

## **Who, What, Why: How long is the ideal nap?**

**By Tom Geoghegan BBC News, Washington DC**

### ***Air traffic controllers in the US have been advised to take 26-minute naps, after a string of incidents involving workers falling asleep. So is 26 minutes the ideal length of time for a nap?***

Five cases of air traffic controllers falling asleep on the job have been revealed since March.

In three of those cases, disclosed by the Federal Aviation Association, workers have been fired.

Now the National Transportation Safety Board (NTSB) is calling for "controlled naps" to be built into night shifts.

Referring to a 1995 study from Nasa, which he co-authored, NTSB member and fatigue expert Mark Rosekind said that a 26-minute nap would improve performance by 34% and alertness by 54%.

There was other supporting evidence that said naps of between 20 minutes and 30 minutes were beneficial, he said. His call for work naps is supported by the controllers' union, which wants naps to be allowed in both overnight and day shifts.

Beyond the aviation industry, combating fatigue is an issue that affects many people across all professions, working day and night, although it carries obvious risks in jobs that involve motoring or machinery.

But other experts are doubtful that 26 minutes is the optimum napping time.

It's a bit too long and risks you falling into a deep sleep, says Jim Horne, director of the Sleep Research Council in the UK, which advises the government on guidelines for drivers.

"What we recommend is that a nap is combined with a cup of coffee so you have some caffeine, and that takes about 20 minutes to kick in.

"Have a cup of coffee and get your head down. Done together it has a more powerful effect."

It probably works out that a nap of about 15 minutes is best, he says, because once you get beyond 20 minutes, you risk a deep sleep and you can be much more groggy when you wake up.

"A lot of people take caffeine after they wake up, but you have a window of opportunity of 20 minutes, so it will help you wake up. It works, there's no doubt about it."

People can't instantly fall asleep, so it's impossible to exactly time how long you will be asleep, he says. But even 15 minutes of dozing is beneficial.

"At least by having caffeine, you know that in 20 minutes you will feel more alert."

If you haven't had a wink of sleep the night before, then this tactic won't be enough to refresh you, says Mr Horne, but for those that have had merely a poor night's sleep, it will work.

### **Early or late?**

Longer naps would work if they became part of your daily routine, he says, because your body would get used to it and could wake up quite easily without feeling too groggy.

Health writer Linda Wasmer Andrews, based in Albuquerque, New Mexico, also believes 26 minutes is too long. She says a nap of between 10 and 20 minutes is enough.

The timing of the nap is also important, she says. Putting your head down too early means your body may not be ready to sleep yet, but a nap that is too late in the day might make it harder to fall asleep come bedtime.

Early afternoon is often the best time, between 1-3pm, she says, when people experience a post-lunch dip in energy. Whatever the best strategy is, it's unlikely that the US air traffic controllers will be adopting any such tactics soon.

Transport Secretary Ray LaHood has dismissed the proposal for on-the-job naps to be implemented in the aviation industry.

He said workers would not be paid to sleep, and instead ordered for more managers be hired to supervise nightshift workers and ensure they don't fall asleep on the job.

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## **Study is the first to link sleep duration to infant growth spurts**

***Results provide the first documentation that infant growth in body length is concordant with changes in sleep***

DARIEN, Ill. – A study in the May 1 issue of the journal *Sleep* is the first to show that increased bursts of sleep among infants are significantly associated with growth spurts in body length.

Results show that infants had irregular bursts of sleep, with 24-hour sleep duration increasing at irregular intervals by an average of 4.5 hours per day for two days. The number of sleep episodes per day also increased in intermittent bursts of an average of three extra naps per day for two days. These peaks in total daily sleep duration and number of sleep episodes were significantly associated with measurable growth spurts in body length, which tended to occur within 48 hours of the recorded bursts of sleep. Further analysis found that the

probability of a growth spurt increased by a median of 43 percent for each additional sleep episode and 20 percent for each additional hour of sleep.

"The results demonstrate empirically that growth spurts not only occur during sleep but are significantly influenced by sleep," said principal investigator and lead author Dr. Michelle Lampl, Samuel Candler Dobbs Professor in the department of anthropology at Emory University in Atlanta, Ga. "Longer sleep corresponds with greater growth in body length."

Lampl added that the results may be particularly helpful for parents, who can become easily frustrated by the variability and unpredictability of an infant's sleep patterns.

"On a practical, everyday level, it helps parents understand their infant's behavior and patterns," she said.

The study involved 23 parents who consistently recorded daily sleep records for their infant, providing 5,798 daily records for analysis. The median age of the 14 girls and nine boys at study onset was 12 days. All infants were healthy at birth and free of colic or medical complications during their first year. For a duration ranging from four to 17 continuous months, growth in total body length was assessed using the maximum stretch technique, which was performed semi-weekly for 18 infants, daily for three infants and weekly for two infants.

According to Lampl and co-author Michael Johnson, PhD, professor of pharmacology in the University of Virginia Health System, the exact nature of the relationship between sleep biology and bone growth is unclear. However, they noted that the secretion of growth hormone is known to increase after sleep onset and during the stage of slow wave sleep. This change in hormonal signals during sleep could stimulate bone growth, which would support anecdotal reports of "growing pains," the aching limbs that can wake children at night.

Although a statistically significant relationship between bursts of sleep and growth spurts was found in all infants, the correspondence was imperfect. Some sleep alterations occurred without a growth spurt, and not every growth spurt was preceded by a burst of sleep.

Lampl and Johnson speculate that in some cases growth may have occurred in other parts of the body. For example, another new study they are publishing this month found that infant head circumference grows in intermittent, episodic spurts. They also suggest that sleep may be only one component of an integrated, physiological system that underlies growth timing.

The study is also significant, added Lampl, because it adds a novel finding to the interdisciplinary, multi-faceted body of research targeted at answering the question, "Why do we sleep?"

"It opens another door to understanding why we sleep," she said. "We now know that sleep is a contributing factor to growth spurts at the biological level."

*Data collection was supported by the Developmental Psychobiology Research Group and the Wenner-Gren Foundation.*

[http://www.eurekalert.org/pub\\_releases/2011-05/aaos-aci042711.php](http://www.eurekalert.org/pub_releases/2011-05/aaos-aci042711.php)

## **Adverse changes in sleep duration are associated with lower cognitive scores in middle-aged adults**

### **Study finds that too much or too little sleep may accelerate cognitive aging by 4 to 7 years**

DARIEN, Ill. – A study in the May 1 issue of the journal *Sleep* describes how changes in sleep that occur over a five-year period in late middle age affect cognitive function in later life. The findings suggest that women and men who begin sleeping more or less than 6 to 8 hours per night are subject to an accelerated cognitive decline that is equivalent to four to seven years of aging.

Results show that the sleep duration at follow-up of 7.4 percent of women and 8.6 percent of men had increased from "7 or 8 hours" per weeknight at baseline. Compared with participants whose sleep duration was unchanged, this change to a longer sleep duration was associated with lower scores at follow-up on five of six cognitive function tests, with the only exception being the test of short-term verbal memory. The sleep duration at follow-up of about 25 percent of women and 18 percent of men had decreased from "6, 7, or 8 hours" per night at baseline. This change to a shorter sleep duration was associated with lower scores at follow-up on three of the six cognitive tests, with reasoning, vocabulary and global cognitive status all being affected adversely. Surprisingly, an increase in sleep duration from six hours or less showed no evidence of a beneficial effect.

"The main result to come out of our study was that adverse changes in sleep duration appear to be associated with poorer cognitive function in later-middle age," said lead author Jane Ferrie, PhD, senior research fellow in the University College London Medical School Department of Epidemiology and Public Health in the U.K.

The researchers also found that, in women, sleep duration of 7 hours of sleep per night was associated with the highest score for every cognitive measure, followed closely by 6 hours of nightly sleep. Among men, cognitive function was similar for those who reported sleeping 6, 7 or 8 hours; only short and long sleep durations of less than 6 hours or more than 8 hours appeared to be associated with lower scores.

The study used data for 5,431 participants (1,459 women and 3,972 men) from Phase 5 (1997-1999) and Phase 7 (2003-2004) of the Whitehall II study, which included more than 10,000 London-based office staff

aged 35-55 working in 20 civil service departments in 1985. Phase 5 and Phase 7 follow-ups involved postal questionnaires and clinical examinations. Cognitive function was assessed at Phase 7 using six standard tests that measured memory, reasoning, vocabulary, phonemic fluency, semantic fluency, and global cognitive status.

Habitual sleep duration was measured at Phase 5 (baseline) and Phase 7 (follow-up) using a single question: "How many hours of sleep do you have on an average week night?" Participants were divided into four groupings based on the change in sleep duration between the two checkpoints: an increase from  $\leq 5$  hours or 6 hours per night; an increase from 7 or 8 hours per night; a decrease from 6, 7, or 8 hours per night; and a decrease from  $\geq 9$  hours per night. These groups were compared with reference groups who reported no change in sleep duration between Phase 5 and Phase 7. Overall, about 58 percent of men and 50 percent of women had no change in their self-reported nightly sleep duration during the study period.

Although participants were mostly white-collar workers, the study group covered a wide socioeconomic range with a 10-fold difference in salary across the occupational hierarchy. The researchers adjusted for the effects of education and occupational position due to their known association with cognitive performance. Socioeconomic status did not account for all the observed associations, indicating either a direct association between change in sleep and cognitive function, or an association mediated or confounded by factors other than education and occupational position.

According to the authors, adequate, good quality sleep is fundamental to human functioning and well-being. Sleep deprivation and sleepiness have adverse effects on performance, response times, errors of commission, and attention or concentration. Furthermore, sleep duration has been found to be associated with a wide range of quality of life measures, such as social functioning, mental and physical health, and early death.

"The detrimental effects of too much, too little and poor quality sleep on various aspects of health have begun to receive more attention," Ferrie added. "Given that our 24/7 society increasingly impinges on the lives of many people, it is important to consider what effects changes in sleep duration may have on health and well-being in the long term."

*Healthy sleep habits for all ages are available from the American Academy of Sleep Medicine on the Sleep Education website at <http://www.sleepeducation.com/Hygiene.aspx>.*

[http://www.eurekalert.org/pub\\_releases/2011-05/asfm-wwc050211.php](http://www.eurekalert.org/pub_releases/2011-05/asfm-wwc050211.php)

### **Washing with contaminated soap increases bacteria on hands**

***People who wash their hands with contaminated soap from bulk-soap-refillable dispensers can increase the number of disease-causing microbes on their hands and may play a role in transmission of bacteria in public settings according to research published in the May issue of the journal Applied and Environmental Microbiology.***

"Hand washing with soap and water is a universally accepted practice for reducing the transmission of potentially pathogenic microorganisms. However, liquid soap can become contaminated with bacteria and poses a recognized health risk in health care settings," says Carrie Zapka from GOJO Industries in Akron Ohio, the lead researcher on the study that also included scientists from BioScience Laboratories in Bozeman, Montana and the University of Arizona, Tucson.

Bulk-soap-refillable dispensers, in which new soap is poured into a dispenser, are the predominant soap dispenser type in community settings, such as public restrooms. In contrast to sealed-soap dispensers, which are refilled by inserting a new bag or cartridge of soap, they are prone to bacterial contamination and several outbreaks linked to the use of contaminated soap have already been reported in healthcare settings.

In this study Zapka and her colleagues investigated the health risk associated with the use of bulk-soap-refillable dispensers in a community setting. They found an elementary school where all 14 of the soap dispensers were already contaminated and asked students and staff to wash their hands, measuring bacteria levels before and after handwashing. They found that Gram-negative bacteria on the hands of students and staff increased 26-fold after washing with the contaminated soap.

"This is the first study to quantitatively demonstrate that washing hands with contaminated liquid soap actually increases the number of Gram-negative bacteria on hands. Furthermore, the results directly demonstrate that bacteria from contaminated hands can be transferred to secondary surfaces," says Zapka.

Zapka notes that all the participants' hands were decontaminated after testing by washing with uncontaminated soap followed by hand sanitizer. At the conclusion of the study, all the contaminated soap dispensers were replaced with dispensers using sealed-soap refills. After one year of use, not one of them was found to be contaminated.

*A copy of the research article can be found online at <http://aem.asm.org/cgi/content/full/77/9/2898>.*

[http://www.eurekalert.org/pub\\_releases/2011-05/nyu-rop050211.php](http://www.eurekalert.org/pub_releases/2011-05/nyu-rop050211.php)

## **Rice's origins point to China, genome researchers conclude**

***Rice originated in China, a team of genome researchers has concluded in a study tracing back thousands of years of evolutionary history through large-scale gene re-sequencing.***

Their findings, which appear in the latest issue of the Proceedings of the National Academy of Sciences (PNAS), indicate that domesticated rice may have first appeared as far back as approximately 9,000 years ago in the Yangtze Valley of China. Previous research suggested domesticated rice may have two points of origin - India as well as China.

The study was conducted by researchers from New York University's Center for Genomics and Systems Biology and its Department of Biology, Washington University in St. Louis' Department of Biology, Stanford University's Department of Genetics, and Purdue University's Department of Agronomy.

Asian rice, *Oryza sativa*, is one of world's oldest crop species. It is also a very diverse crop, with tens of thousands of varieties known throughout the world. Two major subspecies of rice – japonica and indica – represent most of the world's varieties. Sushi rice, for example, is a type of japonica, while most of the long-grain rice in risottos are indica. Because rice is so diverse, its origins have been the subject of scientific debate. One theory - a single-origin model - suggests that indica and japonica were domesticated once from the wild rice *O. rufipogon*.

Another - a multiple-origin model - proposes that these two major rice types were domesticated separately and in different parts of Asia. The multiple-origin model has gained currency in recent years as biologists have observed significant genetic differences between indica and japonica, and several studies examining the evolutionary relationships among rice varieties supported more than domestication in both India and China.

In the PNAS study, the researchers re-assessed the evolutionary history, or phylogeny, of domesticated rice using previously published datasets, some of which have been used to argue that indica and japonica rice have separate origins. Using more modern computer algorithms, however, the researchers concluded these two species have the same origin because they have a closer genetic relationship to each other than to any wild rice species found in either India or China.

In addition, the study's authors examined the phylogeny of domesticated rice by re-sequencing 630 gene fragments on selected chromosomes from a diverse set of wild and domesticated rice varieties. Using new modeling techniques, which had previously been used to look at genomic data in human evolution, their results showed that the gene sequence data was more consistent with a single origin of rice.

In their PNAS study, the investigators also used a "molecular clock" of rice genes to see when rice evolved. Depending on how the researchers calibrated their clock, they pinpointed the origin of rice at possibly 8,200 years ago, while japonica and indica split apart from each other about 3,900 years ago. The study's authors pointed out that these molecular dates were consistent with archaeological studies. Archaeologists have uncovered evidence in the last decade for rice domestication in the Yangtze Valley beginning approximately 8,000 to 9,000 years ago while domestication of rice in the India's Ganges region was around about 4,000 years ago.

"As rice was brought in from China to India by traders and migrant farmers, it likely hybridized extensively with local wild rice," explained NYU biologist Michael Purugganan, one of the study's co-authors. "So domesticated rice that we may have once thought originated in India actually has its beginnings in China."

"This study is a good example of the new insights that can be gained from combining genomics, informatics and modeling," says Barbara A. Schaal, Mary-Dell Chilton Distinguished Professor of Biology at Washington University in St. Louis, who is also a co-author. "Rice has a complicated evolutionary history with humans and has accompanied them as they moved throughout Asia. This work begins to reveal the genetic consequences of that movement."

*The research was funded by a grant from the National Science Foundation Plant Genome Research Program.*

<http://news.sciencemag.org/sciencenow/2011/05/first-buildings-may-have-been-co.html>

## **First Buildings May Have Been Community Centers**

**by Michael Balter on 2 May 2011, 3:00 PM**

***Nearly 12,000 years ago, the world's first villages began to spring up in the Near East. Until recently, archaeologists assumed that the stone and mud-brick buildings that made up these small settlements were the houses of the first farmers, who had begun to give up the hunting and gathering lifestyle.***

But the discovery of a large, amphitheater-like building at a site in southern Jordan, reported today, adds to growing evidence that the earliest permanent buildings might not have been homes, but community centers. The find, researchers say, suggests that during the advent of agriculture - a pivotal turning point that



prehistorians call the Neolithic Revolution - early farmers may have come together first to engage in communal activities, and only later did they begin living together.

“This is definitely one of the most exciting discoveries in recent years associated with the [Neolithic] in the Near East,” says Nigel Goring-Morris, an archaeologist at the Hebrew University of Jerusalem in Israel.

Archaeologists have little doubt that the larger villages that crop up after about 10,000 years ago across the Near East - an area that includes modern-day Turkey, Syria, Jordan, and neighboring countries - were residential communities made up of individual family houses. At 9500-year-old Çatalhöyük in Turkey, for example, thousands of people lived in a tight, honeycomb-like cluster of mud-brick homes that they entered through holes in the roof, and hundreds of similar sites have been excavated across the region.

But the earliest Neolithic villages, which date to about 11,700 years ago, are much smaller, and include a variety of buildings of different sizes and shapes. At an 11,500 year old site called Jerf el Ahmar in Syria, for example, the entire community apparently used a number of structures, including storehouses and a circular building with a long bench. And at 11,000-year-old Göbekli Tepe in southeastern Turkey, researchers have argued that fantastic monolithic stone structures were part of a community ritual center.

Today, in a paper published online in the Proceedings of the National Academy of Sciences, a team led by Bill Finlayson, director of the Council for British Research in the Levant in London and archaeologist Steven Mithen, an archaeologist at the University of Reading in the United Kingdom, reports the discovery of a large, oval-shaped building at a site in southern Jordan called Wadi Faynan 16 (WF16). Early farmers lived here between 11,600 and 10,200 years ago, cultivating wild plants such as wild barley, pistachio, and fig trees, and hunting or herding wild goats, cattle, and gazelle.

The structure, designated building 075 was made of mud-brick, with a floor of mud plaster, and measures a whopping (by Neolithic standards) 22 by 19 meters. Its central area is surrounded by a long bench about a meter deep and half a meter high. In parts of the building, there is a second bench above the first one that forms an additional tier of seating. And along the southern side of the building, the lower bench is decorated with a wave pattern incised into the mud-brick.

Thus the structure echoes the architecture of the Jerf el Ahmar community building - but building 075 is about three times larger. The building’s central area also contains a series of stone mortars set into plaster platforms on the floor, which may have been used to grind wild plants. The structure includes a number of post-holes, which the team thinks might have held up a roof that covered at least part of the building. The team also found two other, smaller structures nearby, which it interprets as storehouses for cereals and other food resources.

The three structures, the team reports, lie within a cluster of other buildings in a 1-hectare site. But none of these other buildings appear to be domestic houses either: Rather, they seem to have served as storehouses or workshops; one building contained green stone beads and seems to have specialized in their manufacture.

Finlayson, Mithen, and their colleagues conclude that the evidence from WF16, combined with evidence from other sites, suggests that the earliest villages were not made up of houses, but rather communal structures where people came together to process their wild harvests and possibly also to engage in community performances. “These settlements appear to be all about community and not about emerging households,” the team writes, adding that this “ritualized community activity” might have helped to bring together the work force necessary to harvest the wild crops.

The authors don't speculate on where the farmers lived, and there is no way to be sure. Researchers working at similar sites have surmised that they lived in small camps near the central site, but such open air habitations are very difficult to find and often leave little or no archaeological traces.

Archaeologist Trevor Watkins, emeritus at the University of Edinburgh in the United Kingdom, says he “agrees strongly” with the authors’ conclusion that the social changes that took place during the transition from hunting and gathering to farming were at least as important as the later economic changes that led to full-blown domestication of plants and animals. But he thinks that it’s still possible that some of the other buildings at WF16 were used as domestic dwellings. Nevertheless, Watkins says, the communal activities at WF16 and other Neolithic sites probably created “powerful bonds of collective identity” in the earliest farmers that kept them together in stable societies “over many generations.”

[http://www.eurekalert.org/pub\\_releases/2011-05/nsf-mh050311.php](http://www.eurekalert.org/pub_releases/2011-05/nsf-mh050311.php)

### **'Nutcracker Man' had fundamentally different diet**

#### **Scientists: *P. boisei* probably grazed like ancient warthogs and hippos**

An ancient, bipedal hominid needs a new nickname. *Paranthropus boisei*, a 2.3 million to 1.2 million-year-old primate, whom researchers say is an early human cousin, probably didn't crack nuts at all as his common handle suggests.

"Nutcracker Man" most likely ate grass and possibly sedges, said geochemist Thure Cerling, lead author of a study published in the May 2 online edition of the journal Proceedings of the National Academy of Sciences.

Cerling and colleagues determined *P. boisei*'s diet by analyzing carbon isotope ratios in the tooth enamel of 24 teeth from 22 *P. boisei*'s individuals. The hominid's diet has been a source of scientific debate because his powerful jaws, huge molars and big, flat cheek teeth indicated he probably fed on nuts and seeds or roots and tubers found in the savannas throughout Eastern Africa.

But, a few years ago, National Science Foundation sponsored research, led by anthropologists at the University of Arkansas in Fayetteville, highlighted inconsistencies with the common view by analyzing scratches and wear marks on *P. boisei*'s teeth.

That team concluded the wear marks were more consistent with modern-day, fruit-eating animals than with most modern-day primates. Now, Cerling as his team confirm *P. boisei* wasn't a big fan of nuts.

***Nutcracker Man's diet has been a source of scientific debate because his powerful jaws, huge molars and big, flat cheek teeth indicated he probably fed on nuts and seeds or roots and tubers. But new research shows he most likely ate grass and possibly sedges.*** Nicolle Rager Fuller, National Science Foundation



"Wherever we find this creature, it is predominantly eating tropical grasses or perhaps sedges," he said.

The isotope analysis indicated *P. boisei* individuals preferred C4 grasses and sedges over C3 trees, shrubs and bushes. The findings showed their diets averaged about 77 percent C4 plants, ranging from a low of 61 percent to a high of 91 percent.

That's statistically indistinguishable from the grass diets of grazing animals that lived at the same time: the ancestors of zebras, pigs, warthogs and hippos, said Cerling.

"They were competing with them," he said. "They were eating at the same table."

"Frankly, we didn't expect to find the primate equivalent of a cow dangling from a remote twig of our family tree," said study co-author Matt Sponheimer, anthropology professor at the University of Colorado Boulder.

"Fortunately for us, the work of several research groups over the last several years has begun to soften prevailing notions of early hominid diets. If we had presented our new results at a scientific meeting 20 years ago, we would have been laughed out of the room."

*The researchers report the findings in a paper titled, "Diet of Paranthropus boisei in the Early Pleistocene of East Africa." The National Science Foundation's Physical Anthropology Program provided funding for the research.*

*Other authors included Emma Mbua, Frances Kirera, Fredrick Manthi and Meave Leakey from the National Museums of Kenya, Fredrick Grine from Stony Brook University in New York and Kevin Uno from the University of Utah.*

[http://www.eurekalert.org/pub\\_releases/2011-05/uom-hdc050311.php](http://www.eurekalert.org/pub_releases/2011-05/uom-hdc050311.php)

### **HIV drug could prevent cervical cancer**

***A widely used HIV drug could be used to prevent cervical cancer caused by infection with the human papilloma virus (HPV), say scientists.***

University of Manchester researchers, working with colleagues in Canada, have discovered how the antiviral drug lopinavir attacks HPV by switching on a natural viral defence system in infected cells.

The study, published in the journal Antiviral Therapy, builds on the team's previous work in 2006 that first identified lopinavir as a potential therapeutic for HPV-related cervical cancer following laboratory tests on cell cultures.

"Since publishing our earlier work, we have now found that lopinavir selectively kills HPV-infected, non-cancerous cells, while leaving healthy cells relatively unaffected," said Dr Ian Hampson, from Manchester's School of Cancer and Enabling Sciences.

"This is a very significant finding as these cells are not cancer cells but are the closest thing to being like the cells found in a pre-cancerous HPV infection of the cervix. In addition we were also able to show that lopinavir kills these HPV-infected cells by re-activating a well-known antiviral system that is suppressed by HPV."

In many developing countries, HPV-related cervical cancer is still one of the most common women's cancers accounting for approximately 290,000 deaths per year worldwide. The same virus also causes a significant proportion of cancers of the mouth and throat in both men and women and this disease is showing an alarming increase in developed countries, such as the UK, where it is now more than twice as common as cervical cancer.

Although in the developed world vaccination programmes against HPV are well underway, these are not effective in women already infected with HPV. Furthermore, the current vaccines do not protect against all

types of HPV and they are expensive, which will limit their use in countries with limited resources. A cheap and preferably self-administered treatment that could eliminate early-stage HPV infections before these have developed into cancers would therefore have distinct health advantages.

Dr Hampson said: "Our results suggest that for this drug to work against HPV it would be necessary to treat virus-infected cells of the cervix with roughly 10-15 times the concentration that is normally found in HIV-infected patients taking lopinavir as tablets. This implies that, for this treatment to work, it would need to be locally applied as a cream or pessary."

Co-author on the paper, Dr Lynne Hampson, added: "These results are very exciting since they show that the drug not only preferentially kills HPV-infected non-cancerous cells by re-activating known antiviral defence systems, it is also much less toxic to normal non-HPV infected cells."

"Lopinavir is obviously safe for people to take as tablets or liquid but our latest findings provide very strong evidence to support a clinical trial using topical application of this drug to treat HPV infections of the cervix." *The research in Manchester was carried out by the Hampsons' PhD student, Gavin Batman, who was funded by the Humane Research Trust charity, with additional funding supplied by the Caring Cancer Trust and the Cancer Prevention Research Trust.*

[http://www.eurekalert.org/pub\\_releases/2011-05/lsch-ecr050311.php](http://www.eurekalert.org/pub_releases/2011-05/lsch-ecr050311.php)

### **Emergency care researchers say cheap life-saving drug should be made freely available** **Study measuring cost-effectiveness of tranexamic acid published in PLoS ONE**

How much would you pay for an extra year of healthy life? The cost of filling up your car at the petrol pumps? Researchers at the London School of Hygiene & Tropical Medicine (LSHTM) have found that a year of life could be saved for around the price of filling up the tank of an average family car in the UK - which is a fitting comparison bearing in mind that most of the patients who will benefit from this cheap life-saving drug have been hit by cars.

The results published in the PLoS One journal estimate that giving a drug called tranexamic acid – which reduces clot breakdown - could extend the lives of bleeding trauma patients at a cost in the UK of £38 (\$64) for each additional year. In a low-income country such as Tanzania, the estimated cost per life year gained is £29 (\$48), while in middle-income India the figure stands at £39 (\$66). Giving tranexamic acid within three hours of injury saved an estimated 755, 372, 315 and life years per 1,000 bleeding trauma patients in the UK, Tanzania and India respectively.

This new analysis was based on evidence from the CRASH-2 trial involving more than 20,000 adults in 40 countries, which showed that early administration of tranexamic acid reduces the risk of death in bleeding trauma patients. By assessing the cost of administering the drug and the cost of additional days in hospital in the UK, Tanzania and India, the researchers were able to measure the cost-effectiveness of the medical intervention in terms of life years gained.

The doctors who conducted this research are now calling on governments and aid agencies around the world to make the cheap life saving trauma drug free for patients wherever in the world they may be.

"Our result shows that giving this treatment to trauma victims is at least as cost effective as other interventions such as giving HIV drugs for which governments have been rightly persuaded to provide the drug free of charge - exactly the same arguments can be made for making two shots of tranexamic acid free for all seriously injured patients," say Dr Pablo Perel and Ms Haleema Shakur, who are based in LSHTM's Clinical Trials Unit. "About 1.2 million people die because of road traffic crashes, that is an average 3,242 people killed daily on the world's roads. Road traffic crashes are already at epidemic level and rising in Asia, Africa and Latin America and can be viewed as a neglected tropical disease. Prevention is critical, but even with the best prevention efforts there will still be millions of patients requiring emergency care. We will be writing to aid agencies, which pay for road building, and governments, which subsidise petrol, to make tranexamic freely available to ensure that road traffic victims receive this cost-effective intervention."

[http://www.eurekalert.org/pub\\_releases/2011-05/jhmi-tf042911.php](http://www.eurekalert.org/pub_releases/2011-05/jhmi-tf042911.php)

### **Turning 'bad' fat into 'good': A future treatment for obesity?**

#### **Johns Hopkins researchers transform inert white fat into brown fat to burn off calories and weight**

By knocking down the expression of a protein in rat brains known to stimulate eating, Johns Hopkins researchers say they not only reduced the animals' calorie intake and weight, but also transformed their fat into a type that burns off more energy. The finding could lead to better obesity treatments for humans, the scientists report.

"If we could get the human body to turn 'bad fat' into 'good fat' that burns calories instead of storing them, we could add a serious new tool to tackle the obesity epidemic in the United States," says study leader Sheng



Bi, M.D., an associate professor of psychiatry and behavioral sciences at the Johns Hopkins University School of Medicine. More than two-thirds of adults in the United States are overweight, and more than one-third are obese, according to government estimates.

The Johns Hopkins study, published in the journal *Cell Metabolism*, looks at two types of fat made by the body: white and brown adipose tissue. White fat is the typical fat that ends up around your middle and other places, and is the storehouse for the extra calories we eat. White fat cells have a single large droplet of lipid, one of fat's building blocks, such as cholesterol and triglycerides.

Cells in brown fat, considered a "good fat" for its energy-burning qualities, contain many little droplets of lipid, each with its own power source, which enables heat generation. Babies have ample stores of brown fat at birth as a defense against the cold, but it mostly disappears, as adults have very little of this calorie-burning tissue.

Bi and his colleagues designed an experiment to see if suppressing the appetite-stimulating neuropeptide Y (NPY) protein in the dorsomedial hypothalamus of the brain would decrease body fat in rats. Located just above the brain stem, the hypothalamus helps regulate thirst, hunger, body temperature, water balance and blood pressure.

For five weeks, two groups of rats were fed a regular diet, with one group also treated with a virus to inhibit NPY expression and the other left as a control group. At the end of five weeks, the treated group weighed less than the control group, demonstrating that suppression of NPY reduced eating.

Then, researchers split each of the groups into two, creating four sets of rats. One of the treated groups of rats and one of the control groups were fed a regular diet while the other treated and control groups got a high-fat diet. Of the rats on the regular diet, the control group weighed more at the end of 11 weeks than those rats in which hypothalamic NPY expression was knocked down. In the high-fat group, the control group rats became obese; those rats in which NPY expression was silenced gained less weight.

Bi says the results "made sense," given that NPY has been shown to stimulate eating. The less NPY, the less the rats would eat, his team hypothesized. What was a surprise, however, was what they found after they checked the fat content of rats after death. In the groin area of the NPY rats, researchers discovered not the expected white fat found in adult rats, but the telltale signs of brown fat in its place. They confirmed this change by looking at levels of mitochondrial uncoupling protein-1, or UCP-1, through which brown fat burns to produce heat. They used this protein as a marker to determine that the fat that should have been white was instead brown.

Bi says he believes that the transformation from white to brown fat resulting from NPY suppression may be due to activation of brown fat stem cells contained in white fat tissue. While brown fat seems to vanish in humans as they emerge from infancy, the brown fat stem cells may never disappear and may just become inactive as people age.

Bi says it may be possible to transplant or inject brown fat stem cells under the skin to burn white fat and stimulate weight loss. "Only future research will tell us if that is possible," he says.

This study also shows that low levels of hypothalamic NPY increase spontaneous physical activity, improve blood sugar levels and enhance insulin sensitivity in rats, but it remains undetermined whether this brown fat transformation also contributes to these effects.

*The study was funded by the U.S. National Institute of Diabetes and Digestive and Kidney Diseases. Along with Bi, other Johns Hopkins researchers involved in the study include Pei-Ting Chao, Timothy H. Moran, Ph.D., and Susan Aja, Ph.D. Liang Yang, Ph.D., formerly of Johns Hopkins and now at the Massachusetts Institute of Technology, also contributed.*

[http://www.eurekalert.org/pub\\_releases/2011-05/plos-soj050211.php](http://www.eurekalert.org/pub_releases/2011-05/plos-soj050211.php)

### **Sense of justice built into the brain**

***A new study from the Karolinska Institute and Stockholm School of Economics shows that the brain has built-in mechanisms that trigger an automatic reaction to someone who refuses to share.***

In the study publishing next week in the online open access journal *PLoS Biology*, the subjects' sense of justice was challenged in a two-player monetary fairness game, and their brain activity was simultaneously measured using functional magnetic resonance imaging (fMRI). When bidders made unfair suggestions as to how to share the money, they were often punished by their partners even if it cost them. This reaction to unfairness could be reduced by targeting one specific brain region, the amygdala.

The study is based on the universal human behaviour to react with instant aggression when another person behaves unfairly and in a manner that is not in the best interest of the group. The researchers had 35 subjects play a money-based fairness game, in which one player suggests to another how a fixed sum of money is to be



shared between them; the other player can then either accept the suggestion and take the money, or reject it, in which case neither player receives anything.

"If the sum to be shared is 100 SEK kronor and the suggestion is 50 each, everyone accepts it as it is seen as fair," says Dr Katarina Gospic. "But if the suggestion is that you get 20 and I take 80, it's seen as unfair. In roughly half the cases it ends up with the player receiving the smaller share rejecting the suggestion, even though it costs them 20 SEK."

Previous research has suggested that the area controlling the ability to analyse and make financial decisions is located in the prefrontal cortex and insula. Using fMRI, however, the researchers saw that the brain area controlling for fast financial decisions was actually located in the amygdala, an evolutionary old and therefore more primitive part of the brain that controls feelings of anger and fear.

To explore these results further, the subjects were either given the anti-anxiety tranquiliser Oxazepam or a placebo while playing the game. The researchers found that those who had received the drug showed lower amygdala activity and a stronger tendency to accept an unfair distribution of the money –despite the fact that when asked, they still considered the suggestion unfair. In the control group, the tendency to react aggressively and punish the player who had suggested the unfair distribution of money was directly linked to an increase in activity in the amygdala. A gender difference was also observed, with men responding more aggressively to unfair suggestions than women by showing a correspondingly higher rate of amygdalic activity. This gender difference was not found in the group that received Oxazepam.

"This is an incredibly interesting result that shows that it isn't just processes in the prefrontal cortex and insula that determine this kind of decision about financial equitability, as was previously thought," says Professor Martin Ingvar. "Our findings, however, can also have ethical implications since the use of certain drugs can clearly affect our everyday decision-making processes."

*Funding: This work was funded by the Swedish Research Council, The Barbro and Bernard Osher Foundation, The Swedish Agency for Innovation Systems*

*(VINNOVA), The Swedish Foundation for Strategic Research, The Jan Wallander and Tom Hedelius Foundation, The Swedish Council for Working Life and Social Research, The Knut and Alice Wallenberg Foundation and the Karolinska Institute. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.*

*Competing interests statement: The authors declare that no competing interests exist.*

<http://www.nytimes.com/2011/05/03/health/03really.html>

## **The Claim: Having Tonsil Surgery Causes Weight Gain**

**By ANAHAD O'CONNOR**

### ***THE FACTS Despite concerns about its effectiveness, the childhood tonsillectomy is common.***

Each year more than half a million children in the United States have their tonsils removed. But scientists have noticed what appears to be an unexpected side effect: Children who have the surgery are at greater risk of becoming overweight.

At first glance it makes little sense. Tonsils are typically removed after they become enlarged from repeated infections. Why would that have any effect on weight? One theory is that enlarged tonsils cause difficulty swallowing, prompting a child to eat less. Once the tonsils are removed, appetite returns.

No one knows how to explain it, but studies show a link between the surgery and weight gain. In the most recent and exhaustive report, published this year in the journal *Otolaryngology - Head and Neck Surgery*, researchers analyzed data from 11 studies, following 1,549 children for up to seven years.

Obviously, the children put on weight as they aged, but the analysis showed that the gains were much greater than expected after the surgery and greater than the weight gain in children who had not had their tonsils removed.

But so far only an association has been confirmed, not a direct causal effect. For now, experts say parents should simply keep an eye on a child's weight after the surgery.

**THE BOTTOM LINE** Studies show tonsillectomies are associated with weight gain, but it's not clear there's a causal relationship.

[http://www.eurekalert.org/pub\\_releases/2011-05/cu-peo050411.php](http://www.eurekalert.org/pub_releases/2011-05/cu-peo050411.php)

## **Positive effects of depression**

### ***Evidence that depression has a positive side-effect***

Sadness, apathy, preoccupation. These traits come to mind when people think about depression, the world's most frequently diagnosed mental disorder. Yet, forthcoming research in the *Journal of Abnormal Psychology* provides evidence that depression has a positive side-effect.

According to a new study by Bettina von Helversen (University of Basel, Switzerland), Andreas Wilke (Clarkson University), Tim Johnson (Stanford University), Gabriele Schmid (Technische Universität München,

Germany), and Burghard Klapp (Charité Hospital Berlin, Germany), depressed individuals perform better than their non-depressed peers in sequential decision tasks.

In their study, participants - who were healthy, clinically depressed, or recovering from depression - played a computer game in which they could earn money by hiring an applicant in a simulated job search.

The game assigned each applicant a monetary value and presented applicants one-at-a-time in random order. Experiment participants faced the challenge of determining when to halt search and select the current applicant.

In addition to resembling everyday decision problems, such as house shopping and dating, the task has a known optimal strategy. As reported, depressed patients approximated this optimal strategy more closely than non-depressed participants did.

While healthy participants searched through relatively few candidates before selecting an applicant, depressed participants searched more thoroughly and made choices that resulted in higher payoffs.

This discovery provides the first evidence that clinical depression may carry some benefits. For decades, psychologists have debated whether depression has positive side-effects.

While researchers have recognized that most symptoms of depression impede cognitive functioning, scholars such as Paul Andrews of the Virginia Institute for Psychiatric and Behavioral Genetics and Andy Thomson of the University of Virginia have proposed that depression may promote analytical reasoning and persistence - that is, qualities useful in complex tasks.

Past research provides some evidence in support of this possibility, but it focuses on individuals with low levels of non-clinical depression.

The forthcoming article shows that even severe depression might yield some beneficial side effects. Fully understanding the consequences of depression may help uncover its evolutionary roots and thus opening avenues for treatment.

[http://www.eurekalert.org/pub\\_releases/2011-05/acs-net050411.php](http://www.eurekalert.org/pub_releases/2011-05/acs-net050411.php)

### **New evidence that caffeine is a healthful antioxidant in coffee**

***Scientists are reporting an in-depth analysis of how the caffeine in coffee, tea, and other foods seems to protect against conditions such as Alzheimer's disease and heart disease on the most fundamental levels.***

The report, which describes the chemistry behind caffeine's antioxidant effects, appears in ACS' The Journal of Physical Chemistry B.

Annia Galano and Jorge Rafael León-Carmona describe evidence suggesting that coffee is one of the richest sources of healthful antioxidants in the average person's diet. Some of the newest research points to caffeine (also present in tea, cocoa, and other foods) as the source of powerful antioxidant effects that may help protect people from Alzheimer's and other diseases. However, scientists know little about exactly how caffeine works in scavenging the so-called free radicals that have damaging effects in the body. And those few studies sometimes have reached contradictory conclusions.

In an effort to bolster scientific knowledge about caffeine, they present detailed theoretical calculations on caffeine's interactions with free radicals. Their theoretical conclusions show "excellent" consistency with the results that other scientists have report from animal and other experiments, bolstering the likelihood that caffeine is, indeed, a source of healthful antioxidant activity in coffee.

[http://www.eurekalert.org/pub\\_releases/2011-05/acs-mpa050411.php](http://www.eurekalert.org/pub_releases/2011-05/acs-mpa050411.php)

### **Natural protection against radiation**

***In the midst of ongoing concerns about radiation exposure from the Fukushima nuclear power plant in Japan, scientists are reporting that a substance similar to resveratrol - an antioxidant found in red wine, grapes and nuts - could protect against radiation sickness. The report appears in ACS Medicinal Chemistry Letters.***

Michael Epperly, Kazunori Koide and colleagues explain that radiation exposure, either from accidents (like recent events in Japan) or from radiation therapy for cancer, can make people sick. High doses can even cause death. The U.S. Food and Drug Administration is currently evaluating a drug for its ability to protect against radiation sickness, but it is difficult to make in large amounts, and the drug has side-effects that prevent its use for cancer patients. To overcome these disadvantages, the researchers studied whether resveratrol - a natural and healthful antioxidant found in many foods - could protect against radiation injuries.

They found that resveratrol protected cells in flasks but did not protect mice (stand-ins for humans in the laboratory) from radiation damage. However, the similar natural product called acetyl resveratrol did protect the irradiated mice. It also can be produced easily in large quantities and given orally. The authors caution that it has not yet been determined whether acetyl resveratrol is effective when orally administered.

*The authors acknowledge funding from the National Institutes of Health.*

[http://www.eurekalert.org/pub\\_releases/2011-05/qu-rnp050411.php](http://www.eurekalert.org/pub_releases/2011-05/qu-rnp050411.php)

## **Revolutionary new paper computer shows flexible future for smartphones and tablets Queen's University's Roel Vertegaal says thinfilm phone will make current smartphone obsolete in 5 to 10 years**

KINGSTON, ONTARIO – The world's first interactive paper computer is set to revolutionize the world of interactive computing. "This is the future. Everything is going to look and feel like this within five years," says creator Roel Vertegaal, the director of Queen's University Human Media Lab. "This computer looks, feels and operates like a small sheet of interactive paper. You interact with it by bending it into a cell phone, flipping the corner to turn pages, or writing on it with a pen."

The smartphone prototype, called PaperPhone is best described as a flexible iPhone – it does everything a smartphone does, like store books, play music or make phone calls. But its display consists of a 9.5 cm diagonal thin film flexible E Ink display. The flexible form of the display makes it much more portable than any current mobile computer: it will shape with your pocket.

Dr. Vertegaal will unveil his paper computer on May 10 at 2 pm at the Association of Computing Machinery's CHI 2011 (Computer Human Interaction) conference in Vancouver - the premier international conference of Human-Computer Interaction. Being able to store and interact with documents on larger versions of these light, flexible computers means offices will no longer require paper or printers.

"The paperless office is here. Everything can be stored digitally and you can place these computers on top of each other just like a stack of paper, or throw them around the desk" says Dr. Vertegaal.

The invention heralds a new generation of computers that are super lightweight, thin-film and flexible. They use no power when nobody is interacting with them. When users are reading, they don't feel like they're holding a sheet of glass or metal.

An article on a study of interactive use of bending with flexible thinfilm computers is to be published at the conference in Vancouver, where the group is also demonstrating a thinfilm wristband computer called Snaplet. *The development team included researchers Byron Lahey and Win Burlison of the Motivational Environments Research Group at Arizona State University (ASU), Audrey Girouard and Aneesh Tarun from the Human Media Lab at Queen's University, Jann Kaminski and Nick Colaneri, director of ASU's Flexible Display Center, and Seth Bishop and Michael McCreary, the VP R&D of E Ink Corporation.*

*For more information, articles, videos, and high resolution photos, visit <http://www.humanmedialab.org/paperphone/> <http://www.youtube.com/watch?v=RI-qygUEE2c>*

<http://www.nytimes.com/2011/05/04/science/04language.html>

## **Finding on Dialects Casts New Light on the Origins of the Japanese People**

**By NICHOLAS WADE**

***Researchers studying the various dialects of Japanese have concluded that all are descended from a founding language taken to the Japanese islands about 2,200 years ago.***

The finding sheds new light on the origin of the Japanese people, suggesting that their language is descended from that of the rice-growing farmers who arrived in Japan from the Korean Peninsula, and not from the hunter-gatherers who first inhabited the islands some 30,000 years ago.

The result provides support for a wider picture, controversial among linguists, that the distribution of many language families today reflects the spread of agriculture in the distant past when farming populations, carrying their languages with them, grew in numbers and expanded at the expense of hunter-gatherers. Under this theory, the Indo-European family of languages, which includes English, was spread by the first farmers who expanded into Europe from the Middle East some 8,000 years ago, largely replacing the existing population of hunter-gatherers.

In the case of Japan, archaeologists have found evidence for two waves of migrants, a hunter-gatherer people who created the Jomon culture and wet rice farmers who left remains known as the Yayoi culture.

The Jomon people arrived in Japan before the end of the last ice age, via land bridges that joined Japan to Asia's mainland. They fended off invaders until about 2,400 years ago when the wet rice agriculture developed in southern China was adapted to Korea's colder climate.

Several languages seem to have been spoken on the Korean Peninsula at this time, and that of the Yayoi people is unknown. The work of two researchers at the University of Tokyo, Sean Lee and Toshikazu Hasegawa, now suggests that the origin of Japonic - the language family that includes Japanese and Ryukyuan, spoken in the Ryukyu island chain south of Japan - coincides with the arrival of the Yayoi.

The finding, if confirmed, indicates that the Yayoi people took Japonic to Japan, but leaves unresolved the question of where in Asia the Yayoi culture or Japonic language originated before arriving in the Korean Peninsula.

Mr. Lee is a graduate student studying language and the mind, not a historical linguist. He has used a statistical tree-drawing method that other biologists have applied successfully to language origins, despite some linguists' skepticism. The method, called Bayesian phylogeny, depends on having a computer draw a large number of possible trees and sampling them to find the most probable. Each language is represented by a 200-word vocabulary composed of words known to change very slowly.

If any fork in the tree can be linked to a historical event, all the other branch points can be dated. In this case, Mr. Lee knew dates for Old Japanese, Middle Japanese, and the split between the Kyoto and Tokyo dialects that began in 1603 A.D. when the capital was moved from Kyoto to Edo, the early name for Tokyo.

Mr. Lee reasoned that Japanese would have originated with the Jomon if the root of the tree turned out to be very ancient, but with the Yayoi culture if recent. The computer's date of 2,182 years ago for the origin of the tree fits reasonably well with the archaeological dates for the Yayoi culture, he reported Tuesday in The Proceedings of the Royal Society.

John B. Whitman, an expert on Japanese linguistics who works at the National Institute for Japanese Language and Linguistics, in Tokyo, and at Cornell University, called the new finding "solid and reasonable," although the date of the Yayoi culture, he said, has now been pushed back to around 3,000 years after a recalibration of radiocarbon dates. That would open an 800-year gap with Mr. Lee's date but not necessarily change his conclusion.

The question of Japanese origins has had political consequences, with the link to the Yayoi culture having been invoked to justify the annexation of Korea and Manchuria before World War II. After the war, the link with the Jomon culture was emphasized.

Quentin Atkinson, an expert on language phylogeny at the University of Auckland, in New Zealand, said that Mr. Lee's time scale was plausible but that if Japonic had spread through an agriculturally driven population expansion, his language tree should be much bushier at its root. Mr. Lee said that such earlier versions of Japanese might have disappeared when the island was politically unified about 1,000 years ago.

Genetic studies have suggested interbreeding between the Yayoi and Jomon people, with the Jomon contribution to modern Japanese being as much as 40 percent. Apparently the Yayoi language prevailed, along with the agricultural technology.

<http://www.newscientist.com/article/mg21028114.000-asteroids-make-lifes-raw-materials.html>

### **Asteroids make life's raw materials**

**04 May 2011 by Michael Marshall**

***WERE asteroids the factories that created life's building blocks? For the first time, rocks from an asteroid have been shown to power the synthesis of life's essential chemicals.***

The asteroid in question fell to Earth on 28 September 1969, landing on the outskirts of the village of Murchison in Victoria, Australia. Tests showed it was laced with amino acids and some of the chemicals found in our genetic material. The discovery suggested that space was not the chemically sterile place it was once thought to be, and that organic chemistry was widespread. It hinted that the molecules life needed to get started could have been produced in space, before dropping to Earth.

But how did those molecules form? Raffaele Saladino of the University of Tuscia in Viterbo, Italy, and colleagues wondered if they could have been made deep inside the asteroids from which some meteorites break off. The team knew that a simple chemical present in space, called formamide, can be transformed into many biomolecules, so they used that as their starting point.

They obtained 1 gram of the Murchison meteorite, ground it to powder and removed all the organic molecules, leaving just the mineral. They mixed this with formamide and heated it to 140°C for 48 hours. The reaction produced nucleic acids - essential building blocks of DNA and RNA - as well as the amino acid glycine, carboxylic acids and a precursor to sugar (Origins of Life and Evolution of Biospheres, DOI: 10.1007/s11084-011-9239-0). This suggests the meteorite's parent asteroid was a chemical factory, Saladino says.

Crucially, the compounds produced are both metabolic and genetic, covering two key parts of primitive life, says Monica Grady of the Open University in Milton Keynes, UK, who was not involved in the study. "If you can catalyse both reactions in the same place, from the same starting material, that's obviously advantageous."

The ability to produce a range of essential molecules sets the meteorite mineral apart from Earth minerals, says Mark Sephton of Imperial College London. On Earth, the formation of each biomolecule tends to be catalysed by a different mineral, meaning they end up separated and less likely to form life.

Saladino's team also found that the meteorite mineral could stabilise RNA, thought by some to have been the first genetic material. RNA reacts with water and breaks down easily. Most minerals accelerate this process, but the team found that the Murchison mineral did not. "If RNA could be synthesised [inside the asteroid], this environment would stabilise it," Saladino says.



## **Beleaguered mission measures swirling space-time at last**

21:51 04 May 2011 by David Shiga

### ***The beleaguered Gravity Probe B mission has finally measured a subtle effect of general relativity called frame dragging.***

The result comes nearly six years after it finished making measurements and years after other experiments measured the effect to greater precision.

NASA launched the \$750 million mission in 2004 and it finished collecting data in September 2005. Its goal was to test Einstein's general theory of relativity, the currently accepted theory of gravity, by measuring subtle distortions in the fabric of space-time due to the Earth's gravitational field.

To achieve this, the Gravity Probe B spacecraft contained four superconducting niobium spheres about the size of ping pong balls. They were set spinning, and it was expected that their spin axis would change slightly over time as a result of these distortions.

But the data was much noisier than expected, making it initially difficult to detect these effects.

In April 2007, after more than a year of data analysis, the team reported detecting one such phenomenon, called the geodetic effect, which is due to the dent the Earth's gravity makes in space-time.

The second effect the mission was meant to measure proved much more elusive. As the Earth rotates, it drags the surrounding space around with it – a phenomenon known as frame dragging or the Lense-Thirring effect.

#### **Swirling honey**

"Imagine the Earth as if it were immersed in honey," says Francis Everitt of Stanford University in California, the mission's chief scientist. "As the planet rotates, the honey around it would swirl, and it's the same with space and time."

A 2008 NASA review was pessimistic about the prospects for detecting frame dragging in Gravity Probe B's noisy data. But data analysis continued with private funding, some arranged by the Saudi royal family.

Now, after further analysis of the data, Gravity Probe B scientists say they have detected frame-dragging with a precision of about 20 per cent.

#### **Earlier results**

"We have managed to test two of the most profound effects of general relativity and to do so in a new way," Everitt said in a NASA press conference on Wednesday.

This is the first time frame dragging has been measured in this way. But it was measured previously in 2004 to about 10 per cent precision by its effects on the orbits of the LAGEOS I and II satellites. Tracking the motion of the moon with lasers has also measured frame dragging to a precision of 0.1 per cent.

Given these earlier results, questions are likely to remain about the value of Gravity Probe B's contribution, but Everitt defended the mission's value. "The great beauty of it is that we have complementary tests of general relativity," he said. "We completed this landmark experiment testing Einstein's universe ... and Einstein survives." *Journal reference: Physical Review Letters (forthcoming)*

<http://news.nationalgeographic.com/news/2011/05/110503-sex-pheromones-people-noses-science/>

## **Women Can Sniff Out Men Without Knowing - And Vice Versa**

### ***Sexual chemicals affect how we identify an androgynous figure.***

**Rachel Kaufman for National Geographic News**

Women and men can sniff out the opposite sex via odorless pheromones, a new study suggests.

The discovery adds another piece to the growing body of evidence that humans, much like the rest of the animal kingdom, know more from their noses than previously thought.

"We know that for animals, chemosignals are actually the most used signals to communicate, whereas with humans, we think chemosensation is not really used," said study leader Wen Zhou, a psychologist at the Chinese Academy of Sciences in Beijing.

"But based on our experiences, they are still influenced by these cues, even if they don't explicitly know it."

In a recent experiment, subjects who smelled possible pheromones from the opposite sex were more likely to interpret ambiguous human figures as that sex - even when the participants didn't know they were smelling anything.

Pheromones - chemicals that can communicate sexual information - are widespread in the animal world, and some research suggests humans use them unconsciously as well. Zhou and colleagues used videos of points of light moving in a way that fools the eye into seeing human motion.

The videos were made by filming real people in motion-capture suits with LEDs at each joint - similar to the suits used to create Hollywood special effects. Then the scientists mathematically manipulated the dots until the "figures" had neither a typically male nor typically female gait.

## Sex Pheromones Influence Gender Choice

Twenty men and 20 women watched the video animations of these ambiguous figures, as well as ones that were more obviously male or female. While watching the videos, the subjects sniffed clove oil infused with the male steroid androstadienone, the female steroid estratetraenol, or a plain oil used as a base for many cosmetics.

Men who smelled the female pheromone were more likely to identify the androgynous walker as a woman, and even were more likely to identify more clearly male figures as female than those who just smelled clove oil.

The same results applied when women sniffed the male compound: They more frequently saw the ambiguous figures as male than the women who smelled the plain oil.

Estratetraenol had no effect on women, and androstadienone didn't affect men.

This perception difference seems to be completely unrelated to what their noses told them: A blindfolded test subject couldn't tell the difference between steroid-infused clove oil and plain oil.

"It's completely below their awareness," Zhou said. "They didn't know what they were smelling, but their behavior showed these different patterns."

Zhou presented the research in April at the annual meeting of the Association for Chemoreception Sciences.

<http://www.bbc.co.uk/news/health-13278255>

## Anatomical clues to human evolution from fish

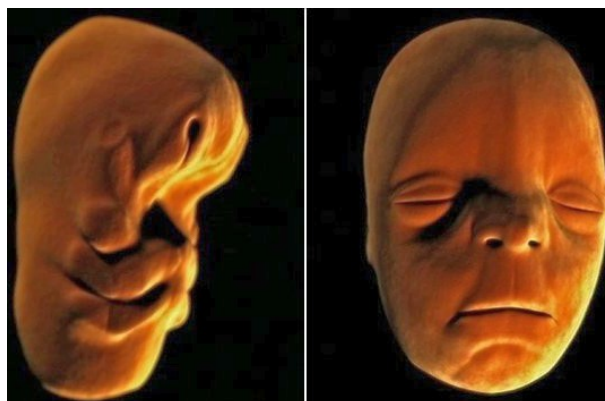
By Dr Michael Mosley BBC

***It may seem strange that humans have evolved from fish, but the evidence can be found not just in fossils but also within our own bodies.***

Your face is your most expressive feature; it tells the world what you are feeling, who you are and where you come from. Although no two faces are exactly the same, they share a number of common characteristics; a couple of eyes, a nose, a mouth and a philtrum.

The philtrum is the groove on your top lip that lies just beneath your nose. You see it every day in the mirror so you probably never think about it. It has no obvious function. Instead it is an accident of our origins, a clue to our fishy past and how our faces first formed.

Your face is formed in the womb in the first couple of months of life, from when you were the size of a grain of rice to when you were the size of a kidney bean.



**Video** *How the human face develops in an embryo at two to three months old*

The video (above) of a growing human face shows how this process happens. It has been created from high quality scans of human embryos at early stages of development, provided by universities and hospitals. This unique time-lapse video shows the face developing from a one-month-old embryo to an age of 10 weeks.

If you watch it closely, you will see that the human face is actually formed of three main sections which rotate and come together in an unborn foetus. The way this happens only really makes sense when you realise that, strange though it may sound, we are actually descended from fish. The early human embryo looks very similar to the embryo of any other mammal, bird or amphibian - all of which have evolved from fish.

Your eyes start out on the sides of your head, but then move to the middle. The top lip along with the jaw and palate started life as gill-like structures on your neck. Your nostrils and the middle part of your lip come down from the top of your head. There is no trace of a scar; the plates of tissue and muscle fuse seamlessly. But there is, however, a little remnant of all this activity in the middle of your top lip - your philtrum.

This whole process, the bits coming together of the various elements to produce a recognisable human face, requires great precision. To fuse correctly the three sections must grow and meet at precisely the right time in the womb. If the timing is out, by as little as an hour, the baby may grow up with a cleft lip or cleft lip and palate, which can be extremely disfiguring. Around the world one in 700 babies are born with clefts.

### Fishy features

There are other odd things about human anatomy that can only really be explained by our fishy ancestry.

For example, if you were to cut up a shark you would discover that its gonads are lodged up in its chest, behind its liver. Like the shark our gonads also start life high up, near the liver. But unlike the shark they need to descend. In a woman they descend and become the ovaries, located conveniently near the uterus and the fallopian tubes. In men, they become the testes; but to get down and fill the scrotum they have to make a far longer and more tortuous journey south.

One consequence of this journey is the creation of a weakening in the abdominal wall. And as a result, men are far more prone than women to what are known as inguinal hernias. An inguinal hernia can appear as a lump in the groin area and may be painful; the lump normally disappears if you lie down. The lump is actually the contents of your gut protruding through that weakness in the muscle wall left behind by the descent of the testes. Inguinal hernias often require surgery, and if you are unfortunate enough to get one, blame it on fish.

## **Hiccups**

An American called Charles Osborne has the dubious honour of holding a record for the longest recorded bout of hiccups - 68 years worth, from 1922 to 1990. It seems that again it is our fishy ancestors who are partly to blame. A hiccup is caused by a spasm of the diaphragm, a big muscle in the chest, followed by an involuntary gulp. Both these actions have watery roots.

In fish the nerves that activate breathing take a short journey from an ancient part of the brain, the brain stem, to the throat and gills. In us, it is more complicated. To breathe properly, our brain stem has to send messages not just to the throat, but down to the chest and diaphragm. This complex arrangement means that the nerves are prone to spasm, which can initiate hiccups. Once a hiccup has started, it is kept going by a simple motor reflex that we seem to have inherited from an amphibian ancestor.

For the ancient tadpole, the nerve controlling this reflex served a useful purpose, allowing the entrance to the lung to remain open when breathing air but closing it off when gulping water - which would then be directed only to the gills. For humans and other mammals who hiccup, it has no value but does provide another bit of evidence of our common ancestry.

*Dr Michael Mosley presents [Inside the Human Body](http://www.newsscientist.com/article/mg21028114.300-why-do-we-remember-some-dreams-but-not-others.html), Thursdays, 9pm, from 5 May on BBC 1.*

<http://www.newsscientist.com/article/mg21028114.300-why-do-we-remember-some-dreams-but-not-others.html>

## **Why do we remember some dreams but not others?**

05 May 2011 by Andy Coghlan

***WHY do we remember some dreams but not others? It's because the brain mechanism that controls whether we remember or forget things when we are awake is involved.***

So say Luigi De Gennaro at the University of Rome, Italy, and his team, who used an electroencephalogram (EEG) to monitor the brain activity of students as they slept. The team monitored 65 students: 30 who habitually wake up while in rapid eye movement (REM) sleep, and 35 who usually wake in stage 2 non-REM sleep. About two-thirds of both groups recalled dreams during the study.

Those who woke during REM sleep and successfully recalled their dreams were more likely to demonstrate a pattern of EEG oscillations called theta waves in frontal and prefrontal cortex areas - the parts of the brain where our most advanced thinking occurs. "The kind of EEG oscillations and the cortical region involved are the same as those important for recalling memories in awake subjects," says De Gennaro.

In non-REM wakers, those who remembered their dreams had patterns of alpha wave activity in the right temporal lobe - involved in recognising emotional events - that resembled activity known to be key for recall while awake (Journal of Neuroscience, DOI: 10.1523/jneurosci.0412-11-2011). The upshot is that even when we are asleep, the same parts of our brains are on the alert for things to remember. These are often events that are emotionally charged and that the brain deems important, whether we are awake or not.

De Gennero says the results are the first evidence that the physiology by which memories are stored is the same whether we are awake or asleep. "These findings are similar to known EEG patterns in wakeful memory recollection, suggesting a continuum of cerebral processes throughout the sleep-wake cycle," says Michael Czisch, who studies sleep at the Max Planck Institute of Psychiatry in Munich, Germany.

[http://www.iah.ac.uk/press\\_release/2011/2011\\_03.htm](http://www.iah.ac.uk/press_release/2011/2011_03.htm)

**Better understanding of foot-and-mouth disease offers potential for alternatives to culling.**

***Dr Bryan Charleston IAH and collaborators in the University of Edinburgh have uncovered a window of opportunity when it is possible to identify cattle infected with foot-and-mouth disease virus (FMDV) before they become infectious and/or show signs of having the disease.***

They have published their findings in the journal Science\*. IAH experts along with colleagues at Defra (Department for Environment, Food, and Rural Affairs) are now assessing if this window of opportunity can be exploited to reduce the number of animals that are culled during an outbreak.

The research, funded by the Biotechnology and Biological Sciences Research Council (BBSRC), has revealed for the first time that the period in which cattle are infectious before they show clinical signs of disease is much shorter than previously thought. One consequence is that diagnosis of FMDV infection is possible during the approximately 24 hours before an infected animal becomes infectious.

Importantly, if this short window of opportunity is to be exploited there is a need for further development of effective and efficient in-field diagnostic tools that can detect the virus as early as researchers have been able to do in the laboratory.

Dr Bryan Charleston who led the team at the Institute for Animal Health said "Our discovery is good news and we hope that it will enable future refinement of the methods we use to control FMDV in the UK and beyond. That said, there are a huge number of factors involved in decisions about controlling this serious and fast-spreading virus. We have proof that it is possible to detect the virus in animals before they display signs of disease and before passing the infection on to other susceptible livestock, but there are a lot of other variables to consider before it is possible to come up with a new control strategy.

"Not least, this result emphasises the need for practical tools for pre-clinical diagnosis and at present we don't have an affordable, reliable, test to use on farms. We can identify infected cattle before they show signs of disease using tests in the laboratory; the next challenge is to do it in the field during an outbreak. This type of testing was successfully applied during the 2007 outbreak in Surrey on the basis of studies at IAH, including the early results of this research. We now need to develop the technology further with Defra in order to realise the potential benefits and possibly reduce the number of animals culled during an outbreak."

During the 2007 outbreak of FMDV preclinical testing of animals not yet showing signs of the disease was done every second day. This was successful in identifying infected cattle that were not showing clinical signs. The very early results of this project – which was funded by BBSRC in response to the 2001 outbreak – and other research programmes informed the decision to take that approach in 2007. This proved an excellent example of how the close interaction between research and diagnostic laboratories at the IAH can accelerate the application of high quality science.

Cows Professor Mark Woolhouse who led the University of Edinburgh team said "This new information pins down the critical times for the detection and control of foot-and-mouth disease much more accurately. We now know that there is a window where if affected cattle are detected and removed promptly, there may be no need for pre-emptive culling in the immediate area of an infected farm.

"This does make it very important that the disease is picked up quickly and farmers and others who care for livestock will continue to play a critical role. The only way we know that the disease is active is when an animal shows up with signs of the disease, which is too late. We now have an opportunity to develop new test systems which can detect infected animals earlier and reduce the spread of the disease."

The research was funded by BBSRC as part of its Combating Viral Diseases of Livestock Initiative. The initiative was launched by BBSRC to further our understanding of damaging livestock diseases that cause significant economic, welfare and food security challenges. The IAH's FMD research is within its Livestock Viral Diseases Programme, headed by Dr Charleston.

*\*This research is published in a paper entitled 'Relationship Between Clinical Symptoms and Transmission of an Infectious Disease and the Implications for Control' and will be available online to subscribers of Science from 1900hrs (BST) Thursday 05 May 2011 from: <http://www.sciencemag.org/lookup/doi/10.1126/science.1199884>*

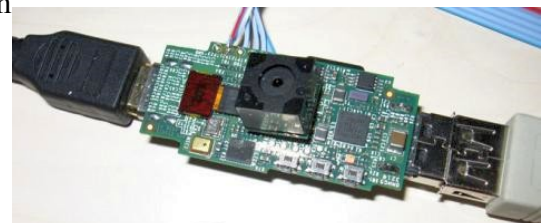
<http://www.physorg.com/news/2011-05-pc.html>

### **The \$25 educational PC**

**(PhysOrg.com) - Have you ever played Elite? What about games in the Rollercoaster Tycoon series, Thrillville, Lost Winds, or Kinectimals?**

If so, then you have enjoyed the work of David Braben. Mr. Braben is a fairly well known video game designer, he also runs the UK development studio Frontier Developments, but soon he may be known as much for his hardware as he is for his software.

Mr. Braben has developed a very small USB stick PC that has an HDMI port in one end and a USB port on the other. The machine, which runs on a version of Linux, is designed to help get programming and the general knowledge of how computers work back into the educational curriculum.



Mr. Braben's central argument stems around the notion that computer science education has, in the 2000's, veered away from development and towards teaching basic skills such as creating custom documents in a word processor, or making presentations, instead of higher-level skills, such as leaning about system architecture or development.

These small PC's, which would cost about \$25 a unit, would be able to be furnished to each student, and have courses structured around their use.

You may be wondering what kind of hardware students will be able to get for that cost? As it turns out, the offerings are pretty solid. The system features a 700MHz ARM11 processor, which is paired with 128MB of



RAM. The system runs OpenGL ES 2.0, which will allow it to have a decent level of graphics performance. The system is already confirmed to have 1080p output. An SD card slot provides storage for this unit.

This computer will be distributed by the Raspberry Pi Foundation, which promotes computer science education in schools. There is no final word on when the devices will be available, but its developer hopes to be shipping them out in the next 12 months. *More information:* - <http://www.raspberrypi.org/> - BBC [http://www.eurekalert.org/pub\\_releases/2011-05/djc-lfb050611.php](http://www.eurekalert.org/pub_releases/2011-05/djc-lfb050611.php)

### **Link found between spending on libraries and student learning Results consistent from studies in 22 states and 1 Canadian province**

It is an article of faith among many critics of public schools that there is no correlation between spending and learning outcomes. But it's not so - at least where library spending is concerned.

When support for school libraries rises, reading scores go up and learning by other measures increases also. That's what researchers at Mansfield University in Mansfield, PA found when they examined and summarized the results of 23 studies done around the United States and Canada.

"Quality school library programs impact student achievement," says Debra E. Kachel, a professor in the School Library and Information Technologies Department at Mansfield University. "The research shows clearly that schools that support their library programs give their students a better chance to succeed."

Kachel and a class of graduate students examined school library impact studies, most done in the last decade, by 22 states and one Canadian province (Ontario). Most examined student standardized test scores. A few used qualitative approaches. All found positive links between library support and learning. The paper, "School Library Research Summarized" was done this spring for the Pennsylvania School Librarians Association.

Among the findings: a California study in 2008 established a strong positive relationship between school library budgets and test scores in language arts and history. In Illinois in 2005 a study found that elementary schools which spend more on their libraries average almost 10 percent higher writing performance. For middle schoolers the average was 13 percent higher.

A Pennsylvania study in 2000 learned that schools that spent more money on their school library programs had higher student achievement on reading scores. And a 2004 Minnesota study discovered a statistically significant relationship at the elementary level between higher reading scores and larger school library budgets.

Although poverty remains a primary force in determining student academic success, the studies in state after state showed that socio-economic conditions could not explain away the impact of school library programs. A Wisconsin study in 2006, for example, found that the impact of a robust library media program in high school was almost seven percentage points greater than the impact of socio-economic variables.

"In fact, quality school library programs may play an even greater role for students from economically disadvantaged backgrounds," says Kachel.

Adequate staffing also correlates with student achievement. In Ontario in 2006, the presence of a school librarian was the single strongest predictor of reading enjoyment for students in grades three and six. In 2010, a New York State research project found that elementary schools with certified school library media specialists were more likely to have higher English language arts achievement scores than those in schools without certified library staff.

The studies also showed that incremental increases in the following can result in incremental increases in student learning: increased library hours and group visits by classes to the library; larger collections with access as school and from home; up-to-date technology; more student use of school library services. "School leaders should to recognize this research and foster school library programs that can make a difference," says Kachel. "School Library Research Summarized" is now a booklet and a website. Both can be found here:

<http://library.mansfield.edu/impact.asp>.

[http://www.esa.int/esaMI/Mars\\_Express/SEMT4TZ57NG\\_0.html](http://www.esa.int/esaMI/Mars_Express/SEMT4TZ57NG_0.html)

### **Mars Express sees deep fractures on Mars**

***Newly released images from ESA's Mars Express show Nili Fossae, a system of deep fractures around the giant Isidis impact basin. Some of these incisions into the martian crust are up to 500 m deep and probably formed at the same time as the basin.***

Nili Fossae is a 'graben' system on Mars, northeast of the Syrtis Major volcanic province, on the northwestern edge of the giant Isidis impact basin. Graben refers to the lowered terrain between two parallel faults or fractures in the rocks that collapses when tectonic forces pull the area apart. The Nili Fossae system contains numerous graben concentrically oriented around the edges of the basin.

It is thought that flooding of the basin with basaltic lava after the impact that created it resulted in subsidence of the basin floor, adding stress to the planet's crust, which was released by the formation of the fractures.

A strongly eroded impact crater is visible to the bottom right of the image. It measures about 12 km across and exhibits an ejecta blanket, usually formed by material thrown out during the impact. Two landslides have taken place to the west of the crater. Whether they were a direct result of the impact or occurred later is unknown.

A smaller crater, measuring only 3.5 km across, can be seen to the left of centre in the image and this one does not exhibit any ejecta blanket material. It has either been eroded or may have been buried.



The surface material to the top left of the image is much darker than the rest of the area. It is most likely formed of basaltic rock or volcanic ash originating from the Syrtis Major region. Such lava blankets form when large amounts of low-viscosity basaltic magma flow across long distances before cooling and solidifying. On Earth, the same phenomenon can be seen in the Deccan Traps in India.

Nili Fossae interests planetary scientists because observations taken with telescopes on the Earth and published in 2009 have shown that there is a significant enhancement in Mars' atmospheric methane over this area, suggesting that methane may be being produced there. Its origin remains mysterious, however, and could be geological or perhaps even biological.

As a result, understanding the origin of methane on Mars is high on the priority list and in 2016, ESA and NASA plan to launch the ExoMars Trace Gas Orbiter to investigate further. Nili Fossae will be observed with great interest.

<http://news.discovery.com/tech/washable-rfid-tags-help-catch-towel-thieves-110506.html>

### **Washable RFID Tags Help Catch Hotel Towel Thieves**

By Nic Halverson | Fri May 6, 2011 09:03 AM ET

***Plush terrycloth bathrobes, 800-thread-count sheets and fluffy, freshly laundered towels can tempt even the most law-abiding hotel guest to take up a life of suitcase-stuffing crime.***

Irresistible as they may be, petty theft of these luxurious (and free!) linens are gouging the hotel industry to the rude wake-up call of approximately \$100 million a year.

Sticky-fingers everywhere, consider this a warning! Some hotels are reinforcing their defences against pilfering patrons like yourself and they're using radio frequency identification (RFID) to catch you in the act.

Three hotels in Honolulu, Miami and New York City have begun using towels, sheets and bathrobes equipped with washable RFID tags to keep guests from snagging the coveted items. Just to keep you guessing, the hotels have chosen to remain anonymous.

Linen Technology Tracking has partnered with Fluensee AssetTrack to optimize and oversee the implementation of this linen-tracking initiative. "Our relationship with Fluensee allows us to easily scale our capability to serve the growing needs of our customers," Executive Vice President at Linen Technology Tracking, William Serbin said in a press release. "Through the utilization of RFID technology we are providing companies with the unique ability to better control their operating costs and investment in assets critical to satisfying the needs of the hotel guests." Besides reducing theft, the washable RFID tags will also help hotels keep track of linens in real time, so they know when to order more.

The anonymous Honolulu hotel says that before employing the RFID tags, they were losing 4,000 towels per month. They've now reduced that number to 750, saving around \$16,000 a month.

No word yet on what other hotel items might be equipped with RFID tags. Toilet paper rolls, miniature soaps, ash trays and unattended maid carts are potentially still up for grabs.

<http://www.newscientist.com/article/dn20453-easily-distracted-people-may-have-too-much-brain.html>

### **Easily distracted people may have too much brain**

14:47 06 May 2011 by Jessica Hamzelou

***Those who are easily distracted from the task in hand may have "too much brain".***

So says Ryota Kanai and his colleagues at University College London, who found larger than average volumes of grey matter in certain brain regions in those whose attention is readily diverted.

To investigate distractibility, the team compared the brains of easy and difficult-to-distract individuals.

They assessed each person's distractibility by quizzing them about how often they fail to notice road signs, or go into a supermarket and become sidetracked to the point that they forget what they came in to buy. The most distractible individuals received the highest score.

The team then imaged the volunteers' brains using a structural MRI scanner. The most obvious difference between those who had the highest questionnaire scores – the most easily distracted – and those with low scores was the volume of grey matter in a region of the brain known as the left superior parietal lobe (SPL). Specifically, the easily distracted tended to have more grey matter here.

### **Brain dampening**

To find out whether activity in the left SPL plays a role in distractibility, the team turned to transcranial magnetic stimulation. This hand-held magnet dampens the activity of the part of the brain beneath it for around half an hour.

First, the researchers asked 15 volunteers to perform a timed task both with and without a distraction. The difference in the time taken to perform the tasks is a measure of how easily distracted a person is, says Kanai.

When the same individuals later repeated the exercise following transcranial magnetic stimulation over the left SPL to dampen its activity, the time each took to complete the task increased by around a quarter, on average. "This suggests that the left SPL is involved in top-down control of attention," says Kanai.

### **Immature brain**

Together, the two experiments suggest that the left SPL works to overcome distraction, and that those with larger left SPLs are more easily distracted.

Quite why SPL size works this way is unclear, but Kanai speculates that it may be linked to that fact that as we mature, the brain's grey matter is pruned of neurons in order to work more efficiently.

He suggests that a greater volume of grey matter may indicate a less mature brain, perhaps reflecting a mild developmental malfunction. "This theory would fit in with the observation that children are more easily distracted than adults," Kanai says.

But all is not lost for the distracted. Having identified that the left SPL plays a role in distraction, Kanai's team has begun to test ways to improve levels of attention by stimulating the left SPL using a technique called transcranial direct current stimulation. This involves placing electrodes on the head to deliver an unnoticeable electrical current to the immediate area.

"There are some signs that we can modulate attention" using transcranial direct current stimulation near to the left SPL, Kanai says. If confirmed, the technique might be useful for people whose distractibility becomes problematic, such as those with attention deficit hyperactivity disorder (ADHD).

*Journal reference: Journal of Neuroscience, DOI: 10.1523/jneurosci.5864-10.2011*

<http://medicalxpress.com/news/2011-05-schizophrenia-misunderstood-psychiatrist.html>

### **Schizophrenia misunderstood, psychiatrist says**

**(Medical Xpress) - Most people have heard the term "schizophrenia" and are aware that it's a mental disorder. Unfortunately, a UC Health psychiatrist says, few people actually understand what schizophrenia is or how pervasively it affects society.**

"Schizophrenia is a very serious disabling brain disease that affects people in the prime of life - usually late adolescence or early 20s," says Henry Nasrallah, MD, a professor in the University of Cincinnati (UC) Department of Psychiatry and Behavioral Neuroscience, director of the schizophrenia program and editor-in-chief of the international journal Schizophrenia Research.

According to the National Institute of Mental Health, about 1 percent of Americans - 3 million people - have schizophrenia. It's characterized by multiple clusters of symptoms, including:

**Psychotic symptoms:** These include delusions, which are fixed, false beliefs, of which paranoia is the most common. "They feel somebody's out to get them," Nasrallah says. "The delusions can also be bizarre, such as believing that somebody on the moon is sending beams into their head and controlling their actions." Another prominent psychotic symptom, Nasrallah says, is hallucinations - most frequently auditory, but sometimes visual of people or animals, or abnormal taste or odors.

**Negative symptoms:** These symptoms are particularly disabling, Nasrallah says, because - unlike psychosis - no treatment is yet available for them. People with negative symptoms are unable to initiate action, are unmotivated, lack social skills, have an expressionless face and do not speak much.

**Cognitive deficits:** "They can't use their brain functions like other people do," says Nasrallah. "Their memory, attention, concentration and decision-making are poor. It's also hard for them to learn and remember new things."

It's important to know that schizophrenia is not "split personality," Nasrallah says. That's a common misconception that dates from 1911, when Swiss psychiatrist Eugen Bleuler coined the term "schizophrenia." It comes from the Greek roots schizo (split) and phrene (mind); Bleuler used it to describe "scattered thoughts." (Split personality is actually known as dissociative identity disorder.)

Schizophrenia has both genetic and environmental causes, Nasrallah says.



"We have already discovered 30 susceptibility genes linked to schizophrenia," he says. "In addition, abnormal events during pregnancy such as infections, starvation, bleeding, drug abuse, anemia or vitamin D deficiency - all that can increase the risk for schizophrenia."

There are many reasons why schizophrenia symptoms commonly don't appear until late adolescence or the early 20s, Nasrallah says, including hormonal changes and the stresses of becoming independent. Additionally, it takes years for the brain to mature structurally and the two regions of the brain that are abnormal in schizophrenia - the hippocampus and the prefrontal cortex - are the last ones to mature in late adolescence. Because many of the psychological causes of schizophrenia are still unknown, treatments focus on suppressing the symptoms of the disease. Treatments include antipsychotic medications and various psychosocial treatments, such as supportive therapy, social skills training and vocational rehabilitation. However, the vast majority of people with schizophrenia become disabled and cannot return to school or get a job.

Nasrallah says society has struggled to manage schizophrenia since states began closing psychiatric hospitals in the 1960s. "They promised to transfer money into community care, but they didn't," he says. "So we have a very broken public mental care system in the United States, where people with schizophrenia are often incarcerated in prisons and jails and are transformed into felons instead of patients.

"This is an absolute injustice to these sick individuals who must be treated, not jailed."

Additionally, he says, people with schizophrenia tend to lead sedentary lives with unhealthy habits such as smoking and overeating and some of their medications cause obesity, high lipids and diabetes, so they die 20 to 25 years earlier than the general population.

Still, there are reasons for optimism, Nasrallah says.

"There's never been a more exciting time to be a schizophrenia researcher," he says. "There has been an explosion of neuroscience advances, and we have learned tremendous amounts about the neurobiology of schizophrenia down to the cellular and molecular level. Breakthroughs will definitely lead to better treatments and even prevention." *Provided by University of Cincinnati*

<http://www.wired.com/wiredscience/2011/05/mars-impact-cluster/>

### **Cluster of Craters Caught on Mars**

**By Lisa Grossman**

#### ***Four fresh impact craters were recently spotted scarring Mars' volcanic plains.***

The new pockmarks were first noticed in August 2010, when the Mars Reconnaissance Orbiter's low-res, grayscale Context camera saw a dark patch that hadn't been there two years before.

Such new spots often come from impact craters left by meteorites.



**Images: NASA/JPL/University of Arizona**

To confirm that, MRO's sharp-eyed HiRISE camera went in for a closer look. While the Context camera takes wide-angles miles across, HiRISE zooms in to resolve objects the size of a beach ball.

The telephoto image revealed four distinct craters, each ringed with a dark blanket where soil was blasted out in the impact. The crater quartet could have been formed by a single meteorite that broke apart on its way through Mars' atmosphere.

By watching the Martian terrain change beneath it, MRO helps researchers determine how often Mars gets hit by interplanetary debris. Based on the number of craters, planetary scientists gauge the age of a planet's surface features.

Whereas the surface of a lightly cratered planet like Earth is regularly changed by volcanic, tectonic and atmospheric processes, worlds with many craters - such as the moon and, to a lesser extent, Mars - have changed little in millions of years.

<http://www.physorg.com/news/2011-05-sodium-intake-riskier-thought.html>

### **Low sodium intake could be riskier than thought**

#### ***Doctors have long encouraged patients to slash their salt intake for good heart health.***

The American Heart Association advises people to consume no more than 1,500 milligrams a day of sodium to reduce their risk of high blood pressure, heart attacks, stroke and kidney disease. This is less than half of what people consume now.

One reason for this advice: Elevated blood pressure is a major public health problem. About 90 percent of all Americans will develop hypertension over their lifetime, the heart association says.

But a European study coordinated in Belgium raises questions about sodium's effect on the heart.

Researchers followed 3,681 people, average age 40, for about eight years, testing sodium excretion in the urine. They found that systolic blood pressure (top number) was slightly lower in those who excreted less



sodium, but that didn't translate into a lower risk of cardiovascular death. In fact, those with lower sodium excretion had an increased risk of cardiovascular death. The findings were consistent in participants younger and older than 60.

Jan Staessen, a professor of medicine at the University of Leuven in Belgium and one of the authors of the report in Wednesday's Journal of the American Medical Association, says the study does not support the recommendation of a general reduction of salt intake for everyone, although salt reduction could be beneficial in lowering the blood pressure of people with hypertension. Reducing salt "is recommended for people with high blood pressure and people with heart failure, but recommending it to the population as a whole, I wouldn't do without proving it's completely safe," he says.

"If one lowers sodium intake to lower blood pressure, this change in sodium activates several systems that conserve sodium, and those systems are implicated in disease processes such as damaging the arterial wall and kidneys."

The findings may apply to Americans of white European descent but might be less applicable to blacks because they are believed to be more salt-sensitive, he says.

The research is drawing fire from medical experts here. Ralph Sacco, president of the American Heart Association and chairman of neurology at the University of Miami, says this is only one study of a relatively young, mostly white population-and blood pressure tends to rise with age and affect African Americans disproportionately.

"We have based our recommendations on the many scientific studies which show a strong relationship between reduced sodium consumption and a lower risk of heart attacks, congestive heart failure and stroke," he says. "There are good randomized, controlled studies-the gold standard of scientific studies-that show a lower sodium diet has a meaningful effect on blood pressure."

Atlanta cardiologist Gina Lundberg supports the 1,500-milligram limit: "We're all eating too much sodium too many prepared, processed foods."

Leaders in the salt industry applaud the new research. "This study basically says that salt reduction to reduce cardiovascular disease is a strategy that is not going to work," says Morton Satin of the Salt Institute, an industry group.

[http://www.eurekalert.org/pub\\_releases/2011-05/bcom-tbp050511.php](http://www.eurekalert.org/pub_releases/2011-05/bcom-tbp050511.php)

### **The brain performs visual search near optimally**

**HOUSTON - *In the wild, mammals survive because they can see and evade predators lurking in the shadowy bushes.***

That ability translates to the human world. Transportation Security Administration screeners can pick out dangerous objects in an image of our messy and stuffed suitcases. We get out of the house every morning because we find our car keys on that cluttered shelf next to the door. This ability to recognize target objects surrounded by distracters is one of the remarkable functions of our nervous system.

"Visual search is an important task for the brain. Surprisingly, even in a complex task like detecting an object in a scene with distracters, we find that people's performance is near optimal. That means that the brain manages to do the best possible job given the available information," said Dr. Wei Ji Ma (<http://neuro.neusc.bcm.tmc.edu/?sct=gfaculty&prf=53>, assistant professor of neuroscience at Baylor College of Medicine ([www.bcm.edu](http://www.bcm.edu)). A report on research by him and colleagues from other institutions appears online in the journal Nature Neuroscience (<http://www.nature.com/neuro/index.html>).

Recognizing the target is more than figuring out each individual object.

"Target detection involves integrating information from multiple locations," said Ma. "Many objects might look like the target for which you are searching. It is a cognitive judgment as well as a visual one."

One factor that must be taken into account is reliability of the information.

"We study that in particular," said Ma. "If you are a detective, you weight different pieces of information based on the reliability of the source. Similarly, the brain has to weight different pieces of visual information."

In his study, he and his colleagues used computer screens to show subjects sets of lines that might or might not contain a line oriented in a particular way. To manipulate reliability, they randomly varied the contrast of each line, making the target easier or more difficult to detect. Each screen was shown for only a fraction of a second, making the search task very difficult.

"We found that even in this complex task, people came close to being optimal in detecting the target," he said. "That means that humans can in a split second integrate information across space while taking into account the reliability of that information. That is important in our daily lives."

The task was deliberately made very hard so that people made mistakes, he said, but their answers were as good as they could be given the noise that is inherent to visual observations.

In the second part of their study, they determined that this ability might rely on groups (populations) of neurons that respond differently to different line orientations. Using such populations, they were able to construct a neural network that could weight information by the appropriate reliability.

They simulated this task on the computer and reproduced the behavior of human subjects, giving credence to their argument that the task requires populations of neurons. "The visual system is automatically and subconsciously doing complex tasks," said Ma. "People see objects and how they relate to one another. We don't just see with our eyes. We see with our brains. Our eyes are the camera, but the process of interpreting the image in our brains is seeing."

The next question is when does a visual task become so complex that the human brain fails to be optimal? *Others who took part in this research include Ronald van den Berg, a postdoc in Ma's lab, Vidhya Navalpakkam of the California Institute of Technology in Pasadena, Jeffrey M. Beck of University College London, and Alexandre Pouget of the University of Rochester in Rochester, New York.*

*Funding for this work came from the National Eye Institute, the National Science Foundation, the Gatsby Charitable Foundation, the Netherlands Organisation for Scientific Research, the U.S. Department of Defense's Multidisciplinary University Research Initiative (MURI), the National Institute on Drug Abuse and the James S. McDonnell Foundation.*

[http://www.eurekalert.org/pub\\_releases/2011-05/you-poa050511.php](http://www.eurekalert.org/pub_releases/2011-05/you-poa050511.php)

### **Prevalence of autism in South Korea estimated at 1 in 38 children**

**New Haven, Conn. - Autism spectrum disorders (ASD) in South Korea affect an estimated 2.64% of the population of school-age children, equivalent to 1 in 38 children, according to the first comprehensive study of autism prevalence using a total population sample.**

The study - conducted by Young-Shin Kim, M.D., of the Yale Child Study Center and her colleagues in the U.S., Korea and Canada - identifies children not yet diagnosed and has the potential to increase autism spectrum disorder prevalence estimates worldwide.

ASDs are complex neurobiological disorders that inhibit a person's ability to communicate and develop social relationships, and are often accompanied by behavioral challenges.

Published online today in the American Journal of Psychiatry, the study reports on about 55,000 children ages 7 to 12 years in a South Korean community, including those enrolled in special education services and a disability registry, as well as children enrolled in general education schools. All children were systematically assessed using multiple clinical evaluations. This method unmasked cases that could have gone unnoticed. More than two-thirds of the ASD cases in the study were found in the mainstream school population, unrecognized and untreated.

The research team, including cultural anthropologist Roy Richard Grinker of George Washington University, took steps to mitigate potential cultural biases that could impact diagnostic practices and prevalence estimates. They also considered that more Korean children with ASD may be found in mainstream educational settings based on the design of the highly structured Korean educational system, which often includes 12-hour-long school days. Therefore Korean children with ASD may function at various levels in the Korean general population while not receiving special education services.

"While this study does not suggest that Koreans have more autism than any other population in the world, it does suggest that autism may be more common than previously thought," said Grinker.

According to Kim, the study's corresponding author, experts disagree about the causes and significance of reported increases in ASD, partly because of variations in diagnostic criteria and incomplete epidemiologic studies that have limited the establishment of actual population-based rates. "We were able to find more children with ASD and describe the full spectrum of ASD clinical characteristics," said Kim, assistant professor in the Yale Child Study Center. "Recent research reveals that part of the increase in reported ASD prevalence appears attributable to factors such as increased public awareness and broadening of diagnostic criteria. This study suggests that better case finding may actually account for an even larger increase."

Kim said that while the current project did not investigate potential risk factors in this particular population, the study does set the stage for ongoing work to examine genetic and environmental factors contributing to the risk of ASD.

She also noted that the study is further evidence that autism transcends cultural, geographic, and ethnic boundaries and is a major global public health concern, not limited to the Western world.

"We know that the best outcomes for children with ASD come from the earliest possible diagnosis and intervention," said Kim, whose co-investigator, Yun-Joo Koh of the Korea Institute for Children's Social Development, reported that in response to the study findings, Goyang City, host of the Korea study, has courageously begun to provide comprehensive assessment and intervention services for all first graders entering their school system. "We hope that others will follow Goyang City's example so that any population-based

identification of children with ASD is accompanied by intervention services for those children and their families.”

*The research was funded by a Pilot Research Grant from Autism Speaks; a Children's Brain Research Foundation Grant; NIMH Career Awards; and the George Washington University Institute for Ethnographic Research Grant.*

*Other authors on the study include Bennett L. Leventhal, M.D., Eric Fombonne, M.D., Eugene Laska, Eun-Chung Lim, Keun-Ah Cheon, M.D., Soo-Jeong Kim, M.D., HyunKyung Lee, and Dong-Ho Song, M.D.*

[http://www.eurekalert.org/pub\\_releases/2011-05/w-soa050411.php](http://www.eurekalert.org/pub_releases/2011-05/w-soa050411.php)

### **Sexual orientation affects cancer survivorship**

***Gay men have a higher prevalence of cancer compared with heterosexual men, and lesbian and bisexual female cancer survivors report lower levels of health than heterosexual female cancer survivors.***

Those are the conclusions of a new study published early online in *Cancer*, a peer-reviewed journal of the American Cancer Society. The study's findings shed light on the types of programs and services that are needed to assist lesbian, gay, and bisexual cancer survivors.

Cancer surveillance studies don't ask questions about sexual orientation, which means there is scarce information about how many cancer survivors identify as lesbian, gay, or bisexual. Hoping to fill this information gap, Ulrike Boehmer, PhD, of the Boston University School of Public Health and her colleagues examined the prevalence of cancer survival by sexual orientation in California. They also investigated how the health of cancer survivors differs depending on sexual orientation.

The study included data from the California Health Interview survey from 2001, 2003, and 2005. This survey is the largest state health survey conducted in the United States. A total of 7,252 women and 3,690 men reported a cancer diagnosis as adults. The researchers found no significant differences in cancer prevalence by sexual orientation among women, but lesbian and bisexual female cancer survivors were 2.0 and 2.3 times more likely to report fair or poor health compared with heterosexual female cancer survivors. Among men, gay men were 1.9 times as likely to report a cancer diagnosis than heterosexual men. Male cancer survivors' self-reported health did not significantly differ by sexual orientation.

"This information can be used for the development of services for the lesbian, gay, and bisexual population," said Dr. Boehmer. "Because more gay men report as cancer survivors, we need foremost programs for gay men that focus on primary cancer prevention and early cancer detection. Because more lesbian and bisexual women than heterosexual women with cancer report that they are in poor health, we need foremost programs and services that improve the well-being of lesbian and bisexual cancer survivors," said Dr. Boehmer.

Dr. Boehmer noted that the results raise questions that should be addressed by future studies. For example, do more gay men report a history of cancer because more are receiving cancer diagnoses, or are more surviving a diagnosis compared with heterosexual men? Similarly, are lesbian and bisexual women just as likely as heterosexual women to receive a cancer diagnosis, or does the similarity of cancer survivorship speak to differences in the survival of lesbian and bisexual women?

<http://www.bbc.co.uk/news/health-13296440>

### **'White glow' in babies' eyes a possible cancer warning**

***Children's cancer campaigners want a section of the personal child health record - or 'little red book' - rewritten to alert new parents to the dangers of an unusual form of eye cancer.***

Retinoblastoma, which affects the retina of children aged under five, can result in the eye being removed if there is any delay in treating it.

Spotting the presence of a tumour is key - and sometimes all it takes is a photograph. The most common sign of retinoblastoma is a white glow in the pupil of the eye, which can look like a 'cat's eye' in a photograph, especially when there is a 'red eye' look in the other eye. The 'glow' is caused by the light reflecting off the tumour at the back of the baby's eye.

#### **Saving sight**

Ali Fryer, mother of Darcey, has the vigilance of a friend to thank for her daughter's diagnosis in February when she was six months old. "An ex piano pupil of mine saw a tiny glow in Darcey's right eye and suggested I take her to the doctor. I took her there the next morning and our GP sent us straight to eye casualty. It was confirmed that afternoon."

Later, in an effort to thank Ruthie for what she did, Ali asked her to be Darcey's godmother. Ali had never heard of the condition before and she and her husband had no idea what the future would hold for their daughter. It was a confusing and distressing time. Chemotherapy at Great Ormond Street Hospital followed and Darcey has regular examinations under anaesthetic at the Royal London Hospital to check on her progress.



"Had the tumour been half a degree bigger at diagnosis, her eye would have been removed immediately. "At the moment there's a chance that six months of chemo might save it."

### **One in 20,000**

Darcey has around a 50% chance of keeping her right eye. The danger is that a tumour could develop in her other eye too - but this is very rare. Meanwhile, the chemotherapy treatment is shrinking the tumour and Darcey is coping well with the few side-effects.

"We are prescribed anti-sickness drugs, a lactulose solution to combat constipation, a lovely thick cream for drying skin and as for hair loss - well, she only had a few strands really," Ali says.

The family have community nurses visiting twice a week, monitoring her chemotherapy and carrying out blood tests. "They are brilliant," says Ali. "They could not make it easier for us."



*An illustration of how retinoblastoma could look in a young baby's eye*

Retinoblastoma affects one in every 20,000 babies born each year and represents 3% of childhood cancers in the UK. The good news is that 98% of children treated will survive, but because most cases are not picked up early enough about 80% of children affected will have an eye removed.

Ashwin Reddy, children's eye surgeon and retinoblastoma expert at The Royal London Hospital, says the tumour can kill. "Spotting the white reflex or white glow in the eye can make a vital difference because the tumour won't be so advanced and we might not have to remove the eye.

"We don't want to panic parents but they can prevent the risk of death by getting their child seen earlier."

### **No guarantee**

The Childhood Eye Cancer Trust are leading the push to make parents more aware of the signs and symptoms of the disease - and they are targeting the 'little red book' and Birth to Five book, both issued to new parents.

Julie Firth, from the cancer trust, says: "The information on childhood eye cancer provided by the NHS for parents is pretty sketchy and non-existent in some places.

"We feel the NHS has a duty to inform parents about the disease to avoid a delay in diagnosis."

While chemotherapy is the standard treatment for retinoblastoma, laser therapy and radiotherapy can also be tried. A relatively new type of chemotherapy in which the drugs are delivered directly to the eye through an artery in the leg avoids the normal complications of chemotherapy given via a central intravenous line.

But there is still no guarantee that it will be successful. Children who are unfortunate to have their eye surgically removed can have an artificial eye fitted about six weeks after the operation.

Ali is adamant that anyone can spot the signs of retinoblastoma: "If you see something unusual about a baby or a young child's eye, please take it to the doctor. "It could well be nothing, and you gain peace of mind. Or it could be something which needs treatment - and if it's retinoblastoma, you may save your child's eyes, if not their life."