diagnosed at an increased rate," said Dr. Jeffrey Dreyer, medical director of cardiac transplantation at Texas Children's Hospital. "Advances in VAD technology provide new opportunities for treatment and recovery. Prior to VADs, a significant number of pediatric heart failure patients did not survive long enough to receive a heart transplant. We are fortunate to have this technology and expertise at Texas Children's."

Frank De Santiago was transferred to Texas Children's Hospital from south Texas after experiencing a temporary stroke. He was diagnosed with dilated cardiomyopathy, a condition in which his heart was enlarged to more than twice a normal size and could not pump blood efficiently. The Texas Children's Heart Center physician team placed him on the heart transplant list and concluded he was an excellent candidate for the HeartMate II VAD that could keep him alive until a suitable donor heart became available.

Texas Children's Hospital is the first pediatric hospital in the world to use the HeartMate II in pediatric patients with a body surface area of at least 1.3 square meters. The device, about the size of two "D" cell batteries laid end-to-end, received U. S. Food and Drug Administration approval on April 26, 2008. Since then, Morales, also director of the Pediatric Mechanical Circulatory Support Program, has implanted the HeartMate II in five teen or pre-teen patients. All patients experienced improved heart health on the device, which allowed them to live until donor hearts became available.