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CONTENTS

Exterminating Africa's horror worms

- 16 March 2010 by **Debora MacKenzie**
- Magazine issue 2751.

Education is an important part of eradication (Image: CDC/The Carter Center)

IT STARTS with a painful blister - a very painful blister. It feels, people say, like being stabbed with a red-hot needle. When the blister bursts, the head of a worm pops out, thin, white and very much alive.

The rest of the worm, about a metre long, remains inside your body. It can take up to two months to pull it out, inch by agonising inch, during which time it may be impossible to walk. In extreme cases, you may host up to sixty of them, anywhere on your body. The worms can cause paralysis or lethal bacterial infections, and even if you survive mostly unscathed, next year it can happen all over again.

The guinea worm (*Dracunculus*, or little dragon) is probably the closest living equivalent to the monsters in the *Alien* movies - except we're beating this enemy. Guinea worm was once widespread in Africa, the Middle East and many parts of Asia. In 1986, there were nearly 4 million cases a year in 20 countries across south Asia and Africa. Last year, there were just 3142 in four countries in Africa. The worm could be extinct by 2012, making dracunculiasis the second human disease ever to be eradicated - the first being smallpox.

Guinea worms start out as minuscule larvae living inside water fleas of the genus *Cyclops*. These millimetre-long crustaceans live in stagnant water, and people can swallow them when they drink from ponds, ditches or shallow wells. Stomach acids dissolve the water fleas but can leave the larvae

untouched. The free larvae then burrow out of the intestine and cross to the chest or abdominal wall, where the male and female worms mature and mate. The males eventually die, but the growing females tunnel imperceptibly to, and then under, the skin.

Even as the females grow up to a metre long, their hosts remain unaware of their presence. The worms prevent pain by secreting opiates and dodge the immune system by coating themselves with human proteins. It may be just as well people don't know they are infected as nothing can help at this stage.

A year after being swallowed, the guinea worms change tack. They secrete a searing acid, create a blister and emerge from the skin - most often on the leg or foot, but it can be anywhere. The acid alerts the immune system, but this only makes matters worse. As the tissue around the worm swells, it adds to the pain and wedges the worm in place.

The worms secrete a searing acid. People seek out water to relieve the burning pain, and the female worms then expel hundreds of thousands of larvae

The horrendous pain is no accident. It causes people to seek out cool water to relieve the burning sensation, and when the females sense the water, they contract violently, expelling hundreds of thousands of larvae. If there are any water fleas in the water, they will be infected and the cycle begins again.

The fact that the worms emerge after a year is no accident either. Water flea populations peak when there is lots of stagnant water, which happens in the dry season in wet areas, such as Ghana, and in the wet season in dry areas, such as Sudan. Either way, a yearly cycle maximises the larvae's chances of finding water fleas.

Death and paralysis

Guinea worms can cause all sorts of problems for their victims. Some worms lose their way and attack the heart or spinal cord, leading to death or paralysis. The emergence site can become infected by bacteria, leading to abscesses and tetanus. If a worm passes near a joint, it can cause stiffness. Joints can even seize up altogether, causing limbs to wither from disuse.

Worst of all, though, the guinea worm season tends to occur at times when people need to plant or harvest their crops. "A family that cannot cultivate because of guinea worm has no harvest," says Makoy Samuel Yibi, head of guinea worm eradication for the south Sudan government. "Every village has stories of people who died after bad guinea worm outbreaks."

There is no drug that kills guinea worm, no vaccine and no protective immunity after infection. There are, however, two simple ways to prevent infection: stopping people with emerging worms from contaminating water sources, and not swallowing water fleas, either by drinking water from clean wells or by filtering infested water. Because water fleas are relatively large, even simple cloth filters can eliminate them.

Clean drinking water alone helped eradicate guinea worm from many countries over the past century. Then, in 1986, the World Health Organization declared guinea worm eradication an official goal and The Carter Center, set up by former US president Jimmy Carter, took up the challenge.

Guinea worm disease is an obvious target for eradication and the only one besides polio now backed by the WHO. Only humans are infected by guinea worm, and the larvae die within months if no one swallows the water fleas carrying them. So stop human infections and the worm disappears.

The eradication programme had succeeded in India and Pakistan by 2000, but donations were flagging. Then the Bill and Melinda Gates Foundation stepped in, and progress resumed. The results are

spectacular (see map). For instance, no cases were reported last year in Nigeria, which in 1986 was the worst-infected country with 700,000 cases.

It helps when governments or charities install tube wells that provide clean water, but this is expensive. Instead, The Carter Center's main strategy is to provide cheap ways to cope with infested water. These include filters for household water stores, drinking straws with filters that people can carry with them, the pesticide Abate to kill water fleas in ponds, and "containment huts" for people to go to when a worm appears, to keep them away from water supplies.

There are now tens of thousands of containment centres across Africa, staffed by local volunteers trained to remove worms using the time-honoured method of winding them gently around a stick (see "The staff of Asclepius"). If a worm breaks and releases its larvae into the flesh, the pain is intense. The centres feed residents and provide bandages, antiseptics, painkillers and cold compresses.

"The heroes of guinea worm eradication are the 10,000 village health volunteers," says Sandy Cairncross of the London School of Hygiene and Tropical Medicine. "The key is to organise institutions in rural communities, and give them continuing modest support."

Cairncross pioneered the use of computer mapping systems to track progress - and to show governments and donors that their efforts are paying off. "Thorough surveillance is key, because it mobilises national leadership," says D. A. Henderson at the University of Pittsburgh, Pennsylvania, who led the fight against smallpox. "The guinea worm campaign has also been brilliant in getting local people to understand and cooperate in the effort."

Part of the problem is persuading people that guinea worms come from water, says Makoy. "They believe it comes from God or eating certain animals or witchcraft. They do not see the point of filtering water," he says. But once some families try it, the effects are so dramatic that the rest soon follow.

"People were sceptical that we could eradicate the worm without drugs or vaccines," says Don Hopkins, a parasitologist at The Carter Center who heads the eradication drive. "Changing people's behaviour is notoriously hard."

The World Bank has estimated that the cost of guinea worm eradication in Africa, which Hopkins puts at $250 million in total, will be recouped within four years in increased food production alone. That's not counting other benefits like children staying at school.

As cases become rarer, each one becomes harder and more expensive to find and contain, but it is crucial to keep going. "As long as there is one worm left, it will spread and be everywhere again," says Makoy.

Hopkins cites cases where the worms were eliminated from a country, only for someone from outside to infect a pond. Such outbreaks often feature infections with multiple worms, as people have let their guard down and stopped filtering water.

With just 452 cases in total in Ghana, Mali and Ethiopia last year, eradication now depends on southern Sudan, which had 2690, or 86 per cent of all cases. "We can stop transmission this year," says Makoy, but it will take another year or two after that to be sure the campaign has succeeded.

The main reason Sudan still has so many cases is the civil war that has raged almost continually since independence in 1956. It could yet derail things. "It's a race between war and the worms," says Hopkins, "but I'm an optimist." He does have reason: in 1995, the warring sides agreed a truce to allow guinea worm teams to work.

There has been a peace agreement between north and south Sudan since 2005, but that could be threatened in the lead-up to elections in April and to a referendum next year, in which the oil-rich south is

expected to reject continued union with the north. Meanwhile, conflict is escalating between southern peoples such as the Nuer and the Dinka. Last year, guinea worm staff had to stay indoors or be evacuated due to a lack of security on 35 occasions, and two local offices were destroyed. "We have the right team and materials to succeed," says Makoy. "All we need is peace."

The staff of Asclepius

Guinea worms have long afflicted humanity. They are thought to have been the "fiery serpents" described as attacking the Israelites in the biblical story of the exodus, and worm tracks have been found in 3000-year-old Egyptian mummies. The only way to get them out, then as now, is to slowly wind them around a stick. While there is no definitive proof, this is widely thought to be the origin of the symbol of the Greek and Roman god of healing, Asclepius - a serpent wrapped around a staff. The staff of Asclepius is on the crest of the World Health Organization and other medical bodies, but it has sometimes been confused with the caduceus, a winged staff entwined by two snakes. The caduceus was a symbol of Mercury, god of commerce and thieves, and later became associated with alchemy.

Debora MacKenzie is New Scientist's correspondent in Brussels

http://www.newscientist.com/article/mg20527511.600-parasite-lost-exterminating-africas-horror-worms.html

Personalised cancer trial promises better drugs faster

- 18:34 17 March 2010 by **Peter Aldhous**

Life-saving cancer drugs are costly and time-consuming to come by – how quickly can we change this?
(Image: Burger/Phanie/Rex Features)

Major changes to the way cancer drugs are tested in people could lead to better and cheaper therapies coming to the market more quickly.

A breast cancer trial called I-SPY 2 TRIAL (Investigation of Serial Studies to Predict Your Therapeutic Response with Imaging and Molecular Analysis 2) was launched today by a US consortium including the National Institutes of Health, the Food and Drug Administration and leading pharmaceutical companies. It is expected to involve up to 800 patients, recruited at up to 20 leading cancer centres across the US.

It is radically different to conventional clinical trials because it will test several drugs at once and allows doctors to adapt the recruitment of patients based on incoming results and to drop ineffective drugs quickly.

Drugs that show promising results will be given to more patients with types of tumours that seem likely to respond.

The idea is to streamline the screening of new therapies.

Personalised promise

Advances in genomics have revealed a wide variety of mutations that can turn cells cancerous. By developing drugs that target these specific defects, it should in theory be possible to tailor therapies to individual patients' tumours.

But there's a big problem: it currently takes longer than 12 years and according to some estimates more than $1 billion to get a new cancer drug into clinical use.

This is where I-SPY 2 TRIAL comes in. Rather than testing one drug at a time, the trial will cut through the red tape that binds individual drug trials by testing up to 12 experimental therapies from a variety of companies.

Women with breast cancer will be given the most suitable current treatment plus one of the new drugs, to see which are best at shrinking tumours before surgery. This will be measured by magnetic resonance imaging, providing the fastest possible results.

The women's tumours will be checked for biomarkers that are known to affect how well existing therapies work – such as receptors for the sex hormone oestrogen. –

Patients will also be assessed for experimental biomarkers, including patterns of gene activity and protein production, and variations in the number of copies of particular genes.

This will allow the researchers to discover which drugs are working best in which patients, according to their tumours' molecular profiles.

Learn faster

"I-SPY 2 will provide a path to personalised medicine," says Laura Esserman of the University of California, San Francisco, who is leading the trial with Donald Berry of the University of Texas M. D. Anderson Cancer Center in Houston.

Crucially, Berry – a specialist in biostatistics – has designed the trial so that results can be assessed quickly and successful drugs can then be given to more patients as soon as they are shown to be beneficial. "We have set up a system where everyone can learn faster," says Esserman.

This should improve the efficiency of subsequent phase-III trials – the huge and costly studies needed before a drug can be approved for use – by ensuring that drugs are given only to women with tumours that are likely to respond. The researchers hope to reduce overall development times by several years and slash costs by hundreds of millions of dollars per drug.

Price control

"This is the type of study that is absolutely needed if we're going to make progress in developing personalised therapies," says Ramesh Ramanathan, medical director of the TGen Clinical Research Services Clinic in Scottsdale, Arizona, who is not involved in the trial.

But some activists warn that reducing development costs won't necessarily make cancer therapies affordable – especially in the US, where the federal government has not stepped in to curb the extremely high prices charged for the current generation of targeted drugs. "If we don't control drug prices, we'll never get there," argues Barbara Brenner, executive director of Breast Cancer Action, based in San Francisco.

http://www.newscientist.com/article/dn18670-personalised-cancer-trial-promises-better-drugs-faster.html

Obesity: Food kills, flab protects

- 10 March 2010 by **Andy Coghlan**

Magazine issue 2751.

Your fat cells lock away the burger grease (Image: Getty Images)

OBESITY kills, everyone knows that. But is it possible that we've been looking at the problem in the wrong way? It seems getting fatter may be part of your body's defence against the worst effects of unhealthy eating, rather than their direct cause.

This curious insight comes at the same time as several studies distancing obesity itself from a host of diseases it has long been blamed for, including heart disease and diabetes.

Instead, these studies point the finger at excess fat in the bloodstream, either when the fat cells of obese people finally get overloaded or when lean people who can't store a lot of fat eat too much. This seems to have a destructive effect by provoking the body's immune response.

None of this changes the fact that too much rich food and too little exercise is bad for you. But viewing obesity as a symptom of an unhealthy diet, rather than the direct cause of disease and death, plus a better appreciation of the immune system's reaction to fat, should radically change our understanding of what is shaping up to be one of modern society's biggest health scourges. The findings also point to new ways to treat diabetes, heart disease and other diet-linked conditions.

In recent years, most rich countries, and some poorer ones, have seen a massive rise in so-called "metabolic syndrome", whose symptoms can include insulin resistance, high blood cholesterol and an increased risk of diabetes, heart disease and stroke. That the syndrome goes hand in hand with obesity is well known, but exactly how all these conditions are linked is unclear.

In an attempt to determine the effects of obesity itself, diabetes researchers Roger Unger and Philipp Scherer, both at the University of Texas Southwestern Medical Center in Dallas, reviewed several recent studies of the role of fat cells in humans and mice.

In particular, the pair looked at the fates of people with a genetic condition that means they can't make their own fat cells and mice genetically engineered to have low supplies of these cells and fed a diet that would make normal mice obese. They found that, despite not being obese, both tend to develop metabolic syndrome earlier on in life than their overweight, overfed counterparts.

This led Unger and Scherer to conclude that obesity protects the body from the effects of overeating by providing somewhere safe to deposit the dietary deluge of fat and sugar, which in excess is toxic to many body tissues (*Trends in Endocrinology and Metabolism*, DOI: 10.1016/j.tem.2010.01.009).

Only when the body's fat cells, or adipocytes, are crammed to capacity do the problems of metabolic syndrome begin. The fully engorged adipocytes begin to die and leak their contents into the bloodstream, including saturated fatty acids such as palmitic acid. Such fats then accumulate in tissues such as the liver, pancreas and heart, where they may prompt the symptoms of metabolic syndrome.

The theory is certainly plausible, says Gökhan Hotamisligil, a diabetes and obesity researcher at the Harvard School of Public Health, Boston, who was not involved in the study. "When fat cells break, it's like an oil tanker being hit," he says. "It unloads this toxic cargo, almost like an oil slick."

When fat cells break, it's like an oil tanker being hit. It unloads this toxic cargo, almost like an oil slick

It also fits with what we know about age-related obesity. Leptin, a hormone produced by fat cells, directs surplus dietary fat into adipocytes and orders other cells to burn off any fat. Unger and Scherer point to rodent studies showing that leptin's ability to do this drops off with age. The researchers conclude that fats locked safely away in adipocytes get released as we age, and that this could explain why older people who are obese are more at risk of metabolic syndrome.

By shifting the blame from fat to food, Unger and Scherer's hypothesis also helps to explain why not all overweight people develop metabolic syndrome and some lean people do. In 2008, a study found that half of overweight and a third of obese Americans had healthy metabolic profiles, whereas a quarter of "lean" people had signs of metabolic syndrome (*Archives of Internal Medicine*, vol 168, p 1617).

So why is fat a problem when it breaks free of the protective adipocytes? The answer, it seems, lies with the immune system.

Preeti Kishore and her colleagues at the Albert Einstein College of Medicine in New York, injected the amount of fat typically found in a large beefburger into the blood of 30 volunteers. The volunteers' bodies responded by producing 3 to 5 times as much as normal of a hormone called plasminogen activator inhibitor-1.

"We were surprised by the magnitude of the rise in PAI-1," says Kishore. The researchers suggest that this increase in PAI-1 leads to metabolic syndrome. This makes sense as we already know that PAI-1 aggravates the symptoms of diabetes by making cells less responsive to insulin, which regulates blood concentrations of glucose. It is also involved in blood clotting, and blood clots can lead to strokes and heart attacks.

Kishore's team was equally surprised to discover that PAI-1 was not produced by fat cells, as had been assumed, but immune cells called macrophages lodged in fat tissue. Fatty acids and fat cells both needed to be present to trigger the production by macrophages of PAI-1 (*Science Translational Medicine*, DOI: 10.1126/scitranslmed.3000292). Kishore says drugs that block PAI-1 or mop up free fatty acids might help prevent metabolic syndrome.

Meanwhile, the link between metabolic syndrome and the immune system has been further confirmed by Hotamisligil and his colleagues. When they fed mice a fat-rich diet, the animals rapidly became obese, insulin-resistant and developed other symptoms of metabolic syndrome. But mice lacking a gene called *PKR* stayed lean and healthy on the same diet (*Cell*, DOI: 10.1016/j.cell.2010.01.001).

It seems that *PKR* activates a "gang" of other genes responsible for inflammation, insulin resistance and metabolic dysfunction. "*PKR* is a high-ranking officer in this destruction," says Hotamisligil, who adds that blocking the activation of *PKR* might be a way to fight both obesity and metabolic syndrome.

Unger stresses that the best way to prevent metabolic syndrome is eating less and exercising more. Still, drugs based on a greater understanding of the immune system's role in the condition could be a useful last resort.

How dangerous are the worst foods?

That fatty foods, not body fat per se, are harmful is becoming clearer (see main story). But just how bad are the worst culprits and how do we best reduce their consumption?

Eating too much fatty food is well known to raise the risk of diabetes and heart disease. But consumption of sugary soft drinks, which has soared over recent decades (see graph), can also be harmful. That's because insulin converts any excess sugar into fats called triglycerides, which get dumped in fat cells.

To find out how harmful these drinks are, Litsa Lambrakos of the University of California, San Francisco, and her colleagues analysed data from several major US studies. They estimate that between 1990 and 2000, sugary drinks contributed to 130,000 new cases of diabetes, 14,000 new cases of coronary heart disease, a total of 50,000 years of incapacitation due to coronary disease, and 6000 extra deaths overall. Lambrakos presented the results at a recent Cardiovascular Disease Epidemiology and Prevention conference in San Francisco. "The impact is substantial," she says.

Lambrakos is now investigating whether a calorie tax would discourage consumption of sugary drinks, and there is already evidence that this might work.

Assessing the impact of price hikes on junk food is tough as such food has tended to become less and less expensive in real terms. However, Barry Popkin's team at the University of North Carolina in Chapel Hill used the eating habits of 5115 young adults over 20 years to determine a relationship between the price of various foods and consumption, which they then applied to hypothetical price hikes.

They conclude that an 18 per cent tax on soda drinks would reduce the weight of the average US citizen aged 18 to 30 by 2.25 kilograms per year (*Archives of Internal Medicine*, vol 170, p 420). A 10 per cent increase in the cost of soda would decrease consumption by 7 per cent, while a similar tax on pizza would reduce consumption by 11 per cent.

Additional reporting by Ewen Callaway

http://www.newscientist.com/article/mg20527513.700-obesity-food-kills-flab-protects.html?full=true&print=true

Amputees could get a helping hand in the virtual world

- 16 March 2010 by **Rebecca Thomson**

Magazine issue 2751.

Real ownership of a virtual limb (Image: Hans Neleman/Getty)

WHAT is the best way to for someone to get used to their artificial limb? Put them in a virtual environment.

So says Anthony Steed, a computer scientist at University College London, who has been studying how the rubber hand illusion works in virtual worlds.

In the standard illusion, a false hand is placed on a table in front of a volunteer whose real hand is out of view, and both are stroked at the same time. After a while people feel a sensation in the rubber hand, even when it is the only one being touched. Steed has now discovered that people relate to virtual appendages so strongly that much of the set-up work normally needed to pull off the illusion is unnecessary in virtual environments. For example, people automatically experience ownership of their virtual limbs, without needing simultaneous stroking in the real world, claims Steed.

People experience ownership of their virtual limb without their real hand being stroked

Twenty volunteers were asked to play simple games in a virtual environment that gave a real-world perspective in which the avatar's hands were represented as if they were the volunteer's own. The volunteers were hooked up to a monitoring system which recorded the movements of muscles and nerve-endings firing. At a random point in the game, a lamp on the virtual table toppled onto the volunteer, and their reactions were monitored. Most made gestures with their arm suggesting they were trying to move it out of the way - despite there being no real risk. In a follow-up questionnaire, volunteers acknowledged they had behaved as if the virtual hand were their own, Steed reports.

When they repeated the experiment using an arrow to represent the arm, there was no empathic response. "The strength of the rubber hand illusion depends critically on the representation of the hand," says Steed.

The experiments suggest virtual reality may be helpful for people learning to use a prosthetic limb, says Kristina Caudle at the Brain Imaging Lab at Dartmouth College, Hanover, New Hampshire. Getting accustomed to moving and feeling ownership of a virtual limb might make it easier for an amputee to accept their prosthetic limb. She believes that human-like movement, as opposed to appearance, is the key for virtual limbs. "A human-like arm that couldn't bend any finger or arm joints would be much less likely to engender the rubber hand illusion."

Steed will present his work at the Virtual Reality 2010 conference in Waltham, Massachusetts, later this month.

http://www.newscientist.com/article/mg20527516.000-amputees-could-get-a-helping-hand-in-the-virtual-world.html

Meet X-woman: a possible new species of human

- 18:00 24 March 2010 by **Ewen Callaway**

Home sweet home. DNA analysis shows a finger bone discovered in the Denisova cave, southern Siberia, may be from a previously unrecognised, extinct human species (Image: Johannes Krause, Max Planck Institute for Evolutionary Anthropology)

The human family tree may be in for a dramatic rewrite. DNA collected from a fossilised finger bone from Siberia shows it belonged to a mysterious ancient hominid – perhaps a new species.

"X-woman", as the creature has been named, last shared an ancestor with humans and Neanderthals about 1 million years ago but is probably different from both species. She lived 30,000 to 50,000 years ago.

"This is the tip of the iceberg," says Chris Stringer, a palaeoanthropologist at the Natural History Museum in London who was not involved in the find. More hominids that are neither Neanderthal nor human are likely to be discovered in coming years, particularly in central and eastern Asia, he says.

Roaming Asia

Previously, anthropologists thought that Neanderthals and humans were the only hominids roaming Europe and Asia during the late Pleistocene. The discovery of 17,000-year-old *Homo floresiensis* – the "hobbit" – dispelled that notion, but many anthropologists look on H. floresiensis as an anomaly, isolated from the human–Neanderthal hegemony on the mainland.

The newly discovered creature, which probably lived in close proximity to humans and Neanderthals, suggests that things were not that simple. "The picture that's going to emerge in the next years is a much more complex one," says Svante Pääbo, a palaeogeneticist at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany.

Pääbo and colleague Johannes Krause discovered the specimen in the Denisova cave in southern Siberia, and sequenced DNA from its mitochondria. It is impossible to say what the creature would have looked like based on a single pinkie bone, so Pääbo and Krause are hesitant to call it a new species.

Though the creature's sex is not known, they are for now referring to her as X-woman because mitochondria are inherited maternally. "No one really knows what she would look like," Pääbo says.

X-woman's mitochondria differ from a human's at nearly 400 DNA letters; Neanderthals show only half as many differences.

African ancestry

This suggests that X-woman shared an African ancestor with the two other species somewhere between 780,000 and 1.3 million years ago, before striking north and east. This expansion is distinct from the one that occurred around 500,000 years ago that gave rise to Neanderthals, and from our own species' peregrinations from about 50,000 years ago.

The split seems too recent for X-woman to be related to *Homo erectus*, which began moving out of Africa around 2 million years ago.

However, Clive Finlayson, a palaeoanthropologist at the Gibraltar Museum, says the idea that there were just a handful of hominid migrations out of Africa is a vast oversimplification that ignores how other species expand their range over time. "To talk about one or two expansions from a particular region doesn't make any biological sense," he says. "There were probably hundreds, thousands of migrations out of Africa."

Though there is no complete skeleton for X-woman, her lineage could mean she is related to any number of more complete specimens recovered in Asia that don't neatly fit human or Neanderthal body patterns, says Stringer. "This new DNA work provides an entirely new way of looking at the still poorly understood evolution of humans in central and eastern Asia."

Nuclear DNA

Pääbo and his team are hesitant to speculate too much about X-woman's nature until they obtain DNA sequences from the nuclear genome's 3.1 billion letters. That project is already under way, and the first results should come within months. Pääbo's team will likely want X-woman's genome to answer the same questions they are asking of the Neanderthal genome, which is due for publication soon.

For instance, humans and Neanderthals share unique mutations in a gene linked to speech and language called *FOXP2*. If X-woman's sequence is complete enough, they will be able to determine if it possesses the same change – and potentially the capability for language.

There is no sign in X-woman's mitochondrial genome that her kind interbred with humans or Neanderthals, but the nuclear genome will offer a far better chance of finding out.

Neanderthal neighbours

Given the close proximity of Neanderthal remains dated to the same time and artefacts that appear to be human, interbreeding is not unlikely, Pääbo says. "Having in about the same time window three different forms [of hominids], increases the potential of all types of interactions, including genetic."

X-woman's mitochondrial DNA begins to paint a picture of what she was like, if only a blurry one. The protein-coding genes do not contain any surprising mutations that would cause disease.

Finlayson would love to link X-woman to other bones, and even stone technologies, though the chances of doing this may be slim. "Ideally we would like to have all that information, but we don't. The fact that we've got this genetic result is important, it's very important."

Pääbo hopes that such a connection will come through sequencing DNA from other Asian hominid fossils. But he, too, is prepared for the possibility that such bones may never turn up.

He sees in X-woman the beginning of a new way of understanding human history. "It gives another picture of our past, a molecular picture of the evolution of our genome" which he says is in some aspects even more conclusive than fossils.

Journal reference: *Nature*, DOI: 10.1038/nature08976

http://www.newscientist.com/article/dn18699-meet-xwoman-a-possible-new-species-of-human.html?DCMP=NLC-nletter&nsref=dn18699

Seabird evolved head feathers as sensory device

- 07:30 17 March 2010 by **Jeff Hecht**

Avoiding bumps in the night (Image: Ian Jones)

Attracting the opposite sex is not the only reason some birds have elaborate head ornamentation. Avoiding things that might bump your head in the dark is also important, at least for crested and whiskered auklets – seabirds famed for their decorative head feathers.

Charles Darwin suggested that elaborate display feathers were involved in sexual selection, and subsequent experiments confirmed his idea. In fact, elaborate feathers may have first evolved for touch sensing, with sexual selection coming later, says Ian Jones of Memorial University in St John's, Newfoundland, Canada, who did the research with Sampath Seneviratne, now at the University of British Columbia in Vancouver, Canada.

Crested and whiskered auklets nest in hollows on rocky islands in the remote northern Pacific Ocean. To see if their elaborate headdresses helped the birds make their way through the rocks to their nests at night, Jones and Seneviratne went to the Aleutian Islands, captured wild birds and put them in a darkened maze – but first they taped down some birds' decorative feathers.

Head banging

Infrared camera recordings (see video) showed that whiskered auklets (*Aethia pygmaea*) bumped their heads nearly three times more often if their long head feathers were taped down. Crested auklets (*A. cristatella*), suffered similarly with their crests taped down, but adding an artificial crest to the naturally unadorned least auklet (*A. pusilla*) – which also nests on the islands but in more open areas – didn't help these birds avoid bumps. Moreover, Sereviratne says, "birds with longer crests had greater difficulty in navigating inside the maze" when their crests were taped down.

The evolutionary origin of the birds' elaborate head feathers supports the idea that their first job was sensing, says Seneviratne. He adds that the auklets' crests evolved from filoplumes, long hair- or thread-like feathers that lack normal feather structures and are attached to pressure-sensitive cells so they can detect touch. In many birds these feathers are hidden by larger contour or wing feathers, but in the auklets they stick out proudly where they can detect obstacles.

The paper "is an interesting and probably a valid interpretation," says ornithologist Alan Brush at the University of Connecticut. He notes that some birds that catch insects on the wing have facial bristles thought to help them collect prey.

Journal reference: *Animal Behaviour*, DOI: 10.1016/j.anbehav.2009.12.010

http://www.newscientist.com/article/dn18662-seabird-evolved-head-feathers-as-sensory-device.html

Mind over matter? How your body does your thinking

- 24 March 2010 by **Anil Ananthaswamy**

Magazine issue 2753.

Let your body do the thinking (Image: Stephen Simpson/Image Bank)

"I THINK therefore I am," said Descartes. Perhaps he should have added: "I act, therefore I think."

Our ability to think has long been considered central to what makes us human. Now research suggests that our bodies and their relationship with the environment govern even our most abstract thoughts. This includes thinking up random numbers or deciding whether to recount positive or negative experiences.

"Advocates of traditional accounts of cognition would be surprised," says Tobias Loetscher at the University of Melbourne in Parkville, Australia. "They generally consider human reasoning to involve abstract cognitive processes devoid of any connection to body or space."

Until recently, the assumption has been that our bodies contribute only to our most basic interactions with the environment, namely sensory and motor processes. The new results suggest that our bodies are also exploited to produce abstract thought, and that even seemingly inconsequential activities have the power to influence our thinking.

Clues that our bodies may play a role in thought can be found in the metaphors we use to describe situations, such as "I was given the cold shoulder" or "she has an excellent grasp of relativity".

Thirty years ago, such observations led the linguist and philosopher George Lakoff at the University of California, Berkeley, together with philosopher Mark Johnson at the University of Oregon in Eugene, to propose "metaphor theory", the notion that we think of abstract concepts in terms of how our bodies function. Now evidence for the theory has started to trickle in. In 2008, for example, researchers found that people made to feel socially excluded reported feeling physically colder.

Now, Loetscher and his colleagues have linked our ability to think of random numbers - an example of abstract thought - to bodily movements.

His team asked 12 right-handed men to generate a string of 40 numbers, each between 1 and 30, in as random a sequence as possible. The researchers recorded the vertical and horizontal movements of the men's eyes as they spoke the numbers out loud to the beat of a metronome.

The team found that the eye movements could be used to predict the size of the next number before it was spoken. If a volunteer looked left and downwards, he would typically chose a number that was smaller than the previous number, and if he looked up and to the right, he chose a number that was larger (*Current Biology*, DOI: 10.1016/j.cub.2010.01.015). What's more, the extent to which he looked in a particular direction correlated with the extent to which the number was larger or smaller than the last. The result strongly suggests that abstract thought is tied to the physical movements of our bodies, says Loetscher.

But why would two seemingly unconnected things - apparently inconsequential eye movements and random numbers - be connected? Lakoff, who calls Loetscher's experiment a "particularly beautiful example" of embodied cognition, says it is to do with how our ability to think develops during childhood.

Lakoff reckons that the volunteers are making use of two sets of metaphors for imagining numbers: that up is more and down is less, and that right is more and left is less. Such metaphors would have been learned and hard-wired into the brain at a young age. A child watching a glass of water being filled up, or building blocks piled up, will learn that increasing height means greater quantity, for example. Separate brain regions that process quantity and height could then have been linked up in the growing brain, he says, leading to a hard-wired understanding of the metaphor that up is more. Similarly, right-handed people may learn to link right with more because that hand is dominant for them.

What's not clear from Loetscher's experiment, however, is if eye movements are driving the number selection, or if the number selection triggers particular eye movements.

To probe whether movements can drive thought, Daniel Casasanto of the Max Planck Institute for Psycholinguistics in Nijmegen, the Netherlands, turned to the metaphors that we use to speak of our moods. "We can hardly help mapping them onto a vertical, spatial schema, with the good end 'up' and the bad end 'down'," says Casasanto. "We talk of being high on life, or our mood taking an upswing, or feeling down in the dumps."

We map our moods onto a vertical, spatial schema, with the good end 'up' and the bad end 'down'

His team asked 24 students to move marbles from a box on a higher shelf to one on a lower shelf, or vice-versa, while talking about events that had positive or negative emotional significance - such as a time when they were proud or ashamed of themselves.

As it turns out, the students were significantly faster at retrieving and retelling stories that chimed with the metaphor implied by their actions. So if they were moving marbles upwards, they were faster at retelling stories with positive emotional content than those linked to negative emotions, and vice versa (*Cognition*, DOI: 10.1016/j.cognition.2009.11.002).

The results also led to a deeper question: does physical movement have the power to change not just the speed at which people talk, but also what they choose to talk - or even think - about? Casasanto's next experiment found that it does.

As the students were moving the marbles either up or down, they were asked neutral questions, such as "tell me what happened yesterday". In this task, the subjects were more likely to talk of positive happenings when they were moving marbles upwards, and narrate negative stories when moving marbles downwards. "Isn't that somewhat scary?" Casasanto asks.

They would talk positively when moving marbles upwards, but negatively when moving them down

If bodily motions really are driving our thoughts, Casasanto reasoned that people who use their bodies differently should have different thoughts. To test this, he turned to left-handed people. He asked 286 students, 40 of whom were left-handers, to make judgements about cartoon characters called Fribbles. A

page contained 12 pairs of Fribbles and members of each pair looked similar but had distinguishing features. In each pair one member was located to the right and the other to the left of a question.

The questions asked students to circle one of each pair based on their judgement of its personal characteristics, such as honesty, happiness, intelligence and attractiveness. They were either worded positively (which Fribble is the most attractive) or negatively (which Fribble looks less attractive).

The researchers found that 210 students showed a leftward or rightward preference and, of these, 65 per cent of the left-handers attributed positive attributes more often to the Fribbles on the left, while 54 per cent of the right-handers saw positive attributes in Fribbles to the right (*Journal of Experimental Psychology*, DOI: 10.1037/a0015854). "Righties think right is good, and lefties think left is good," Casasanto concludes.

This bias towards ascribing positive virtues to our dominant side may also be reflected in sayings such as "my right-hand man", or "two left feet", which may have arisen because most people are right-handed.

If the inherent characteristics of our bodies are responsible for our abstract thoughts - what does that mean for bodies that are drastically different to our own?

Lakoff says that if intelligent aliens exist, they may have very different bodies and therefore have developed very different abstract thought - even perhaps a different mathematical system. "People assume that mathematics is objective and that everybody will have the same math," says Lakoff. "But there is no reason to believe that."

Editorial: *It's not mind or body – it's both*

Will thinking machines need bodies?

If our ability for abstract thought is closely tied to our physical selves (see main story), will intelligent machines also need bodies?

It is a question that is being investigated. Roboticist Josh Bongard at the University of Vermont in Burlington says that the physical bodies of robots and the way that they interact with the environment might be key to creating the capability for intelligent, abstract thought. For a start, Cynthia Breazeal at the Massachusetts Institute of Technology and her team has already created anthropomorphic robots that use knowledge of their own bodies to infer the mental states of humans.

The development of such robots can also further the study of embodied cognition - the idea that even abstract thoughts are rooted in the physical world, says Bongard. "Robots provide a unique perspective on embodied cognition because we can perturb any part of a robot - its body or its brain - and observe the impact on behaviour. This is something that is usually not possible with animals or people."

But Kevin Gold of Wellesley College in Massachusetts is more circumspect about whether machines that think will need bodies. He argues that machines endowed with mathematical models of reasoning and abstract thinking - but not bodies - might still be highly intelligent. "It's still an open question whether we need to cleave closely to human cognition to make human-level intelligence," he says.

http://www.newscientist.com/article/mg20527535.100-mind-over-matter-how-your-body-does-your-thinking.html

Where consciousness comes from

- 22 March 2010 by **Anil Ananthaswamy**

Magazine issue 2752.

Brain chat (Image: Studio Tonne/Agency Rush.com)

STEVEN LAUREYS will always remember the 21-year-old woman who had had a stroke. She had been taken to a hospital in Liège, Belgium, where her condition worsened rapidly. She soon lost all motor movement, even the ability to open her eyes. Her prognosis looked bleak, so her doctors turned to Laureys, a neurologist, for a final opinion before turning off her ventilator.

By recording her brain activity as she was asked to respond to simple tasks, such as counting the number of times her name was spoken in a random string of first names, Laureys confirmed that the woman was aware of her surroundings, and so she remained on life support (*Neurocase*, vol 15, p 271). Clearly that was the right decision: a year later she had recovered enough to be discharged from hospital. "It was only technology that permitted us to show that she was conscious," says Laureys of the University of Liège.

There had, however, been another clue to the patient's active mental state - too tentative to hold any weight in the diagnosis, but nevertheless significant. Laureys had observed a signature of coordinated neural activity, present in the resting patient, which seems to appear in the brain of anyone who is conscious. While such readings may one day provide a better diagnosis of coma patients, their ultimate implications may be even more profound, providing evidence for a 30-year-old theory that claims to explain consciousness itself.

Consciousness is one of neuroscience's long-standing mysteries. At its most basic, it is the simple question of why we become aware of some thoughts or feelings, while others lurk unnoticed below conscious perception. Is there a single module in the brain, a "seat of consciousness" if you like, that is responsible for awareness? Or is it a result of more complicated activity across a number of brain regions? Solve this, and we may be a little closer to explaining the more esoteric aspects of our complex internal experience.

Now one theory that claims to do just that is rapidly gaining weight, with strong evidence from research such as Laureys's to back up its predictions. The idea, dubbed the global workspace theory, was first

floated in 1983 by Bernard Baars of The Neuroscience Institute in San Diego, California. He proposed that non-conscious experiences are processed locally within separate regions of the brain, like the visual cortex. According to this theory, we only become conscious of this information if these signals are broadcast to an assembly of neurons distributed across many different regions of the brain - the "global workspace" (see diagram) - which then reverberates in a flash of coordinated activity. The result is a mental interpretation of the world that has integrated all the senses into a single picture, while filtering out conflicting pieces of information (see "Neural conflicts").

The 'global workspace' integrates the senses into a single picture, filtering out conflicting information

Lack of compelling evidence left the idea languishing on the shelf. Indeed, it took more than 15 years for the theory to prove its mettle, when Stanislas Dehaene of the French National Institute of Health and Medical Research (INSERM) in Gif sur Yvette and Jean-Pierre Changeux of the Pasteur Institute in Paris updated Baars's model with the latest findings on the brain's wiring. Dehaene's group had already shown that distant areas of the brain are connected to each other and, importantly, that these connections are especially dense in the prefrontal, cingulate and parietal regions of the cortex, which are involved in processes like planning and reasoning.

Considering Baars's theory, the team suggested that these long-distance connections may be the architecture that links the many separate regions together during conscious experience. "So, you may have multiple local processes, but a single global conscious state," says Dehaene. If so, the areas with especially dense connections would be prime candidates for key regions in the global workspace.

The team put the theory to the test in 2005 by studying a neurological phenomenon known as "inattention blindness", where we fail to see things that are before our eyes. They presented their volunteers with two strings of letters in quick succession. In some instances, they had to answer a question about the first stimulus just after they had seen it, which caused them to miss the second string of letters and only perceive them non-consciously.

By placing 128 electrodes on their volunteers' scalps, Dehaene's team teased out the differences in neural activity when they were conscious of the second stimuli, and when it escaped their attention. For the first 270 milliseconds the neural activity was roughly the same in both cases. After that there were stark differences. The neurons quickly stopped firing if the letters were perceived unconsciously. But when the subjects were conscious of the letters, the neurons in a number of brain regions thought to be part of the global workspace, including the frontal and parietal lobes, exploded into synchronous activity (*Nature Neuroscience*, vol 8, p 1391). "Suddenly, your brain ignites with additional activation, particularly in the frontal lobes, when you are conscious," says Dehaene.

This explosion of coordinated activity was just what Baars had proposed, corresponding to the widespread "broadcast" of signals across the global workspace that he predicted would accompany conscious perception.

Encouraged by this preliminary evidence, Dehaene's team decided to put the global workspace model through its paces again. This time, volunteers were shown a number (the target), which appeared at one of four locations on a computer screen. After a random delay, the computer blanked out the original number and placed four letters around the original location. If the delay was less than 50 ms, the change becomes too confusing for the brain to process, and it cannot consciously detect the target. Any longer than 50 ms, though, and the subjects were aware of the target.

A signature of consciousness

The team measured the subjects' neural activity with scalp electrodes as they completed the task. As expected, conscious perception coincided with a burst of activity in some of the regions implicated in the global workspace model, spanning the frontal, parietal and temporal brain regions. What's more, the

researchers again found a 300 ms delay between presenting the stimuli and witnessing this explosion of neural activity (*PLOS Biology*, vol 5, p e260).

This 300 ms delay is one of the theory's key predictions, since you would expect any signals to take a while, relatively speaking, to reach the different parts of the global workspace, before we are fully aware of perceiving something.

Further evidence arrived last year, when Dehaene's team studied people with damage to their prefrontal cortex, which should disrupt the long-distance connectivity in the global workspace. They would therefore take significantly longer to become conscious of the information, as it would have to find its way through alternative, longer routes. And that's exactly what they found, with the patients taking around 18 ms longer to become aware of the stimuli (*Brain*, vol 132, p 2531). The same was true for people with multiple sclerosis, who also have extensive damage to their nerve connections, particularly in the prefrontal cortex (*NeuroImage*, vol 44, p 590).

Compelling as these results are, the real proof of the pudding for any theory in neuroscience comes from precise measurements of brain activity taken by electrodes implanted in the brain - the most accurate technique available. Such evidence arrived in 2009, when Raphael Gaillard, who was working in Dehaene's lab and is now at the University of Cambridge, and his colleagues took the opportunity to test the conscious perception of patients with epilepsy, who had electrodes implanted in various regions of their brains as part of exploratory surgery.

As in the previous experiments, brain activity during both conscious and unconscious perception was similar for the first 300 ms, followed by increased and coordinated activity in distant parts of the brain whenever something was perceived consciously. Crucially, although the electrodes had been placed in areas relevant to the treatment of epilepsy - and not specifically areas proposed to be important in conscious perception - 68 per cent of the electrodes still recorded a significant response to the conscious stimulus. This suggests that the global workspace may in fact occupy a significant chunk of the cortex.

It was the most compelling evidence yet for the "signature of consciousness" predicted by the global workspace theory. Baars was elated. "I'm thrilled by these results," he said at the time. "It is the first really solid, direct evidence for the notion of conscious global access, or global broadcasting." More detailed experiments have supported these results by looking at the activity of single neurons (see "Consciousness, one neuron at a time").

Following these advances, researchers like Dehaene and Laureys are now attempting to ask more nuanced questions thrown up by the global workspace theory. An important question from a clinical perspective, for example, is how the signatures of consciousness might differ between people with brain damage and the healthy population.

Laureys thinks he has some answers. Certain regions of the brain's global workspace, dubbed the default mode network (DMN), are active even when we are resting and not concentrating on any particular task. If the global workspace really is essential for conscious perception, Laureys's team predicted that the activity of the DMN should be greatest in healthy volunteers and in people with locked-in-syndrome, who are conscious but can only move their eyes, and much less active in minimally conscious patients. Those in a vegetative state or in a coma should have even less activity in the DMN.

The researchers found just that when they scanned the brains of 14 people with brain damage and 14 healthy volunteers using fMRI. In a paper published in December 2009, they showed that the activity of the DMN dropped exponentially starting with healthy volunteers right down to those in a vegetative state (*Brain*, vol 133, p 161). "The difference between minimally conscious and vegetative state is not easy to make on the bedside and four times out of 10 we may get it wrong," he says. "So this could be of diagnostic value."

Even more important, Laureys thinks that a person's DMN could one day determine their prognosis. "I'm predicting those with a higher level of DMN activity will be the ones who will recover from their coma, or vegetative states, or minimally conscious states," he says.

Those with a higher level of activity in certain brain areas will be the ones who recover from their coma

He cautions that neuroscientists have to be "humble and honest" in their search for the neural basis of consciousness, since many questions remain. We still don't know the exact chain of activity within the global workspace, for example, or what information the brain regions are communicating to each other. "These neurons are electrical units in a chemical soup, and we have not yet decoded their language," says Laureys.

Then there are the philosophical questions to consider. Philosophers like David Chalmers at the Australian National University in Canberra, tend to divide the study of consciousness into the so-called hard and easy problems. The easy problem looks at correlations between brain activity and different states of consciousness - something the global workspace theory is beginning to crack. The hard problem, meanwhile, probes the deeper question of how these patterns of electrical activity could ever give rise to the many subjective facets of our internal life that we experience as conscious human beings.

Indeed, philosophers like Chalmers remain unconvinced that we are even close to approaching a solution to the hard problem. Dehaene, however, predicts that it will all fall into place once we have a comprehensive global workspace theory to work with. "Once the easy problem is solved, there will be no hard problem," he says.

Consciousness, one neuron at a time

Rodrigo Quiroga at the University of Leicester, UK, may be famous for identifying the individual neurons that fire in response to the actress Jennifer Aniston, but his technique of using very small and precise electrodes to record the activity of single neurons has unearthed even greater treasures: patterns of single neuron activity that result in either non-conscious or conscious perception.

Quiroga's team worked with people with epilepsy who were undergoing surgery to treat their condition. The researchers were interested in neurons in the medial temporal lobe (MTL), which is known to be involved in the transformation of perceptions into memories. Since you would expect conscious perceptions to be stored in long-term memory, the group suspected the MTL may be part of the global workspace network underlying consciousness.

As with other such tests, the patients were shown a target image followed by a mask, another image that is meant to confuse the brain's perception of what it has just seen. Importantly, the delay between the target image and the mask controls whether the subject becomes conscious of the target or not. When the volunteers reported perceiving the image, Quiroga's team found that certain MTL neurons fired about 300 milliseconds after the target stimulus. The same neurons never fired at that late stage when the stimulus was processed non-consciously (*Proceedings of the National Academy of Sciences*, vol 105, p 3599). This all-or-nothing response of single neurons is predicted by the global workspace model, providing some of the strongest evidence for the theory.

Although it's not yet known whether all the neurons in the relevent brain areas are roped into the global workspace, or just a subset, the ease with which Quiroga found them does at least suggest they are very prevalent.

Neural conflicts

The global workspace model of consciousness, proposed by Bernard Baars of The Neuroscience Institute in San Diego, California, argues that non-conscious perceptions are processed in relatively small, local

areas of the brain. It is only when this information is broadcast to a network of neural regions, the "global workspace", that we become conscious of whatever it is that we are experiencing. That, of course, relies on the ability of the brain to prevent conflicting messages from separate regions of the brain from being broadcast to the global workspace, which would confuse our picture of the world. "The reason why one needs a single coherent interpretation is because you need to broadcast it, and you don't want to broadcast competing messages at the same time," says Baars.

This could have been a deal breaker for Baars's theory, but luckily so-called binocular rivalry experiments provide good evidence that the brain does indeed actively select which information to send to our consciousness. Normally, both our eyes see the same scene, so the brain can easily combine the two monocular inputs into a coherent picture. But present the left eye with an image that's dramatically different from what the right eye is seeing, and experiments have revealed the brain resolves this conflict by allowing you to only see one or the other image at any one time. In other words, you are only conscious of either the left-eye image or the right-eye image, but never both simultaneously.

Anil Ananthaswamy is a consulting editor for New Scientist

http://www.newscientist.com/article/mg20527520.400-firing-on-all-neurons-where-consciousness-comes-from.html

Fingerprint evidence to harden up at last

- 22 March 2010 by **Linda Geddes**, Seattle
- Magazine issue 2752.

Same finger, different prints

HOW courts use fingerprints, the icons of forensic science, is on the cusp of a much-needed revolution. In response to claims that their use is often unscientific, statistical tools are now being designed to determine the probability that "matches" between a suspect and prints from a crime scene are spurious.

If used in court, these tools could vastly reduce the number of people convicted of crimes they didn't commit. But their use may also face resistance from some fingerprint analysts who are reluctant to give up the long-held, but incorrect, notion that crime-scene fingerprints could only have originated from one person.

Since their first use in 1892 (see timeline), fingerprints have formed the heart of many criminal trials. But recently the realisation has dawned that two prints deemed a match by an expert may in fact come from two separate people, due to human error, coincidence, low-quality prints or a mixture of all three.

In 2005, Itiel Dror and Ailsa Peron of the University of Southampton, UK, showed that fingerprint examiners could come to different conclusions about whether two fingerprints matched when presented with the same prints under different circumstances. Fingerprints have also led to some high-profile mistakes. In 2004, they led the FBI to incorrectly identify Oregon lawyer Brandon Mayfield as a suspect in the terrorist bombings in Madrid, Spain (try our fingerprints quiz to see how well you do).

But fingerprint analysts have been slow to acknowledge the problem, and still present matches to courts with no accompanying error rate - a state of affairs that shocked the US National Academy of Sciences (NAS), which presented a report on US forensic science last year. "The NAS committee was horrified by the testimony of the fingerprint analysts," says Thomas Bohan, who stepped down as president of the American Academy of Forensic Sciences (AAFS) last month. "[One] guy came in and said: 'It's infallible. It has a zero error rate. If we say it's a match, there's no one else in the universe it could be.'"

The NAS report, which called for new research to assess fingerprint reliability, shook forensic scientists. A year on, steps are now being taken to make the use of such evidence more scientific.

Last month the US National Institute of Justice commissioned the School of Law at the University of California, Los Angeles, to investigate error rates associated with fingerprint analysis. "Even though we have been using fingerprint evidence in court for almost a hundred years, not nearly enough is known

about how often fingerprint examiners might make mistakes, or in what circumstances," says study leader Jennifer Mnookin. The plan is for fingerprint analysts and defence lawyers to use the results of this study to give judges and juries a clearer idea of the accuracy of fingerprint evidence.

The attitudes of forensic scientists are also changing. In a 2009 survey, 75 per cent of US forensic scientists believed that innocent people may be in jail or on death row because of fingerprint errors. That's up from 56 per cent in 2007, says Samantha Neal of West Virginia University Forensic Science Initiative in Morgantown, who presented the results at a recent AAFS meeting in Seattle. "I think the NAS report has had an impact on the perception of fingerprint analysis," she says.

Some analysts are now taking matters into their own hands. Cedric Neumann at the UK's Forensic Science Service in Birmingham and his colleagues have created a program that calculates the statistical weight that should be attached to a given fingerprint match. Such statistics are already used when a DNA match is presented in court.

Computer programs, such as those used by US immigration, can already match a scanned fingerprint against a database to confirm people are who they say they are. But these require good-quality prints, whereas crime-scene prints are frequently smudged or only exist in partial form. Other programs are used to pull up possible matches from a database of criminal suspects, but a human analyst ultimately decides whether there is a match.

Saying a fingerprint is a match or not doesn't represent the actual weight of the evidence

This is where problems can creep in. Analysts will pick a number of features from a fingerprint and compare these with the second print, declaring it either a match, an exclusion (a non-match) or inconclusive. But not all prints are of equal quality.

"Saying something is excluded or included doesn't represent the actual weight of the evidence," says Glenn Langenburg, a certified fingerprint analyst with the Minnesota Bureau of Criminal Apprehension, who has been training US analysts to use Neumann's program.

Analysts are also under no obligation to document how they reached a conclusion, so the level of accompanying information varies between labs from a little to extensive, Langenburg says.

To solve these problems, Neumann's team asked 40 people to print their fingers 704 times. Then they created a program that uses this data, together with fingerprints taken from 12,000 people, to come up with a probability that a crime scene print matches a given suspect's.

"It asks 'what proportion of [features] from the suspect look like the crime scene mark, and what proportion from fingers in the general population look like the crime scene mark?'" says Neumann, who presented the program at the AAFS meeting. "Instead of going to court and saying: 'It's him because I say so, and I have 25 years' experience and I've never been wrong', I can say, 'It's him because the data supports it and here's how I came to that conclusion'," he says.

Justice Joseph Maltese of the New York Supreme Court agrees that if validated, such a model would be a welcome addition to the courtroom. "'I know it's a match because you say it's a match' isn't good enough today," he says. "If you could buttress that with some statistical data that would be very useful."

There are still some kinks to iron out. One is that the probability given by the program depends on the number of features an analyst highlights as "of interest", which can vary widely between analysts. "You could have very confused juries. We need a system to help us select features reliably, routinely and reproducibly," says Langenburg.

One such tool is being developed by Virginia-based company, Noblis, in consultation with the FBI. Although the exact details are not yet public, the tool maps fingerprints for regions of high and low reliability, flagging up the areas that analysts should focus on. "It's very promising," says Christophe Champod of the University of Lausanne in Switzerland, who is working on a program similar to Neumann's.

Even if fingerprint analysis can be made more consistent, there's also the issue of what happens in court. "It will be interesting to see what jurors make of it," says Christine Funk of the State of Minnesota Board of Public Defense. "For my whole career, it has always been definitive that a fingerprint either belongs to an individual or it doesn't. For me as a defence lawyer it says: 'this isn't an absolute certainty'."

Langenburg agrees that a statistical model may make it easier for defence lawyers to undermine fingerprint evidence, a big fear for some analysts. "They have been taught not to open the door for the defence," he says. But if analysts are serious about transforming their field into a scientific discipline, that's a risk they may have to take.

http://www.newscientist.com/article/mg20527522.600-fingerprint-evidence-to-harden-up-at-last.html

Extreme empaths

- 15 March 2010 by **Helen Thomson**

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Painful to watch (Image: Everett Collection/Rex Features)

HORROR films are simply a disconcerting watch for the majority of us, but for Jane Barrett they are literally torturous. She writhes in agony whenever the actors on the screen feel pain. "When I see violence in films I have an extreme reaction," she says. "I simply have to close my eyes. I start to feel nauseous and have to breathe deeply."

She is just one of many people who suffer from a range of disorders that give rise to "extreme empathy". Some of these people, like Barrett, empathise so strongly with others that they experience the same physical feelings - whether it's the tickle of a feather or the cut of a knife. Others, who suffer from a disorder known as echopraxia, just can't help immediately imitating the actions of others, even in inappropriate situations.

Far from being mere curiosities, understanding these conditions could have many pay-offs for neuroscience, such as illuminating conditions like phantom pain. They may even help answer the age-old question of whether empathy really is linked to compassion.

There is a general consensus that empathy-linked conditions arise from abnormalities in the common mechanisms for empathy found in all humans: although few of us experience sensations as powerful as Barrett's, we all wince at a brutal foul on the football field and feel compassion for someone experiencing grief. Many studies have suggested that our capacity for empathy arises from a specific group of neurons, labelled mirror neurons. First discovered in macaque monkeys, they are situated in and around the premotor cortex and parietal lobe - regions that span the top of the brain near the middle of the head. These neurons fire both when you perform an action and when you see someone else perform that action.

Although the challenges inherent in placing electrodes in people's brains have so far made it difficult to prove convincingly that individual neurons also act like this in humans, fMRI scans have supported the idea that certain populations of neurons do seem to behave in this mirroring fashion.

Compulsive imitation

Put simply, this means that at some level we mentally imitate every action we observe, whether it's a somersault or a look of disgust. The popular theory has it that this imitation allows us to put ourselves in the place of those around us, to better interpret their behaviour. This hypothesis has been consistently supported by numerous tests, with empathy scores strongly correlating with the behaviour of the brain's mirror-circuits. "How empathetic we are seems to be related to how strongly our mirror neuron systems are activated," says Christian Keysers, a neuroscientist at the University of Groningen in the Netherlands.

Yet if our brains are primed to live out every experience we observe, why is it that we aren't all wandering around manically imitating each other's actions and absorbing their feelings the whole time? It's here that hyper-empathic people, who do exhibit some of these symptoms, enter the picture.

Those with echopraxia, for example, compulsively mimic the actions of everyone they come across, and with a speed and abruptness that suggests it's a reflex rather than premeditated. As a result, cognitive neuroscientist Nina Bien at Maastricht University in the Netherlands had long suspected that there must be some inhibition mechanism that prevents us from following through our brain's mental rehearsals, one that is absent in echopraxic people.

To put this idea to the test, Bien and her colleagues attempted to recreate the symptoms of echopraxia using transcranial magnetic stimulation (TMS), which can temporarily disturb the electrical activity of neurons in targeted brain areas, preventing them from functioning normally. Figuring that the TMS may be able to turn off their participants' inhibition mechanism, the team showed the subjects specific finger movements, while "deactivating" various parts of their brains. The team struck gold when they targeted the left frontal region of the brain, an area known to be involved in motor function. "When we disrupted this area, people started to show an increase in imitative behaviour," Bien says (*Cerebral Cortex*, vol 19, p 2338).

Could something similar be happening in the other conditions of hyper-empathy? Mirror-touch synaesthetes, for example, cannot watch someone else experience a tactile sensation without feeling it themselves. "If I see someone being slapped it registers in my mind as if I was being touched on my own body," says Fiachra Mckeown, a mirror-touch synaesthete from Ireland.

A squeamish feeling at certain sights is hardly unusual, but cognitive neuroscientists Michael Banissy and Jamie Ward of University College London, showed that synaesthetes like Mckeown have genuine difficulty in telling their direct physical experience from their synaesthetic one. The pair asked mirror-touch synaesthetes to report the location of a gentle prod to either their cheeks or hand. At the same time as being touched themselves, the subjects also observed another person being touched on either the cheek or the hand, though not necessarily in precisely the same place as their own stimulation. As expected, the mirror-touch synaesthetes confused the observed and experienced stimulation significantly more than non-synaesthetes.

What could be causing this confusion? One theory has it that there is a threshold of mirror-neuron activation that must be exceeded before you consciously feel the sensation yourself, and that mirror neurons in the synaesthetes exceed this threshold for some reason. Banissy is not convinced by this. "The problem is, if it's a conscious threshold, now and again you might expect that it would happen to the rest of us," he says, "and I'm not sure that people experience the world like this." Others proposed that touch synaesthesia arises from heightened connectivity between sensory and motor regions of the brain, or a malfunctioning inhibitory mechanism akin to that in echopraxia.

Whose body is it anyway?

There is another intriguing possibility. When mirror-touch synaesthetes observe touch, they have increased activation in their anterior insula (AI) - activity which the rest of the population lack under those circumstances (*Brain*, vol 128, p 1571). "This is the only region that differs between these synaesthetes and you and I," says Banissy. Since the AI is thought to aid awareness of our inner body, allowing us to experience a sense of body ownership, "the activity in the anterior insula might lead to observed touch in others being misattributed as touch to the synaesthete's own body," he says.

While it is doubtless an inconvenience, most mirror-touch synaesthetes don't appear to mind the condition, never having known life to be any different. "We have one mirror-touch synaesthete who is a nurse. She says she is quite good at shutting off the experience when she's at work," says Banissy.

For some, though, the symptoms are far more severe. "When I witness distress, I start to get this familiar tingling feeling in my phantom leg," says Barrett, who since having her leg amputated suffers from phantom-limb pain when she sees another person suffering. "I also get a general feeling of disquiet and almost helplessness."

Barrett suffers from a highly specific form of mirror-touch synaesthesia characterised by strong reactions to the sight of painful stimuli. The first reported case of pain synaesthesia came in 2001, when a woman described to a group of neuroscientists how her late husband had felt acute pain whenever he observed her in distress: "If I slightly knocked my finger... he would immediately grasp his own finger and say 'don't do that'; he actually felt it," she said at the time. Inspired by this unusual case, neuroscientists have now discovered many others who report similar symptoms.

If I slightly knocked my finger, he would immediately grasp his own: he actually felt it

The simple existence of people with this type of synaesthesia has informed the debate on how the rest of us deal with other people's pain. There was previously a great deal more scepticism that the brain subconsciously mirrors the physical aspect of another's pain - in the same way that it mimics another's movements - because early fMRI scans had suggested only the parts of the brain involved in processing emotion react when we see someone's physical suffering.

But fMRI can be fairly imprecise in pinning down subtle changes in brain activity, so researchers have since looked to other experiments for clues to the existence of the physical aspects of empathy. For example, cognitive neuroscientist Alessio Avenanti at the University of Bologna in Italy has shown that the automatic nervous activity in the hand muscles of participants watching a needle pierce another's hand is very similar to the activity triggered by a needle piercing their own hand. It's by no means conclusive, but the results strongly suggested to Avenanti that the same circuits within the brain must be responsible for sending out the signals to the hand in both scenarios.

Evidence from pain synaesthetes would seem to lend some weight to the idea that the brain mirrors the physical aspects of pain, since it would make sense that their physical sensations would arise through some malfunctioning of this mirror system. "It is highly plausible that [sensitivity] for pain is common in all of us, and varies in response to seeing or thinking about another in pain, from tingling through to the actual perception of pain," says Bernadette Fitzgibbon at Monash University in Melbourne, Australia.

There is, however, one key difference between pain synaesthesia and other types of hyper-empathy. Besides having a heightened sensitivity to another's pain, all the documented pain synaesthetes shared one other characteristic - they had all suffered traumatic pain before developing the condition. Many are amputees, and their phantom limb is the site of the pain they feel when faced with another's distress (*Neuroscience and Biobehavioural Reviews*, vol 34, p 500).

Since the condition is not present from birth, Fitzgibbon suggests it might have been the painful experience that somehow heightened their sensitivity to another's pain. When we are threatened, our body naturally becomes hypervigilant to pain: our pain threshold lowers, making even small triggers painful, and our pain response increases, making every injury feel larger than it otherwise would. Pain synaesthesia may be a symptom of an abnormal, ongoing hypervigilance that reduces the natural inhibition of the mirror-neuron system, making the people afflicted with it more sensitive to other potentially dangerous situations.

That may be why Barrett finds the sound of her husband's power tools distressing - since they are potentially threatening objects - and it could also explain symptoms felt by Anton Alers, who has suffered from pain synaesthesia since losing his right leg to gangrene. As you might expect from somebody whose body is stuck with a hypervigilant response, even scenes from light-entertainment TV shows can bring sharp flashes of pain to his phantom limb: "I have painful experiences watching programmes such as the *Funniest Home Videos* TV series, which often shows impact-related events."

Even power tools and light-entertainment TV shows can bring sharp flashes of pain to phantom limbs

Taken together, these findings support the idea that we all lie somewhere on a scale of empathy dictated by the activity of our mirror neuron systems, which throws up the question of whether we could manipulate this activity to help certain disorders.

People who have experienced trauma such as severe burns or post-traumatic stress disorder may particularly benefit from this knowledge. That's because, in these people, the same hypervigilance that may spark pain synaesthesia might instead lead to some kinds of phantom pain not associated with any physical stimulus. "Ultimately, by elucidating the underlying neural mechanisms we may be able to improve pain-management strategies and trauma counselling," says Fitzgibbon. The benefits of understanding empathy in autism could also be immense, she adds, if it leads to better diagnosis and support.

One approach to manipulate our mirror systems might involve TMS, which could stimulate or reduce activity in cortical regions that are under or overactive. Another could be behavioural therapy, since many touch-synaesthetes report having some ability to consciously reduce their responses, and other evidence suggests that phantom-limb pain can be reduced through visual tricks.

Beyond medicine, why not increase the empathy in all of us? Popular opinion, after all, holds that empathy leads to kindness and compassion. Shirley Fecteau at Harvard Medical School in Boston, for example, has started studying the link between empathy and psychopathic traits. She conducted an experiment similar to Avenanti's study of subjects' physical reaction to videos of painful stimuli. Participants were also asked to complete a psychopathic personality inventory (PPI), a questionnaire designed to probe psychopathic traits such as egocentricity, fearlessness, and the ability to influence and manipulate others.

The result? Participants who scored highest on one particular aspect of PPI, cold-heartedness, showed the least physical identification with the painful videos. "They don't have that sense of putting themselves in the situation," says Fecteau.

Still, manipulating the brain's mirror response to increase compassion and empathy could be unpleasant, warns Fecteau, exposing someone to painful experiences they might prefer not to feel. As many hyper-empathisers would testify, it's not always comfortable walking in another's shoes.

Get in touch: If you experience pain synaesthesia, Bernadette Fitzgibbon would like to hear from you. You can contact her here

Sharing pain you've never felt

If you've never felt pain, can you empathise with someone else's? Nicolas Danziger, a clinical neurophysiologist at the Pitié-Salpêtrière Hospital in Paris, France, and his colleagues, believe so.

They chose to study subjects with congenital insensitivity to pain (CIP), a rare condition in which a person cannot feel pain. It is caused by the irregular growth of pain fibres in their nervous system or faults in the neurons that transmit pain through the body.

To find out whether people with CIP can empathise with others in pain, Danziger used fMRI to compare brain activation in 13 people with CIP and 13 healthy controls, while they observed pictures of body parts in painful situations or pictures of pained facial expressions. The participants were asked to actively imagine how each pictured person felt. They also took written tests to measure their capacity for empathy.

Perhaps surprisingly, fMRI revealed that CIP participants showed normal responses to observed pain in the anterior insula (AI) and the anterior mid-cingulate cortex (aMCC) when observing all of the painful situations. These areas are normally activated in response to one's own pain, and also when viewing someone else in pain, suggesting the participants related to the injuries in some way (*Neuron*, vol 61, p 203).

It's unclear whether they were really empathising in the same way as the controls, though, since these brain areas also react to emotional upset. This ties in with the fact that the CIP group also exhibited greater activity than controls in key midline brain structures, which are more specifically involved in emotional responses. This suggests they used their own experiences of emotional distress to relate to physical sensations they had never experienced themselves.

Helen Thomson is New Scientist's careers editor

http://www.newscientist.com/article/mg20527511.700-we-feel-your-pain-extreme-empaths.html

Where species come from

- 10 March 2010 by **Bob Holmes**

Magazine issue 2751.

An accident of fate? (Image: Richard Wilkinson)

ANTARCTIC fish deploy antifreeze proteins to survive in cold water. Tasty viceroy butterflies escape predators by looking like toxic monarchs. Disease-causing bacteria become resistant to antibiotics. Everywhere you look in nature, you can see evidence of natural selection at work in the adaptation of species to their environment. Surprisingly though, natural selection may have little role to play in one of the key steps of evolution - the origin of new species. Instead it would appear that speciation is merely an accident of fate.

So, at least, says Mark Pagel, an evolutionary biologist at the University of Reading, UK. If his controversial claim proves correct, then the broad canvas of life - the profusion of beetles and rodents, the dearth of primates, and so on - may have less to do with the guiding hand of natural selection and more to do with evolutionary accident-proneness.

Of course, there is no question that natural selection plays a key role in evolution. Darwin made a convincing case a century and a half ago in *On the Origin of Species*, and countless subsequent studies support his ideas. But there is an irony in Darwin's choice of title: his book did not explore what actually triggers the formation of a new species. Others have since grappled with the problem of how one species becomes two, and with the benefit of genetic insight, which Darwin lacked, you might think they would have cracked it. Not so. Speciation still remains one of the biggest mysteries in evolutionary biology.

Even defining terms is not straightforward. Most biologists see a species as a group of organisms that can breed among themselves but not with other groups. There are plenty of exceptions to that definition - as with almost everything in biology - but it works pretty well most of the time. In particular, it focuses attention on an important feature of speciation: for one species to become two, some subset of the original species must become unable to reproduce with its fellows.

How this happens is the real point of contention. By the middle of the 20th century, biologists had worked out that reproductive isolation sometimes occurs after a few organisms are carried to newly formed lakes or far-off islands. Other speciation events seem to result from major changes in chromosomes, which suddenly leave some individuals unable to mate successfully with their neighbours.

It seems unlikely, though, that such drastic changes alone can account for all or even most new species, and that's where natural selection comes in. Species exist as more or less separate populations in different areas, and the idea here is that two populations may gradually drift apart, like old friends who no longer take the time to talk, as each adapts to a different set of local conditions. "I think the unexamined view that most people have of speciation is this gradual accumulation by natural selection of a whole lot of changes, until you get a group of individuals that can no longer mate with their old population," says Pagel.

Until now, no one had found a way to test whether this hunch really does account for the bulk of speciation events, but more than a decade ago Pagel came up with an idea of how to solve this problem. If new species are the sum of a large number of small changes, he reasoned, then this should leave a telltale statistical footprint in their evolutionary lineage.

Whenever a large number of small factors combine to produce an outcome - whether it be a combination of nature and nurture determining an individual's height, economic forces setting stock prices, or the vagaries of weather dictating daily temperatures - a big enough sample of such outcomes tends to produce the familiar bell-shaped curve that statisticians call a normal distribution. For example, people's height varies widely, but most heights are clustered around the middle values. So, if speciation is the result of many small evolutionary changes, Pagel realised, then the time interval between successive speciation events - that is, the length of each branch in an evolutionary tree - should also fit a bell-shaped distribution (see diagram). That insight, straightforward as it was, ran into a roadblock, however: there simply weren't enough good evolutionary trees to get an accurate statistical measure of the branch lengths. So Pagel filed his idea away and got on with other things.

Then, a few years ago, he realised that reliable trees had suddenly become abundant, thanks to cheap and speedy DNA sequencing technology. "For the first time, we have a large tranche of really good phylogenetic trees to test the idea," he says. So he and his colleagues Chris Venditti and Andrew Meade rolled up their sleeves and got stuck in.

The team gleaned more than 130 DNA-based evolutionary trees from the published literature, ranging widely across plants, animals and fungi. After winnowing the list to exclude those of questionable accuracy, they ended up with a list of 101 trees, including various cats, bumblebees, hawks, roses and the like.

Working with each tree separately, they measured the length between each successive speciation event, essentially chopping the tree into its component twigs at every fork. Then they counted up the number of twigs of each length, and looked to see what pattern this made. If speciation results from natural selection via many small changes, you would expect the branch lengths to fit a bell-shaped curve. This would take the form of either a normal curve if the incremental changes sum up to push the new species over some threshold of incompatibility, or the related lognormal curve if the changes multiply together, compounding one another to reach the threshold more quickly.

To their surprise, neither of these curves fitted the data. The lognormal was best in only 8 per cent of cases, and the normal distribution failed resoundingly, providing the best explanation for not a single evolutionary tree. Instead, Pagel's team found that in 78 per cent of the trees, the best fit for the branch length distribution was another familiar curve, known as the exponential distribution (*Nature*, DOI: 10.1038/nature08630).

Happy accidents

Like the bell curve, the exponential has a straightforward explanation - but it is a disquieting one for evolutionary biologists. The exponential is the pattern you get when you are waiting for some single, infrequent event to happen. The time interval between successive telephone calls you receive fits an

exponential distribution. So does the length of time it takes a radioactive atom to decay, and the distance between roadkills on a highway.

To Pagel, the implications for speciation are clear: "It isn't the accumulation of events that causes a speciation, it's single, rare events falling out of the sky, so to speak. Speciation becomes an arbitrary, happy accident when one of these events happens to you."

All kinds of rare events could trigger the accident of speciation. Not just physical isolation and major genetic changes, but environmental, genetic and psychological incidents. The uplift of a mountain range that split a species in two could do it. So too could a mutation that made fish breed in surface waters instead of near the bottom, or a change in preference among female lizards for mates with blue spots rather than red ones.

The key point emerging from the statistical evidence, Pagel stresses, is that the trigger for speciation must be some single, sharp kick of fate that is, in an evolutionary sense, unpredictable. "We're not saying that natural selection is wrong, that Darwin got it wrong," Pagel adds. Once one species has split into two, natural selection will presumably adapt each to the particular conditions it experiences. The point is that this adaptation follows as a consequence of speciation, rather than contributing as a cause. "I think what our paper points to - and it would be disingenuous for very many other people to say they had ever written about it - is what could be, quite frequently, the utter arbitrariness of speciation. It removes speciation from the gradual tug of natural selection drawing you into a new niche," he says.

The trigger for speciation must be some single, sharp kick of fate that is, in an evolutionary sense, unpredictable This has implications for one of the most contentious aspects of evolution: whether it is predictable or not. If Pagel is correct, natural selection shapes existing species in a gradual and somewhat predictable way, but the accidental nature of speciation means that the grand sweep of evolutionary change is unpredictable. In that sense his findings seem to fit with the famous metaphor of the late Stephen Jay Gould, who argued that if you were able to rewind history and replay the evolution of life on Earth, it would turn out differently every time.

If you were able to rewind history and rerun the evolution of life on Earth, it would turn out differently every time

So far, other evolutionary biologists have been reluctant to accept Pagel's idea wholeheartedly. Some regard it as interesting but in need of further testing. "The single, rare events model is brilliant as an interpretation - as a potential interpretation," says Arne Mooers at Simon Fraser University in Vancouver, Canada.

Others suspect Pagel's analysis has highlighted only part of the story. "It's telling you about one necessary but not sufficient component of speciation," says Daniel Rabosky at the University of California, Berkeley. "You have to have two things: something to cause isolation, and something to cause differentiation." And the latter process - through which the two isolated populations change enough that we recognise them as two distinct species - is likely to involve gradual, adaptive change under the hand of natural selection.

The notion that the formation of a new species has little to do with adaptation sits uncomfortably with fundamental ideas about evolution. A particular stumbling block is what evolutionary biologists call "adaptive radiations". When ecological opportunities open up - as, for example, when finches from the South American mainland first colonised the Galapagos - species seem to respond by diversifying into a host of new forms, each adapted to a particular niche. These bursts of speciation suggest that organisms need not wait for some rare event to push them into speciating, but instead can be pulled there by natural selection. "I would take it that there is quite a bit more pull than push," says Leigh Van Valen at the University of Chicago.

But is there? In his analysis, Pagel specifically looked for the signature of this kind of evolutionary exuberance. Bursts of speciation would manifest as trees with lots of branching at irregular intervals; in other words, a highly variable rate of change over time, giving rise to a subtly different curve. "It was the model that, going in, I thought would explain far and away the most trees," says Pagel.

He was wrong. "When it works, it works remarkably well," he says. "But it only works in about 6 per cent of cases. It doesn't seem to be a general way that groups of species fill out their niches."

This finding has independent support. Luke Harmon at the University of Idaho in Moscow and his colleagues have examined 49 evolutionary trees to see whether there are bursts of evolutionary change early in a group's history, when unfilled niches might be expected to be most common. There is little evidence for such a pattern, they report in a paper that has been accepted for publication in the journal *Evolution*.

Why so many rodents?

If speciation really is a happy accident, what does that mean for the way biologists study it? By focusing on the selective pressures that drive two species into different ecological niches, as they currently do, they may learn a lot about adaptation but not much about speciation. "If you really want to understand why there are so many rodents and so few of other kinds of mammals, you should start to look at the catalogue of potential causes of speciation in an animal's environment, rather than take the view that there are all these niches out there that animals are constantly being drawn into," Pagel says.

Rodents adapted to cool climates, for example, would be prone to isolation on mountain tops if the climate warmed. That could make them more likely to speciate than mammals adapted to warm temperatures. Likewise, marine animals whose larval stages live on the sea floor might be more likely to split into separate isolated populations and therefore speciate more often than those with free-floating larvae. Indeed, this is exactly what palaeontologist David Jablonski of the University of Chicago has found among marine snails. Similarly, species with narrow habitat requirements or finicky mate-choice rituals may also be prone to accidental splits.

What other possible accidents might there be? No one knows yet. "We'd like people to start compiling the lists of these things that might lead to speciation, and start making predictions about who's going to have a high rate of speciation and who's going to have a low rate," says Pagel. If these lists help us understand the broad sweep of evolutionary history - the rise of mammals, why there are so many species of beetles, or the remarkable success of flowering plants - then we will know Pagel is onto something fundamental.

In the meantime, though, Pagel's take on speciation may help explain another puzzling feature of the natural world. Over and over again, as biologists sequence the DNA of wild organisms, they find that what appears superficially to be a single species is actually two, several or even many. The forests of Madagascar are home to 16 different species of mouse lemurs, for example, all of which live in similar habitats, do similar things, and even look pretty much alike. These cryptic species complexes are difficult to explain if speciation is the end result of natural selection causing gradual divergence into different niches. But if new species are happy accidents, there need be no ecological difference between them.

Pagel's own epiphany in this regard came in Tanzania, as he sat at the base of a hardwood tree watching two species of colobus monkeys frolic in the canopy 40 metres overhead. "Apart from the fact that one is black and white and one is red, they do all the same things," he says. "I can remember thinking that speciation was very arbitrary. And here we are - that's what our models are telling us."

Bob Holmes is a consultant for New Scientist based in Edmonton, Canada

http://www.newscientist.com/article/mg20527511.400-accidental-origins-where-species-come-from.html

Briefing: Should miaow-miaow be banned?

- Updated 15:43 18 March 2010 by **Nic Fleming**

It's dangerous – so ban it? (Image: Rex Features)

The "legal high" mephedrone – also known as M-Cat, plant food, and miaow miaow – is getting a lot of attention because a series of deaths have been linked to the drug. Most recently, two teenaged men in the UK died after taking it on Sunday night, although the results of medical tests to determine the causes of their deaths will not be known for several weeks.

It has become the fourth most popular drug in the UK behind cannabis, ecstasy and cocaine over the past year. The British government's official drug advisers are expected to recommend that it be banned, but some drugs policy experts say criminalisation could do more harm than good. Now *New Scientist* cuts through the hype.

What is mephedrone?

The leaves of the khat plant, *Catha edulis*, are chewed for the stimulant, amphetamine-like properties of its active ingredients cathinone and cathine, mostly in east Africa and in migrant groups elsewhere. Mephedrone – more properly 4-methylmethcathinone – is the best known of a family of synthetic or substituted cathinones. It is commonly sold as a white powder or in capsules and is usually snorted or swallowed.

Where does it come from?

The vast majority is produced by Chinese chemical companies, which sell it for around £4,000 a kilogram, mostly to European dealers who sell it online for £10 to £15 per gram or less for larger quantities.

What are its effects?

There has been very little peer-reviewed research. Users who have posted their experiences online or taken part in surveys describe the effects as similar to those of taking amphetamine or ecstasy. They include euphoria, increased energy levels, alertness, sociability, jaw grinding, blurred and twitchy vision, pupil dilation, excessive perspiration and increased heart rate and sex drive. Some users have reported re-dosing compulsively. Even less is known about the effects of combining mephedrone with alcohol and/or other drugs.

Can it kill you?

Yesterday, it was confirmed that mephedrone poisoning killed John Sterling Smith, a 46-year-old man who died in the UK last month. His death is considered to be the first in the world that can definitely be blamed on mephedrone: several other suspected cases in the UK and elsewhere have turned out not to have been caused by mephedrone – or are still unconfirmed.

Gabrielle Price, 14, from Worthing in the UK, died in November after taking the drug at a party. Journalists are still saying her death was linked to the drug despite the publication of a medical tests showing she died of a "cardiac arrest following broncho-pneumonia which resulted from streptococcal A infection". Other reports of fatalities have turned out to be similarly unfounded.

Fiona Measham at Lancaster University, UK, a member of the committee that is advising the British government on whether to ban cathinones, says deaths caused by the drug are "inevitable" if it triggers heart palpitations, as reported, and because of the similarities of side effects to other stimulants that can be fatal.

Where is it used?

Significant use has been reported in Sweden, Finland, Israel, the UK, Ireland and Australia. Discussions about it first appeared on internet forums in 2007, and French police identified it in a pill in May that year. It has been banned in Israel, Sweden, Finland, Germany, the Netherlands and Germany.

What about in the US?

Hardly any use of mephedrone has been reported in the US, but under the US Controlled Substances Act, its chemical similarity to MDMA mean that it is considered to be a banned substance.

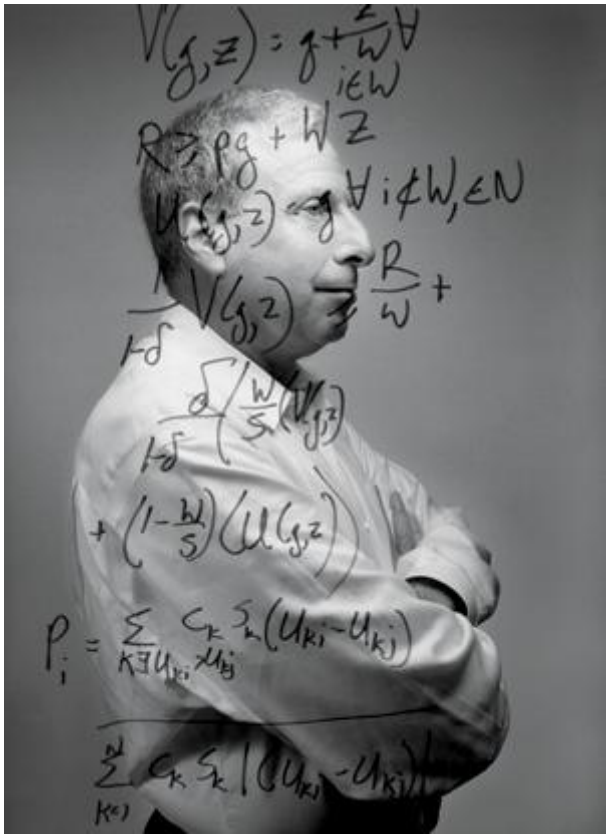
Should it be banned elsewhere?

A tricky one. Young people may be encouraged to take mephedrone because it is legal. On the other hand, making it illegal would hand the trade to organised crime, drive users to crime to pay the higher prices that would result, turn others back to existing illegal drugs and create a market for the next generation of legal highs.

http://www.newscientist.com/article/dn18672-briefing-should-miaowmiaow-be-banned.html

The predictioneer: Using games to see the future

- 17 March 2010 by **Sanjida O'Connell**
- Magazine issue 2752.



Three decades of getting it right (Image: Ethan Hill/Contour by Getty Images)

MY HOROSCOPE this week says that now is the perfect time to relocate, or at least de-clutter. I know it's nonsense, but I can't help wishing there was a genuine way to predict the future.

Perhaps there is. One self-styled "predictioneer" believes he has found the answer. Bruce Bueno de Mesquita is a professor of politics at New York University and a senior fellow at the Hoover Institution at Stanford University in California. In his new book, *The Predictioneer* (*The Predictioneer's Game* in the US), he describes a computer model based on game theory which he - and others - claim can predict the future with remarkable accuracy.

Over the past 30 years, Bueno de Mesquita has made thousands of predictions about hundreds of issues from geopolitics to personal problems. Overall, he claims, his hit rate is about 90 per cent. So how does he do it?

Bueno de Mesquita's "predictioneering" began in 1979 when he was on a Guggenheim fellowship writing a book about the conditions that lead to war. He had designed a mathematical model to examine the choices people could make and the probability that their actions would result in either diplomacy or war. Like any model, he needed data to test it.

A good opportunity arose when the US State Department asked his opinion about an ongoing political crisis in India. The ruling coalition had become unstable and it was clear that Prime Minister Morarji Desai would be forced to stand down and a new prime minister chosen from within the coalition.

Since his PhD thesis had been on Indian politics, and data on politics didn't seem a million miles from data on war, Bueno de Mesquita agreed to help. He compiled a list of all the people who would try to influence the appointment of the next prime minister, what their preference was and how much clout they had. He fed this information into his computer programme, asked it to predict how the negotiations would play out and left it to run overnight. His own hunch was that the deputy prime minister, Jagjivan Ram, would take over. Many other experts on Indian politics thought the same thing.

The following morning, he checked the computer and found to his surprise that it was predicting a politician called Chaudhary Charan Singh would be the next prime minister. It also predicted that he would be unable to build a working coalition and so would quickly fall.

Strange result

When Bueno de Mesquita reported the result to an official at the State Department, he was taken aback. The official said no one else was saying Singh and the result was strange, at best. "When I told him I'd used a computer programme I was designing, he just laughed and urged me not to repeat that to anyone," says Bueno de Mesquita. A few weeks later, Singh became prime minister. Six months on his government collapsed. "The model had come up with the right answer and I hadn't," says Bueno de Mesquita. "Clearly there were two possibilities: the model was just lucky, or I was on to something."

Three decades later, it is clear that Bueno de Mesquita is on to something. The model has been used by Bueno de Mesquita, his students and clients (including the US government) to make thousands of predictions published in hundreds of peer-reviewed publications. These include whether or not North Korea's supreme leader, Kim Jong Il, would dismantle his nation's nuclear arsenal, how a land-for-peace formula could work in the Israeli-Palestinian conflict, and which clients of a risk-management group were likely to commit fraud. According to research by the CIA, Bueno de Mesquita's model is more than 90 per cent accurate (*British Journal of Political Science*, vol 26, p 441). He now spends a considerable proportion of his time running a consultancy firm based in New York.

How is such accuracy possible? What Bueno de Mesquita is not doing is predicting random events such as lottery draws. Nor does he claim to be able to forecast the movement of stock markets, the outcome of general elections or the onset of financial crises - events where millions of people have a small influence, but none is able to move the market on their own.

Rather, he confines himself to "strategic situations" where relatively small numbers of people are haggling over a contentious decision. "I can predict events and decisions that involve negotiation or coercion, cooperation or bullying," he says. That includes domestic politics, foreign policy, conflicts, business decisions and social interactions.

I can predict events and decisions that involve negotiation or coercion, cooperation or bullying

His main tool is game theory, which uses mathematics to predict what people will do in a situation where the outcome also depends on other people's decisions. "It's a fancy label for a pretty simple idea: that people do what they believe is in their best interest," says Bueno de Mesquita.

Invented in the 1940s by John von Neumann and Oskar Morgenstern, the original formulation was based on games where players tried to anticipate other players' moves or countermoves but essentially all participants were cooperative and truthful. In the 1950s, mathematician John Nash, subject of the film *A Beautiful Mind*, created a more realistic formulation in which players are out for themselves and can bully, lie, bluff or renege on their word to achieve their desired outcome. The classic example is the

prisoner's dilemma (see "Game theory in action"). Bueno de Mesquita uses Nash's assumptions: players are motivated by self-interest and will do whatever they can to get what they want - or at least to block an undesired outcome.

In its simplest form the model works like this. First, Bueno de Mesquita decides what question to ask - for example, will Iran build a nuclear warhead. He then compiles a list of everybody who might influence that decision, and assigns each of them a value from 1 to an arbitrary number, say 100, in each of four categories: what outcome they want; how important they think the issue is; how determined they are to reach agreement; and how much influence they have.

At that point, the "negotiations" begin. Say there are five players, A, B, C, D and E. To arrive at a result, every player is paired with every other and their positions compared. When A is paired with B, for example, A must decide whether to support or resist the central proposal ("Iran should build a nuclear weapon") or offer a counter-proposal, taking into account B's position and the likelihood of getting C, D or E's support. B either agrees, negotiates or bullies in return, all the while taking the positions of the other three players into account. Once every possible combination has been played out, each player sorts through the various proposals or demands they received, and evaluates the credibility of any threats made against them. Players may then shift position accordingly. At the end, the model calculates the group's overall position as a number between 1 and 100. This is taken to be the "result".

When five players are involved there are 120 possible interactions - every player's interaction with every other, in both directions (5 × 4), multiplied by the other three players' positions (3 × 2). But the complexity soon skyrockets. If you jump to 10 players there are 3.6 million potential interactions. A typical predictioneer problem involves 30 to 40 players, although Bueno de Mesquita has tackled problems with more than 200.

Game theory aside, one of the key determinants of the model's success is the quality of the original data: garbage in leads to garbage out. To obtain good quality data, Bueno de Mesquita consults widely with experts in the field.

According to political scientist Nolan McCarty of Princeton University, this is the real strength of the approach. "I suspect the model's success is largely due to the fact that Bueno de Mesquita is very good on the input side; he's a very knowledgeable person and a widely respected political scientist. I'm sceptical that the modelling apparatus adds as much predictive power as he says it does."

McCarty's Princeton colleague, economist Avinash Dixit agrees, but adds a word of warning. "Experts can be wrong, as we have seen in a different context recently, namely the financial crisis."

Dixit has another problem with the data produced by the model. "There's ambiguity about what the final number means. For example, if the prediction is whether Iran acquires nuclear weapons, and the answer is graded on the scale from 0 to 200, what would 120 mean? There's going to be a bomb or there will be no bomb? That is not so clear. I think the seemingly precise answers are deceptive, and game theorists should be more humble and more open about the uncertainty that is unavoidable in their calculations and results."

Bueno de Mesquita accepts that the results require expert interpretation, but says there is no ambiguity. "The issue scales are not just whether a bomb will be built or not," he says. "Rather they define points in between; 120 on the Iran nuclear scale refers to Iran developing weapons-grade fuel but not building a bomb."

Bueno de Mesquita is now working on a new and more complex model using Bayesian game theory, which also takes into account players' beliefs about other players and also allows for scenarios with imperfect or incomplete information.

"The old model - essentially a sophisticated version of the one I used in 1979 - was accurate 90 per cent of the time," he says. "This new model blows the old one out of the water in terms of the result and the accuracy of the path leading up to the outcome." In February he presented a paper at a meeting of the International Studies Association detailing the difference in performance between the two models.

The old model was accurate 90 per cent of the time; the new one blows it out of the water in terms of accuracy

So how good is the new model? Bueno de Mesquita recently used it to make a prediction on the political situation in Pakistan. Working with a group of students, he asked how willing the Pakistani government would be to pursue Al-Qaida and Taliban militants in its territory, and how the US government could exert influence on their decision.

Targeting terror

In January 2008 the students fed in data on all the players, including the US, Pakistan's then president Pervez Musharraf and other leading Pakistani politicans. Their assumption was that the US would offer foreign aid to persuade Pakistan's leaders to target the terrorists, and Pakistan would try to extract the maximum amount of aid possible from the US.

The model predicted that to get maximum cooperation from Pakistan, the US would need to donate at least $1.5 billion in 2009, double the projected 2008 figure. In return for this Pakistan would pursue the terrorists on a scale of 80 out of 100, but no more. In other words, the leadership would make considerable effort to reduce the terrorist threat but not to completely eliminate it. "The Pakistani government are no fools," explains Bueno de Mesquita. "They know that the money will dry up if Al-Qaida and the Taliban are destroyed. So they will rein the threat in and reduce it, but not utterly destroy it."

The Pakistani government are no fools. They know the money will dry up if the militants are destroyed

The outcome? According to Bueno de Mesquita, the US government authorised $1.5 billion in foreign aid to Pakistan in 2009, and the Pakistani leadership sustained pursuit of the militants at that level. "We have done very well," says Bueno de Mesquita.

With such a powerful tool at your disposal, it must be tempting to use it for yourself. Bueno de Mesquita admits that he has received a few shady offers. In 1997, representatives of Mobutu Sese Seko, the recently deposed president of Zaire (now the Democratic Republic of the Congo), asked him to calculate how to salvage control of the country in return for 10 per cent of Mobutu's substantial wealth. Bueno de Mesquita alerted the US government.

He has, however, used his model to help friends and also to assist the San Francisco Opera when it was having financial difficulties.

So what of the future? Another of Bueno de Mesquita's recent predictions addresses the future of climate change negotiations up to 2050. Depressingly, he predicts that although the world will negotiate tougher greenhouse gas reductions than in the Kyoto protocol, in practise these are likely to be abandoned as Brazil, India and China rise in power in relation to the European Union and the US.

The predictioneer has also been spectacularly wrong, though. In 1992, he was asked to predict which bills would be likely to get through the US Congress after Bill Clinton was elected president. It was well known that Clinton was planning to push through a healthcare bill, but all 27 of Bueno de Mesquita's predictions of what was likely to be in it and which elements would be passed by Congress turned out to be incorrect.

Where did it all go wrong? The problem was with the inputs. Bueno de Mesquita had assumed that an influential congressman, Daniel Rostenkowski, would be the key to getting healthcare reform through. But just as Clinton began to push through the plan, Rostenkowski came under investigation for corruption and was eventually forced to resign from office. Bueno de Mesquita was unhappy at the time, but now shrugs it off: "I have been willing to put my reputation on the line and publish before events happened. So far I've not been too embarrassed."

Game theory in action

The classic example of a problem in game theory is the prisoner's dilemma. It was formulated in 1950 to illustrate a situation where cooperation is the best policy overall but is trumped by raw self-interest, leading to a less-than-ideal outcome for everybody. It goes something like this.

You and your partner in crime have been arrested and placed in separate cells. You are each offered the following deal by the prosecutor: confess, or remain silent. If you confess and your partner remains silent, all charges will be dropped against you and your partner will go to prison for 10 years. If you remain silent and your partner confesses, he will go free and you will go down for 10 years. If you both confess, you will both be sent to prison for 5 years. If both of you stay silent the prosecutor will rustle up some lesser charge and you'll each do 6 months. Neither you nor your partner will learn what choice the other has made until after you have both announced your decision.

The dilemma is that, whatever your partner does, you're better off confessing. So the rational choice is to confess. But when you both confess, the outcome is far worse than if you had both remained silent.

Sanjida O'Connell is an editor in New Scientist's opinion section

http://www.newscientist.com/article/mg20527520.500-the-predictioneer-using-games-to-see-the-future.html

Energy-efficient homes make householders complacent

- 23 March 2010

Magazine issue 2752.

Let's use some of that energy we saved (Image: Nick M. Do/Photodisc/Getty)

SURVEYS of hundreds of UK households reveal that people who have made their houses more energy efficient are more likely to indulge in small excesses - turning up the heating, for example, or keeping it on for longer.

Small excesses add up to large costs. The results of the studies - seven of them in total - suggest that such energy creep could wipe out as much as half of the anticipated savings from making homes more energy efficient (*Building Research & Information*, vol 38, issue 1).

"Some householders who install double-glazing, insulation and energy-efficient boilers end up using fuel at close to the old levels, often because they are more concerned about comfort than saving energy," says David Lomas of Loughborough University, UK. He was a lead member of the UK-government-funded consortium which carried out the surveys.

Lomas says the results question whether the government's target of reducing energy consumption in homes to 20 per cent of 1990 levels by 2050 is achievable.

Paul Stern of the US National Research Council agrees but emphasises that efficiency measures do save energy overall.

http://www.newscientist.com/article/mg20527522.100-energyefficient-homes-make-householders-complacent.html

green consumers' dirty little secrets

- 13:23 22 March 2010 by **Peter Aldhous**

The glow of green virtue (Image: Nicola Tree/Photodisc/Getty)

Green consumers sometimes take the moral high ground – but it's all too easy to slide back down. New research suggests that those who make "green" purchases are subsequently more likely to behave selfishly, cheat and steal.

"Another way to think about it is that you're off the hook – you've done your good deed," explains Benoît Monin, a psychologist at Stanford University in California who studies the phenomenon, called "moral self-licensing".

Moral self-licensing has been shown elsewhere, too. In the run-up to the 2008 US presidential election, for instance, Monin found that people who expressed their support for Barack Obama, thereby winning credit as non-racists, were more likely to later declare that whites would be better suited than blacks for a hypothetical job vacancy in a police department (*Journal of Experimental Social Psychology*, vol 45, p 590).

To find out if green consumerism gives people a similar licence to behave badly, Nina Mazar and Chen-Bo Zhong of the University of Toronto in Canada set up experiments in which students were presented with simulated online stores.

Good shop, bad shop

Students were asked to fill their online shopping baskets with up to $25-worth of items, and half were presented with a store stocked mostly with "green" products – compact fluorescent instead of incandescent light bulbs, for instance – to make it more likely that they would shop green. The other half were given a store stocked with a majority of conventional products.

After their online shopping spree, the students were asked to carry out one of two tasks.

One group was told to allocate $6 between themselves and another participant. Mazar and Zhong found that green shoppers in this group kept more for themselves than the others did.

The most striking results, however, came from the group that carried out the second task. Students were shown a pattern of dots and asked to say whether more fell to the left or the right of a diagonal line. They

were told they would get half a cent each time they said more dots were on the left, but 5¢ each time they said more were on the right – providing a clear incentive to lie about the results to earn more money.

Those who played the game both accurately and truthfully would make $2.07. The winnings of those who had shopped in the conventional store did not differ significantly from this sum. The green shoppers, however, earned on average 36¢ more, showing that they had lied to boost their income.

Light green fingers

Finally, the volunteers in the second group were shown on screen how much they had won and told to take the right amount of cash from an envelope. Both groups took more than their due, but the green shoppers on average stole 48¢ more than those who had shopped in the conventional store. "It's a very impressive paper," says Monin.

It remains unclear how far the moral glow of green consumerism makes people feel they have licence to cheat and steal in the real world. Douglas Medin, a psychologist at Northwestern University in Evanston, Illinois, says that more work must be done to see whether the same thing happens in different situations and cultures.

But moral self-licensing could explain the counterproductive results of some attempts to reduce environmental footprints, such as the recent finding that people in the UK who have made their homes more energy-efficient are more likely to turn up their heating or keep it on for longer.

Journal reference: *Psychological Science*, DOI: 10.1177/0956797610363538 (in press)

http://www.newscientist.com/article/dn18686-exposed-green-consumers-dirty-little-secrets.html

Recipe for rarity: fish threatened by cookbooks

- 13:00 19 March 2010 by **Bob Holmes**

Cod: big, tasty, prestigious and in trouble (Image: Francis Dean/Rex Features)

Rare is not only beautiful but also tasty. A study of a century's worth of seafood recipes has revealed that big, predatory fish like salmon and tuna have grown in prestige, even as overfishing has caused their populations to plummet – sometimes to the point of endangerment.

Phillip Levin and Aaron Dufault, conservation biologists with the US government's Northwest Fisheries Science Center in Seattle, Washington, gathered 3092 seafood recipes from 105 cookbooks published in the Seattle region between 1885 and 2007. For each recipe, they noted the species of seafood called for, and estimated its trophic level – a measure of how high in the food chain the species sits. For example, sharks, which sit at the top of the food chain, have a tropic level of 4 or higher.

The study offers a rare insight into consumer demand for different species of fish. Fisheries biologists usually study fishing from the "supply side" instead, by measuring fish harvests.

Over the 122 years of the study, the average trophic level of the recipes rose from 2.92 to more than 3.4. In other words, newer recipes were more likely to call for the large, predatory fish than were older recipes.

Wrong way

A trophic level of 3.4 is relatively high, and the 0.48 rise is also considerable: a 0.15 change in trophic level is normally significant enough to have an impact on the marine ecosystem.

Levin had expected the opposite trend, because decades of intense fishing have depleted the populations of many fish with a high trophic level, and as a result more and more of the world's fish harvest is now

made up of smaller "trash" fish of lower trophic levels. He suggests it didn't work out that way because cookbooks don't reflect what we eat so much as what we aspire to eat. "It's more about culture than fish," he says.

Indeed, Levin suspects that rarity may be partly responsible for the prestige of fish like cod and tuna. "When food is expensive, that's the stuff that shows up in cookbooks," he says. If so, cooks will continue to seek out these species even as their populations dwindle still further – a perverse demand that could stymie efforts to restore healthy fish populations.

Recently, several conservation groups have published lists to guide consumers' seafood buying towards more sustainable choices. However, such efforts are unlikely to dent the status-seeking that Levin documents, says Daniel Pauly, a fish biologist at the University of British Columbia in Vancouver, Canada. "That has no impact on the real consumption patterns of people, which are dictated by prestige at the upper income levels and necessity for lower-income people," he says.

Journal reference: *Fish and Fisheries*, DOI: 10.1111/j.1467-2979.2010.00355.x

http://www.newscientist.com/article/dn18676-recipe-for-rarity-fish-threatened-by-cookbooks.html

Barefoot statistics: Data for the people

- 19 March 2010 by **Ludi Simpson**

Magazine issue 2752.

Whose numbers are they anyway? (Image: Andrzej Krauze)

GOT something big to say? Grab a statistic, it lends authority. Most people know perfectly well that statistics can support different angles on the same story. But who has the time to put together the whole picture for themselves?

In the UK, concern for the health of statistics - not least when it comes to statistics relating to health issues, such as patient waiting times, public-private health financing, and more - has led to attempts to rescue the field from the spin of political and industrial lobbies. The UK Statistics Authority now oversees the production of official statistics independently of government, and is answerable only to Parliament.

Straight Statistics, a pressure group of legislators, statisticians and journalists, runs a website presenting statistics that have been "straightened out", having previously been twisted for political, business or personal advantage - a practice the organisation says is "widespread - and often undetected".

Partiality is deeply embedded in statistics. Data collection generally costs so much that little will be counted unless it is a government priority. This holds as much for questions in fundamental surveys such as the 10-yearly national census as it does for one-off inquiries. So it is not only the twisting of statistics that needs addressing but the way they are produced.

Data collection generally costs so much that little will be counted unless it is a government priority

This is a starting point for the UK group Radical Statistics, which held its 35th annual conference in London last month. Among the highlights was a lecture by journalist and freedom of information activist Heather Brooke, best known for her work exposing the House of Commons' resistance to disclosing figures about the expenses claimed by its members. Another was provided by David Miller from Spinwatch, who outlined how the organisation's new website spinprofiles.org monitors public relations activities and spin in political and corporate life, and how supposedly independent institutes and disinterested experts are used as a front by vested interests to gain media coverage and policy clout.

The audience and contributors were bound together not just by an understanding of statistics: these were people who produce and live by statistics, a diverse bunch of researchers and commentators who like what they do but don't always like what is done with their skills. Or what is not done with their skills: that is the extra ingredient. If current statistics are shaped by their funders' priorities, who will produce statistics to fulfil other priorities - and what would those statistics look like?

Take the "league tables" that rank the performance of UK schools. Decades of work has shown beyond doubt that these divisive tables are statistically meaningless. Once standard errors of uncertainty are attached, the vast majority of schools are very similar. Only the extreme outliers remain interesting. The best use of the tables would be to screen for a few examples of best or worst practice, or ones which suffer from poor measurement.

So what might statistics aimed at improving schooling achieve? In their recent book *The Spirit Level*, Richard Wilkinson and Kate Pickett argued that societies with the most unequal incomes have the worst health and most crime. If they are right, we might look to reduce inequalities between and within schools, and later at work.

It's the same when it comes to employment. Figures purporting to measure unemployment tend to hide the full cost, not least by omitting people not claiming state benefits. Statistical skills could be applied to estimating how many of these missing unemployed there are, and how the figures are affected when governments change the rules.

Worldwide, the tussle between statisticians' paymasters and democratic need plays out in different ways, and arrangements for producing official statistics vary considerably. In Denmark and Finland, for example, the national statistical bodies are almost autonomous, while in the US they are under close government control.

Can the priorities underlying the collection of statistics be changed? This is where it gets interesting. What might a new statistics of social justice look like? And is it possible to convey the meaning of statistics to ordinary people without so many intermediaries, or is a different kind of intermediary needed?

A commitment to using statistical skills in areas away from state or business agendas has taken Radical Statistics to all sorts of places. Its 2000 book *Official Health Statistics: An unofficial guide* was the product of a decade working with public-sector health campaigns. And challenging official figures on immigration and nuclear weapons has been a big priority. We may not have transformed government practice, but we have given confidence to voluntary campaigns and established statistical practice among new, usually receptive, audiences.

Forays by Radical Statistics into local campaigns to define community needs or to challenge a school closure, say, have led us to pioneering grass-roots statistical education. This can involve going back to basics: doing away with computer power, and replacing it with people totting up questionnaire results. Some members now think "barefoot statisticians" practising in the community could prove a high point for our profession.

Whether on employment statistics, official statistics independent of government, or meaningful performance statistics, Radical Statistics often lines up with majority thinking in the more formal Royal Statistical Society. Perhaps the lining up is in both directions: over 35 years, some angry young statisticians have risen to senior positions in the profession. However you look at it, the burning moral issues - war, corruption, climate change and inequality - keep the search for radical statistics bubbling.

Ludi Simpson is a convenor of the Radical Statistics group, www.radstats.org.uk

http://www.newscientist.com/article/mg20527525.500-barefoot-statistics-data-for-the-people.html

Motion sensors could track troops when GPS cuts out

- 23 March 2010 by **Paul Marks**

Magazine issue 2752.

Keep moving to fix a position (Image: Chad Hunt/Corbis)

KNOWING where troops are during combat operations can be a matter of life and death - but GPS technology used to track troops is fragile, the signal easily lost. Now a UK company is developing a lightweight, wearable tracker that can provide location cover when GPS is down.

The system uses novel software to decipher position data from the signals generated by cheap microchip-based motion sensors - like those used in the Nintendo Wii and Apple iPhone.

The device is being developed by Tessella in Stevenage, Hertfordshire, which normally develops orientation software for spacecraft like the European Space Agency's Herschel Space Observatory, launched last year. The software fuses data streaming from an on-board star-tracking camera with data from laser gyroscopes, enabling the system to gauge the craft's position in space and its rotation.

These algorithms can also discern location when used with motion sensors, David Dungate of Tessella told the SpaceTech conference at the Rutherford Appleton lab in Oxfordshire, UK, last week. The motion sensor worn by the soldier is a matchbox-sized unit containing three microchip accelerometers and three gyroscopes mounted at right angles to each other. Using the data transmitted from this, the algorithm can work out the wearer's position relative to a known start point - perhaps the point where GPS was lost.

The system would be less cumbersome than existing motion-sensing devices - footstep-detecting trackers worn on the foot or ankle, Dungate says.

But the microchip sensors are prone to producing additional noise, resulting from variations in power supply, temperature and the like, making it tricky to get reliable data to work from.

Tessella is examining the noise produced by commercial motion sensors - like those used in smartphones - to look for characteristic patterns that filtering algorithms could use to determine which signals are relevant. These algorithms, or "Kalman filters", use past data to predict how noise is likely to affect a signal, aiming to produce measurements close to their true value. "We're already showing that [applying the algorithm to] some of the data correctly eliminates errors," says Dungate. "Our algorithms wring the data's neck to get every last bit of info."

The company hopes to have its tracker working in six months, and claims defence contractors have already shown interest.

If it works, it will be boon way beyond the military, says Bob Cockshott, head of location and timing at the UK's National Physical Laboratory in Teddington, Middlesex. "There's a huge need for a non-GPS technology, not only for use when jamming is being used, but locations like urban canyons where GPS simply can't reach."

http://www.newscientist.com/article/mg20527524.500-motion-sensors-could-track-troops-when-gps-cuts-out.html

Hybrid fusion: the third nuclear option

- 04 March 2010 by **Julian Hunt** and **Graham O'Connor**

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Going the hybrid way (Image: David Hills/iStock)

THE long-anticipated nuclear renaissance has arrived. In his State of the Union address last month, President Barack Obama announced plans for the US to build a new generation of nuclear power plants, and his budget for 2011 proposes large funding increases for the industry.

Several European countries are also likely to restart their nuclear power programmes soon. The UK plans to increase to 20 per cent the proportion of its electricity generated from nuclear.

A return to nuclear power is attractive right now for many reasons. It promises to help cut carbon emissions and reduce imports of fossil fuel. What's more, unlike renewables, it can ensure a stable baseload electricity supply whatever the weather.

However, nuclear energy also creates problems of its own, not least the risk of Chernobyl-style accidents and the production of radioactive waste that takes tens of thousands of years to decay. One thing Obama did not spell out is how the US will deal with a new generation of waste now that it has abandoned plans for a storage facility at Yucca mountain.

There is a way of returning to nuclear while overcoming all these concerns: hybrid nuclear fusion. The concept has been around for decades, and has been discussed in the technical literature and at the International Atomic Energy Agency. But it has not yet been explained to governments, industry, researchers and the public.

Hybrid nuclear fusion combines the two forms of nuclear power, fission and fusion, in a single reactor. This has several advantages over fission alone: it minimises the environmental impact, reduces risks, enlarges reserves of nuclear fuel and is more flexible to operate.

Fission, the process behind conventional nuclear power, harnesses energy from the radioactive decay of uranium and other fissile materials. Fusion, meanwhile, is an experimental technology that extracts energy from processes similar to those occurring inside the sun, where hydrogen atoms are fused together to form helium.

"Pure" fusion is often touted as the solution to all our energy problems, and it has undeniable advantages over fission. It produces no long-lived nuclear waste and needs no fuel other than water. But it could take another 50 years to make fusion technically and economically viable - if it can ever be made to work at all.

One problem with fusion is the size of the reactor core. To make a fusion reaction self-sustaining requires a plasma volume of about 3300 cubic metres, more than three times the proposed volume of ITER, the world's most advanced fusion project now under construction in France.

Another unsolved issue is how to construct a reactor wall, or "blanket", capable of withstanding intense bombardment from high-energy neutrons generated by the plasma. Materials that can do this do not yet exist.

Hybrid nuclear power potentially solves both these problems. First, the blanket is itself a fission reactor that burns nuclear fuels and generates neutrons. In the process it absorbs high-energy neutrons from the plasma, reducing the energy flux reaching the outer wall by a factor of 50, meaning that existing materials could be used.

Second, a hybrid reactor's plasma ball can be much smaller than in a pure fusion reactor - about the same size as ITER's, in fact - because energy generated by fission can be fed back into the plasma to keep it burning.

Hybrid reactors have other advantages too. One is that the fission reaction can burn a range of fuels, including the long-lived high-level nuclear waste produced in conventional fission reactors. It "transmutates" these waste products into isotopes that decay over a hundred years rather than tens of thousands. Not only does this eliminate some of the nuclear industry's waste problems, it also potentially helps to rid the world of plutonium and other weapons-grade materials.

Hybrid reactors can help rid the world of plutonium and other weapons-grade materials

Hybrid reactors also sidestep looming shortages of the high-grade uranium required to fuel conventional reactors, as they can run on non-enriched uranium and thorium. Low-grade uranium and thorium are plentiful in most parts the world. And because the fissile material produced in the blanket remains at well below critical mass, hybrid reactors have a much lower risk of suffering an accident than conventional reactors, as runaway reactions and consequent meltdown are impossible.

Finally, the power output of a hybrid reactor can be easily varied. That would allow nuclear power to be combined with renewables, which are inherently unpredictable, to provide baseload power.

There is growing interest in hybrid reactors. The Institute of Plasma Physics in Hefei, China, a world-class fusion research centre, is planning to build a prototype by 2020 in collaboration with China's growing nuclear industry. Other countries, including those participating in ITER, are also looking at R&D programmes on hybrid reactors. Last month the UK science minister, Paul Drayson, suggested that nuclear research in the UK and elsewhere should consider hybrid systems. The US energy secretary, Steven Chu, has also mentioned hybrid reactors. Existing fusion research programmes, such as the Culham Centre for Fusion Energy in Oxfordshire, UK, can contribute a great deal to these efforts.

Workable hybrid technology is still some way off, but given the inherent problems with fission and the uncertainty over fusion it has to be worth pursuing. Even modest-sized reactors could provide affordable and almost limitless energy for all. Hybrid fusion deserves wider understanding and support from governments, scientists and environmentalists.

Julian Hunt is professor of climate modelling at University College London and a former fusion researcher.

Graham O'Connor is a former senior scientist at the ITER project

http://www.newscientist.com/article/mg20527505.900-hybrid-fusion-the-third-nuclear-option.html

Brain scans now catch chemicals too

- 17:09 02 March 2010 by **Ewen Callaway**

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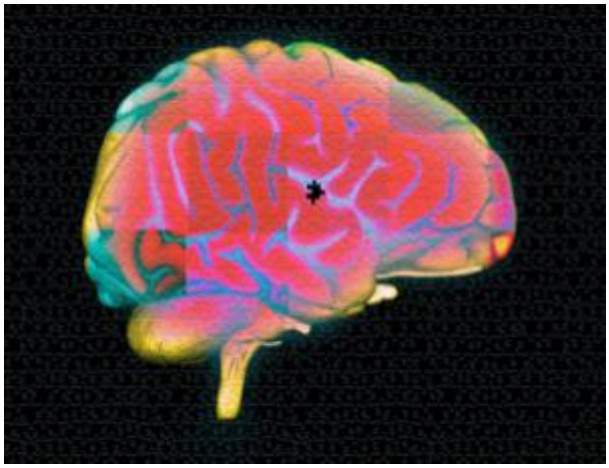


Taking a different look at the brain (Image: Kallista Images/Getty)

A chemical produced during sex and linked to addiction has been visualised in a scanner as it washes across rats' brains. The feat means that functional magnetic resonance imaging (fMRI), a workhorse of neuroscience, can now be used to observe the flow of brain chemicals, not just oxygen-rich blood.

By pinpointing increases in blood oxygenation in the brain in response to different events – a sign that specific groups of neurons are active – fMRI is responsible for some of the hottest findings about the brain. Now Alan Jasanoff at the Massachusetts Institute of Technology and colleagues have extended its power.

His team repeatedly mutated a magnetic, iron-containing enzyme that "lights up" in fMRI readings. With each mutation, the researchers tested its tendency to bind to dopamine, a learning and reward chemical in the brain involved in sex and addictive behaviours. Mutations that increased this tendency were combined, resulting in a molecule that was both magnetic and strongly attracted to dopamine.

The team injected the molecule into the brains of rats, in a region laden with dopamine-producing cells. When given a chemical that triggers dopamine release, that area "lit up" under fMRI.

Animal minds

Because the molecule must be injected into the brain, this kind of chemical-based fMRI won't be applied to humans anytime soon, says Jasanoff, but it could be used to probe addiction and disease using animals.

His lab is now using the enzyme to view how dopamine-sensitive neurons across animal brains react when the chemical is produced in a specific region. The technique could also be used to probe dopamine's role in diseases such as Huntington's.The magnetic enzyme can in theory be "evolved" to bind to other brain chemicals.

Journal reference: *Nature Biotechnology*, DOI: 10.1038/nbt.1609

http://www.newscientist.com/article/dn18602-brain-scans-now-catch-chemicals-too.html

Polluting ships have been doing the climate a favour

- 17 March 2010 by **Fred Pearce**

Magazine issue 2752.

Geoengineering – by accident (Image: Thierry Dosogne/Image Bank)

ENVIRONMENTAL paradoxes don't come much bigger. In July this year, the world's shipping lines will begin to apply pollution-cutting rules that will save tens of thousands of lives a year. Yet these very measures - which will radically cut sulphur emissions from ships - have a downside: they will also increase global warming.

When it meets next week, the Marine Environment Protection Committee of the International Maritime Organization (IMO), the UN body that regulates world shipping, will not even be discussing setting limits on regulating the carbon emissions of shipping. Yet it will confirm plans to slash the permitted sulphur content of fuel oil burned by most of the world's ships. Sulphur dioxide (SO_2) emissions will diminish by as much as 90 per cent, and with them the resulting haze of sulphate particles.

That's where the problem lies. By shading the planet, the haze partially masks the warming effects of greenhouse gases such as carbon dioxide also produced by the world's fleet of 100,000 ships. Almost a billion tonnes of CO_2 are emitted annually by shipping, some 3 per cent of the global total, and it was originally planned that measures to reduce these emissions would also be introduced at next week's meeting.

Those plans are now on hold. As a result, the world is set to suffer a double warming effect from shipping, says Jan Fuglestvedt of the Centre for International Climate and Environmental Research in Oslo, Norway: "one from CO_2 and one from the reduction of SO_2" (*Environmental Science & Technology*, vol 43, p 9057).

Shipping lags behind most other industries in tackling sulphur pollution. Emissions from power stations, road vehicles and other land-based sources have been reduced to very low levels both for health reasons and to curb acid rain. But ships can still burn fuel containing 4.5 per cent sulphur; for European cars the limit is 0.001 per cent. Just 16 large ships could emit as much SO_2 as all the world's cars.

Two years ago, the IMO agreed a plan to cut the emissions of SO_2 from the world's fleet. The plan, which comes into force in July, will cut the maximum sulphur content of shipping fuel to 3.5 per cent in 2012 and 0.5 per cent by 2020. Special sulphur emission control areas around the coastlines of North America and in the Baltic and North seas set lower limits: 1 per cent from this July and 0.1 per cent by 2015.

The net effect of the warming and cooling influences of shipping currently neutralises about 7 per cent of human-produced global warming. That is about to end as the new rules will cut global sulphur emissions from shipping, and with it their cooling effect, by 80 to 90 per cent in the coming decade.

Few policy issues are more complex than the effects of carbon and sulphur emissions from shipping, partly because one contributes to global warming while the other has the opposite effect, and also because the impacts of CO_2 and SO_2 emissions are felt on very different timescales.

Few policy issues are more complex than the effects of carbon and sulphur emissions from shipping

The climatic effect of emissions from a typical ship at sea is initially dominated by the strong cooling influence of the SO_2. As well as providing a direct shading effect, sulphate particles also act as nuclei around which water droplets form, making skies cloudier. Direct SO_2 shading from today's shipping is estimated to cool the planet by 31 milliwatts per square metre. Though hard to model precisely, the influence on cloud formation is likely to be three times that.

But the SO_2 only stays in the air for a few days. If it were not constantly replaced, the warming effect of the ships' CO_2 emissions would quickly dominate. This lasts for centuries. The accumulated CO_2 emissions of two centuries of steam shipping are currently heating the planet by 37 milliwatts per square metre. But at the moment, the overall effect is to cool the planet. As more and more CO_2 accumulates in the air from shipping, however, warming will come to dominate. The only question is when.

Veronika Eyring of the Institute for Atmospheric Physics in Wessling, Germany, says that if emissions remain as they are today, the tipping point is 50 years away. The reductions in sulphur emissions planned for the next decade will push shipping into a net warming influence within that period (*Atmospheric Environment*, DOI: 10.1016/j.atmosenv.2009.04.059).

There is little chance of the controls on SO_2 being reversed - and with good reason. James Corbett of the University of Delaware at Newark estimates that it currently kills around 64,000 people a year worldwide from lung and heart disease, of which some 27,000 are in Europe.

Any hopes that the IMO would act on CO_2 at the same time as cutting SO_2 emissions evaporated with the failure of climate talks in Copenhagen in December. The IMO now says it awaits a UN lead.

Who's responsible?

It could be a long wait. Like air transport, shipping was left out of the 1997 Kyoto protocol. Nor was there any mention of shipping in the Copenhagen accord, intended as a blueprint for what should replace the Kyoto protocol in 2012, which was signed by more than 20 world leaders.

Admittedly, setting CO_2 emissions targets for international shipping is not easy. As with airlines, it is not obvious which country should be responsible, but for shipping the problem is made worse by the popularity of flags of convenience. Two-thirds of the world's ships are registered in small non-industrial countries such as Panama and the Bahamas that do not have national emissions targets.

One proposed solution is to treat the entire industry as if it were a single country, with its own emissions ceiling. Developing countries say this would be unfair, because it undermines the principle that the industrialised nations should bear the brunt of emissions targets. Another suggestion is to create a tax whose revenues would go to developing nations, but the US and China have so far both opposed it.

There is huge potential to cut CO_2 emissions from shipping. The Danish shipping line Maersk claimed last month that by making its massive container ships travel more slowly it had cut their fuel use, and hence carbon emissions, by 30 per cent.

The International Chamber of Shipping, an industry association, says better-designed engines, hulls and propellers could cut CO_2 emissions by a further 15 to 20 per cent. And waiting in the wings are biofuels, currently being trialled by Maersk, solar panels, nuclear reactors and even a return to sailing, using giant kites. But without a cap on shipping emissions, much of this may not happen. If it doesn't, CO_2 emissions from shipping are predicted to triple by 2050.

That brings closer the possibility that the world will one day need to take emergency action to stave off runaway climate change. One of the most effective ways of cooling the planet, suggested by Nobel prizewinning atmospheric chemist Paul Crutzen, might then be to spray the atmosphere with sulphur. In other words, to do exactly what shipping is doing today.

"SO_2 emissions are a form of inadvertent geoengineering," says Fuglesvedt. Wouldn't it be weird, he suggests, if we cleaned up the ships and then were forced to spend billions of dollars to do just what they have been doing for free?

Wouldn't it be weird if we were forced to spend billions to do what ships have been doing for free?

Good intentions, unforeseen results

Sulphur dioxide is not the only pollutant that has beneficial effects, and sometimes measures intended to protect the environment can have unexpected negative consequences.

Treating sewage

Untreated sewage kills fish by generating oxygen-depleted dead zones, but it also provides food for some bird species. One study in 2001 found that after a sewage treatment plant came on stream, the number of gulls in the affected area fell by 93 per cent.

Cutting carbon dioxide

The arch-villain of climate change may be boosting growth in some plants. In chambers where levels of CO_2 have been deliberately boosted, plants have been shown to grow up to 40 per cent faster than normal.

Recycling paper

According to a 1996 study, it may actually be less harmful to burn magazines than to recycle them. De-inking paper in order to recycle it leaves a toxic sludge of heavy metals.

Mending the ozone hole

In the 1970s, high levels of CFCs in the atmosphere caused a damaging thinning of the ozone layer. This has cooled the air over east Antarctica, and temperature rises in the region are predicted to accelerate as the hole heals following a ban on CFCs.

Hydropower

Rotting vegetation in newly flooded reservoirs can emit methane - a powerful greenhouse gas. Dissolved methane builds up and is released when water passes through the dam's turbines.

Shanta Barley

http://www.newscientist.com/article/mg20527522.500-polluting-ships-have-been-doing-the-climate-a-favour.html

UN to look at climate meat link

By Richard Black
Environment correspondent, BBC News

UN specialists are to look again at the contribution of meat production to climate change, after claims that an earlier report exaggerated the link.

A 2006 report concluded meat production was responsible for 18% of greenhouse gas emissions - more than transport.

The report has been cited by people campaigning for a more vegetable-based diet, including Sir Paul McCartney.

But a new analysis, presented at a major US science meeting, says the transport comparison was flawed.

Sir Paul was one of the figures launching a campaign late last year centred on the slogan "Less meat = less heat".

" **I must say honestly that he has a point** "
Dr Pierre Gerber, FAO

But curbing meat production and consumption would be less beneficial for the climate than has been claimed, said Frank Mitloehner from the University of California at Davis (UCD).

"Smarter animal farming, not less farming, will equal less heat," he told delegates to the American Chemical Society (ACS) meeting in San Francisco.

"Producing less meat and milk will only mean more hunger in poor countries."

Leading figures in the climate change establishment, such as Intergovernmental Panel on Climate Change (IPCC) chairman Rajendra Pachauri and Lord (Nicholas) Stern, have also quoted the 18% figure as a reason why people should consider eating less meat.

Apples and pears

The 2006 report - Livestock's Long Shadow, published by the UN Food and Agriculture Organization (FAO) - reached the figure by totting up all greenhouse-gas emissions associated with meat production from farm to table, including fertiliser production, land clearance, methane emissions from the animals' digestion, and vehicle use on farms.

But Dr Mitloehner pointed out that the authors had not calculated transport emissions in the same way, instead just using the IPCC's figure, which only included fossil fuel burning.

"This lopsided 'analysis' is a classical apples-and-oranges analogy that truly confused the issue," he said.

One of the authors of Livestock's Long Shadow, FAO livestock policy officer Pierre Gerber, told BBC News he accepted Dr Mitloehner's criticism.

"I must say honestly that he has a point - we factored in everything for meat emissions, and we didn't do the same thing with transport, we just used the figure from the IPCC," he said.

"But on the rest of the report, I don't think it was really challenged."

FAO is now working on a much more comprehensive analysis of emissions from food production, he said.

It should be complete by the end of the year, and should allow comparisons between diets, including meat and those that are exclusively vegetarian.

Different pies

Organisations use different methods for apportioning emissions between sectors of the economy.

In an attempt to capture everything associated with meat production, the FAO team included contributions, for example, from transport and deforestation.

By comparison, the IPCC's methodology collects all emissions from deforestation into a separate pool, whether the trees are removed for farming or for some other reason; and does the same thing for transport.

This is one of the reasons why the 18% figure appears remarkably high to some observers.

The majority of the meat-related emissions come from land clearance and from methane emissions associated with the animals' digestion. Other academics have also argued that meat is a necessary source of protein in some societies with small food resources, and that in the drylands of East Africa or around the Arctic where crop plants cannot survive, a meat-based diet is the only option.

Dr Mitloehner contends that in developed societies such as the US - where transport emissions account for about 26% of the national total, compared with 3% for pig- and cattle-rearing - meat is the wrong target in efforts to reduce carbon emissions.

Richard.Black-INTERNET@bbc.co.uk

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8583308.stm

Published: 2010/03/24 00:15:30 GMT

X-rays 'can miss many fractures'

X-rays fail to spot up to nearly a third of fractures in the bones of the hip and pelvis, research suggests.

US doctors from Duke University warn that relying on standard X-rays alone to give a clean bill of health could lead to wrong diagnoses and law suits.

When they re-checked the X-ray results of 92 patients using a more detailed scanner, called MRI, they found 35 fractures that had been missed.

The findings are published in the American Journal of Roentgenology.

Dr Charles Spritzer, who led the research, said: "The diagnosis of traumatic fracture most often begins and ends with X-rays of the hip, pelvis, or both.

"In some cases though, the exclusion of a traumatic fracture is difficult."

Delayed diagnosis

In the study of patients complaining of pain after an injury to the hip or pelvis, 13 with normal X-ray findings were found to have a collective total of 23 fractures seen on MRI (magnetic resonance imaging).

Another 15 patients with abnormal X-rays had 12 additional pelvic fractures seen on MRI that otherwise would not have been identified.

“ **Ultimately, it comes down to clinical acumen** ”
Dr Tony Nicholson of the Royal College of Radiologists

And in 11 patients, MRI showed no fracture after X-rays had suggested there might be one.

The researchers say it is worth using MRI as well as an X-ray if doctors are in any doubt, particularly since hip patients tend to be frail and elderly with a higher than average risk of complications and death.

Dr Spritzer said: "Accurate diagnosis of hip and pelvic fractures in the emergency department can speed patients to surgical management, if needed, and reduce the rate of hospital admissions among patients who do not have fractures.

"Use of MRI in patients with a strong clinical suspicion of traumatic injury but unimpressive X-rays has a substantial advantage in the detection of pelvic and hip fractures."

Dr Tony Nicholson, from the Royal College of Radiologists, said the findings quantified something already known or suspected.

But he did not think it would be feasible or sensible to give every patient an MRI scan.

"Ultimately, it comes down to clinical acumen. If an elderly patient has persistent pain even though their X-ray shows only minor arthritis, an MRI would be a very reasonable request to check that there is not a fracture.

"It is always worrying when something is not diagnosed immediately, but I think most clinicians are first class and would follow up a patient appropriately."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8579846.stm

Published: 2010/03/24 01:28:56 GMT

'Good fat' cuts heart risk by 20%

Replacing saturated fats with healthier options can cut the risk of heart disease by a fifth, a US study says.

The Harvard Medical School reports adds weight to the growing evidence about polyunsaturated fats, found in some fish and vegetable oils.

The team analysed the findings from eight previous studies, covering more than 13,000 people, in their research.

Experts said cutting down on saturated fats, found in butter and meat, was just one part of a healthy diet.

It is recommended that adults get no more than 11% of their energy from saturated fats.

" **Our findings suggest that polyunsaturated fats would be a preferred replacement for saturated fats for better heart health** "
Dariush Mozaffarian, lead researcher

This is because the fats raise the levels of bad cholesterol that block the arteries to the heart.

In comparison, polyunsaturated fats have the opposite effect by increasing the levels of good cholesterol.

The Harvard analysis suggested that for every 5% increase in polyunsaturated fat consumption there was a 10% fall in heart disease.

The average rise in uptake of such fats was 10% giving the overall figure of a fifth lower risk over a period of just over four years.

Replacement

Lead researcher Dariush Mozaffarian said there was always a risk cutting down on saturated fats meant they were replaced with other bad options such as trans-fats which are found in processed foods such as biscuits and cakes.

He added: "Our findings suggest that polyunsaturated fats would be a preferred replacement for saturated fats for better heart health."

Victoria Taylor, from the British Heart Foundation, said the research reinforced existing recommendations to reduce saturated fats.

But she added: "What this study doesn't consider is whether substitution with monounsaturated fats, such as olive and rapeseed oils, would have similar benefits so more research is needed to understand this area fully.

"While the fat content and profile of your diet is clearly important, it must also be seen as just one part of a heart healthy diet where a low saturated fat and salt intake is combined with the consumption of oily fish and at least five portions of fruit and vegetables a day."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8580899.stm

Published: 2010/03/23 00:50:25 GMT

Athlete's foot therapy tapped to treat bat-killing fungus

Hibernating bats treated in several New York mines.
By Janet Raloff
Web edition : Monday, March 22nd, 2010

SAN FRANCISCO — Over the past four years, a mysterious white-nose fungus has struck hibernating North American bats. Populations in affected caves and mines can experience death rates of more than 80 percent over a winter. In desperation, an informal interagency task force of scientists from state and federal agencies has just launched an experimental program to fight the plague. Their weapon: a drug ordinarily used to treat athlete's foot.

John Eisemann of the Agriculture Department's Animal and Plant Health Inspection Service, better known as APHIS, in Fort Collins, Colo., mentioned the new program during his talk, here, at the American Chemical Society's spring national meeting. He was describing legal tactics by which wildlife officials can thwart invasive vertebrate species with off-the-shelf chemicals.

He noted, for instance, how scientists have used a contraceptive vaccine — one designed to control white-tail deer populations — on rodents. It offered a nonlethal approach to reining in the population explosion of non-native fox squirrels on a University of California campus. In another instance, wildlife managers employed a cholesterol inhibiting drug to reduce sex hormone levels — and the urge to reproduce — among invasive monk parakeets. And on Guam, Eisemann's team designed special traps baited with neonatal mouse carcasses. Each bait had been implanted with a child's dose of acetaminophen, the active ingredient in Tylenol. It proved amazingly effective in strategically poisoning a major scourge, invasive brown treesnakes — and only that species.

The bat task force enlisted Eisemann's help to make sure that whatever they tried would be legal. He's the go-to guy for identifying what permissions, waivers or requests are required before wildlife managers can apply poisons or anti-fertility drugs. The Food and Drug Administration allows for some off-label use of an existing drug as a veterinary prescription. And that's the tactic he arranged for the task force to use with the athlete's foot drug .

Theoretically, Eisemann says, it should have been possible for scientists to apply to get the chemical officially registered — as in approved — for use on bats. But with the disease spreading like wildfire and the potential market for a white-nose therapeutic tiny, the time and expense didn't seem feasible.

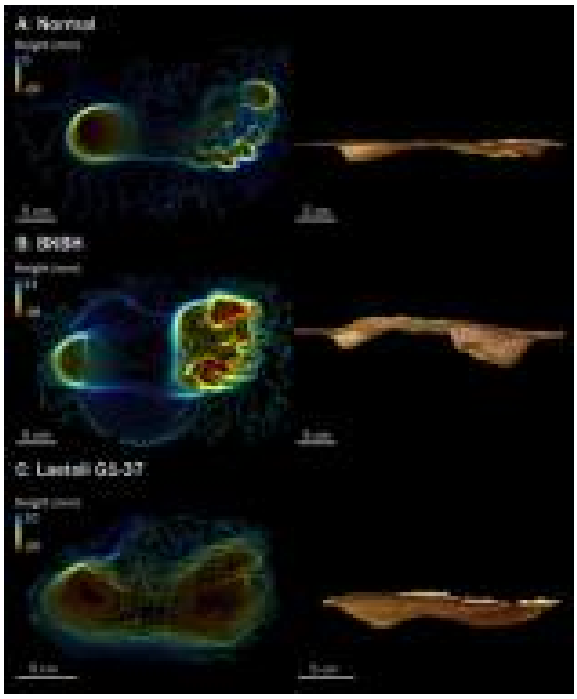
Afraid of upsetting the ecological balance of endemic fungi in caves, the scientists decided to pilot test the program in already perturbed and disturbed environments -- a few mines in upstate New York. Earlier this year, the researchers applied the antifungal medicine onto the noses of several hundred bats. It killed the fungus, Eisemann says. Now the goal is to see if and how it might have affected the treated colonies' die-off rate, since only a small share of any population had their noses rubbed with the antifungal drug.

Indeed, the scientists are hoping they might not need to treat the entire colony. "If there's enough communal grooming," Eisemann said, "they may only need to treat a certain percentage of the bats."

http://www.sciencenews.org/view/generic/id/57531/title/Athlete%E2%80%99s_foot_therapy_tapped_to_treat_bat-killing_fungus

Ancient footprints yield oldest signs of upright gait

Human ancestors may have been walking with an efficient, extended-leg technique by 3.6 million years ago
By Bruce Bower
Web edition : Monday, March 22nd, 2010



Gait keepersThree-dimensional scans show heel and toe depths created by a modern human while walking with a normal gait, top, and a crouched gait, middle. Ancient Laetoli footprints, bottom, display heel and toe depths much like those for a normal human gait today.Raichlen/PLoS ONE

Despite a penchant for hanging out in trees, human ancestors living 3.6 million years ago in what's now Tanzania extended their legs to stride much like people today do, a new study finds. If so, walking may have evolved in leaps and bounds, rather than gradually, among ancient hominids.

The discovery comes from the famed trackway site in Laetoli, Tanzania, where more than 30 years ago researchers discovered footprint trails from two, and possibly three, human ancestors who had walked across a wet field of volcanic ash. The new analysis shows that the Laetoli hominids made equally deep heel and toe impressions while walking across a soft surface, say anthropologist David Raichlen of the University of Arizona in Tucson and his colleagues.

That pattern is a cardinal sign of a humanlike gait, and suggests that an energetically efficient, extended-leg stride appeared surprisingly early in hominid evolution, Raichlen's team proposes in a paper published online March 22 in *PLoS ONE*. Until now, many researchers suspected that such a gait did not appear at least until the appearance of early *Homo* species around 2.5 million years ago.

"By the time hominids walked through the ash at Laetoli, they walked more like us than like apes," Raichlen says.

Many anthropologists attribute the Laetoli prints to *Australopithecus afarensis*, the species that includes the partial skeleton dubbed Lucy.

Some researchers previously argued that the Laetoli footprints resulted from a humanlike gait. Others have seen signs of a bent-knee, bent-hip stride characteristic of modern chimpanzees. The new investigation challenges that view.

"Raichlen's data are persuasive but admittedly limited in focus," remarks anthropologist William Jungers of Stony Brook University Medical Center in New York. Lucy's species differed from modern humans in ways that might have created gait disparities, in his view. Still, heel and toe depths at Laetoli provide a glimpse of efficient walking "long before the emergence of our own genus, *Homo*," Jungers says.

Raichlen's group is the first to analyze the Laetoli footprints from a biomechanical perspective. Eight adult volunteers walked twice across a lightly moistened sand walkway meant to reproduce the conditions in which the Laetoli prints formed. They then walked twice across the same sand surface while assuming a crouched stance. Special motion tracking and scanning equipment calculated the degree to which each person's hips and knees bent during all trials and generated three-dimensional models of participants' footprints.

People walking with an erect gait produced footprints with nearly equal heel and toe depths, the team found. In contrast, a crouched stride yielded markedly deeper toe impressions than heel impressions, reflecting faster weight transfer over the length of the foot.

To Raichlen's surprise, previous calculations of Laetoli footprint depths closely matched the even heel and toe depths left by people walking in their usual fashion.

A. afarensis fossils display an inwardly curved lower back, pronounced foot arches and other traits consistent with Raichlen's evidence for a humanlike gait at Laetoli, comments anthropologist Carol Ward of the University of Missouri in Columbia. "Any energy inefficiencies in walking relative to later *Homo* would have come from a small body size and wide body breadth, nothing more," she says.

No one knows precisely how hominids before Lucy's time walked. *Ardipithecus ramidus*, known primarily from a 4.4-million-year-old partial skeleton (*SN: 1/16/10, p. 22*) did not walk like people today, but the nature of its gait is unclear, he says.

"I doubt that the case is closed on debate over what gait was like in australopithecines, but this new study has made important strides in that direction," says anthropologist Brian Richmond of George Washington University in Washington, D.C.

http://www.sciencenews.org/view/generic/id/57513/title/Ancient_footprints_yield_oldest_signs_of_upright_gait

Who's White?
By LINDA GORDON

THE HISTORY OF WHITE PEOPLE

By Nell Irvin Painter

Illustrated. 496 pp. W. W. Norton & Company. $27.95

Nell Irvin Painter's title, "The History of White People," is a provocation in several ways: it's monumental in sweep, and its absurd grandiosity should call to mind the fact that writing a "History of Black People" might seem perfectly reasonable to white people. But the title is literally accurate, because the book traces characterizations of the lighter-skinned people we call white today, starting with the ancient Scythians. For those who have not yet registered how much these characterizations have changed, let me assure you that sensory observation was not the basis of racial nomenclature.

Some ancient descriptions did note color, as when the ancient Greeks recognized that their "barbaric" northern neighbors, Scythians and Celts, had lighter skin than Greeks considered normal. Most ancient peoples defined population differences culturally, not physically, and often regarded lighter people as less civilized. Centuries later, European travel writers regarded the light-skinned Circassians, a k a Caucasians, as people best fit only for slavery, yet at the same time labeled Circassian slave women the epitome of beauty. Exoticizing and sexualizing women of allegedly inferior "races" has a long and continuous history in racial thought; it's just that today they are usually darker-skinned women.

"Whiteness studies" have so proliferated in the last two decades that historians might be forgiven a yawn in response to being told that racial divisions are fundamentally arbitrary, and that deciding who is white has been not only fluid but also heavily influenced by class and culture. In some Latin American countries, for example, the term blanquearse, to bleach oneself, is used to mean moving upward in class status. But this concept — the social and cultural construction of race over time — remains harder for many people to understand than, say, the notion that gender is a social and cultural construction, unlike

sex. As recently as 10 years ago, some of my undergraduate students at the University of Wisconsin heard my explanations of critical race theory as a denial of observable physical differences.

I wish I had had this book to offer them. Painter, a renowned historian recently retired from Princeton, has written an unusual study: an intellectual history, with occasional excursions to examine vernacular usage, for popular audiences. It has much to teach everyone, including whiteness experts, but it is accessible and breezy, its coverage broad and therefore necessarily superficial.

The modern intellectual history of whiteness began among the 18th-century German scholars who invented racial "science." Johann Joachim Winckelmann made the ancient Greeks his models of beauty by imagining them white-skinned; he may even have suppressed his own (correct) suspicion that their statues, though copied by the Romans in white marble, had originally been painted. The Dutchman Petrus Camper calculated the proportions and angles of the ideal face and skull, and produced a scale that awarded a perfect rating to the head of a Greek god and ranked Europeans as the runners-up, earning 80 out of 100. The Englishman Charles White collected skulls that he arranged from lowest to highest degree of perfection. He did not think he was seeing the gradual improvement of the human species, but assumed rather the polygenesis theory: the different races arose from separate divine creations and were designed with a range of quality.

The modern concept of a Caucasian race, which students my age were taught in school, came from Johann Friedrich Blumenbach of Göttingen, the most influential of this generation of race scholars. Switching from skulls to skin, he divided humans into five races by color — white, yellow, copper, tawny, and tawny-black to jet-black — but he ascribed these differences to climate. Still convinced that people of the Caucasus were the paragons of beauty, he placed residents of North Africa and India in the Caucasian category, sliding into a linguistic analysis based on the common derivation of Indo-European languages. That category, Painter notes, soon slipped free of any geographic or linguistic moorings and became a quasi-scientific term for a race known as "white."

Some great American heroes, notably Thomas Jefferson and Ralph Waldo Emerson, absorbed Blumenbach's influence but relabeled the categories of white superiority. They adopted the Saxons as their ideal, imagining Americans as direct and unalloyed descendants of the English, later including the Germans. In general, Western labels for racial superiority moved thus: Caucasian → Saxon → Teutonic → Nordic → Aryan → white/Anglo.

The spread of evolutionary theory required a series of theoretical shifts, to cope with changing understandings of what is heritable. When hereditary thought produced eugenics, the effort to breed superior human beings, it relied mostly on inaccurate genetics. Nevertheless, eugenic "science" became authoritative from the late 19th century through the 1930s. Eugenics gave rise to laws in at least 30 states authorizing forced sterilization of the ostensibly feeble-minded and the hereditarily criminal. Painter cites an estimate of 65,000 sterilized against their will by 1968, after which a combined feminist and civil rights campaign succeeded in radically restricting forced sterilization. While blacks and American Indians were disproportionately victimized, intelligence testing added many immigrants and others of "inferior stock," predominantly Appalachian whites, to the rolls of the surgically sterilized.

In the long run, the project of measuring "intelligence" probably did more than eugenics to stigmatize and hold back the nonwhite. Researchers gave I.Q. tests to 1,750,000 recruits in World War I and found that the average mental age, for those 18 and over, was 13.08 years. That experiment in mass testing failed owing to the Army's insistence that even the lowest ranked usually became model soldiers. But I.Q. testing achieved success in driving the anti-immigration movement. The tests allowed calibrated rankings of Americans of different ancestries — the English at the top, Poles on the bottom. Returning to head measurements, other researchers computed with new categories the proportion of different "blood" in people of different races: Belgians were 60 percent Nordic (the superior European race) and 40 percent Alpine, while the Irish were 30 percent Nordic and 70 percent Mediterranean (the inferior European race). Sometimes politics produced immediate changes in these supposedly objective findings: World War I caused the downgrading of Germans from heavily Nordic to heavily Alpine.

Painter points out, but without adequate discussion, that the adoration of whiteness became particularly problematic for women, as pale blue-eyed blondes became, like so many unattainable desires, a reminder of what was second-class about the rest of us. Among the painfully comic absurdities that racial science produced was the "beauty map" constructed by Francis Galton around the turn of the 20th century: he classified people as good, medium or bad; he categorized those he saw by using pushpins and thus demonstrated that London ranked highest and Aberdeen lowest in average beauty.

Rankings of intelligence and beauty supported escalating anti-Catholicism and anti-Semitism in early-20th-century America. Both prejudices racialized non-Protestant groups. But Painter misses some crucial regional differences. While Jews and Italians were nonwhite in the East, they had long been white in San Francisco, where the racial "inferiors" were the Chinese. Although the United States census categorized - Mexican-Americans as white through 1930, census enumerators in the Southwest, working from a different racial understanding, ignored those instructions and marked them "M" for Mexican.

In the same period, anarchist or socialist beliefs became a sign of racial inferiority, a premise strengthened by the presence of many immigrants and Jews among early-20th-century radicals. Whiteness thus became a method of stigmatizing dissenting ideas, a marker of ideological respectability; Painter should have investigated this phenomenon further. Also missing from the book is an analysis of the all-important question: Who benefits and how from the imprimatur of whiteness? Political elites and employers of low-wage labor, to choose just two groups, actively policed the boundaries of whiteness.

But I cannot fault Nell Painter's choices — omissions to keep a book widely readable. Often, scholarly interpretation is transmitted through textbooks that oversimplify and even bore their readers with vague generalities. Far better for a large audience to learn about whiteness from a distinguished scholar in an insightful and lively exposition.

Linda Gordon is a professor of history at New York University and the author, most recently, of "Dorothea Lange: A Life Beyond Limits."

http://www.nytimes.com/2010/03/28/books/review/Gordon-t.html?nl=books&emc=booksupdateema1

With Justices for All

By ALAN BRINKLEY
Skip to next paragraph

SUPREME POWER

Franklin Roosevelt vs. the Supreme Court

By Jeff Shesol

Illustrated. 644 pages. W. W. Norton & Company. $27.95

In 1937, a few months after his landslide re-election to a second term, Franklin Roosevelt set out on one of the boldest and most dangerous courses of his presidency. The conservative Supreme Court had already struck down a series of New Deal programs. Roosevelt feared that the mostly aged justices would go on to destroy the rest of his legislative achievements before he would have a chance to make any new appointments. As a result, he proposed a "reform" of the courts that would, among other things, have added an additional justice to the Supreme Court for every current justice over the age of 70. It became the most controversial proposal of his presidency — so much so that it nearly paralyzed his administration for over a year and destroyed much of the fragile unity of the Democratic coalition.

Jeff Shesol (the author of "Mutual Contempt," an account of the relationship between Lyndon Johnson and Robert Kennedy) is not the first to chronicle what became known as the "court-packing" controversy, but "Supreme Power" is by far the most detailed — and most riveting — account of this extraordinary event. Shesol provides a revealing portrait of the "nine old men," as opponents of the court described them. At the same time, he presents in great detail Roosevelt's own anguish over what he considered the court's reactionary views. Both sides of the controversy were the products of deep conviction. The court was on a mission to combat what the justices viewed as a great danger to the basic principles of American democracy. The White House was on its own mission to save not just the New Deal, but also its restoration of the nation.

Within the Roosevelt administration, the proposal to enlarge the court seemed eminently reasonable. There was no constitutional bar to expanding the number of justices. All other measures — constitutional amendments, legislative remedies, mandatory retirements and similar proposals — seemed far more

radical and far less likely to succeed. Court packing seemed the most moderate and cautious of the paths available — but still, they realized, a tremendously risky one.

Both the court and the White House paid a considerable price for their insularity and secrecy. The justices, of course, were isolated by design. But the White House and the Justice Department created their own insularity, pursuing their goals with such surprisingly successful secrecy that they gave few people, even within the administration, the opportunity to warn Roosevelt of the dangers he faced. Shesol recounts these miscalculations on both sides with particular skill.

And the dangers, it quickly became clear, were much greater than Roosevelt and his advisers had imagined. It was not surprising that the court-packing controversy would arouse the rage of the right, which already detested Roosevelt and the New Deal and believed the White House was building a dictatorship. More startling to the president was the outrage from within his own party — even among many staunch progressives — and the lukewarm loyalty he received even from those who agreed to support him. Many opponents of the proposal shared Roosevelt's dismay at the court's conservatism, but tampering with the institution seemed even to many liberals to represent excessive presidential power and a threat to the Constitution.

The justices of the Supreme Court were as sharply divided in the 1930s as they often seem to have become in the 21st century. Five of them (George Sutherland, James McReynolds, Willis Van Devanter, Pierce Butler and Owen Roberts) were largely opposed to the New Deal measures they were asked to consider. Four others (Louis Brandeis, Harlan Fiske Stone, Benjamin Cardozo and, somewhat precariously, Chief Justice Charles Evans Hughes), mostly supported the New Deal. In 1937, when the court-packing fight began, most of the justices had been on the bench for well over a decade, and none had been appointed during Roosevelt's first four years. Hence the president's frustration, and his belief that the court had become out of touch with the realities of the time.

During the first months of controversy, the likelihood of success, given the huge Democratic majorities in Congress, seemed high, despite the ferocity of the opposition. But gradually the president's position eroded — a response to growing opposition and to the resentment of what many considered Roosevelt's duplicity in proposing what he claimed to be court "reform" rather than what many people considered naked political pressure. In July 1937, the court proposal died in the Senate, by now undefended even by the White House and unlamented by most of the public. It was widely described as the most devastating defeat Roosevelt had ever experienced.

But how devastating was the defeat? In West Coast Hotel Co. v. Parrish, a 1937 case contesting a minimum wage law in Washington State, Owen Roberts voted with the liberals to sustain the law. (Only one year earlier he had joined the conservatives in voting down another minimum wage law.) Over the following months, Roberts continued to vote mostly with the liberals. And beginning in mid-1937, a number of conservative justices retired, providing the president with the opportunity to appoint several new justices who transformed the ideological balance of the court.

Shesol does not engage directly with the scholarly debate over whether the court-packing controversy was responsible for the shift in the court's behavior. The traditional story, supported by some of the leading historians of the New Deal, maintains that the pressure from Roosevelt persuaded Roberts, and perhaps others, to shift positions. Other historians — mostly legal scholars — argue that the court-packing fight had little or nothing to do with the court's shift, that it represented instead a slow and steady evolution of constitutional law that long preceded the controversy. But even without taking an explicit stand, Shesol suggests a plausible argument that falls somewhere between these two interpretations.

One of Shesol's many important contributions to an understanding of this controversy is his powerful description of the extraordinary opprobrium the court confronted as it began to overturn New Deal measures in 1935. Indeed, it was the deep unpopularity of the court that helped embolden Roosevelt to challenge it in 1937. In those first years of the New Deal, Shesol suggests, the conservative justices were stunned by the boldness and, they thought, radicalism of the New Deal; their opinions seemed to reflect

their alarm and caused them to take positions even more conservative than they had in the recent past. Two years later, similarly stunned by the criticism they were receiving, the justices began to slowly back away from their most conservative views. Roberts's shift occurred even before Roosevelt announced his court-packing plan; but that does not mean that the political furor played no role in his decision.

Shesol also draws attention to a more mundane but nevertheless considerable factor in the shift of the court. In 1937 Roosevelt supported, and Congress approved, a bill to assure retired justices that they would continue to receive their judicial salaries even after retirement. The absence of such benefits had deterred some aged justices from retiring; once the pensions were assured, several of them resigned.

"Supreme Power" is an impressive and engaging book — an excellent work of narrative history. It is deeply researched and beautifully written. Even readers who already know the outcome will find it hard not to feel the suspense that surrounded the battle, so successfully does Shesol recreate the atmosphere of this great controversy. There are many ways to explain what become known as the "Constitutional revolution of 1937," but Shesol's book is — at least for now — the most thorough account of this dramatic and still contested event.

Alan Brinkley, the Allan Nevins professor of history at Columbia University, is the author of "The Publisher: Henry Luce and His American Century."

http://www.nytimes.com/2010/03/28/books/review/Brinkley-t.html?ref=books

What Lies Beneath

By NATHANIEL PHILBRICK
Skip to next paragraph

THE WHALE

In Search of the Giants of the Sea

By Philip Hoare

Illustrated. 453 pp. Ecco/HarperCollins Publishers. $27.99

"Moby-Dick" is often viewed as a singularly American creation. Part of the beguiling genius of "The Whale," a rhapsodic meditation on all things cetacean, is that Philip Hoare so suggestively explores the English origins of Herman Melville's masterpiece while providing his own quirky, often revelatory take on the more familiar aspects of the novel. But "The Whale" is about much more than the literary sources of "Moby-Dick." Always in the foreground of Hoare's narrative is the whale itself, a creature that haunts and fascinates him as he travels to old whaling ports in both Britain and America, where he speaks with cetologists, naturalists, museum curators and former whalers on a quest to understand the whale, the cosmos and himself.At least to the human eye, a sperm whale is a profoundly weird-looking animal, and Hoare makes the weirdness seem somehow familiar. The pale interior of the whale's mouth "glows like a half-open fridge." When the whale closes its mouth, the teeth of its lower jaw "fit," Hoare informs us, "into its toothless upper mandible like pins in an electrical socket." Hoare is always on the lookout for the revealing detail. When he visits the whaling museum in New Bedford, Mass., he notices that the recently installed skeleton of a whale "incontinently . . . drips oil, like sap from a newly cut conifer." He also has a finely tuned sense of perspective and pacing. As we read about how the six-man crew of a 19th-century whaleboat pursued its prey, we suddenly find ourselves underwater. "A mile below, the whale might be scooping up squid in the silent depths," Hoare writes, "unaware of the danger that lurked above, the shapes that sculled over the ceiling of its world."

Hoare is particularly insightful about Melville's relationship with Nathaniel Hawthorne, the author whose influence turned what might have been, in Hoare's words, "an exercise in propaganda for the American

whaling industry" into "a warning to all mankind of its own evil." It is a fascinating process to contemplate, how a 31-year-old former teacher and whaleman came to write a book "that saw into the future even as it looked into the past." For a few brief months, Melville was in that unsustainable zone of miraculous creation, channeling a text that is as close to scripture as an American novelist is likely to write. "Each time I read it," Hoare insists, "it is as if I am reading it for the first time."In one of the more entertaining episodes of "The Whale," Hoare ventures to Cape Cod to trace Henry David Thoreau's engagement with that region's wave-battered coast. In Provincetown, he finds himself in a boat with the redoubtable and magnificently named Stormy Mayo, a Cape Codder who has devoted his life to studying and protecting the 350 to 400 remaining Atlantic right whales. Hoare describes how Mayo — wearing a hockey mask and a helmet equipped with a video camera — tries to untangle right whales from fishing nets. When Hoare finally sees a right whale for the first time, he is overwhelmed not by wonder but by the smell, which he describes as "somewhere between a cow's fart and a fishy wharf."

It is near the British whaling port of Hull in East Yorkshire, on the banks of the Humber River, that Hoare's pilgrimage leads him to the "English Anchor" of "Moby-Dick." In the great hall of the expansive manor house Burton Constable, Hoare comes face to face with "the only physical relics of Melville's book": pieces of the skeleton described by Thomas Beale in "The Natural History of the Sperm Whale." Melville quoted relentlessly from Beale's treatise, providing his own book with the factual ballast that kept it from being overwhelmed by its many literary influences, which in addition to Hawthorne included Shakespeare, Thomas Browne and a host of others.

Hoare provides a graphic account of whaling's "historical crescendo" during the second half of the 20th century, when more than 72,000 whales were killed in a single year. Elsewhere he evokes a possible future in which the rising sea levels associated with global warming will allow the whale to become the planet's dominant species "with only distant memories of the time when they were persecuted by beings whose greed proved to be their downfall." As it turns out, whales have already ventured beyond this paltry planet. Unlike any other known substance, sperm whale oil works as a lubricant in the extra-ordinarily cold temperatures of outer space. "The Hubble space telescope is wheeling around the earth on spermaceti," Hoare writes, "seeing six billion years into the past." But that's not all. The scientists who fitted out the Voyager probe decided that the song of the humpback was the best way to greet any possible aliens. This means that long after all of us are gone, the call of the whale will be traveling out into the distant reaches of the universe.

Hoare is to "The Whale" what Ishmael is to "Moby-Dick": the genial, deceptively complex narrator who reveals only those personal details that are essential to his narrative. Since this is a book about deep divers, Hoare starts with an account of his near birth within a submarine. His parents had just begun a tour of a naval sub tied up to the docks in Portsmouth, England, when his very pregnant mother felt her first contraction. "For a moment," Hoare writes, "it seemed as though I was about to appear below the waterline." As it turned out, Hoare was born not beneath the waves but at his parents' home in nearby Southampton, the famous port to which he returns near the conclusion of the book to discover that his mother is approaching the end. After a night on a cot beside her hospital bed, he awakens in the early morning just as she ceases to breathe, "leaving me," he writes in an evocation of Ishmael's fate in the epilogue of "Moby-Dick," "another orphan." In the end Hoare plunges into the amniotic waters surrounding the Azores, where he sees his first living sperm whale. As he snorkels beside the huge creature he can feel its sonarlike clicks resonating through his body. "My rib cage had become a sound box," he writes. "The whale was creating its own picture of me in its head; . . . an outline of an alien in its world." Coupled with the recognition of his own inherent strangeness is the realization that this is a female sperm whale and that there is "an invisible umbilical between us." And so "The Whale" finishes where it began, in the midst of a birth at the surface of a deep and mysterious sea.

Nathaniel Philbrick is the author of "In the Heart of the Sea" and, most recently, "Mayflower." His next book, "The Last Stand: Custer, Sitting Bull, and the Battle of the Little Bighorn," will be published in May.

http://www.nytimes.com/2010/03/28/books/review/Philbrick-t.html?ref=books

Honor Among Base Stealers

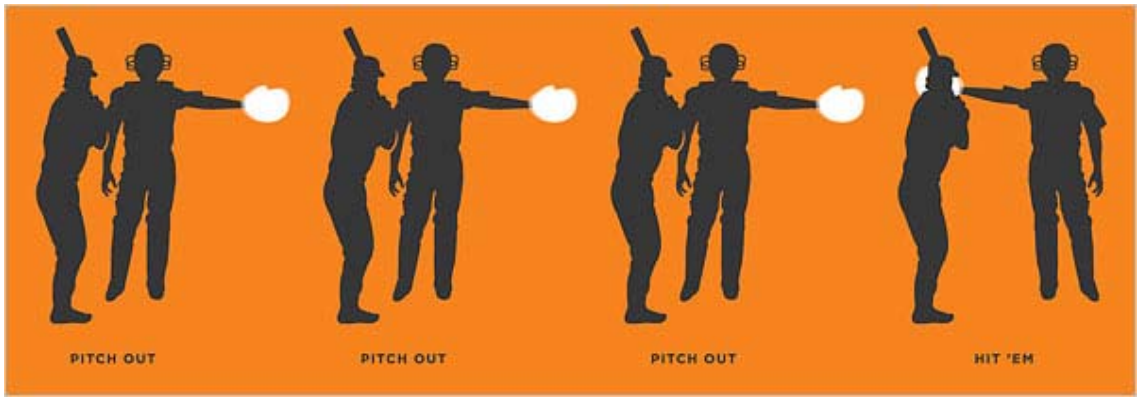
By BRUCE WEBER
Skip to next paragraph

THE BASEBALL CODES

Beanballs, Sign Stealing, and Bench-Clearing Brawls: The Unwritten Rules of America's Pastime

By Jason Turbow with Michael Duca

294 pp. Pantheon Books. $25



Professional baseball is a society, of sorts, and "The Baseball Codes" is a book of casual sociology. The premise is that ballplayers, managers, coaches and various other participants in the culture of baseball are all clued in to a value system, a mode of behavior that defines a gauzy ideal: the right way to play the game.

That phrase in itself needs explaining. If you're not fluent in sportspeak, you might think the right way to play would involve skills — techniques for a hitter's taking the outside pitch to the opposite field, say. Or maybe it would involve rules. But no. As the savvy fan knows, the right way to play refers to being a proper baseball citizen — that is, showing respect for your opponents, your teammates and the game itself, whether or not you hit .300 or your team makes it to the World Series.

Jason Turbow and Michael Duca, obvious baseball obsessives from the San Francisco Bay Area, have collected dozens of stories from baseball history about situations that are not governed by the rule book but that pertain to the fuzzy notions of rightness and respect and that describe the contours of the so-called baseball codes. When is it legitimate for a pitcher to knock down a hitter? When is it unsportsmanlike for a base runner to steal a base? Spitballs may not be legal, but are they ethical? Why might a player lie to his manager? Is it ever O.K. not to join your teammates when a brawl starts on the field? And how about stealing your opponent's signs? Is it proper? Always? Are some methods of thievery more tolerable than others?

For true baseball-niks, the discussions of these issues won't be especially enlightening. With so many former athletes now in the broadcast booth, the unwritten rules of the game get a pretty regular airing. (Disappointingly for a book that devotes a substantial section to cheating, there is no discussion at all of steroid use.) But the stories the authors have unearthed to illustrate ballpark justice and morality are often delicious.

It won't be news, for example, that when your team is ahead by seven runs in the eighth inning, it's bad form to swing at a 3-0 pitch. (For the unimmersed: The pitcher will most likely throw the ball right down the middle in order to get a strike, and taking advantage of this when your team is way ahead is considered rubbing it in.) To do so is to invite retribution; sometime soon — that inning, the next inning, tomorrow's game — the opposing team's pitcher will be aiming a fastball at you or a teammate.

But it is entertaining to learn that in 2006, Torii Hunter, the splendid outfielder then with the Minnesota Twins (he now plays for the Los Angeles Angels of Anaheim), made just that mistake against the Boston Red Sox. And that after the game, to palliate the feelings of their opponents and prevent an act of revenge, the Twins' manager, Ron Gardenhire, brought Hunter to the Red Sox clubhouse, like a parent teaching a 6-year-old a lesson, to apologize to the team's manager, Terry Francona.

Gardenhire is quoted as having said that he wanted Francona "to know we didn't give a sign for him to swing away, that Torii just made a mistake." He added, "I thought that it was good for Torii to explain it to him, so I took him over."

The authors offer stories like this in a spirit of romanticism, as though matters of violating and adhering to the codes of the game were enmeshed in its glorious tradition. But readers who are lesser fans may have limited tolerance for such minor episodes of baseball life, especially since what is collectively revealed is how thin-skinned, pouty, childish, vulgar and vengeful the baseball codes condition participants to be. The main dictum seems to be that even though you're trying to beat your opponents' brains in, you have to do it in a mannerly fashion, and if you don't, you're dead meat.

How players follow this principle takes some interesting forms, and in many places "The Baseball Codes" reads like a lab report by a psychologist who has been observing hostile toddlers whack one another with plastic shovels in a sandbox. Nolan Ryan was so put off if a batter dared to bunt and make him field his position, the authors write, that he'd knock him down with his 100-mile-per-hour fastball.

If a hitter smacks a home run and stands a little too long in the batter's box admiring his feat, the pitcher — it doesn't matter who — may be so ticked off that he'll take the next opportunity to drill the guy. Ditto if a hitter tries to sneak a peek at the catcher's signs. If one of your teammates is hit with a pitch, it's incumbent on you, as a pitcher, to retaliate and nail one of their guys.

Bob Gibson settled a grudge against one player 15 years after the fact, hitting him with a pitch in an old-timers' game. In 1976, Frank Robinson, then a player-manager with the Cleveland Indians, sent a pitcher, Bob Reynolds, to the Toledo Mud Hens, a minor-league affiliate, and when the Indians played the Mud Hens in an exhibition game, Reynolds, still miffed, threw a pitch over Robinson's head.

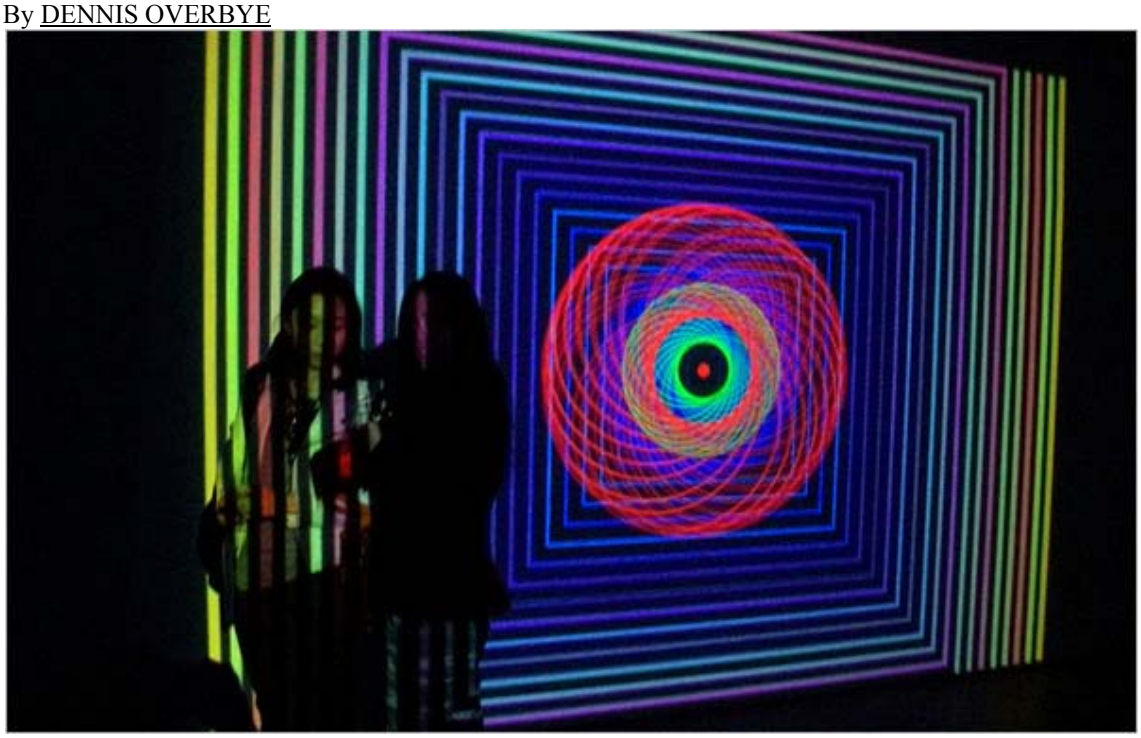
"Robinson's response wasn't standard fare for most management types," the authors write. "After grounding out, he walked to the mound and punched Reynolds twice, felling him with the second blow." No punishment for Robinson was forthcoming. The general manager of the Indians shrugged off the event. "Things like this happen in baseball from time to time," he said.

Bruce Weber, a reporter at The Times, is the author of "As They See 'Em: A Fan's Travels in the Land of Umpires," which has just been published in paperback.

http://www.nytimes.com/2010/03/28/books/review/Weber-t.html?ref=books

'Ouroboros: The History of the Universe'
For 3-D Travelers, a Cosmic Journey

By DENNIS OVERBYE



In the standard histories of the universe there are so many impossible things to believe before breakfast, as the White Queen put it in "Through the Looking Glass" — black holes, antigravity, dark matter and all those sneaky subatomic particles zipping through us — that the strangest and most amazing part of the universe gets short shrift. That would be us, collections of space junk, somehow perceiving and pondering the grandiosity that gave us birth in a sort of intellectual and emotional equivalent of the snake eating its tail.

That is the point of "Ouroboros: The History of the Universe," a 3-D visual collage of vibrating mandalas, exploding galaxies, astronauts and corporate logos, among much more, on six screens, all in the service of reconnecting consciousness and cosmos. It's now running in a darkened basement at the Ise Cultural Foundation in SoHo. Put on your 3-D glasses — what isn't 3-D these days? — and plug yourself back into the cosmos. The show was created by Ali Hossaini, a biochemist turned philosopher turned television producer turned visual poet, and a pair of video artists and programmers, Blake Shaw and Bruno Levy, a k a Sweatshoppe, who devised the 3-D effects.

Ouroboros, as the Greeks called the snake that eats its tail, has from ancient times been a symbol of cosmic unity and self-sufficiency. Dr. Hossaini says his mission here is to reverse what he calls the "fractionalizing of culture" that began with modern science, industry and art.

One consequence of that split is the continuing ravaging of the environment, he believes. "We know we're pillaging our habitat, but we can't make the leap from knowledge to right action," he writes in a statement that accompanies the show.

"Art cannot be science," he goes on, "but it can convey the sense of wonder that drives scientists. It can visualize the worlds of science while honoring our sense of self as beings that transcend the mundane" — and thereby, he suggests, help us remember who and where we are.

The show's six screens are arranged in triptychs at either end of a long, dark room. At one end, a series of mandalalike "sacred shapes" made up of circles, triangles, squares — forms that have recurred in mythological and artistic representations of the cosmos — bounce out of the walls, evolving and morphing into cylinders, Slinkys, and other configurations. There is a red dot front and center, representing, Dr. Hossaini explained, the omnipresent center from which perception and creation proceed.

The other end of the room is heavy on astronomical, geological and biological content, with a multilayered history of the universe, from the big bang to the Moon landings, flashing across the screens. The images flip in and out of visibility so fast that they almost register subliminally: comets, volcanic flows, galaxies and chemical symbols, among others, from a reservoir of 30,000 images pulled from the Internet. These images are constantly being reshuffled, as the artists, who met each other only last December, learn how to drive their show. The quality of the 3-D is not likely to make you forget "Avatar," and Dr. Hossaini isn't really interested in teaching you the mechanics of the expansion of the universe or the divergence of the species; this is not a planetarium or museum show. There is the sensation at one point of flying through a star field, but we recognize no constellation, nor do we arrive at any star.

At other moments moons, comets and volcanoes burst forth, but unconnected to familiar surroundings, they seem alien. Human faces appear, but we don't know who they are. The show's collaborators appear to have decided to bypass the rational part of the brain and head straight for someplace deeper, to make us experience the universe not as a concatenation of forces but as a poem. Viewers can roam around or just sit on a mattress on the floor and let their eyes do the wandering. The result is trippy. I felt as if I were watching two shows, one — the sacred images in front — cold and abstract, but hypnotic; the other warmer and full of meaning, if somewhat predictable. Still, the two inform and at times reinforce each other. Near the end of the "history," for example, the logos of companies like Wal-Mart and Delta Air Lines predominate in the background. These corporations are the evolved building blocks of modern culture, economics and politics (having even been granted personhood by the Supreme Court). Their logos have become the sacred shapes of our own time, just as the geometric shapes at the other end of the room were said by sages to be the soul of nature, building blocks of the world. I felt a click of my psyche reconnecting, the snake chomping down on its sacred tail.

An hour spent on the floor interviewing Dr. Hossaini and his colleagues (who all spend time at the show every day and "very much want to discuss the work" with visitors, he told me later) left me feeling transported back to 1969, when animated discussions of issues of cosmic import could go on all night on similarly unadorned floors, under the influence of slightly different stimulation.

Dr. Hossaini said that he (and the show) was partial to panspermia, the idea that life originated somewhere else — Mars, giant clouds in the Milky Way — and migrated to Earth, floating through space. That is a science-fiction-sounding idea that, as of yet, no astronomer can knock down.

Likewise, the presence of comets in the show testifies to the theory, held by many astronomers, that the Earth got its water from being bombarded by comets, which are just "dirty snowballs" in the lexicon, early in cosmic history.Dr. Hossaini said he liked the idea that water was brought to Earth from space. I replied that in fact everything on Earth came from space. He laughed.

"We're stardust," somebody in the dark said.

Exactly.

"Ouroboros: The History of the Universe" continues through April 23 at the Ise Cultural Foundation, 555 Broadway, at Prince Street, SoHo; (212) 925-1649, iseny.org.

http://www.nytimes.com/2010/03/27/arts/design/27ouroboros.html?ref=design

Monkey Business in a World of Evil

By EDWARD ROTHSTEIN

You don't really think about Curious George saving the day, as the title of the new exhibition at the Jewish Museum puts it. A "good little monkey," he is called in the classic series of picture books by Margret and H. A. Rey, but he was no savior. He was a mischief maker, an innocent, born in the jungle and lured into the strange world of humans.

He imitates gestures, examines objects. He sees a hat, he puts it on his head; he sees a seagull and is determined to fly himself; he sees a telephone and dials, accidentally summoning the fire department; he sees house painters and decides to paint.

His misadventures, particularly in the early books, are ignited by impulse and inquiry, the consequences of wanting to see and to know, and the books' charm is that they don't condemn this curiosity; they relish it. Reality's hard knocks — the chases, the falls, the breaking of limbs and objects — are ultimately taken care of by the nameless man in the yellow hat, who never seems to learn that you don't leave such a childlike creature alone with a new bike, saying, "Keep close to the house while I am gone."

But as the exhibition points out, at least outside of the books' frames, Curious George really did save the day, and more than once. In early September 1939, just after World War II began, the Reys — a husband-and-wife team of German Jews living in Paris — sought refuge at Château Feuga, an old castle owned by some friends in southern France.

At such a time, Hans A. Rey wrote in a letter, "it feels ridiculous to be thinking about children's books." But that is what they were doing, prolifically, including a book about a monkey named Fifi, who later became known as Curious George.

When suspicious villagers reported the strange couple in the old castle to the authorities, gendarmes searched the place for expected bomb-making material, but the studio with pictures of the mischievous monkey convinced them of the Reys' innocence.

Apparently, Fifi/George served much the same function when, in more serious straits in June 1940, his creators fled Paris on bicycles Hans Rey built from parts. As Louise Borden described in her 2005 picture book, "The Journey That Saved Curious George," they left two days before the Nazis entered Paris and rode 75 miles in three days. Their four-month journey on bicycle, train and boat led them to Lisbon, then to Rio de Janeiro and New York, the drawings offering proof of their occupations when they sought American visas. Surely Curious George could not have more deftly escaped the elevator operator, the firefighters, the farmers, the cook and the zookeepers who at one time or another pursued him through a series of seven books selling almost 30 million copies (thus saving the day for the Reys again).

Yet there is something curious here, in the sense of peculiar: a meaning that, the exhibition tells us, prevented the Reys' British publisher from following the American example in naming the monkey. The suggestion of "strange George" would have also seemed a tasteless allusion to George VI, then the British king (which is why the character became known as Zozo in Britain).

At first, the peculiarity is not apparent. The material for this show was gathered by the museum's curator Claudia J. Nahson, who combed through the extensive archives left by the Reys to the de Grummond Children's Literature Collection at the University of Southern Mississippi. It is an enticing, appealing, intelligent show, for which Ms. Nahson has included personal memorabilia (including a wedding invitation sent out in 1935, soon after Hans Augusto Reyersbach shortened his last name to Rey, and Margarete Waldstein shortened her first name to Margret; Hans depicted himself as an artist's palette, and Margret, a photographer, as a camera). There are letters (including some fascinating prewar correspondence with the French publisher Jacques Schiffrin, who tested out one of the Reys' early books on his son, André) and watercolors of George at his best, along with little-known characters from other books (like Raffy the giraffe, on whose neck a George-like monkey rides to sunlit safety above the clouds). In all, there are about 80 drawings and watercolors, along with photographs Margret took of Paris in the 1930s.

The exhibition is also true to its pictorial subject. It playfully expands some drawings into full-scale sets (you enter the first gallery through a portal resembling the entrance to a French hotel in one of the Reys' prewar books), creates a children's reading room (with pillows shaped like Georgian creatures) and features a gallery of the Reys' later work, whose sets evoke the places they ultimately considered home: first Greenwich Village, then Cambridge, Mass. And the peculiarity of the Curious George books? Like the Babar tales (which also grew out of the milieu of 1930s Paris) they have an almost colonial-era vision of the uncultivated naïf at large in the imperial world. But George is far more childish. One appeal of these volumes is their almost manic celebration of innocent desire.

"Little monkeys sometimes forget," we read of the warnings he regularly violates. Seeing something interesting, George, of course, "could not resist." He lifts a lid on a pot of spaghetti, plays tricks on his bicycle, races down a fire escape, climbs a tree in a natural history museum. His curiosity is clever, but consequences are never foreseen: he seems to be a fearless 5-year-old. Yet his romps began at a place and time —Europe in 1939 — when consequences were all, when almost nothing about the world could be relied on, and when curiosity had to take second place to survival. One reason the Jewish Museum has created this exhibition (and why the new Contemporary Jewish Museum in San Francisco will later show it) is that the Reys were not only Jewish, but they also had lives whose trajectory was a consequence of their identity.

But was their work also linked to that identity and their experience? Though the show points out the analogies we might make between the Reys' adventures and Curious George's, ultimately, of course, those suggestions are fairly trivial. There is simply nothing in these books that gives a clue of the dark times in which the first of them was conceived or the second one written, nor of the personal facts that led to the Reys' escape. There is nothing in any of the documents here — and Ms. Nahson said there was nothing in any of the material she examined, either — that indicated the Reys gave much thought to their Jewish origins; nor is there much to suggest an awareness of the wider world in which they were moving.

There is a letter here from 1939, written by Hans Rey from the Château Feuga, where the couple had taken temporary shelter; he expresses concern about the war, but notes that "life goes on, the editors edit, the artists draw, even during wartime." And yes, it does indeed go on, if you can find shelter, though generally, artists and editors have been deeply affected by their experiences. That letter to Schiffrin, in fact, went unanswered for months, since the editor had been drafted into the French Army; he later had to flee for his life as well.

But Curious George and his world seem almost to have been a refuge in which historical forces were held at bay by a focus on the timeless innocence of childhood, sensed in the artificial world of this strangely tailless monkey.

We know that both the Reys must have enjoyed adventure and exoticism. Hans had moved from Hamburg to Rio de Janeiro as early as 1924, and sold bathtubs and sinks along the Brazilian Amazon. Margret, eight years his junior, went to Rio in 1935; the two were soon married (their families had known each other in Hamburg) and opened Rio's first advertising agency. Their belated honeymoon in Paris in 1936 turned into a four-year residence. They had taken their two pet marmosets on the voyage, but both had perished.

You can sense George's jungle origins in these facts, along with the almost restless enterprise the monkey displayed. But where is the rest of the world? In the books, it is present mainly by its absence. In the first Curious George book, the exhibition notes, "the ship's arrival with the yellow-hatted man and George happily displaying their identification papers, stands in contrast to the Reys' plight at the time." The drawing was created "when they were struggling to secure the necessary papers to leave France."

There is also a fair number of H. A. Rey's journals on display here — miniature notebook/calendars — but their main function seems to have been to keep track of expenses in difficult times. The ones selected for display are, presumably, among the most interesting, but their comments are cryptic and unrevealing. It is almost as if there were very little inner life to account for.

The duo must have been terrific together; Margret Rey explained how she would often act out George's gestures as her husband drew. The man in the yellow hat, the exhibition explains, was like Hans Rey, even smoking a pipe. Was George, then, a sort of joint cocoon for them, shaping a world secure enough to exist independent of the forces that gave them chase?The show points out that George's later stories may reflect some of his creators' experiences of America, invoking Hollywood, rocket ships, newspapers — the bustle of American commercial and social life. Somehow, the trials of the past must have been subsumed into these books and (judging from the exhibition) other volumes less well known. And whatever darkness they had experienced was displaced by the "disarming innocence," "buoyant colors" and "unstinting optimism" the show correctly notes that we find in the artwork.

For me, this simplicity makes the books less interesting than those of other children's book writers and illustrators of their era — from Robert McCloskey to Maurice Sendak — but it is still no small achievement to capture the thrills and risks of curious innocence even if they couldn't capture the real human world surrounding them.The Reys never had any children themselves, though many young readers may have pledged familial allegiance. Later in life, we read, Margret Rey told of a little boy who came to meet them, thinking they were the parents of Curious George. With "disappointment written all over his face," the boy said, "I thought you were monkeys too."Not quite, of course — any more than the world in which George moved was the world the Reys knew, all too well.

"Curious George Saves the Day: The Art of Margret and H. A. Rey" is on view through Aug. 1 at the Jewish Museum, 1109 Fifth Avenue, at 92nd Street; (212) 423-3200, thejewishmuseum.org.

http://www.nytimes.com/2010/03/26/arts/design/26curious.html?ref=design

'Rising Currents: Projects for New York's Waterfront'

Imagining a More Watery New York

By NICOLAI OUROUSSOFF

Abandoned neighborhoods. Boarded-up harbor facilities. An oil refinery submerged under several feet of brackish water. The Statue of Liberty slowly sinking into the sea.

"Rising Currents: Projects for New York's Waterfront," a new show at the Museum of Modern Art, reflects a level of apocalyptic thinking about this city that we haven't seen since it was at the edge of financial collapse in the 1970s, a time when muggers roamed freely, and graffiti covered everything.

Organized by Barry Bergdoll, the Modern's curator of architecture and design, the show is a response to the effects that rising sea levels are expected to have on New York City and parts of New Jersey over the next 70 or so years, according to government studies. The solutions it proposes are impressively imaginative, ranging from spongelike sidewalks to housing projects suspended over water to transforming the Gowanus Canal into an oyster hatchery.

Yet the show is no crackpot fantasy. Based on a two-year research project by the engineer Guy Nordenson, the landscape architect Catherine Seavitt and the architect Adam Yarinsky, it builds on recent municipal efforts to create a greener New York, from bike lanes to the construction of the new Brooklyn Bridge Park. Its vision of "soft infrastructure," which would replace much of the city's aging concrete waterfront with a more porous blend of land and sea, is the most coherent model we have for a sustainable city in the current century — as well as one that would radically transform New York's Manhattan-centric identity by reorienting the city around its harbor.

One of the first things you see in the show is a provocative series of images of Lower Manhattan in 2080. The Freedom Tower has (just?) been completed and dominates the downtown skyline. Many of Battery Park City's towers, which were built on landfill produced by the construction of the original World Trade Center, are gone. A swath of green extends from the water's edge halfway up to Wall Street. At first glance, it looks like a sci-fi disaster flick.

The elegance of this design, by Architecture Research Office and dlandstudio, is in the way it manages to marry a wholly new landscape to Lower Manhattan's irregular pattern of streets. A series of bays proposed for the worst flood zones are carved out of the west side, creating a richly crenelated pattern along the island's coast. Delicate strips of restored wetland extend out into the water to attenuate waves, as if other parts of the city's grid were dissolving.

More radical, however, is the way the team has completely redesigned a typical Manhattan street. The asphalt has been ripped up and replaced with a perforated "green" cast-concrete surface designed to absorb rainwater. Sewer, water, gas and electric pipes are enclosed in waterproof vaults beneath this new skin, which can be removed for repairs.

A general interest in re-examining parts of the urban fabric that we take for granted, like streets, piers and canals — as opposed to the more familiar desire to create striking visual objects — is one of the main strengths of the exhibition. A team led by Matthew Baird Architects, for example, has focused on a huge oil refinery in Bayonne, N.J., that, if current estimates hold, will be entirely under water before our toddlers have hit retirement age. Rather than taking the predictable and bland route of transforming the industrial site into a park, the team proposes a system of piers that would support bio-fuel and recycling plants, including one that would produce the building blocks for artificial reefs out of recycled glass. Those large, multipronged objects, which the architects call "jacks," could be dumped off boats in strategically chosen locations, where their forms would naturally interlock to create artificial reefs once they settled at the bottom of the harbor. The jacks are magical objects, at once tough and delicate, and when you see examples of them from across the room at MoMA, their heavy legs and crushed glass surfaces make them look almost like buildings. But here again, what's really commendable about the design is the desire to look deeper into how systems — in this case, global systems, both natural and economic — work. According to Mr. Baird's research, the melting of the ice cap could one day create a northern shipping passage that would make New York Harbor virtually obsolete. The manufacturing component of the design is meant as part of a broader realignment of the city's economy that anticipates that shift.

Because the contributors to this show are young and relatively untested (they are mostly in their late 30s and early 40s), there are some slightly hokey elements. A team led by Kate Orff of SCAPE/Landscape Architecture re-imagines the heavily polluted Gowanus Canal as an oyster nursery, in an effort to turn back the clock to a time when New York was an oyster capital of the world. Oddly, the proposals that are most architectural in their approach often don't hold up as well as those that focus more on big infrastructure issues. NArchitects proposes a series of artificial islands that extend like fingers out into the harbor near the Verrazano Bridge, supporting suspended housing blocks. Channels are dug between the fingers into Sunset Park, Brooklyn, to obscure further the boundary between land and sea. The design is a nice counterpoint to the most brutal large-scale infrastructure and housing projects of Robert Moses-era New York. But the drama of suspending the structures from above doesn't read clearly enough in the design, and the effort seems wasted.

Still, the value of the show has more to do with the story it tells as a whole rather than with any of the individual chapters. A healthy museum architecture department explores the kinds of ideas that are rarely addressed in the back and forth between government bureaucrats and bottom-line developers that characterizes most large-scale design projects. This is particularly true in an age that more and more seems to abhor creative risks of any kind. The MoMA show asks us to rethink what the city could be, and in doing so nudges us away from a parochial mentality that tends to cling to the city's past greatness rather than embracing — and facing up to — its future. If the show has a flaw, it is that it should push even harder.

"Rising Currents: Projects for New York's Waterfront" continues through Oct. 11 at the Museum of Modern Art; (212) 708-9400, moma.org.

http://www.nytimes.com/2010/03/26/arts/design/26rising.html?ref=design

Celebrating the Delicate Beauty of the Desert Landscape

By NICOLAI OUROUSSOFF

Few architects have invested more time trying to bridge the gap between the high-tech aesthetics of the West and the traditions of the Middle East than Jean Nouvel.

His design for the Arab World Institute in Paris in 1987 was dominated by mechanical, light-regulating apertures arranged in a pattern that evoked Islamic motifs. A planned branch of the Louvre Museum in Abu Dhabi will be shaded by a gigantic dome that turns its grounds into a kind of oasis. And workers are putting the final touches on an office tower in Doha, Qatar, that is sheathed in aluminum latticework and capped by a filigreed, mosquelike dome.

But Mr. Nouvel's design for the National Museum of Qatar, scheduled to be unveiled on Tuesday at the Museum of Modern Art in New York, may be that French architect's most overtly poetic act of cultural synthesis yet. One of a number of major museum projects in Doha, including I. M. Pei's year-old Museum of Islamic Art, it is part of a government push to encourage the exchange of cultural traffic — between East and West, tradition and modernity — after many years in which it seemed to move only one way. Every level of Mr. Nouvel's project, from its materials to its dominant forms to its sprawling layout, reflects a richly imaginative effort to retain a connection to the fading world of the Bedouins from which modern Qatar sprang, while also embracing the realities of a rapidly urbanizing society.

As recently as the 1950s Doha was a small town built on fishing and pearl diving; its souk served as a trading center for Bedouin tribes.

That began to change with the rise of an economy built on oil, and the urban growth that resulted. By the 1990s high rises and air-conditioned malls were replacing traditional stucco houses. The process accelerated during the global economic boom, creating an entirely new skyline, and has continued apace since, as the government pushes ahead with construction projects like the new museums and vast Western-style university campuses. Meanwhile, as younger Qataris, many of them educated in the West, began to embrace urban culture, an older generation that grew up in the desert began to die off, taking their memories with them.

As the national museum's director, Peggy Loar, an American who was formerly the director of the Wolfsonian Museum in Miami, put it: "The problem is that Bedouin culture is very intangible," with artifacts that are few and fragile: "tents, hand painting, the delicate stitch on a textile."

The Bedouins were "really about telling stories," she continued. "So even as you see this amazing second renaissance in the Arab world, they are losing the basic underpinnings of who they are. Younger people go out into the desert in their SUVs, but they don't live there anymore. They are losing a connection to their culture."

Mr. Nouvel's design begins by making a fundamental connection along these lines.

Inspired by sand roses, the tiny formations that crystallize just below the desert's surface, the building's dozens of disclike forms, intersecting at odd angles and piling up unevenly atop one another, celebrate a delicate beauty in the desert landscape that is invisible to those who have not spent time there. The lightness with which these forms rest on the land, meanwhile, conjures the ethereality of desert life.

Under these disclike roofs, the building is a chain of interconnected pavilions and outdoor terraces surrounding a large open-air courtyard, a layout that evokes caravanserais, shelters that were built along the old trade routes. The Amiri Palace, a traditional mud-brick structure built for the royal family in the 1920s, breaks in among the pavilions near the museum's main entry, where it serves as a visual anchor.

Seen from above in a model, the tumbling abstract disc forms recall the explorer Wilfred Thesiger's description of the "apparently haphazard confusion" of the desert dunes. The discs' pinkish-beige concrete surfaces echo the hidden patterns that give the desert sands their richness — the subtle blend of colors, of heavy and light grains.

But the more you stare at the renderings, the more the project becomes recognizable as a building shaped by a forward-looking sensibility. The asymmetrical arrangement of the discs — whose razor-thin edges emphasize the building's lightness — speaks to contemporary architectural ideas about heterogeneity and openness.

The galleries will be loosely arranged in chronological order, beginning with exhibitions on the natural history of the desert and the Persian Gulf, artifacts from Bedouin culture, historical exhibitions on the tribal wars and the establishment of the Qatari state, and finally the discovery of oil to the present. The tilting plates that form the walls in some places will create peekaboo views from one gallery to another, pulling you along. But the arrangement will also allow the audience to drift in and out of the gallery pavilions, treating them as a single sequence or as individual chapters in a looser narrative.

Mr. Nouvel imagines a minimal number of fixed displays — tents, textiles, fishing boats — set at the center of the rooms, as in a more traditional museum. The walls of the larger galleries would be covered in large-scale moving images meant to immerse visitors in the world of the desert. As he put it recently, "To understand the desert today you need helicopters and four-wheel-drive Jeeps. I think we could replicate that experience here, so the museum becomes a kind of portal to the desert."

The design's freshness is thrown into relief by its relationship to Mr. Pei's distinguished Museum of Islamic Art. That building's heavy stone geometric forms were intended as an expression of an ideal balance between traditional Islamic architecture and an equally traditional modernism. They speak of permanence. Mr. Nouvel's creation gives weight to an underappreciated history while remaining firmly pointed toward the future. It shows an awareness of the speed with which contemporary cultures change.

Together, the two museums form the beginnings of a conversation about cultural identity that should resonate on both sides of the divide.

http://www.nytimes.com/2010/03/23/arts/design/23doha.html?ref=design

Why @ Is Held in Such High Design Esteem

By ALICE RAWSTHORN

NEW YORK — The French and Italians have nicknamed it the "snail." The Norwegians have plumped for "pig's tail," the Germans "monkey's tail," and the Chinese "little mouse." The Russians think of it as a dog, and the Finns as a slumbering cat.

It's the @ symbol on the computer keyboard, which is an essential component of every e-mail address. Millions of us type it each day, usually without thinking about it. Yet the Museum of Modern Art in New York has deemed it to be such an important example of design that the @ has been officially admitted to its architecture and design collection. That's as good as it gets in the design world, rather like bagging a Tony on Broadway or an Oscar in Hollywood.

You may be wondering why a keyboard symbol should be lauded as a design coup. It's a reasonable question, and the answer tells us a great deal about how design and our expectations of it are changing.

Let's start by looking at the @. No one knows for sure when it first appeared. One suggestion is that it dates to the sixth or seventh century when it was adopted as an abbreviation of "ad," the Latin word for "at" or "toward." (The scribes of the day are said to have saved time by merging two letters and curling the stroke of the "d" around the "a.") Another theory is that it was introduced in 16th-century Venice as shorthand for the "amphora," a measuring device used by local tradesmen.

Whatever its origins, the @ appeared on the keyboard of the first typewriter, the American Underwood, in 1885 and was used, mostly in accounting documents, as shorthand for "at the rate of." It remained an obscure keyboard character until 1971 when an American programmer, Raymond Tomlinson, added it to the address of the first e-mail message to be sent from one computer to another.

At the time, he was working for Bolt, Beranek & Newman, a technology company that was developing a communications network for the U.S. Department of Defense. Mr. Tomlinson was responsible for the messaging service. He wrote the addresses in computer code, which needed to be translated into a form of words that the rest of us could understand.

Having decided that the first half of the address should identify the user and the second the computer, he looked for a symbol to indicate that he or she was literally "at" that machine. The @ not only had a similar meaning, but was so seldom used that it was open to reinterpretation. (If you're a "Gossip Girl" fan, think of it as Little J. being crowned "queen" of Constance; or, if you prefer "Mad Men," as Peggy after her promotion from secretary to copywriter.)

We all know what happened next. The @ became a supernova of the digital age and part of our daily lives, although that still doesn't explain why it has been elevated to MoMA's design collection.

There are some 175,000 pieces in MoMA's entire collection, and roughly 28,000 in the architecture and design section, which includes everything from some of the 20th century's most famous cars and chairs to the archive of the modernist grandee Mies van der Rohe. New pieces can only be added after winning the approval of an acquisitions committee composed of 25 architecture and design specialists, who meet every three or four months.

The committee must be convinced that each addition meets the entry criteria. Does it excel in terms of form and function? Does it embody the values of clarity, honesty and simplicity that MoMA considers essential to good design? Has it has made an impact on our lives? Is it innovative? Then there's the clincher. "If this object had never been designed or manufactured, would the world miss out?" said Paola Antonelli, senior curator of architecture and design at MoMA. "Even just a bit?"

How did the @ fare? Brilliantly, according to Ms. Antonelli. By giving that once obscure accountancy symbol a new application without distorting its original meaning, Mr. Tomlinson was deemed to have checked all of MoMA's boxes in terms of form, function, values, cultural impact and innovation. She sees "snail," "pig's tail" and its other nicknames as proof of its importance, because we care so much about the @ that we've started to mythologize it.

Fair enough, you might say, but what does its transformation have to do with design? After all, the new @ looks exactly the same as the old symbol, and isn't a physical object like the chairs, cars or architectural drawings that you'd expect to find in a design museum.

That's exactly why MoMA admires it. First, both the old and new @ fulfill the same function of simplifying and clarifying something that's fiendishly complicated to make and interpret: handwritten script and computer code respectively. Ms. Antonelli describes that as "an act of design of extraordinary elegance and economy." Both qualities are prized by MoMA, especially "economy" in a time of recession and environmental crisis, when reinventing something that's under-used seems much smarter than designing something new.

Timeliness matters to MoMA too, and the new @ is timely not only in its economy but also precisely because it is not physical (just like equally dynamic areas of contemporary design such as software and social design). "MoMA's collection has always been in touch with its time," Ms. Antonelli said, "and design these days is often an act with aesthetic and ethical consequences, not necessarily a physical object."

That's why MoMA decided against adding a specific version of the @ to the collection in favor of using it in different typographic styles and sizes. Ms. Antonelli likens it to the museum's acquisition of "The Kiss," a performance art piece by Tino Sehgal, in which a couple embrace for several hours. Just like the @, each performance can take a different form with new protagonists — though there is a difference. MoMA reportedly paid $70,000 for "The Kiss," while the @ is joining the collection free.

http://www.nytimes.com/2010/03/22/arts/design/22iht-design22.html?ref=design

Searching the Bones of Our Shared Past

By EDWARD ROTHSTEIN

WASHINGTON — Our species has undergone a significant evolutionary change in the last 150 years. This is scarcely a sigh on the scale of long-term hominin evolution, some six million years of transformation that is the main concern of the impressive David H. Koch Hall of Human Origins, which opened this week at the Smithsonian's National Museum of Natural History. But without this recent, subtle, quick change, this $20.5 million exhibition would hardly have been possible.

Look, for example, at the gallery called "Meet Your Ancestors." You can, if you like, gaze at the fossilized fragments of a Neanderthal skeleton discovered during the excavation of an Iraqi cave in 1958. Or you can examine two astonishingly well-preserved skulls on loan from the Musée de l'Homme in Paris for a few months — one from a 50,000-to-70,000-year-old Neanderthal, the other the original 1868 Cro-Magnon discovery, about 30,000 years old, representing our own species (Homo sapiens).

But these still might prove to be a little abstract to get the museum's point, even with the careful preparation that went into the 15,000-square-foot exhibition. Move instead around a wall of 76 human skulls from different eons and see how the artist John Gurche has put flesh and hair on fossilized bones' barren shapes. Here, mounted in cases, are heads of eight beings we recognize as distant kin, their simian characteristics qualified by expressions that reflect varying degrees of inner life.

Each is a different species, and each of these species, we learn, is human. Here is Homo heidelbergensis, who lived 200,000 to 700,000 years ago and may have been the ancestor of Neanderthals in Europe's cold latitudes; the individual here looks out beneath protruding brow ridges, alert, interested, wary. Nearby is a less brawny, fierce-looking representative of Homo erectus, a species that roamed the world for almost 1.8 million years, far more than our own can yet dream of.

And, perhaps most startling, here is a female from Homo floresiensis, a species discovered on the Indonesian island of Flores only in 2003 that apparently became extinct just 17,000 years ago. Or is it a species at all? It has been casually referred to, as it is here, as a "hobbit" species since it stands just over three feet tall. But it clearly had a much smaller brain than Frodo's or Bilbo's.

Think, though, of what has happened to allow us even to acknowledge these personifications as close relations. Just a little more than 150 years ago Charles Darwin was made almost physically ill when contemplating the religious and cultural trauma his theory of evolution would inspire. He was deposing a divine order of immutable categories; he was also dissolving a sacral boundary that had separated the animal from the human.

Over the next century natural history museums remade themselves. Once they offered displays of hierarchical clarity. This approach changed into a narrative of transformations and demonstrations of a nature "red in tooth and claw," as Tennyson put it; survival was the force of creation. The classical museum diorama shows habitats: nature's theaters, whose forces shaped animal life. Ultimately Homo sapiens arose, standing erect over ancestral battlegrounds.

But now, under the oversight of the director of the Smithsonian's Human Origins Program, the paleoanthropologist Richard Potts (who is also an author of a catalog published for the exhibition), something has changed again. As the hall points out, we now have far more information than Darwin did. There are fossil findings from thousands of humans extending over millions of years; we know how DNA works and can pinpoint the genetic crossroads of history; advances in microscopic analysis have allowed even identification of particles of fossilized pollen. These developments have offered a clearer understanding of the one idea that was always most difficult: the evolution of the human.

The exhibition's theme is "What Does It Mean to Be Human?" And the new image of the human it creates is different from the one from a century ago. It isn't that nature has suddenly become a pastoral paradise. Some of the most unusual objects here are fossilized human bones bearing scars of animal attacks: a 3-year-old's skull from about 2.3 million years ago is marked by eagle talons in the eye sockets; an early human's foot shows the bite marks of a crocodile. In one of the exhibition's interactive video stations, in which you are cleverly shown how excavated remains are interpreted, you learn that the teeth of a leopard's lower jaw found in a cave at the Swartkrans site in South Africa match the puncture marks in a nearby early-human skull: evidence of a 1.8 million-year-old killing.

Yet the emphasis here is not on the battle for survival but on the long trail of evidence left as the human thrived. Unlike Darwin, the hall reminds us, we know that there have been multiple human species, including Homo floresiensis, Homo neanderthalensis, Homo heidelbergensis, Homo erectus, Paranthropus boisei, Paranthropus robustus, Australopithecus afarensis and Sahelanthropus tchadensis.

During the brief 200,000-year life of Homo sapiens, at least three other human species also existed. And while this might seem to diminish any remnants of pride left to the human animal in the wake of Darwin's theory, the exhibition actually does the opposite. It puts the human at the center, tracing how through these varied species, central characteristics developed, and we became the sole survivors. The show humanizes evolution. It is, in part, a story of human triumph.

Thus along one wall of the exhibition space, we see a series of panels and cases that trace characteristic developments. We see how walking upright provided both advantages and disadvantages (by about 6 million years ago). Then came tool making (by about 2.6 million years ago), alterations in body shape, rapid increases in brain size (some 500,000 years ago), the urge for social interactions and the development of symbolic language and art (250,000 years ago). We see Neanderthal ornaments made from animal bone and the reproduction of a flute made from a mammoth's ivory, about 35,000 years old, found in a German cave.

We also come to understand how interpretations of fossil remains are made by paleoanthropologists like Mr. Potts. A jawbone from which teeth are missing appears to be from an aged Neanderthal, part of a nearly complete skeleton found in a pit in the Shanidar Cave in Iraq. Analysis of the soil found bits of wood there along with pollen, suggesting that some 65,000 years ago an early human community ceremoniously buried its dead.

And at recent excavations in China, at Majuangou, stone tools were found in four layers of rock dating from 1.66 million to 1.32 million years ago; fossil pollen proved that each of these four time periods was also associated with a different habitat. “The toolmaker, Homo erectus,” we read, “was able to survive in all of these habitats.”

That ability was crucial. The hall emphasizes that enormous changes in the planet’s climate accompanied hominin development, suggesting that the ability to adapt to such differing circumstances was the human’s strength. Climate change was one of the forces that led to the triumph of Homo sapiens. A closing portion of the exhibition, with displays about population growth and contemporary climate change, suggests that Homo sapiens’ skills are being challenged yet again.

The hall bears repeated, close viewing, though children will also find amusements here, including the opportunity to come face to face with floor-level bronze models of their ancestors. But the two computer simulations at the exhibition’s end — one a simplified Sims-type game of cultural and environmental choice, the other a cartoonish vision of possible future evolutionary change — should be far more subtle. More wall text summarizing themes would have also helped: too much is left to the text of touch screens, buried inside menus of choices.

There are times too when it seems as if the Smithsonian has almost gone too far in humanizing evolution, as if it were answering those who, on religious grounds, object to the evolutionary universe and its inhuman brutality. (A touch-screen F.A.Q. suggests simply that such visitors use the show to “explore new scientific findings and decide how these findings complement their ideas about the natural world.”)

At any rate, the exhibition’s focus doesn’t really give us a feel for the daring of the evolutionary vision, which is a tale not of progress but of accident, frightening in the moment, fortuitous only in retrospect.

But the retrospective vistas provided here are, nevertheless, compelling and illuminating. This was conceived as a permanent exhibition, meant to serve a generation of visitors, but it was also designed to be easily adaptable to the pressures of scientific advances and visitor tastes. The evolution continues.

The David H. Koch Hall of Human Origins is at the Smithsonian’s National Museum of Natural History, 10th Street and Constitution Avenue NW, Washington; humanorigins.si.edu.

http://www.nytimes.com/2010/03/19/arts/design/19museum.html

Behavior of Single Protein Observed in Unprecedented Detail

Stanford chemist W. E. Moerner. (Credit: L.A. Cicero)

ScienceDaily (Mar. 27, 2010) — For the first time, researchers have been able to confine and study an individual protein, one that plays a key role in photosynthesis, without having to pin it down so tightly as to alter its fundamental behavior.

In the first practical application to proteins of a recently developed technique, two Stanford chemists were able to make detailed observations of the dynamic behavior of the molecule for more than one second, a 50- to 100-fold increase in viewing time compared to other methods, and thereby "set a new standard in single-molecule spectroscopy," according to a commentary in the March issue of *Nature Chemistry*.

The groundbreaking study is described in a paper by Stanford chemists W. E. Moerner and Randall Goldsmith in that issue, now available online. The commentary was written by researchers not involved in the study.

Observing molecules one at a time is valuable because it lets researchers get a clear picture of that molecule's changing behavior over time, without the picture being confused by the presence of other molecules.

Up until now, researchers have had to remove a molecule from its normal environment -- typically a solution such as the bloodstream or the fluids inside a cell -- and "basically staple it to some surface such as a glass slide or a large plastic bead, or imbed it in a synthetic polymer to observe it," said Goldsmith, a postdoctoral researcher in chemistry.

The result, he said, is like trying to discern how a tiger behaves in the wild by watching it pace back and forth in a cage at the zoo. "You have every reason to be suspicious that you might profoundly alter the behavior of the molecule by binding it to a surface," Goldsmith said.

That perspective is buttressed by the results of their study, in which they "trapped" in solution a molecule of a fluorescent photosynthetic protein called allophycocyanin, which is found in red algae and cyanobacteria (formerly known as blue-green algae). Both algae hold promise as key components in next-generation solar technologies and biofuels.

Moerner, a professor of chemistry, and Goldsmith used a device developed in Moerner's lab several years ago by former graduate student and postdoctoral scholar Adam Cohen, called an Anti-Brownian Electrokinetic (ABEL) trap. In his thesis work Cohen used the trap to precisely measure shape fluctuations in single DNA molecules before starting his own academic career at Harvard.

Brownian motion is the random movement of small particles in a gas or liquid. The movement arises from the particles being bumped by molecules of the fluid; the trap works by cancelling out a molecule's Brownian motion. Goldsmith described the method this way: "If the molecule moves east, we give it a kick west. If it moves west, we give it a kick back east. And we have that process going about 40,000 times a second."

The "kicks" are produced by controlled flows of the solution in which the molecule is placed for observation. The flows are driven by four electrodes evenly spaced around the perimeter of the trap. Although the molecule is actually tumbling around slightly in the solution in response to the many little kicks it receives, it tumbles in such a confined area that for practical purposes, it is being held in suspension and is stable enough for extended viewing by the researchers. In the case of the protein in this study, Goldsmith said they were often able to hold onto a molecule and view it for more than an entire second.

"That may not sound like very much, but if you don't have the trap and you don't want to staple your molecule to a surface, you are basically limited to 10 or 20 milliseconds," he said.

All the current single-molecule techniques -- whether the older, more confining ones or Moerner and Goldsmith's comparatively free-range method -- involve fluorescence microscopy, which employs a laser to excite the molecule of interest into emitting photons.

Not all parts of a protein fluoresce, only certain subgroups within the structure, but the brightness levels of the fluorescence tell the researchers something about how the fluorescent subgroups are interacting with each other.

Goldsmith said one of the previous studies had observed three brightness levels, whereas he saw four or more distinct levels in their experiments. "That doesn't sound like it makes a big difference, but for these particular molecules it speaks to a fundamentally different type of behavior," he said.

"We saw that these proteins were undergoing dynamics that would have been more or less impossible to see, had you had them confined," Goldsmith said. "What we think is happening is that the protein that encompasses these fluorescent groups is actually changing shape."

Currently thereare only two ABEL traps in the world besides the one in Moerner's lab. "It is a complex scientific instrument. It is not something trivial to build," Goldsmith said. "But whenever we take this story on the road and talk to other researchers about what the ABEL trap can do, we always see everyone's eyes get really wide, when they see the sort of unperturbed behavior you can get."

"It is not perfect," Goldsmith said. "But we have moved a lot closer to the ideal." "And the ABEL trap is being used for other exciting experiments on single molecules," Moerner said.

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Story Source:

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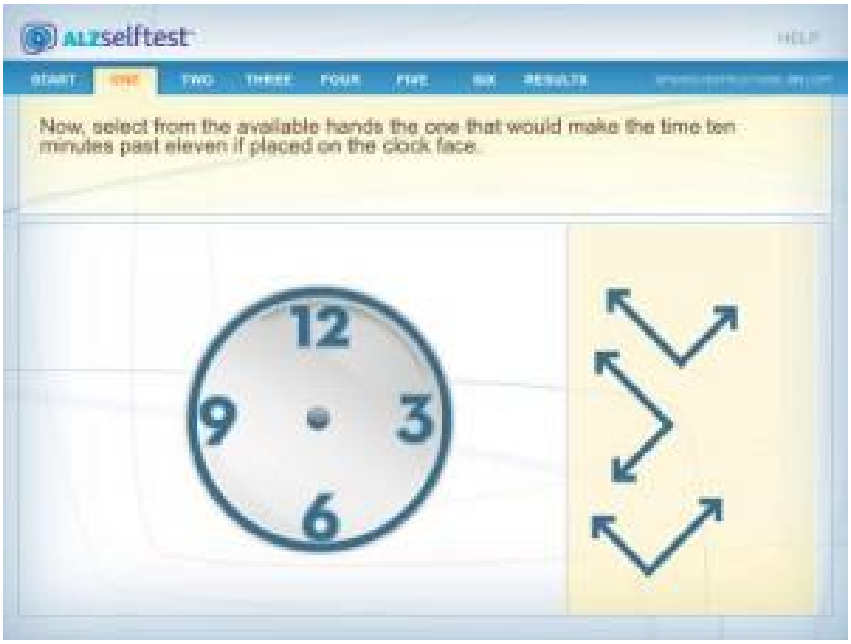
Journal References:

1. Randall H. Goldsmith, W. E. Moerner. **Watching conformational- and photodynamics of single fluorescent proteins in solution**. *Nature Chemistry*, 2010; 2 (3): 179-186 DOI: doi:10.1038/nchem.545
2. Peter Dedecker, Johan Hofkens. **Single-molecule spectroscopy: Caught in a trap**. *Nature Chemistry*, 2010; 2 (3): 157-159 DOI: 10.1038/nchem.562

http://www.sciencedaily.com/releases/2010/03/100311101600.htm

New Alzheimer's Test Offers Better Opportunities for Early Detection



This is a s screenshot from the Computerized Self Test for Alzheimer's Disease. The test was developed by University of Tennessee researchers, and findings published in the April 2010 issue of the Journal of Alzheimer's Disease showed that the test was highly effective at early detection of the disease. (Credit: Rex Cannon and Andrew Dougherty/University of Tennessee)

ScienceDaily (Mar. 27, 2010) — Early detection is key to more effective treatment for Alzheimer's disease and other forms of cognitive impairment, and new research shows that a test developed at the University of Tennessee is more than 95 percent effective in detecting cognitive abnormalities associated with these diseases.

The test, called CST -- for computerized self test -- was designed to be both effective and relatively simple for medical professionals to administer and for patients to take.

Rex Cannon, an adjunct research assistant professor of psychology at UT Knoxville, and Dr. John Dougherty, an associate professor in the UT Graduate School of Medicine, worked with a team of researchers to develop CST. The impetus for the test came from data showing that 60 percent of Alzheimer's cases are not diagnosed in the primary care setting, and that those delays lead to missed treatment opportunities.

"Early detection is at the forefront of the clinical effort in Alzheimer's research, and application of instruments like CST in the primary care setting is of extreme importance," said Cannon.

The CST is a brief, interactive online test that works to asses various impairments in functional cognitive domains -- in essence, it's a "fitness test" of sorts for the basic functions of thinking and processing information that are affected by Alzheimer's and milder forms of cognitive impairment.

Cannon and Dougherty's research, published in the April issue of the *Journal of Alzheimer's Disease* and in an early online edition of the journal, showed that the CST was substantially more effective and more accurate in detecting the presence of Alzheimer's and other forms of cognitive impairment in patients than other existing tests. The CST had a 96 percent accuracy rate compared to 71 percent and 69 percent for the tests that are currently in use.

Part of the goal in developing the test, according to Cannon, was to ensure that the test is useful in the primary care setting, where physicians may not have detailed training in recognizing cognitive impairments, but where an early diagnosis may do the most good for patients.

"Computerized testing is a developing and exciting area for research," said Cannon, who noted that the test can provide an objective way to determine what diseases may affect the patient and provide information to begin treatments that can blunt the effects of Alzheimer's.

Cannon and Dougherty, who also are affiliated with the Cole Neuroscience Center at the UT Medical Center, collaborated with Medical Interactive Education in developing the CST over the past two years.

Story Source:

Adapted from materials provided by University of Tennessee at Knoxville, via EurekAlert!, a service of AAAS.

Journal Reference:

1. John H. Dougherty Jr., Rex L. Cannon, Christopher R. Nicholas, Lorin Hall, Felicia Hare, Erika Carr, Andrew Dougherty, Jennifer Janowitz and Justin Arunthamakun. **The Computerized Self Test (CST): An Interactive, Internet Accessible Cognitive Screening Test For Dementia**. *Journal of Alzheimer's Disease*, 2010; DOI: 10.3233/JAD-2010-1354

http://www.sciencedaily.com/releases/2010/03/100311111733.htm

Plant Hormone Increases Cotton Yields in Drought Conditions

Applying naturally occurring plant hormones called cytokinins to cotton seeds or young cotton plants can increase yields 5 to 10 percent under drought conditions, according to new ARS research. (Credit: Photo by David Nance)

ScienceDaily (Mar. 27, 2010) — A naturally occurring class of plant hormones called cytokinins has been found to help increase cotton yields during drought conditions, according to Agricultural Research Service (ARS) scientists.

Cytokinins promote cell division and growth in plants. In cotton, cytokinins stimulate the growth of the main plant stem and branches. Commercially produced cytokinins are routinely applied in apple and pistachio orchards to promote fruit growth.

John Burke, director of the ARS Cropping Systems Research Laboratory in Lubbock, Texas, found that applying cytokinins to cotton crops can increase yields in water-limited environments with reduced irrigation or no irrigation. Burke was granted a patent for his discovery.

Half of the U.S.-produced cotton is grown in the arid high plains of Texas. In addition to a short growing season, 60 to 65 percent of the acreage in the area is dry land and relies on rainfall for soil moisture. Young cotton seedlings have small root systems, making it difficult for them to reach available soil water. Cytokinins trick the young plant's water stress defenses, prompting the plant to quickly build a bigger root system to access deep soil moisture. They also stimulate the growth of a protective wax on the surface of the plant that helps reduce water loss.

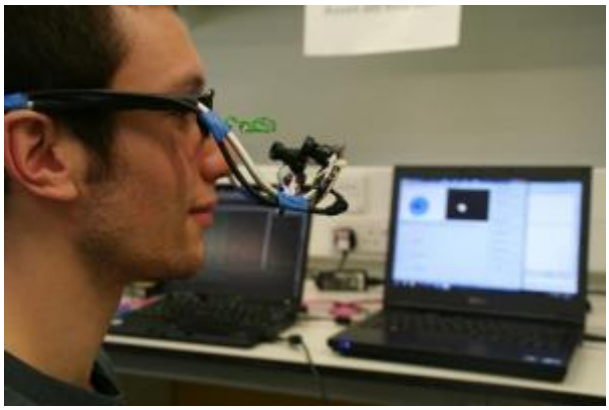
Tests conducted by Burke found one application of cytokinins produced a 5 to 10 percent increase in yields under water-reduced conditions. Additionally, tests determined that cytokinins didn't help or hinder yields under fully irrigated or rainy conditions, making it safe for use in all weather environments. There is also no extra work involved for the grower because cytokinins can be applied when conducting normal weed-management practices early in the season.

To be effective, the cytokinins should be applied at a relatively low concentration to cotton seeds or to cotton plants at an early stage of development. ARS is working closely with commercial companies to make this material available to cotton growers in the future.

Story Source:

Adapted from materials provided by USDA/Agricultural Research Service.
http://www.sciencedaily.com/releases/2010/03/100310142449.htm

Playing 'Pong' With the Blink of an Eye



Imperial student demonstrates how neurotechnology works. (Credit: Image courtesy of Imperial College London)

ScienceDaily (Mar. 26, 2010) — University students have developed a computer game that is operated by eye movements, which could allow people with severe physical disabilities to become 'gamers' for the first time.

The students, from Imperial College London, have adapted an open source game called 'Pong', where a player moves a bat to hit a ball as it bounces around the screen. The adaptation enables the player to move the bat using their eye.

To play the game, the user wears special glasses containing an infrared light and a webcam that records the movement of one eye.

The webcam is linked to a laptop where a computer program syncs the player's eye movements to the game.

The prototype game is very simple but the students believe that the technology behind it could be adapted to create more sophisticated games and applications such as wheelchairs and computer cursors controlled by eye movements.

One of the major benefits of the new technology is that it is inexpensive, using off-the-shelf hardware and costing approximately £25 to make.

Eye movement systems that scientists currently use to study the brain and eye motion cost around £27,000, say the researchers.

Dr Aldo Faisal, the team's supervisor from the Department of Computing and the Department of Bioengineering at Imperial College London, says:

"Remarkably, our undergraduates have created this piece of neurotechnology using bits of kit that you can buy in a shop, such as webcams. The game that they've developed is quite simple, but we think it has enormous potential, particularly because it doesn't need lots of expensive equipment. We hope to eventually make the technology available online so anyone can have a go at creating new applications and games with it and we're optimistic about where this might lead. We hope it could ultimately provide entertainment options for people who have very little movement. In the future, people might be able to blink to turn pages in an electronic book, or switch on their favourite song, with the roll of an eye."

Mr Ian Beer, who is a third year undergraduate from the Department of Computing, adds: "This game is just an early prototype, but we're really excited that from our student project we've managed to come up with something that could ultimately help people who have really limited movement. It would be fantastic to see lots of people across the world creating new games and applications using our software."

Researchers in Dr Faisal's lab are now refining the technology so that it can monitor movements in both eyes. This would enable a user to carry out more complicated tasks such as plotting a journey on screen. This might ultimately allow them to use eye movements to steer a motorised wheelchair.

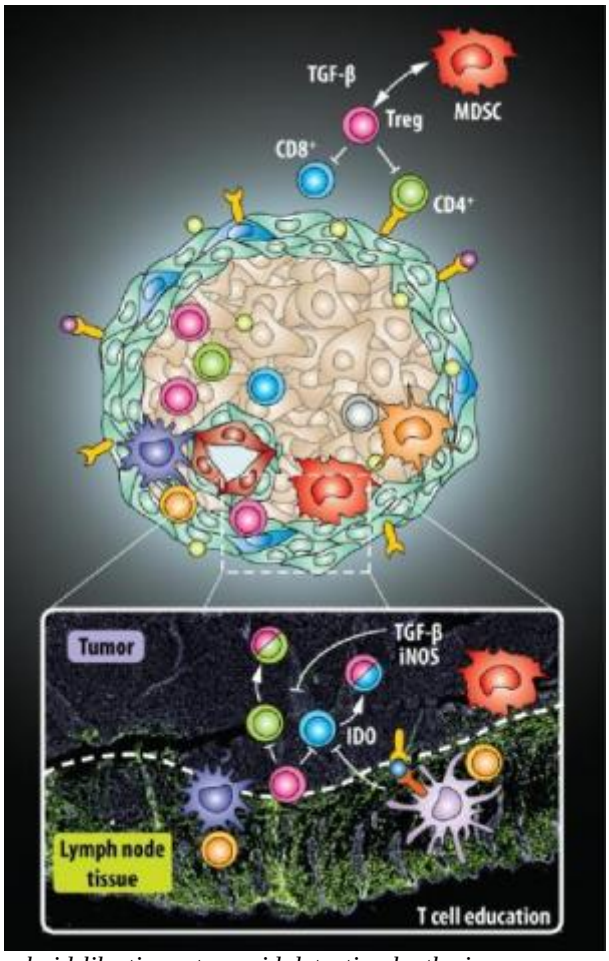
Student team includes: William Abbot, Department of Biomedical Engineering; Oliver Rogers, Department of Maths and Department of Computing; Tim Treglown, Department of Maths and Department of Computing; Aaron Berk, Department of Computing; Ian Beer, Department of Computing.

A video demonstrating how the computer game works can be downloaded and embedded from YouTube: http://www.youtube.com/watch?v=9gU8RqttXeo

Story Source:

Adapted from materials provided by Imperial College London.
http://www.sciencedaily.com/releases/2010/03/100326101113.htm

Tumors Hide out from the Immune System by Mimicking Lymph Nodes



The tumor has transformed its outer layer into lymphoid-like tissue to avoid detection by the immune system. (Credit: EPFL)

ScienceDaily (Mar. 26, 2010) — A new mechanism explaining how tumors escape the body's natural immune surveillance has recently been discovered at EPFL (Ecole Polytechnique Fédérale de Lausanne) in Switzerland. The study shows how tumors can create a tolerant microenviroment and avoid attack by the immune system by mimicking key features of lymph nodes.

The discovery, published in *Science* and in *Science* Express, online March 25, 2010, underscores the role of the lymphatic system in cancer and may open up new possibilities for cancer treatment.

"The tumor tricks the body into thinking it is healthy tissue," says lead author Melody Swartz, head of the Laboratory of Lymphatic and Cancer Bioengineering (LLCB) and EPFL professor. Swartz and her team set out to understand how immune tolerance is induced by tumors, allowing them to progress and spread. The researchers from EPFL concentrated their efforts on a certain protein that is normally present in healthy lymph nodes to attract T cells and program them to perform vital immune functions. They found that some tumors can secrete this protein to transform the outer layer of the tumor into lymphoid-like tissue. This outer layer then attracts and effectively re-programs the T cells to recognize the tumor as friend not foe, resulting in a tumor that goes undetected by the immune system.

Since most tumors progress only if they have escaped the immune system, this new understanding of one mechanism by which the tumor can bypasses or hides from immune defenses is an important step towards future cancer therapies. "The finding that tumors can attract naïve and regulatory T cells and educate

them has important implications for tumor immunotherapy," says Jacqui Shields, from LLCB. The study also opens up potential novel areas of research focusing on the relationship between lymphatic systems and cancer research. According to Shields, the concept that tumors mimic lymphoid tissue to alter the host's immune response represents a new understanding of tumors' interactions with the lymphatic system.

The laboratory is affiliated with the EPFL's Institute of Bioengineering and the Swiss Institute for Experimental Cancer Research.

Authors include Jacqueline D. Shields, Iraklis C. Kourtis, Alice A. Tomei, Joanna M. Roberts, Melody A. Swartz, from the the Laboratory of Lymphatic and Cancer Bioengineering at EPFL, Lausanne, Switzerland.

Story Source:

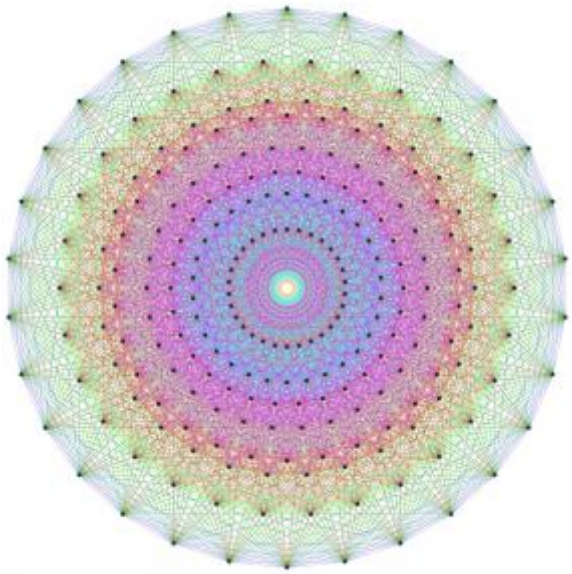
Adapted from materials provided by Ecole Polytechnique Fédérale de Lausanne, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Jacqueline D. Shields, Iraklis C. Kourtis, Alice A. Tomei, Joanna M. Roberts, Melody A. Swartz. **Induction of Lymphoidlike Stroma and Immune Escape by Tumors That Express the Chemokine CCL21**. *Science*, March 25, 2010 DOI: 10.1126/science.1185837

http://www.sciencedaily.com/releases/2010/03/100325143042.htm

No 'Simple Theory of Everything' Inside the Enigmatic E8, Researcher Says



E8-inspired graph. (Credit: Wikimedia Commons, J. G. Moxness, an emulation of a hand-drawn original by Peter McMullen.)

ScienceDaily (Mar. 26, 2010) — The "exceptionally simple theory of everything," proposed by a surfing physicist in 2007, does not hold water, says Emory mathematician Skip Garibaldi.

Garibaldi, a rock climber in his spare time, did the math to disprove the theory, which involves a mysterious structure known as E8. The resulting paper, co-authored by physicist Jacques Distler of the University of Texas, will appear in an upcoming issue of *Communications in Mathematical Physics.*

In November of 2007, physicist Garret Lisi published an online paper entitled "An Exceptionally Simple Theory of Everything." Lisi spent much of his time surfing in Hawaii, adding an alluring bit of color to the story surrounding the theory. Although his paper was not peer-reviewed, and Lisi himself told the Daily Telegraph that the theory was still in development and he gave a "low" likelihood to the prediction, the idea was widely reported in the media, under attention-grabbing headlines like "Surfer dude stuns physicists with theory of everything."

Garibaldi was among the skeptics when the theory hit the news. So was Distler, a particle physicist, who wrote about problems he saw with Lisi's idea on his blog. Distler's posting inspired Garibaldi to think about the issue more, eventually leading to their collaboration.

Lisi's paper centered on the elegant mathematical structure known as E8, which also appears in string theory. First identified in 1887, E8 has 248 dimensions and cannot be seen, or even drawn, in its complete form.

The enigmatic E8 is the largest and most complicated of the five exceptional Lie groups, and contains four subgroups that are related to the four fundamental forces of nature: the electromagnetic force; the strong force (which binds quarks); the weak force (which controls radioactive decay); and the gravitational force.

In a nutshell, Lisi proposed that E8 is the unifying force for all the forces of the universe.

"That would be great if it were true, because I love E8," Garibaldi says. "But the problem is, it doesn't work as he described it in his paper."

As a leading expert on several of the exceptional Lie groups, Garibaldi felt an obligation to help set the record straight.

Using linear algebra and proving theorems to translate the physics into math, Garibaldi and Distler not only showed that the formulas proposed in Lisi's paper do not work, they also demonstrated the flaws in a whole class of related theories.

"You can think of E8 as a room, and the four subgroups related to the four fundamental forces of nature as furniture, let's say chairs," Garibaldi explains. "It's pretty easy to see that the room is big enough that you can put all four of the chairs inside it. The problem with 'the theory of everything' is that the way it arranges the chairs in the room makes them non-functional."

He gives the example of one chair inverted and stacked atop another chair.

"I'm tired of answering questions about the 'theory of everything,'" Garibaldi says. "I'm glad that I will now be able to point to a peer-reviewed scientific article that clearly rebuts this theory. I feel that there are so many great stories in science, there's no reason to puff up something that doesn't work."

Story Source:

Adapted from materials provided by Emory University.

http://www.sciencedaily.com/releases/2010/03/100326132341.htm

Green Computing: New World Record in Energy-Efficient Data Processing

ScienceDaily (Mar. 26, 2010) — Scientists from Frankfurt´s Goethe University and the Karlsruhe Institute of Technology (KIT) developed a system that substantially reduces the energy consumption for processing huge amounts of data. They improved over the power efficiency of the former record holders from Stanford University by a factor of three to four.

The record is listed in the "sort benchmark," which is published by companies like Hewlett-Packard und Microsoft.

The team around Prof. Ulrich Meyer from Goethe University and Prof. Peter Sanders from KIT enabled the record by using seemingly unconventional hardware: instead of server processors with high power requirements, the computer scientists took processors of type Intel Atom. These are microprocessors originally developed for netbooks.

Their lower processing power compared to server systems was compensated by the usage of highly efficient algorithms. Instead of hard drives, which consume a lot of power for the mechanics, the team employed so-called Solid State Disks (SSD), which are clearly faster and, at the same time, more power-economical.

The record pops the question if the increasing hunger for energy in information technology could be strongly reduced. "In the long run, many small, power-efficient and cooperating systems are going to replace the so far used, heavy weighted ones," explains Peter Sanders.

Starting point for their research project was one of the key problems in computer science, namely sorting of data. Computers connected via Internet generate constantly growing amounts of data. In order to enable analysis of the data, it has to be sorted according to a specific criterion first. The efficient sorting of data is thus of central interest for search engines and databases -- and therefore an important research topic in both theoretical and practical computer science.

In the three categories of the competition, the researchers had to sort data amounts of 10GB, 100GB and 1TB, respectively, consisting of datasets with 100 Byte each. Even in the largest category of 1 Terabyte, which corresponds to a stack of paper of 10km height, the new record holders only spent 0,2 kWh. This is about the energy needed to boil 2 liters of water.

Supervised by Sanders and Meyer, the Ph.D. candidates Johannes Singler (KIT) and Andreas Beckmann (Goethe University) developed the energy-saving system. The research groups of both universities are internationally noted for their work on the design and implementation of efficient algorithms for processing large data.

The world records are listed as "JouleSort" entries in the »Sort Benchmark. For further information please see http://sortbenchmark.org

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Story Source:

Adapted from materials provided by Goethe University Frankfurt, via EurekAlert!, a service of AAAS.
http://www.sciencedaily.com/releases/2010/03/100325131556.htm

Happy 20th, Hubble

Flying observatory's cosmic portraits continue to capture hearts and minds
By Ron Cowen
April 10th, 2010; Vol.177 #8 (p. 16)

Death to LifeThe filaments in this portrait, assembled from images taken by the Hubble Space Telescope in 1999 and 2000, are the tattered remains of the Crab Nebula supernova. Since its launch 20 years ago this month, Hubble has been capturing images like this one that awe and inspire scientists and the public alike. NASA, ESA

When NASA announced in 2004 that it was canceling a final mission to repair the then-ailing Hubble Space Telescope — effectively a death sentence — the agency received a letter from a 9-year-old girl who wanted to donate her lunch money to save Hubble. That letter, among countless others, exemplifies the public's love affair with the observatory, which turns 20 years old this month.

Since its launch on April 24, 1990, Hubble has repeatedly risen from the ashes to produce pictures of unparalleled clarity and beauty. The observatory has recorded nearly a million images and spectra in about 110,000 trips around the Earth. Among its cosmic postcards — some of the best in the pages to

follow — Hubble has caught bruises left on Jupiter by fragments of a comet, elderly stars gift-wrapped in shells of glowing gas, the slender arms of spiral galaxies and nebulae ablaze with the light of newborn stars.

Not bad for a telescope initially dubbed a techno-turkey for its flawed primary mirror. Soon after astronauts fixed that problem during a series of space walks in late 1993, Hubble began living up to its promise as the first major visible-light telescope to fly above Earth's image-distorting atmosphere. The telescope has several times rewritten the textbooks on astronomy. Perhaps most dramatically, Hubble's study of remote stellar explosions (inset) provided key evidence for an acceleration in the rate of cosmic expansion, leading scientists to surmise the existence of dark energy. Hubble also delivered compelling confirmation that the universe has evolved in a way predicted by the Big Bang theory. Closer to home, Hubble recorded one of the first images of a planet beyond the solar system.

Yet for all of Hubble's scientific breakthroughs, the beauty of its images ranks high among its most lauded achievements. Hubble's pictures hang in museums, adorn album covers and have appeared in major motion pictures. Its online image gallery receives about 200 million hits a month.

Last May, astronauts did indeed perform a final servicing mission, transforming Hubble into a spanking new observatory that has become the ultimate galactic time machine. Hubble's new infrared camera has already spotted galaxies believed to be the most distant ever recorded. Because peering deep into space is the same as peering far back in time, the pictures reveal what the galaxies looked like just a few hundred million years after the Big Bang. If the servicing mission was an early birthday present from Earth, then Hubble has more than returned the favor. Taking us back to our cosmic beginnings may be the observatory's ultimate gift.

http://www.sciencenews.org/view/feature/id/57590/title/Happy_20th%2C_Hubble

UV radiation, not vitamin D, might limit multiple sclerosis symptoms

Sunshine effects on MS might be more complicated than previously thought, mouse study suggests
By Nathan Seppa
Web edition : Tuesday, March 23rd, 2010

Ultraviolet radiation from sunshine seems to thwart multiple sclerosis, but perhaps not the way most researchers had assumed, a new study in mice suggests.If validated in further research, the finding could add a twist to a hypothesis that has gained credence in recent decades. The report appears online March 22 in the *Proceedings of the National Academy of Sciences.*

Scientists have hypothesized that MS is rare in the tropics because people synthesize ample vitamin D from exposure to the UV radiation in equatorial sunlight. What's more, MS is more common in the high latitudes of northern parts of Europe and North America than in regions farther south. That pattern has led to the assumption that higher levels of vitamin D might prevent people from developing MS, what became known as the latitude hypothesis.But a direct cause-and-effect relationship between vitamin D deficiency and MS has never been established. In past experiments, giving vitamin D supplements to mice with an MS-like disease required giving the animals harmful amounts of the nutrient, notes Hector DeLuca, a biochemist at the University of Wisconsin–Madison.

"It just didn't add up," he says. "We decided to go back and see if maybe UV light by itself was doing something."In MS, the fatty myelin sheaths that insulate nerves in the central nervous system are damaged by attacks by the immune system. In a series of experiments in mice, DeLuca and his team induced a condition comparable to human MS by injecting the animals with proteins that instigate similar myelin damage.

The researchers exposed some mice to UV radiation before and after giving the animals the damaging injection. Another group of mice got the injection but not the UV exposure.

The mice exposed to UV rays suppressed the effects of MS-like disease better than the control mice, the researchers found, even though the amount of radiation wasn't enough to greatly increase the animals' blood concentrations of vitamin D. In another test, the researchers gave injected mice varying doses of vitamin D supplements, but no UV radiation. The supplements failed to control the disease onset, severity or progression."We concluded that UV light is doing something beyond [making] vitamin D," DeLuca says. There's no question that the latitude hypothesis has merit, says George Ebers, a neurologist at the University of Oxford in England. "MS risk is geographically related." But that risk is more complicated than exposure to UV radiation during an MS attack, as this mouse model used. For example, previous research has shown that children in northern latitudes who are born in May, after their mothers had spent a winter with little sunshine, are more likely to develop MS than are kids born in November, he says.

Ebers notes that mice in this study were exposed or not exposed to UV over a matter of weeks and were in the throes of an MS-like disease during the study. "That's completely separate ... from the question of whether your risk is boosted or diminished by where your mother lived," he says.Apart from the timing issue, MS risk might well be influenced by a biological mechanism apart from vitamin D blood levels, but many questions remain, Ebers says. Those include how UV radiation might inhibit MS and, more specifically, what is the effect of UV rays in suppressing the immune system. "It's quite possible that UV exposure will have a number of other mechanisms and be involved in hormonal circuits," he says.

DeLuca and his colleagues speculate that UV radiation is playing a mysterious role in MS that is independent of vitamin D production. "We're doing experiments trying to find out what it is," he says.

http://www.sciencenews.org/view/generic/id/57542/title/UV_radiation%2C_not_vitamin_D%2C_might_limit_multiple_sclerosis_symptoms

Farming's rise cultivated fair deals

Market economies may owe more to cultural evolution than to Stone Age instincts
By Bruce Bower
Web edition : Thursday, March 18th, 2010

Let's make a deal A Samburu woman in Kenya, from a population of livestock herders, plays an experimental economics game while a research assistant watches.Carolyn Lesorogol

Blanche DuBois, Tennessee Williams' wide-eyed protagonist who relied on "the kindness of strangers," had nothing on ancient farmers.

In rapidly expanding settlements, early cultivators had no choice but to bargain for daily goods with lots of folks they didn't know. A fundamental redefinition of a fair deal soon followed, according to a new cross-cultural study.

Around 10,000 years ago, residents of large farming communities had to learn to make fair exchanges with strangers and to retaliate against selfish exploiters, researchers propose in the March 19 *Science*.

Before the rise of modern agriculture and resulting trade, the researchers contend, people rarely had to behave this way with strangers. During Stone Age days, members of small hunter-gatherer groups exchanged favors only with those they knew.

"Cultural and institutional evolution harnessed and extended our evolved psychology so that we could cooperate and exchange goods in vast communities," says anthropologist and study director Joseph Henrich of the University of British Columbia in Vancouver.

To arrive at this conclusion, the team set up money-swapping games played by people from small societies around the world — farmers, hunter-gatherers, seaside foragers, livestock herders, and wage laborers — and looked at how each group divvied up resources.

Participants who regularly have to deal with outsiders treated strangers more fairly, sharing a pool of money or valuables more equally, the team found.

Give it upAn Au man, from a group of foragers and plant growers in Papua New Guinea, ponders how to divide money between himself and an anonymous partner.David Tracer

Game players' willingness to split up resources fairly with an unknown partner rose sharply with their "market integration," or the extent that they lived in communities with market economies. The researchers measured market integration by calculating the degree to which families purchased food, rather than hunting or growing it.

Fair play also rose substantially among volunteers who subscribed to Christianity or Islam, as opposed to local religions. Large-scale religions with strict moral codes galvanize a "golden rule" approach to social exchanges, the researchers propose. Supernatural threats, such as the prospect of spending eternity in hell, and community-building rituals jointly promote fairness toward strangers, in their view.

In addition, participants from the largest communities were most likely to punish players whom they regarded as offering unfair deals. That meant canceling the deal and getting nothing or paying part of one's own pool of money to cause an even bigger loss for the unfair player.

That's not good news for traditional economic theories that regard self-interest as the engine of commerce. If those theories are right, players should take whatever someone else gives them, because that's better than nothing.

Neither do the new results bode well for evolutionary psychologists who argue that people in small Stone Age groups evolved brain circuits for kin favoritism, tit-for-tat exchanges and protecting one's own reputation. In their view, these biologically ingrained social tactics now often lead people astray, Blanche Dubois–style, by inducing excessive trust in strangers.

"This new study powerfully challenges the view in evolutionary psychology that cultural inventions during the last 10,000 years are irrelevant to human cooperation," remarks economist Ernst Fehr of the University of Zurich.

Market economies didn't exist during the Stone Age, Fehr notes. But Henrich's study indicates that the relatively recent expansion of market economies inspired a growing concern for dealing fairly with strangers, he says. People living in communities most like those of Stone Age hunter-gatherers — small in numbers and lacking a "moralizing god" — made the most unfair offers to strangers and were least likely to punish stingy partners. Reputation concerns and a focus on give-and-take exchanges can't explain such behaviors, Fehr asserts.

Henrich's data suggest that modern economic development has prompted people to find new ways to be selfish within vast markets, comments economist Karla Hoff of the World Bank in Washington, D.C.

Henrich's new data build on a previous study of fair play in 15 small-scale societies (*SN: 2/16/02, p. 104*). In each group, a person given a chunk of money or other valuable stuff tended to offer a substantial, but highly variable, share to an anonymous partner. Partners often rejected offers deemed to be too low, resulting in both parties getting nothing.

In the new study, three economic games were played by 2,148 volunteers from 15 small-scale populations, including five communities from the earlier project. Community sizes ranged from 20 to 4,600 people.

One game allotted an amount of money, set at one day's local wage, to a pair of players who could not see each other. One player decided how much to keep and how much to give to the other player. This provided a basic measure of fair play toward strangers.

A second game worked in much the same way. But the receiving player first decided the amount that he or she considered a minimum acceptable offer. If that minimum was met, the deal went through. If not, both players got nothing.

A third game was similarly framed, but also provided one-half day's local wage to a third person who observed the action. The observer first determined the amount of a minimum acceptable offer between the other players. If the offer fell short, the observer forked over 20 percent of his or her pot and the offending player lost triple that amount.

Going from a fully subsistence-based society with a local religion to a fully market-based society grounded in Christianity or Islam led to increases in amounts offered by players of about 23 percent in the first game, 20 percent in the second game and 11 percent in the third game.

http://www.sciencenews.org/view/generic/id/57417/title/Farmings_rise_cultivated_fair_deals

One of H1N1's mysteries explained
Laura Sanders follows the twists and turns of the pandemic virus
By Laura Sanders
Web edition : Friday, March 26th, 2010

Scientists now have solid evidence that may explain one of the oddities of last year's pandemic H1N1 virus. Two new studies, one published in *Science* and the other in *Science Translational Medicine*, point out how the latest pandemic flu strain is eerily similar to viruses present before 1957, explaining why the current virus spares the elderly.

The results are interesting, but not jaw-dropping, which is why you're reading about them here in the Deleted Scenes blog and not in the Science News' news section. There have been strong hints that influenzas circulating before 1957 — the 1918 pandemic flu strain and its offspring — were similar to the current H1N1 pandemic.

The new studies seem to nicely confirm a hunch discussed in our previous coverage of H1N1: Older folks' immune systems have been around the influenza block, so to speak, and encountered flu strains similar to the current pandemic. Since their bodies had been exposed to those viruses, the reasoning went, their immune systems remembered how to fight them off. In contrast, young people's naïve immune systems were caught unawares by this recent H1N1.

Although the 1918 influenza and the current pandemic swept the globe over 90 years apart, they possess key similarities, the new studies show. In the *Science Translational Medicine* paper, which appeared March 24, a team of researchers from the National Institutes of Health in Bethesda, Md., and the Centers for Disease Control and Prevention in Atlanta show that antibodies in mice that had been vaccinated against the 1918 pandemic could also dispatch the 2009 pandemic virus, and mice vaccinated against the current pandemic flu were impervious to the 1918 virus. This coprotection appears to be why elderly people aren't as easily infected with the current pandemic flu.

The new studies go further and pinpoint similarities between a key protein of the H1N1 virus and one of the 1918 pandemic strain's. The protein in question is hemagglutinin, which decorates the outside of the viral particle — making it a big target for antibodies and vaccines. (The version of hemagglutinin also gives viruses part of their names — both the current pandemic and the 1918 pandemic carry H1 subtypes of the protein.)

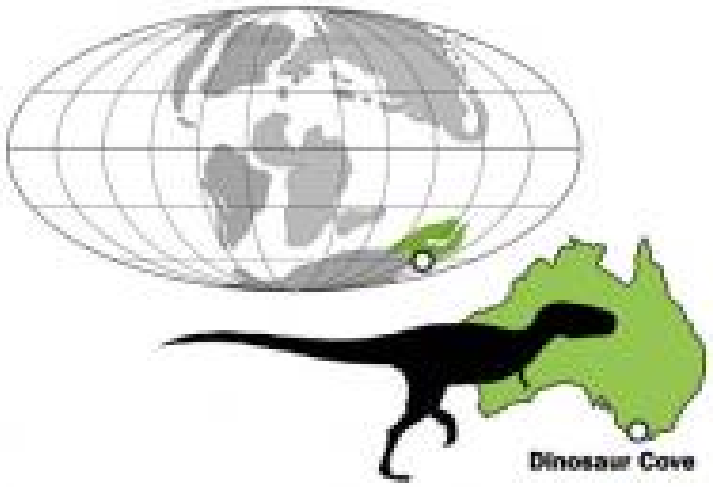
Unlike most seasonal flus, parts of the hemagglutinin proteins in both strains lack the ability to get decorated with a type of sugar molecule called a glycan, the team found. This lack of glycosylation allows the virus to infect a target cell.

The other recent study, appearing March 25 in *Science*, resolved very detailed structures of the hemagglutinin proteins from the current pandemic and the 1918 virus. Scientists from The Scripps Research Institute in La Jolla, Calif., Vanderbilt University in Nashville and Mount Sinai School of Medicine in New York compared the shape of the two proteins and concluded that hemagglutinin from the 1918 virus is "a remarkably close relative" of the current virus. That team also detected that both viruses lack glycosylation sites.

As time goes on, the H1N1 virus is fading. CDC reports that right now, its activity is relatively low. But studies that help illuminate H1N1's quirks, like these, will give scientists a better idea about how to handle the virus, which they say is likely resurface next flu season.

http://www.sciencenews.org/view/generic/id/57641/title/One_of_H1N1%E2%80%99s_mysteries_explained

Tyrannosaurs lived in the Southern Hemisphere, too
Australian fossils suggest the kin of T. rex dispersed globally
By Sid Perkins
Web edition : Thursday, March 25th, 2010



Kin down south Paleontologists have unearthed the first known fossil of a tyrannosaur that lived on a Southern Hemisphere landmass. This map shows the configuration of landmasses about 110 million years ago (when the human-sized creature lived) and the location of the discovery in Australia.R.B.J. Benson/Univ. of Cambridge

Paleontologists digging in Australia's aptly named Dinosaur Cove have unearthed the first known fossils of a tyrannosaur from the Southern Hemisphere.

The fossils include the remains of just one 30-centimeter-long bone from the creature's pelvic girdle, but certain features of that bone are seen only in tyrannosaurs, says Roger B.J. Benson and his colleagues report in the March 26 *Science*. Previously, all known fossils of the tyrannosaur lineage have been unearthed in the Northern Hemisphere.

The size and proportions of the pelvic bone suggest that the dinosaur, which lived around 110 million years ago, was approximately the size of an adult human and tipped the scales at around 80 kilograms. That's around the same size as *Raptorex*, a tyrannosaur that lived in what is now China at about the same time.

The new find suggests that tyrannosaurs, fierce bipedal carnivores known for their short arms and massive jaws, could be found worldwide during at least part of their reign, says Benson, a vertebrate paleontologist at the University of Cambridge in England.

When the first tyrannosaurs evolved around 160 million years ago, dinosaurs and other creatures moved freely between northern and southern landmasses that were connected by various land bridges. Many paleontologists had suspected tyrannosaurs were part of that interchange, but no one had found evidence in the fossil record until now, says Thomas Holtz, Jr., a paleontologist at the University of Maryland in College Park.

Though it's possible that convergent evolution could have produced a tyrannosaur-shaped bone in an unrelated species of dinosaur, Holtz notes, the bone has several features that are found only in tyrannosaurs. "If anyone had found this fossil in Asian or North American rocks of the same age, no one would doubt it came from a tyrannosaur," he says.

http://www.sciencenews.org/view/interest/id/2362/topic/Earth

Existing antibiotic might help keep wraps on AIDS virus
Acne drug minocycline inhibits HIV activation in infected immune cells
By Nathan Seppa
Web edition : Thursday, March 25th, 2010

An inexpensive antibiotic might complement standard drugs in fighting the AIDS virus, a new study shows. The drug, called minocycline, has been used for decades to control acne, but the new findings suggest it inhibits HIV that has infected cells from reactivating and replicating itself. The report will appear in the April 15 *Journal of Infectious Disease.*In most people, HIV can be controlled with a drug combination called HAART, short for highly active antiretroviral therapy. But HAART doesn't wipe out the virus, and stresses on the immune system such as an infection can reactivate the latent virus and trigger its spread.

In the new study, molecular biologist Janice Clements of Johns Hopkins University in Baltimore and her colleagues infected human CD4 T cells with HIV in lab dishes, then added minocycline to some of these batches. After 24 hours, the minocycline-treated cells contained half as much HIV RNA as the other cells, suggesting the drug had inhibited the ability of the virus to replicate. The scientists also tested minocycline on CD4 T cells obtained from HIV patients who had been treated with HAART. Minocycline again stalled HIV replication, as demonstrated by a 60 percent decline in activity of a key gene that HIV needs to awaken and replicate.These properties of minocycline add to the drug's growing résumé. In addition to its role as an acne-fighting antibacterial, minocycline slows inflammation and can limit brain damage. In earlier work, Clements and her colleagues found that minocycline reduced brain inflammation and limited the amount of virus in the brains of monkeys with SIV, the simian version of the AIDS virus. And in the mid-1990s, Dutch scientists found that minocycline, a derivative of tetracycline, knocked down inflammation in rheumatoid arthritis patients.

Although inflammation is a normal immune response, too much causes damage. Minocycline seems to reduce hyperactivation of T cells, key players in inflammation, says immunologist Gregory Szeto of Johns Hopkins, who coauthored the new study.In a third experiment using healthy CD4 T cells that were activated by the presence of an antibody, Clements, Szeto and their colleagues showed that cells exposed to minocycline made reduced amounts of three inflammatory proteins.

In HIV patients, inflammation can exhaust the immune response and contribute to AIDS progression. But Szeto cautions that inflammation can be accurately evaluated only in the context of a person's body and not in a cell study such as this. Meanwhile, minocycline's brain-protecting attributes have attracted interest (*SN 10/13/07, p. 238*). HIV can enter the central nervous system and remain dormant there for long stretches. Even as HAART has extended survival in AIDS patients, many now develop cognitive impairments, several studies have shown. Clements estimates that roughly half of HIV patients receiving HAART for more than 10 years have some cognitive damage from the virus. Because minocycline can enter the brain, it may provide protection to these patients, Clements says.

"Certainly, this could have very positive effects, because HAART drugs have differing abilities to cross the blood-brain barrier," says virologist Celsa Spina of the Veterans Affairs San Diego Healthcare System and the University of California, San Diego. "That would be a benefit — to reduce HIV activation within the central nervous system."At Johns Hopkins and elsewhere, scientists are now testing whether giving HIV patients minocycline benefits them.Spina cautions that although minocycline has a long track record in acne patients, HIV patients are a very different group. "I would be worried about using something that appears to be a broad-spectrum suppressor of T cell activation," she says. "If you have patients who are immune-suppressed but otherwise healthy, you don't want to subject them to something that's going to hurt them." She says patients will require close monitoring in these trials.

http://www.sciencenews.org/view/generic/id/57626/title/Existing_antibiotic_might_help_keep_wraps_on_AIDS_virus

Bacteria show new route to making oxygen

Discovery adds to the few known biological pathways
By Sid Perkins
Web edition : Wednesday, March 24th, 2010

Microbiologists have discovered bacteria that can produce oxygen by breaking down nitrite compounds, a novel metabolic trick that allows the bacteria to consume methane found in oxygen-poor sediments. Previously, researchers knew of three other biological pathways that could produce oxygen. In photosynthesis, microbes or plants containing chlorophyll grow by gleaning energy from the sun, releasing oxygen as a waste product. In the two other schemes, cells generate oxygen — typically for their own internal use — by using enzymes to break down oxygen-containing substances such as chlorates, says Katharina Ettwig, a microbiologist at Radboud University Nijmegen in the Netherlands.

The newly discovered pathway opens up new possibilities for understanding how and where oxygen can be created, Ettwig and her colleagues report in the March 25 *Nature*. "This is a seminal discovery," says Ronald Oremland, a geomicrobiologist with the U.S. Geological Survey in Menlo Park, Calif., who was not involved with the work. The findings, he says, could even have implications for oxygen creation elsewhere in the solar system. Ettwig's team studied bacteria cultured from oxygen-poor sediment taken from canals and drainage ditches near agricultural areas in the Netherlands. The scientists found that in some cases the lab-grown organisms could consume methane — a process that requires oxygen or some other substance that can chemically accept electrons — despite the dearth of free oxygen in their environment. The team has dubbed the bacteria species *Methylomirabilis oxyfera*, which translates as "strange oxygen-producing methane consumer."

When the team gave the bacteria nitrates, a common oxygen-bearing component of fertilizers, no methane was consumed. But when nitrites, close chemical relatives of nitrates, were added to the mix, the bacteria fed on the methane and released nitrogen gas. That combination suggests that the microbes were breaking down nitrites, using the oxygen to consume the methane and releasing nitrogen as waste.

Although the team has sequenced the full genome of the microbe, the researchers don't know which of the enzymes it produces actually drives the oxygen-producing reaction. "It's like looking for a needle in a haystack," says Ettwig. "These cells make hundreds of unknown proteins, and all of them are candidates."

Certain sequences of genetic material suggest that the bacteria share metabolic pathways seen in many other microbes, including those used for denitrification and for the consumption of methane in an oxygen-rich environment. The ***M. oxyfera*** bacteria, however, "are combining those pathways in a previously unexpected way," says Ettwig.The team's findings "are exciting and new," says Julia Vorholt, a microbiologist at the Swiss Federal Institute of Technology Zurich. The next big step, she notes, is to isolate the enzyme or enzymes that enable oxygen production and show how they work.By producing their own oxygen, the bacteria can take advantage of a much more energy-efficient method of consuming methane and can therefore grow and proliferate more quickly, says Martin Klotz, an evolutionary microbiologist at the University of Louisville in Kentucky.

It isn't clear, Oremland says, whether the newly identified oxygen-making technique is a recent biological adaptation that allows proliferation in fertilizer-polluted sediments or an ancient pathway that evolved when Earth was young and its atmosphere was methane-rich but oxygen-poor.

Many of the planets and moons in the outer solar system are lousy with methane, so the new oxygen-producing pathway would allow life there a way to feed in an environment that lacks free oxygen. When looking for life beyond Earth, he notes, "NASA's always had this mantra: 'Follow the water.' Maybe we should think about following the methane."

http://www.sciencenews.org/view/generic/id/57570/title/Bacteria_show_new_route_to_making_oxygen

Bar codes could be next to check out
New radio frequency tags would use nanotechnology to identify and track products
By Lisa Grossman
Web edition : Friday, March 26th, 2010

No waiting Radio-frequency identification tags printed in carbon nanotube ink on paper or plastic could make checkout lines obsolete — or at least a lot shorter.Gyou-Jin Cho/Sunchon National University

Lines at the grocery store might become as obsolete as milkmen, if a new tag that seeks to replace bar codes becomes commonplace.

Researchers from Sunchon National University in Suncheon, South Korea, and Rice University in Houston have built a radio frequency identification tag that can be printed directly onto cereal boxes and potato chip bags. The tag uses ink laced with carbon nanotubes to print electronics on paper or plastic that could instantly transmit information about a cart full of groceries.

"You could run your cart by a detector and it tells you instantly what's in the cart," says James M. Tour of Rice University, whose research group invented the ink. "No more lines, you just walk out with your stuff."

RFID tags are already used widely in passports, library books and gadgets that let cars fly through tollbooths without cash. But those tags are made from silicon, which is more expensive than paper and has to be stuck onto the product as a second step.

"It's potentially much cheaper, printing it as part of the package," Tour says.

The new tag, reported in the March issue of *IEEE Transactions on Electron Devices*, costs about three cents to print, compared to about 50 cents for each silicon-based tag. The team hopes to eventually bring that cost below one cent per tag to make the devices commercially competitive. It can store one bit of information — essentially a 1 or a 0 — in an area about the size of a business card.

That's not much compared to computer chips, but Tour says this tag is just a "proof of concept." Study coauthor Gyoujin Cho of Sunchon National University, along with a team from the Printed Electronics Research Center of the Paru Corporation in Suncheon, Korea, are working to pack more transistors into a smaller area to ultimately squeeze 96 bits onto a 3-square-centimeter tag. That would be enough to give a

unique identification code to each item in a supermarket, along with information like how long the item has been on the shelf, Tour says.

The tags were made possible by the creation of semiconducting ink, which contains carbon nanotubes that will hold an electrical charge. A transistor needs to be completely semiconducting to hold information, Tour says. If there are any bits of conducting metal — which moves electric charges around easily — mixed in, the information-holding charge will leak out quickly.

The mixture of nanotubes created in Tour's lab includes both semiconducting nanotubes and conducting nanotubes. Separating out the conducting nanotubes is "a horrid experience," Tour says. "They're very painful to separate." So instead, the team devised a way to coat the conducting nanotubes in a polymer to protect the electric charge and allow the ink to be purely semiconducting.

Once they had the ink, Cho and his colleagues built roll printers to transfer ink to the final material. The tags are printed in three layers, and one of the remaining hurdles to making the tags store more memory in less space is to improve the alignment of those layers, Cho says.

"The work is impressive," comments Thomas N. Jackson of Penn State University in University Park, who is also developing flexible electronics. He thinks it will be difficult to compete with silicon, which is well established in the realm of consumer products packaging. But similar technology could be used to do things silicon can't do, he says, such as make smart bandages that can sense infections or freshness-sensing food packaging.

And for those who would rather not have their food broadcast radio waves after getting it home, fear not. Tour says the signals can be blocked by wrapping groceries in aluminum foil.

http://www.sciencenews.org/view/generic/id/57659/title/Bar_codes_could_be_next_to_check_out

Building a cheaper catalyst
Less costly than platinum, perovskite may do even better at cleaning diesel exhaust
By Alexandra Witze
Web edition : Thursday, March 25th, 2010

Improving enginesA perovskite catalyst could work better and more cheaply than traditional catalysts for cleaning exhaust from diesel engines.Wei Li

Chemical engineers have found a cheaper and possibly better material than platinum for cleaning up the exhaust streams of diesel vehicles.

Many automobiles use platinum-containing catalytic converters to help clean their exhaust streams of various pollutants, notably the nitrogen oxide compounds that can contribute to smog. But the high and volatile price of the precious metal makes it difficult to build an economical catalyst.

An alternative material, known as perovskite, is far less expensive than platinum and may do the job more effectively, engineers from the research arm of General Motors report in the March 26 *Science*.

"It's excellent work, really groundbreaking to be able to have an alternative to platinum-based catalysts," says Louise Olsson, a catalysis researcher at Chalmers University of Technology in Göteborg, Sweden, who was not involved in the research. "It's going to save a lot of money."

Diesel cars can cost $1,000 to $5,000 more than comparable gasoline models because of the need to modify the engine and add more expensive catalytic converters to meet emissions standards. Platinum, used in many of those converters, sells for about $1,590 per troy ounce.

In Europe, about half of passenger vehicles run on diesel. The percentage is far lower in the United States, although many large vehicles and freight trucks run on diesel because of the high fuel efficiency of those engines. The problem is that diesel engines need to burn "lean," or in the presence of extra air, compared with regular gasoline engines. The additional oxygen makes it harder to remove the resulting nitrogen oxide compounds.

A team led by Wei Li at GM's Global Research and Development branch in Warren, Mich., decided to focus on a particular chemical reaction in diesel exhaust streams, in which platinum is used to convert NO to NO2, which can be further processed and released to the atmosphere as nitrogen gas.

"This is a critical reaction required in the diesel system," explains Li. "For most gas applications people have already moved away from platinum, but for diesel we cannot."

In their laboratory the researchers replaced a commercial platinum-based catalyst with one based on perovskite oxides made of cobalt or manganese combined with oxygen. By adding a bit of strontium and lanthanum into the mix, Li's team showed that the manganese-based perovskite catalysts converted NO to NO2 about as well as platinum-based ones did.

The cobalt-based perovskite catalyzed the reaction at rates significantly higher than platinum. "We were looking for a good catalyst, but we were not expecting it to be that good," says Li.

The new catalysts are not, however, entirely free of precious metals. The team had to add a bit of palladium – which goes for about one-quarter the cost of platinum – to eliminate some sulfur buildup.

There's a long way to go before perovskite-based catalysts appear in automobiles, notes Jim Parks, a catalyst researcher at the Oak Ridge National Laboratory in Knoxville, Tenn. Li's team performed its tests in simulated exhaust streams; now other GM researchers are doing experiments to see how the perovskite catalysts handle real pollutants, Li says.

The new work is "a step in the right direction, but there will be more to do with developing this technology," says Parks.

http://www.sciencenews.org/view/generic/id/57618/title/Building_a_cheaper_catalyst

Next on CSI: Surface-enhanced Raman spectroscopy
New twist on powerful analytic method makes it much more useful
By Rachel Ehrenberg
Web edition : Thursday, March 18th, 2010

Scientists have developed a quick and dusty method for detecting trace quantities of unknown substances.

Described in the March 18 *Nature*, the new technique amounts to little more than sprinkling a layer of gold dust on the surface to be tested. Yet it will soon make one of science's most powerful but unwieldy chemical analysis methods useful for detecting trace amounts of materials such as explosives, drugs and environmental contaminants, the researchers who invented it say.

"This really does make the possibility of detecting things … very, very practical, says physical chemist Martin Moskovits of the University of California, Santa Barbara, who wrote a commentary on the research in the same issue of *Nature*. The new method could have broad applications, from forensics to food inspection, says Moskovits. "It potentially allows you to do in situ analysis at a much greater level of sensitivity."

The researchers, led by Jian Feng Li of Xiamen University in China, call their new method shell-isolated nanoparticle-enhanced Raman spectroscopy, or SHINERS for short. They tested it by identifying minute amounts of hydrogen on a one-crystal silicon wafer, probing the surfaces of yeast cells and detecting the insecticide parathion on an orange peel.

The new research is a variation on the technique known as surface-enhanced Raman spectroscopy, which shines a laser on a substance sitting on a specially prepared surface and then analyzes interactions between the laser light and the molecules in the substance.

The research team tipped this method on its head. Traditional surface-enhanced Raman spectroscopy relies on the nooks and crannies of a specialized surface to concentrate the light energy emitted by the sample. But the new method lays this specialized light-concentrating surface on top of the sample, in the form of a "smart dust" of tiny gold nanoparticles coated with a thin inert shell containing silicon or aluminum. When laser light strikes the gold nanoparticles, "hot spots" of emitted energy are created between the nanoparticles and the sample that can be analyzed spectrographically.

http://www.sciencenews.org/view/generic/id/57401/title/Next_on_CSI_Surface-enhanced_Raman_spectroscopy_

Forest loss slows as China plants
By Richard Black
Environment correspondent, BBC News

The world's net rate of forest loss has slowed markedly in the last decade, with less logging in the Amazon and China planting trees on a grand scale.

Yet forests continue to be lost at "an alarming rate" in some countries, according to the UN Food and Agriculture Organization (FAO).

Its Global Forest Resources Assessment 2010 finds the loss of tree cover is most acute in Africa and South America.

But Australia also suffered huge losses because of the recent drought.

"It is good news," said the report's co-ordinator Mette Loyche Wilkie, a senior forestry office with FAO.

" **The area of... forests undisturbed by human activity continues to decrease, so countries must further strengthen their efforts to conserve and manage them** "
Eduardo Rojas, FAO

"This is the first time we've been able to say that the deforestation rate is going down across the world, and certainly when you look at the net rate that is certainly down.

"But the situation in some countries is still alarming," she told BBC News.

The last decade saw forests being lost or converted at a rate of 13 million hectares per year, compared to 16 million hectares in the 1990s.

However, new forests were being planted to the tune of more than seven million hectares per year; so the net rate of loss since the year 2000 has been 5.2 million hectares per year, compared to 8.3 million in the 1990s.

Globally, forests now cover about 31% of the Earth's land surface.

The biggest losses of forest occurred in Brazil, Indonesia and Australia.

Australia's reduction of half a million hectares per year is principally down to the drought conditions that have covered most of the country in recent years, thought to be a consequence of global climate change.

The Indonesian and Brazilian figures were not such a surprise, with both countries possessing vast tracts of forest and major logging industries; and deforestation is slowing.

"Both Brazil and Indonesia are reporting a significant drop in the loss of forests," said Dr Loyche Wilkie.

"In Brazil it's spectacular, and that's largely because there is a political goal to reduce deforestation by 80% by 2020 and that's supported by the president."

As deforestation has fallen, there has also been an increase in the planting of new forests, particularly in China, leading to a net increase in national forest cover of three million hectares per year.

But the programme - aimed at preventing desertification, reducing flooding and protecting farmland - is due to end in 2020, and if it does, the FAO points out, that will rapidly lead to an increase in the net loss of forest figure.

India and Vietnam have also mounted significant forest-planting programmes, the FAO notes.

UN agencies hope the net rate of loss will be slowed further in coming years if the climate change-related initiative on Reducing Emissions from Deforestation and forest Degradation (REDD) comes to fruition.

Diverse roots

The Global Forest Resources Assessment is principally based on data submitted by governments.

Details also include how forests are regulated and how they are used; and here, there are also some encouraging trends, according to Eduardo Rojas, assistant director-general of FAO's forestry department.

"Not only have countries improved their forest policies and legislation, they have also allocated forests for use by local communities and indigenous peoples and for the conservation of biological diversity and other environmental functions.," he said.

"However, the rate of deforestation is still very high in many countries and the area of primary forest - forests undisturbed by human activity - continues to decrease, so countries must further strengthen their efforts to better conserve and manage them."

The FAO is conducting another survey using satellite observations that they hope will provide a much more detailed assessment, and should be published at the end of next year.

Richard.Black-INTERNET@bbc.co.uk

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8586701.stm

Published: 2010/03/25 11:21:34 GMT

Ada Lovelace voted tech heroine
By Zoe Kleinman
Technology reporter, BBC News

Ada Lovelace has emerged as the most popular role model in a day dedicated to celebrating women working in the fields of science and technology.

So far, 2,239 people around the world have posted blogs, videos and podcasts online nominating their heroines.

Additionally, events were held in London, Copenhagen, Dresden, Montreal and Brazil to mark the day, named after Ada Lovelace, held on 24 March.

Ada Lovelace worked with mathematician Charles Babbage in the 1800s.

Mr Babbage's invention, the Analytical Engine, formed the basis of modern computing.

Ada Lovelace is therefore credited with writing the world's first computer program when she came up with a way of using the machine, which was never actually built, to calculate a mathematical sequence known as Bernoulli numbers.

Other nominees included scientist Marie Curie, mathematician-turned-actress Hedy Lamarr, programmer Grace Hopper and Lisbeth Salander, fictional creation of the late author Stieg Larsson.

Wonder women

"For years I've worked in technology, and every time you see a list of the top people in tech, it's dominated by men," said Suw Charman-Anderson, who created Ada Lovelace Day in 2009 and runs the annual event.

"There's always a discussion about where the women in technology are. I thought, I know loads of women in technology. Why are we asking where they are?"

Ms Charman-Anderson invited people to nominate any woman in technology who had been a positive influence or inspiration - including teachers, parents and lecturers.

She chose broadcaster Maggie Philbin as her own role model, having watched her present BBC science programme Tomorrow's World during her teenage years.

"Here was a woman who looked very cool and talked about technology articulately - technology was second nature to her," she told BBC News.

"This was someone who understood what was going on and could communicate very clearly."

" **Having a role model is important, it means you don't question whether you can do something because you can see another woman doing it already** "
Suw Charman-Anderson

Ms Charman-Anderson was one of only two girls in her school year to study maths, physics and chemistry at A-level and now works as a social media consultant.

"Having a role model is important, it means you don't question whether you can do something because you can see another woman doing it already," she said.

Early inspiration

Maggie Philbin told BBC News she was flattered by the nomination, although she had not considered herself to be a role model at the time.

"When I watched Tomorrow's World in the 60s and early 70s, it was just blokes. It was fabulous to watch, but at that stage I never imagined that it would have anything to do with me," she said.

"Look at the archives from the 60s - there are so many references to secretaries. That's what I, as a 10-year-old, was consuming."

Ms Philbin's interest in science was sparked because of an early, and unrealised, ambition to become a vet, she added.

She now credits social media such as Twitter for introducing her to inspirational women such as Ms Charman-Anderson and Dr Sue Black, who orchestrated a social media campaign to save World War II code-breaking centre Bletchley Park.

"These are my role models and technology heroines - they are using technology in a really ambitious and positive way. I'm learning a huge amount from them," she said.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/8587131.stm

Published: 2010/03/25 14:27:20 GMT

China faces 'diabetes epidemic'

China faces a diabetes epidemic, with almost one in 10 adults having the disease while most cases remain undiagnosed, researchers have said.

Tests showed diabetes was more endemic than previously thought, according to the New England Journal of Medicine.

The figures suggest China has some 90 million diabetics, far more than India.

Rapid economic growth has affected public health, through urbanisation, changed diets and more sedentary lifestyles, researchers said.

Rigorous new tests suggested that more than 92 million Chinese adults had diabetes and that nearly 150 million more were showing early symptoms, researchers said.

This represents a major public health problem for the authorities in Beijing as diabetes is a major factor in illnesses such as heart disease, stroke and kidney disease, correspondents say.

"In the last 10 years, with the country's economy expanding quickly and people's standard of living improving, people's lifestyles have changed," said Yang Wenying, one of the report's 20 authors, who is head of endocrinology at Beijing's China-Japan Friendship Hospital.

"China's economic development has gone from a situation of not being able to eat enough, of poverty, to having enough food and warm clothes, and doing much less exercise," she told the AFP news agency.

The US has a similar percentage of sufferers, but China with its massive population now has more diabetics than anywhere else in the world, says the BBC's Michael Bristow in Beijing.

The Chinese study was based on a representative sample of more than 46,000 adults aged 20 years or older from 14 provinces and municipalities.

Last year, US research suggested that diabetes was becoming a global problem, with more than 60% of all cases likely to occur in Asia.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/asia-pacific/8587032.stm

Published: 2010/03/25 12:58:54 GMT

Doctors urge full car smoking ban
By Clare Murphy
Health reporter, BBC News

Smoking should be banned in all cars as well as in public places where young people congregate, doctors are urging.

The Royal College of Physicians wants England's imminent review of anti-smoking laws to consider such measures to protect the young.

It says passive smoking results in 300,000 extra child visits to GPs in the UK every year for problems such as asthma and bacterial meningitis.

But driving and smoking lobby groups say cars are a "private space".

Wheezing

A number of medical bodies have supported a ban on smoking in cars transporting children, but the RCP goes a significant step further, urging a blanket ban on anyone lighting up in a vehicle - regardless of whether children or indeed any other passengers are inside.

It is calling for a two-pronged approach which would see children protected from second-hand smoke and shielded from the sight of adults smoking - whether in the playground or on the TV.

The RCP's report - Passive Smoking and Children - is being released ahead of the three-year review of the ban on smoking in enclosed public spaces in England. Similar bans have been introduced across the UK, with Scotland having led the way.

Drawing on a series of studies, the report suggests that in the UK, tens of thousands of youngsters are falling ill as a result of exposure to cigarette smoke.

Exclusion zones

These calculations include 20,000 chest infections, some 22,000 new cases of asthma and wheezing, as well as 200 cases of bacterial meningitis and 40 cases of Sudden Infant Death Syndrome - or cot death.

Each year it claims these account for more than 300,000 visits to a GP - some of which end up in hospital - costing the NHS £23.3m.

" **The car is a private space and it crosses a line to start interfering in it, however much one disapproves of smoking** "
Nigel Humphries Association of British Drivers

The report does concede that these figures are only estimates, but says it is confident they give an "indication" of the number of children who become ill.

The doctors acknowledge that a ban on smoking in the home, however desirable it believes this to be, would be neither politically or practically possible, but sees the car as an intervention in the private sphere which the public would tolerate.

But it argues that the only way to make it practically enforceable would be to introduce it as a blanket ban on all private vehicles - regardless of their passengers, as exemptions would prove too complex.

In addition, it wants to see smoking banned in places frequented by children, such as parks and outdoor swimming pools - and exclusion zones outside school gates.

Campaigns to explain to parents the importance of a smoke-free home, price hikes and generic cigarette packaging are also among the recommendations issued.

"This report isn't just about protecting children from passive smoking, it's about taking smoking completely out of children's lives," says Professor John Britton, head of the college's Tobacco Advisory Group and lead author of the report.

Parental responsibility

A Department of Health spokesman stressed the role that anti-smoking legislation had played in curbing exposure, but added: "The government is looking at ways to go further to reduce the 9,500 children admitted to hospital every year as a direct result of exposure to second-hand tobacco smoke.

"Parents have a responsibility to protect their children by stopping smoking around them in enclosed spaces like their cars and in their homes."

The Welsh Assembly Government said it had commissioned a tobacco control group to advise specifically on how to protect children, while a Scottish Government spokeswoman said it was conscious smoking in cars was a source of exposure that needed highlighting but had no plans for a ban. Northern Ireland is to conduct its own review.

The driving and smoking lobby groups expressed their anger at the recommendations, arguing that adults did not needs laws regulating every aspect of their behaviour.

Simon Clark, of Forest, which campaigns for smokers' rights, questioned the figures used in the report, noting that cases of asthma had been rising as the number of smokers had fallen.

HAVE YOUR SAY It's bad enough having a government that wants to micro-manage our lives, without the medical fraternity climbing on the bandwagon Darkseid

"It's unacceptable to single out smokers and imply that they are solely responsible for the cost of asthma treatments, hospital admissions and asthma drugs for children up to the age of 16.

"We want smokers to be considerate towards those around them, especially children, but changing people's behaviour should be achieved by education and encouragement not by legislation and enforcement."

Nigel Humphries, spokesman for the Association of British Drivers, said the car should be seen as an extension of the home and treated as such.

"The car is a private space and it crosses a line to start interfering in it, however much one disapproves of smoking."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8583551.stm

Published: 2010/03/24 00:48:35 GMT

Define a 'Great' City

By: Erik Hayden | March 22, 2010 | 12:00 PM (PDT)

A University of Louisville researcher data-crunches and theorizes about the 'greatest' American cities.

H.V. Savitch knows that "Best of" lists are always debatable. That's why he didn't make one.

Instead, the distinguished research professor at the University of Louisville took a less-traveled road. He analyzed other authoritative sources to glean information on an endlessly debated topic: What's the "greatest" American city?

Sure, it's a frivolous question. And it begs to be countered with a simple, "Define 'great.'" But it's also a question dear to the hearts of nearly every glossy travel magazine, cultural watch-dog and, apparently, AOL or MSNBC blogger. Iconic cities, after all, seem to hold that romantic allure for the young — at least according to their tourism campaigns.

When Savitch pondered this "great" question (and recently published his research in the academic journal *Cities*), he started by culling data from three of the most recent authoritative city rankings: the *Foreign Policy* magazine Global Cities Index, the Anholt-GFK Roper City Brands Index and the MasterCard Worldwide Centers of Commerce Index.

He then defined "great" as empirically as possible, knowing that any attempt to quantify the notion can "be problematic because of what is selected, how a given quality is measured and whether indicators point in a certain direction." For instance, the amount of artists nestled in a dense city area may mean less to someone who is searching for the most hospitable place to raise a family.

What the researcher came up with was a grid headed by four words beginning with the letter "C": Currency, Cosmopolitanism, Concentration and Charisma. To define these, he compiled data points from a variety of quantitative sources.

For example, "Currency" is measured by gross metropolitan product, the amount of Fortune 500 companies located within the city, per capita income and other measures. "Charisma," one of his quirkier

categories, is measured by the number of Google hits, the Bohemian Index rating, "amenity richness," Internet Movie Database titles referencing the city and other factors.

The results from his two-part research? Well, it appears that the professor's data has much in common with many list-making magazine bloggers.

New York, Chicago, San Francisco and Los Angeles most frequently charted as the top American cities in the three indices he evaluated. In nearly every "C" category New York attained top honors, followed by a rotating assortment of the next three cities. By these measures, it seems that the Big Apple can still lay claim as the "greatest" American city. (Popular culture never had a doubt.)

Chicago, one of the top 10 "miserable cities" according to Forbes, was also lauded by the professor's study. The Windy City, Savitch contends, was ranked highly for coming to "embrace that accolade of America's 'second city.'" That is, "the city has found its identity as the big city that's not New York — more manageable, cleaner and more affordable with a hominess of its own." Its strongest suits appear to be in Currency and Cosmopolitanism, where it received high rankings for its "global network connectivities," status as a "high-tech city" and for the size of its downtown in square miles (second only to NYC).

San Francisco, on the other hand, "is a city of balance and economic diversification." Noted scholar Richard DeLeon is quoted in the study for observing that "hyper-pluralism reigns. That means mutual tolerance is essential, social learning is inevitable, innovation is likely." And yes, according to the Daily Beast of all places, it's considered one of the "smartest cities" in the nation.

Even though San Francisco is the smallest of the four cities — 12th on the list of most populous U.S. cities — it houses the nation's highest per capita income and has an apparently commendable large influx of foreign tourists (though less than N.Y. and L.A.).

The "greatest" challenge to New York's supremacy may not be any of the above cities. It appears that Savitch's "quintessential 20th century city" could face a truly 21st contender: Los Angeles, a city that scholars have praised for its "post-modern" (read: disjointed, sprawling) sensibilities.

The City of Angels, it appears, "exceed[ed] many of its sister cities on the Bohemian Index" and was ranked highly for its ever-"desirable location." Not to mention the fact that influential critics think L.A. surpasses N.Y. as the "best deli town" in America. Now that's a revolutionary finding.

Could Los Angeles eventually overtake New York as the "greatest" American city?

Savitch wouldn't be on that bandwagon — he coined the acronym DEAD (Density Extensive, Auto Dependent) to neatly describe L.A.

http://www.miller-mccune.com/culture-society/define-a-great-city-11113/

Nuclear Déjà Vu: Panel Seeks Solution to Waste

By: Max S. Power | March 25, 2010 | 05:00 AM (PDT) |

With nuclear power back under serious consideration as a U.S. power source, a blue ribbon panel's decisions on what to do with waste carry great import.

At the end of January, Energy Secretary Steven Chu appointed a Blue Ribbon Commission on America's Nuclear Future. The commission's principal purpose is to propose how to deal with spent nuclear fuel and high-level nuclear waste.

Bipartisan co-chairs Lee Hamilton, a former Democratic congressman, and Brent Scowcroft, national security adviser under two Republican presidents, will need all their renowned diplomatic skills and political savvy to produce a viable, sustainable answer. The urgency the administration feels to resolve the nuclear waste problem is further reflected in the commission's makeup: two former senators, two leaders of major environmental groups, several former high-ranking officials in the Department of Energy, the Nuclear Regulatory Commission and the Federal Energy Regulatory Commission, and heads of major labor and industry groups.

National policymakers thought they had a viable answer more than a quarter century ago, in the Nuclear Waste Policy Act of 1982. That law set out a process to develop and pay for deep geologic repositories; the first was to begin receiving waste in 1998.

A permanent and viable solution to the nuclear waste problem was deemed necessary to allow further development of nuclear power in the United States and to meet the obligation to future generations to provide a permanent waste solution. For the next two decades and more, however, such development did not occur. The repository program fell victim to siting politics. The 1998 date had turned into 2020 by the time the Obama administration took office.

At that point, the only option on the table was to develop a repository in the welded tuff, a uniformly dense volcanic rock, inside Yucca Mountain, Nev. Congress had approved the site in 2002 over the objections of the state of Nevada and its senior senator, Harry Reid. The outgoing Bush administration submitted a license application to the Nuclear Regulatory Commission in 2008.

On March 3 of this year (and with Reid now the Senate majority leader), Secretary Chu moved to withdraw the application "with prejudice" — to "provide finality in ending the Yucca Mountain project."

The program to site and develop a repository has cost upwards of $14 billion, collected from ratepayers whose electricity has come from nuclear plants and from Congress to cover the costs of disposal for high-level defense wastes. In addition, the federal government continues to pay for the costs of on-site storage of spent fuel as a result of lawsuits filed by utilities after the Department of Energy was unable to begin to accept the fuel in 1998. These costs will continue to grow until the federal government begins accepting the fuel.

Now the administration wants to include nuclear power in its strategy to reduce carbon emissions. It is counting on the commission, which starts meeting today, to provide answers for the safe management and disposal of nuclear wastes. In doing so, the commission will have to confront three major challenges.

Credibility: To anyone who has followed the Nuclear Waste Policy Act, it appears that short-term political calculations have prevented orderly and timely development of geologic disposal. The secretary of energy abruptly terminated the act's prescribed effort to site a second repository in Eastern and upper Midwestern states in the spring of 1986, when there were key House and Senate races in a number of affected states. Congress eliminated potential sites in Washington and Texas at the end of 1987 — when the speaker of the house hailed from Washington and the majority leader from Texas. The current administration ended the Yucca Mountain project in line with primary-season commitments the then-presidential candidate made in the home state of the Senate majority leader.

Therefore, both industry representatives and environmental skeptics of nuclear power will be reluctant to believe that the federal government will actually implement whatever solutions the commission recommends. The path forward will need many check-in points where all sides can see that commitments are kept.

Facing up to long-term storage: Since the early 1980s, both the commercial nuclear power industry and defense nuclear facilities have assumed there would be adequate geologic disposal for their wastes within a few decades. They and the commission now have to face the reality that spent fuel and high-level waste will have to be stored for many more decades.

That raises at least three gnarly issues. First, the regulatory regime for on-site storage has focused on the short term. The Nuclear Regulatory Commission must now undertake an extensive review of its approach in order to assure safety, environmental protection and physical security for a much longer term.

Second, maintaining storage at many sites, including those of reactors that have been decommissioned, is costly and provides opportunities for highly visible acts of terrorism. On the other hand, moving toward consolidated storage will ignite new siting battles and controversy over transport of nuclear wastes.

Third, there are innumerable legal issues to sort out. For example, litigation about federal acceptance of spent fuel continues. Objections to withdrawal of the Yucca Mountain licensing application are likely to produce additional litigation if the Nuclear Regulatory Commission accedes to the secretary's request. A 1995 settlement with the state of Idaho requires spent fuel and high-level waste to be removed from the Idaho National Engineering Laboratory by 2035. Neither Hanford, Wash., nor Savannah River, S.C., has adequate National Environmental Policy Act coverage to continue to store spent fuel and high-level waste indefinitely.

Backyards: Whether for interim storage or new exploration for geologic repositories, the country will have to face siting issues. The Nuclear Waste Policy Act of 1982 had probably the most elaborate facility siting process of any federal statute. Yet it foundered repeatedly on Not In My Back Yard politics.

The commission may be tempted to rely (as some recent legislative initiatives have) on existing federal nuclear sites, like Hanford or Savannah River. It would be well to remember, however, that Hanford and the Nevada Test Site (where both surface and underground nuclear tests took place for 40 years) were "grandfathered" into the Nuclear Waste Policy Act. Yet Yucca Mountain, adjacent to the Nevada Test Site, and Hanford were eliminated politically. In the 1980s, Oak Ridge was taken off the table as sites for centralized interim storage.

This suggests why former members of Congress and experienced Washington hands make up a majority of the commission's members. However, the commission lacks state and local representation. This could weaken the viability and credibility of its recommendations concerning siting. (Note: Two governors and two organizations of states affected by nuclear waste issues recommended appointment of the author of this article to the commission; the recommendation was not accepted.)

Finally, while the commission's charter does not explicitly mention reprocessing of spent nuclear fuel, the issue will surely come up. (See Miller-McCune articles on reprocessing here and here. In the 1980s, Congress' Office of Technology Assessment concluded "reprocessing — which generates additional radioactive waste streams and involves operational risks of its own — does not offer advantages that are sufficient to justify its use for waste management reasons alone." The commission is likely to hear both that the failure to move quickly to geologic disposal and new technological breakthroughs make reprocessing an attractive option.

The fact remains, however, that reprocessing generates waste streams and emissions as well, so that siting facilities would still be a major issue. As would the prospect of transporting spent fuel to the facilities.

The commission has two years to reach its conclusions. Much is riding on its deliberations. Whatever its conclusions, Congress will have to enact new legislation to put them into effect. Given the history of the nuclear waste issues that must be addressed, the task is daunting — and based on past experience, frustrating. Preparing to attend the commission's first meeting in Washington, a person heavily involved in development of the Nuclear Waste Policy Act said, "I wouldn't miss the meeting next week for anything, although I will take a big dose of anti-déjà vu pills beforehand."

Transparency will be vital if it is to succeed. If the commission comes to a town near you, it is bound to present an intriguing view into the state of American policymaking.

http://www.miller-mccune.com/politics/nuclear-deja-vu-panel-seeks-solution-to-waste-11401/

The Risky Business of Slicing the Pie

By: Ben Preston | March 22, 2010 | 09:00 AM (PDT) |

Conservationists find themselves at the back of line in divvying up water from one of the world's most litigated rivers.

In this, the final installment, of the Miller-McCune.com series on the Colorado River, Ben Preston examines the cooperation between American and Mexican entities. The Colorado River conservation community is tight-knit, but there are transnational political considerations to be made when working with a natural resource that isn't confined by political boundaries.

After 10 years of drought in the Colorado River watershed, this year's extremely wet winter season has been a boon to every living thing that depends upon the river's water, from the Yuma clapper rail to the San Diego apartment dweller.

In theory, anyway.

As of March 17, the National Water and Climate Center reported on its Web site that the Upper Colorado River snowpack — where 85 percent of the river system's water originates — is at only 83 percent of its average. While the levels of lakes Powell and Mead — the river's two largest reservoirs — have risen in recent months, officials speculate the reason for the rise to be more closely linked to rain in agricultural areas. Rain there lessens demand for releases from the Glen Canyon and Hoover dams.

Despite concern that the river's resources are stretched thin, Herculean efforts are being made by environmental groups and government agencies to navigate the perilous labyrinth of Colorado River water rights to secure a sustainable future for wildlife habitat that either has been restored or is slated for restoration. None of the 29 dams along the river's 1,450-mile course were designed with environmental impacts in mind. Times have changed, and so have priorities, and the importance now given to the riparian ecosystem — both the river and the land extending from its banks — has greatly aided conservationists in reclaiming some of what was lost.

Nicknamed the American Nile, the Colorado River is one of the most regulated, litigated and depended-upon rivers in the world, and one of the most politically complex. With tens of millions of city dwellers

using the river for drinking water and hundreds of thousands of acres of farmland relying upon it for irrigation, dividing water rights among the various parties has always been complicated.

In the 1920s, as seven U.S. states jockeyed for assigned water allotments, the river was simply sliced into two basins — Upper and Lower. The Upper Basin contains Utah, Wyoming, Colorado and New Mexico, and the Lower California, Arizona and Southern Nevada. Based upon the U.S. Bureau of Reclamation's average annual flow estimate of 17.5 million acre-feet, the Upper Basin received an annual allotment of 7.5 million acre-feet, the more developed Lower Basin got 8.5 million acre-feet. And 1.5 million acre-feet were set aside for Mexico.

States largely were left to their own devices to figure out a further breakdown amongst themselves based upon irrigable acreage and urban populations. Negotiations took decades, resulting in one of the longest and most costly Supreme Court cases in American history — *Arizona v. California*.

Unfortunately, the 17.5 million acre-foot annual flow estimate presented at the Colorado River Compact meeting in 1922 was not a realistic number. In the arid American West, rainfall varies greatly, and the river's annual flow can be as low as 4 million acre-feet one year to as high as 22 million only a few years later.

Furthermore, river-flow-gauge data from the past hundred years shows a slight downward trend in average annual flow. According to Joe Gelt, a researcher at the University of Arizona's Water Resources Research Center, data spread over three centuries indicates that the river's average annual flow is closer to 13 million acre-feet.

Regardless of flow numbers, the river was dammed to store its capacity for human consumption, all but drying up downstream ecosystems over the years. The passage of the Endangered Species Act in 1973 tipped the scale slightly, in theory, back toward Mother Nature, but it has taken years for state and federal government agencies and nongovernmental organizations to get restoration programs off the ground. Although plants and animals endemic to the Lower Colorado River corridor aren't necessarily political or nationalistic, the international border has been a major stumbling block in coming up with a comprehensive, transnational plan covering the entire ecosystem.

Even today, most riparian habitat areas are fed by agricultural runoff.

The largest, the Cienega de Santa Clara — a 12,000-acre wetland near the Gulf of California is all that remains of a once vast Delta ecosystem — is fed by runoff from Arizona's Wellton-Mohawk Irrigation and Drainage District. Since the drained water is too salty to return to the main stem of the Colorado River, for the last 45 years it has been released through a channel called the Main Outlet Drain Extension into the Cienega.

"If we continue to rely on this gap in the system, we're not going to have much of an environment left," said Jennifer Pitt, a resource analyst for the Environmental Defense Fund specializing in Colorado River Delta issues.

As water and irrigation districts find solutions to inefficiencies in the system, unintended impacts are often felt as well. Recently, Mexican authorities complained bitterly when California's Imperial Irrigation District opted to line the All American Canal — an 82-mile water conduit feeding Imperial and Coachella valleys' agriculture with Colorado River water — with concrete to prevent water loss. Seepage through the unlined canal had provided millions of gallons of water to a nearby aquifer across the border, which in turn fed agricultural operations in the populous Mexicali Valley.

A pilot plan to fire up the long-dormant Yuma desalination plant in May 2010 to de-salt agricultural return flows from Wellton-Mowhawk had caused concern that the Cienega would again dry up, destroying one of the most important migratory waterfowl flyway stopovers in North America.

Pitt said that coming up with solutions for cross-border disputes can be even more tricky than interstate squabbles, drawing in numerous treaties, jurisdictional overlaps and even attention from the State Department, but multiagency cooperation has led to hope that salty effluent from the desalinization plant will feed the Cienega. The pilot plan calls for the plant to run for 365 days over 18 months at one-third of its capacity.

On the international front, progress began to be made toward a binational ecological plan near the end of the Clinton Administration. As George W. Bush took over as president, an international conservation conference, with 350 attendees, was planned to see what could be hammered out. "Vicente Fox and George W. Bush looked like they'd be down to cooperate, but [the conference] was held on Sept. 11-12, 2001. Let me tell you, the wind was taken out of our sails. We were headed in the right direction, but events much bigger on the geopolitical scale broke down the U.S.-Mexico relationship," said Pitt. The Sept. 11 terror attacks virtually closed U.S. borders, and the ensuing invasion of Afghanistan diverted the administration's focus from water negotiations with Mexico.

Then, Mexico's decision as a United Nations Security Council member to vote against the U.S.-led invasion of Iraq soured U.S.-Mexico relations, and that damage is only beginning to be overcome today. "The U.S. and Mexico are at the table talking," said Pitt. Currently, aside from the treaties in place, the language of U.S. laws isn't generally sympathetic to the water issues, driven by the environment or thirst, of the poorer neighbor to the south.

Away from Washington, there is some progress among federal agencies, NGOs and researchers. Restoration projects like the Bureau of reclamation's Multi Species Conservation Program and projects led by the Sonoran Institute, Pro Natura, EDF and a number of academic research teams are loosely coordinated, but there is an effort afoot to set up a formal structure for obtaining water rights — meaning dedicated flows rather than just inadvertent ones — for conservation and restoration areas.

(It helps collegiality that the Lower Colorado River conservation community is a small one. Pitt, who is based in Colorado, has worked with the Sonoran Institute's Francisco Zamora Arroyo, whose office is in Tucson. Both of them have spoken and toured project sites with the Bureau's Terrence Murphy and members of his MSCP team, who are all headquartered in Boulder City, Nev.)

"We're not talking about restoration of the pre-development Delta. Mexico has developed agriculture and communities there that aren't interested in moving," said Pitt. Solutions currently on the table include a multi-organization water trust aimed at purchasing permanent water rights, possible expansion of desalination, and, because Mexico doesn't have any storage reservoirs of its own, banking conservation water for Mexico further upstream in Lake Mead.Pitt maintained that for the Colorado River Delta Water Trust, as it would be called, to work, an annual base flow of 50,000 acre-feet per year is needed, with occasional "pulse flows" — to simulate the river's natural cycle of flooding — of up to 260,000 acre-feet per year.There are still a number of issues to work through. For years, Southern California took more than its annual 4.4 million acre-foot allotment; currently, the take is about 5.2 million. But Arizona is developing, and wants its water back from California.

A vast and complicated legal arrangement, the Quantification Settlement Agreement, has been the subject of hot debate as the various entities involved attempt to figure out the best agricultural and urban uses of the Southern California's smaller, but legally mandated, allotment while also trying to save the Salton Sea from disappearing.The possibility of building more desalination plants is on the table, but Mexico waits anxiously to see what happens north of the border. Last in line to have their fate decided are the conservationists.

"I don't know that we'll get a deal at the end of the day," said Pitt, "but I'm optimistic."

http://www.miller-mccune.com/science-environment/the-risky-business-of-slicing-the-pie-11068/

Environmental Literacy: No Child Left Indoors

By: Emily Badger | March 23, 2010 | 16:50 PM (PDT) |

Without instituting a fifth-period forestry class, federal officials want school kids to get outside and observe what's there.

Page 28 of the Obama administration's blueprint for rewriting No Child Left Behind, released earlier this month, contains a vague but interesting paragraph about ensuring that American students have a "well-rounded education." The plan would provide grants to states and school districts to bolster the teaching of arts, foreign languages, history, civics and something called "environmental education."

Patrick Fitzgerald, the director of education advocacy for the National Wildlife Federation, could not think of another time when environmental literacy has been explicitly broached in reauthorization of the Elementary and Secondary Education Act. And so the mention, albeit a brief one in an early-stage blueprint, is a big deal for advocates who worry children are spending dramatically less time around nature at precisely the moment when environmental crises demand a basic understanding of everything from the carbon cycle to the recycling process.

As the Department of Education's broad-brush outline gets translated in the coming months into specific legislative language, many environmental groups hope it will include the No Child Left Inside Act. Critics wary of environmental demagoguery should take note: The act includes no mandates, only incentives.

Science education has become a politically hot topic, with several states and school boards recently adopting or considering requirements that teachers emphasize "uncertainty" around climate change and evolution. No Child Left Inside is not about dictating this curriculum dispute (and the bill, Fitzgerald points out, has both Republican and Democratic co-sponsors).

"Environmental education is really about teaching kids how to think," Fitzgerald said, "not what to think."

He stresses the benefits of learning about nature — and directly in nature — not just for environmental literacy, but also for the success of students across other subject areas. A number of studies have

suggested that students who receive environmental education have higher standardized test scores, better grades in reading, writing and math, and improved behavior and critical thinking skills.

One study, conducted in 2004 by the Pacific Education Institute and requested by the Washington state Legislature, analyzed more than 150 schools in the state, half with environmental education integrated across age groups and curriculum, and half with no such education. Students in the first group performed better on standardized tests, improved their GPAs and were more likely to stay in school longer.

No Child Left Inside would similarly encourage integrating environmental education across existing subjects. This would counteract an opposite trend since the 2001 passage of No Child Left Behind, which pushed many subjects out of the classroom as teachers focused on preparing for reading and math standardized tests.

"We're not trying to get schools to create a fifth-period environmental education class," Fitzgerald said. "It's more around training teachers, getting them to understand how to use the environment and the outdoors in educating kids."

The bill, like the Obama blueprint, would do this by providing grants to educate teachers and develop curriculum.

Another set of studies portrays a grim picture of what Americans — children and adults — currently know about the environment. Most of us, for starters, think we know more than we actually do. A 2005 report from the National Environmental Education Foundation concluded that only 12 percent of Americans could pass a basic quiz on energy topics.

Equally discouraging: 45 million Americans think fresh water comes from the ocean; 120 million think chlorofluorocarbons are still contained in spray cans (they haven't been since 1978); and 130 million think America gets most of its energy from hydropower.

This leaves an awful lot of ground to cover before we ever even get to the part about anthropogenic climate change.

"We do know that kids are spending just seven minutes a day outdoors currently compared to over seven hours in front of a screen," Fitzgerald said. "Generally, this contact with nature, this time outdoors, whether it's after school or in school, is just not happening. The connection to nature in that sense is dwindling quite rapidly."

http://www.miller-mccune.com/politics/environmental-literacy-no-child-left-indoors-11299/

Good Intentions Always in Season at Farmers Markets

By: Elisabeth Best | March 20, 2010 | 05:00 AM (PDT) |

Although shopping at the farmers market may or may not reduce your carbon footprint, these community bazaars offer benefits beyond efficiency.

The coming of spring means different things to different people. For college students, it's the debauchery of Spring break. For baseball fans and TBS audiences, it's the return of Major League Baseball. For Midwesterners (and, this year, Washingtonians), it's in a welcome respite from winter storms. But for farmers across America, it means the return of the farmers market.

If you've never been to a farmers market, close your eyes and imagine an avenue of folding tables brimming with vibrant vegetables and fruit and spilling melt-in-your-mouth local products like cheese, hummus and fresh-baked bread. In California, at least, it's an open-air bazaar where, rain or shine, local farmers and artisans sell their goods back to their community with an idyllic synergy reminiscent of a simpler time (that probably never existed).

The concept underlying farmers markets is to get eaters in touch with those who produce their food. In a highly processed, dollar-menu world, that's an admirable goal, and it draws a diverse group of customers, from low-income shoppers looking for cheaper produce to high-minded professors hoping to support local agriculture and eco-friendly foodies seeking out the best ingredients for their quinoa salads.

To hear some locavores talk, farmers markets sound like the be-all end-all of solving the Earth's problems. Their logic: The food at these markets travels a shorter distance to get to your kitchen than the food on your grocery store's shelves, which significantly reduces its (and your) carbon footprint. By supporting local agriculture, you're pumping money into your local economy. And by eating locally available foods, you're also eating seasonally, which is not only sustainable, but can have dietary benefits, too.

Farmers markets can be a great way to educate and provide people with biologically diverse food options, including but hardly limited to the heirloom tomato (the posterproduce of food biodiversity) or the heirloom apple. As Emily Badger noted in her article, "We Gotta Eat 'Em to Save 'Em," eating biodiverse foods is one way to ensure that Broad-Breasted White turkeys won't gobble up the Earth.

Farmers market champions cite their ability to improve public health, lower food prices and, perhaps most contentiously, reduce greenhouse gas emissions. Can farmers markets single-handedly save the world? Probably not. But they embody a growing thread in an increasingly "global" world: a focus on the local.

Farmers markets are sprouting like weeds: Since 1994, the number of farmers markets in the U.S. has increased from 1,755 to 5,274. There was a 13 percent increase between 2008 and 2009 alone.

It's important to note, however, that farmers markets still represent a relatively small piece of the pie. In 2008, there were approximately 85,200 grocery stores nationwide (this number includes both supermarkets and convenience stores), which means that there are still more than 15 grocery stores for each farmers market in the United States.

As they've grown in popularity, farmers markets have also undergone changes. Gail Feenstra, the food systems coordinator of the University of California, Davis-based UC Sustainable Agriculture Research and Education Program, describes the change as a slow buildup over a number of years.

"In the very old days, they were more or less produce," she said. "Maybe 15 years ago, you started seeing more value-added products — dried tomatoes, peaches, jams and other things. That was stage two. The next stage, I would say, tended to be increasing the variety of the kinds of foods you would see at the markets. Then you would see more types of different foods; now you have the fish guy, the pig man and the milk man. Proteins in particular are much more common, and there has also been an increase in the amount of dairy present. Today, I can get almost everything I need at the farmers market."

Feenstra attributes the growing popularity of farmers markets to an increased awareness about climate change and public health. "When it looked like the global supply of energy was going to be limited, people immediately started looking more locally. They started asking themselves, 'How do I create a more resilient local-food system for me and my family?'"

She noticed that around 2000, people started looking for ways to eat better. They realized that farmers markets offered a lot of vegetables and saw them as a good place to start. "Michael Pollan's book, *The Omnivore's Dilemma*, spread the movement to a much larger portion of the population," she said. "Popular education and awareness kind of exploded there."

In the United States, research suggests it costs significantly more to eat healthy than to eat processed. As *Food, Inc.* points out, when a family has a few dollars to spend on food per day, why would they buy a few apples if they can buy a Big Mac for the same price?

Farmers markets may help mitigate that problem. In Canada, Kristian Larsen and Jason Gilliland found that the addition of a farmers market to a "food desert" — an urban location with poor access to healthy and affordable food — significantly reduced the cost of eating a nutritionally balanced meal. Another team of Canadian researchers found that local food environments can lead to obesity and suggests that improving access to natural food — farmers markets, anyone? — can combat this trend.

Plus, as Jaydee Hanson argues, eating locally has food safety perks because it minimizes the number of places your food has been. "It won't keep you from getting sick," she said, "but at least you'll know who made you sick."

Unfortunately, in food as in politics, things aren't always what they seem, and it's important to read the fine print. Simply going to the farmers market isn't a guarantee that anything you buy has been grown by a local farmer. At many farmers markets, local chambers of commerce have given the go-ahead to commercial growers, who sell customers the same vegetables they likely could buy cheaper at the grocery store.

A 2009 *Mother Jones* article by Danielle Duane highlights the pressure faced by farmers market managers to grow the markets. And grow them they do, with street performers and restaurant booths selling breakfast burritos and doughnuts, with the only local ingredient most likely being the person making them.

Although theoretically these attractions might bring a new breed of shoppers to support their local farmers, one study found that they simply cater to a different clientele. Some markets focus on prepared foods, targeting the people who make the farmers market a Saturday morning activity. Others focus on different types of shoppers, ranging from the casual browser to the serious buyer. Either way, the markets self-select their customers, and not all of these customers are all that interested in locally grown food. (Neighboring retail stores hoping to lure farmers market shoppers are out of luck, too — the same study found that the markets are a one-stop shop.)

But Feenstra sees the prepared food at farmers markets as a good thing. "My opinion is that it brings more people to the market," she said. "Sometimes those people don't end up buying stuff from vendors, but sometimes they do. Just being there increases awareness. If they go there enough, they're going to start understanding and experimenting."

When market managers were asked in the USDA's 2005 National Market Manager Survey why people came to their markets, the top three reasons offered were freshness, taste and access to local food, which suggests that the main draw of farmers markets may be the superior taste of the products.

But isn't it more efficient — and therefore better for the environment — to buy local food at the farmers market? The short answer is not necessarily.

First off, what exactly does "local food" mean? Does it mean food grown in your city, state, country or backyard? There is no universally accepted definition. One study from Iowa State University found that more than two-thirds of participants defined local food as having traveled 100 miles or less (as the locavore Web site does); Feenstra says that for growers, local is anything that they can do in a day's drive.

With the typical American meal consisting of ingredients from five or more countries and the average fresh produce in America traveling 1,500 miles or more, the connection between "food miles" and greenhouse gas emissions may seem obvious.

But food miles aren't the only way to measure your carbon forkprint. Researchers in the United Kingdom argue that food miles aren't even a useful way to measure the environmental impacts of food production. Instead, they say, the entire production system needs to be taken into account. Was the produce grown in a greenhouse? How were the livestock raised? These on-farm practices can have as big an impact on greenhouse emissions as food transport — and in some cases, an even bigger one.

Research aside, the reality is that with the average farmers market customer spending about $10 per trip, very few people survive entirely off their farmers market purchases, which means that the farmers market potentially is an extra trip in a gas-guzzling SUV that might not otherwise be made.

A *New York Times* article points out if a strawberry producer in California ships his berries to Chicago in a truck, the fuel used per carton is relatively small because the truck bed is carrying thousands of them. If, however, the same strawberry farmer takes a much smaller quantity of the fruit to his stand at the local farmers market in his pickup, he might use more fuel per carton than would the berries shipped to Illinois.

And although people may be willing to pay more for locally grown food, they aren't necessarily willing to pay more for food with a lower carbon footprint. Feenstra said a carbon footprint is only one of a few factors that can attract someone to the farmers market. Getting the freshest, tastiest produce and supporting local agriculture also attract customers.

And efficiency isn't the only factor that influences a farmer's decision to sell at the farmers markets. Most farmers sell at a number of outlets to "hedge their bets."

"Some growers who love selling directly would never not do it, but it is costly in terms of the time they have to spend at the market," Feenstra said. "In terms of efficiency, it may not be the most efficient way to sell local produce, but it has benefits beyond efficiency that cannot be understated."

So if green is your goal, it might be more productive for you to reduce your meat consumption (save the phosphorus!) than become a locavore. If, however, you are looking for a more sustainable way to eat, engage in your community and boost your local economy, supporting your local farmers market can be a good first step.

"Increasing awareness of local agriculture is important in effecting change in public policy," Feenstra said, "and wanting to support local agriculture is as important as wanting to promote efficiency."

http://www.miller-mccune.com/science-environment/good-intentions-always-in-season-at-farmers-markets-11036/

Today's Health Hazard: Job Insecurity

By: Elisabeth Best | March 19, 2010 | 13:21 PM (PDT) |

More data comes in proving that, for American workers, specifically the older ones, job insecurity is bad for your health.

With a final vote on health care slated for this weekend, reform has never been closer. But as legislators weigh in on the health care bill this Sunday, they may want to keep in mind the lurking variable undermining health in America today. We're not talking about agricultural subsidies, junk food advertising or racism.

In the words of Bill Clinton, "It's the economy, stupid!"

The connection between job loss and poor health has been well documented; some researchers estimate that a worker displaced at age 40 will have a loss in life expectancy of 1 to 1.5 years. It appears that even the threat of losing your job can decrease your overall health because chronic stress can increase your susceptibility to disease.

A new study from the Gerontological Society of America suggests that job insecurity is a very real health hazard for people over 50, but one that manifests itself in different ways. While downsizing and demotions affect men's physical health, they manifest themselves psychologically in women.

A team of researchers led by Ariel Kalil studied approximately 200 residents of Cook County, Ill., ages 50 to 67. They defined "job insecurity" as having experienced being disciplined, a demotion, downsizing or reorganization at work.

The researchers found that job insecurity did not affect all individuals equally. After two years, men who had experienced it had lower self-reported health. They also had higher blood pressure and epinephrine levels. But under the same conditions, women displayed more hostility, loneliness and symptoms of depression.

As Kalil, a professor at the University of Chicago, observed, "Older adults in the United States are living longer and working harder. Increased exposure to the labor market brings increased exposure to employment challenges."

With 70 percent of U.S. working adults between 45 and 74 planning to work during retirement or forgo retirement altogether, older workers constitute a very large proportion of the labor market. But as Miller-McCune's Tom Jacobs writes, "The current economic climate may very well be eroding months or even years from the lives of those on the bleeding edge of insecurity."

http://www.miller-mccune.com/print/?open=11063

Bright Ideas: Light Bulbs Stimulate Insights

By: Tom Jacobs | March 26, 2010 | 14:17 PM (PDT) |

New research finds exposure to a bare, illuminated light bulb — a universal symbol of bright ideas — is a catalyst to reaching insights.

In recent weeks, we've summarized some new research documenting the ways subtle environmental cues can influence our behavior. A voter whose polling place is in a church is more likely to support the religious right. Looking at logos for fast-food franchises seems to make people impatient and in need of instant gratification.

Now comes still another study on how our surroundings interact with our unconscious minds — one that points to a bright outcome. It concludes we're more likely to come up with insights if we've been exposed to that universal symbol of brilliant ideas: a glowing light bulb.

The notion that achieving an insight is akin to shining a light on a darkened space has been traced back to Plato. Could it be more than a metaphor? To find out, a research team led by psychologist Michael Slepian of Tufts University conducted a series of experiments.

In one, 79 college students were given three minutes to solve a spatial problem involving connecting four dots via straight lines without lifting the pencil form the page. Just before leaving the room so the participants could begin, an experimenter remarked "It's a little dark in here" and turned on either a lamp with an unshaded 25-watt bulb (which was visible to the students), or an overhead fluorescent light.

Forty-four percent of those exposed to the bare bulb solved the problem in the allotted time, compared to 22 percent of those sitting under the florescent fixture.

In another experiment using that same technique, 69 students were asked to complete four algebra equations – three of which could be figured out using "a multi-step incremental process," and a fourth that required a leap of insight. "Compared to participants exposed to fluorescent light, those exposed to the illuminating light bulb solved the insight problem more often, but did not solve the non-insight problems more often," the researchers report.

Slepian and his colleagues also tested verbal insight. Thirty-eight students were presented with combinations of three words; they had five seconds to come up with a fourth word that would form a compound phrase with each. (Example: One of the groups featured the words sense, courtesy and place; the answer was "common.")

"As predicted, participants exposed to the illuminating light bulb solved more triads correctly than participants exposed to the overhead fluorescent light," they report.

A different group of students took that same test while being exposed either to the bare, glowing 25-watt light bulb mentioned earlier, or to a shaded 40-watt bulb. Those exposed to the less powerful but unshaded bulb solved more triads correctly.

Together, the studies clearly suggest exposure to an bare, glowing light bulb stimulates mental processes that lead to insights. Perhaps our brains are responding to a familiar symbol; perhaps the symbol retains its meaning because it reflects the way our brains operate. Either way, one thing is clear: All those cartoons and comic strips where a light bulb goes off over someone's head were apparently a more literal reflection of reality than we realized.

http://www.miller-mccune.com/culture-society/bright-ideas-light-bulbs-stimulate-insights-11677/

With Music, Ignorance May Be Bliss

By: Tom Jacobs | March 25, 2010 | 12:38 PM (PDT)

Put down those program notes: New research suggests describing a piece of classical music may diminish the pleasure of listening.

Last month, we reported that providing contextual information may diminish viewers' enjoyment of modern art. A commenter suggested that dynamic may apply to music as well, noting that a class he took on the music of Aaron Copland "lessened my appreciation of the composer's work."

A study just published in the journal *Psychology of Music* suggests his experience was far from unique. It finds that reading a what-to-listen-for guide before hearing a piece of music seems to make the actual aesthetic experience less pleasurable.

"Descriptions may interfere with the directness and intimacy with which listeners are able to experience a work," writes Elizabeth Hellmuth Margulis of the University of Arkansas. "It may distance listeners, or place them at a remove — as if they were listening through someone else's ear."

Margulis, whose research on musicians' brains was described on Miller-McCune.com in 2008, selected 24 excerpts from Beethoven string quartets. For each of these 45-second snatches of music, she wrote two brief descriptions: One labeled "dramatic" ("The opening evokes a deeply felt hymn"), the other "structural" ("This piece begins with a series of slow, sustained chords").

The 16 non-musicians who participated in the experiment listened to all 24 excerpts. For eight of the pieces, they first read the dramatic description of what it was they were about to hear. For another eight, they read the structural description. The remaining eight were presented without any preparation. Afterward, the participants rated their enjoyment of each excerpt.

"Excerpts without descriptions were enjoyed more than excerpts with them," Margulis writes. "Dramatic descriptions seemed to reduce enjoyment more than structural descriptions, but this effect did not rise to significance."

Is it possible the test participants were simply annoyed by the instruction to read the description, which influenced how they perceived the piece? Possibly, but a follow-up experiment determined any such effect did not account for the difference in enjoyment levels.

So what does explain it?

"Music has been associated with the pleasure of 'flow,' a state that may be harder to achieve when conceptual knowledge intervenes," Margulis notes. "Listeners are less likely to let the music wash over them if they have just read a description.

"When people without extensive formal training listen to music in terms of verbal descriptions, they may work so hard at connecting the notes into label-able phenomena that they lose the ability … to hear the subtle interconnections among the sounds. These interconnections may be fundamental to music enjoyment."

So should program notes and pre-concert lectures be abandoned? Not necessarily, says Margulis, who cautions her study is preliminary and "raises more questions than it answers."

"It is plausible," she writes, "that program notes with other types of information — composer background, for example — may enhance enjoyment in a way that descriptive notes appear not to." (This is the approach of many classical music stations, including KUSC Los Angeles, where announcers often discuss the circumstances of a work's composition but seldom address specifics of structure.) She adds that "even if descriptive notes don't increase enjoyment in the short term, they might over the longer term."

Then again, perhaps our entire impulse to translate music into words is misguided. Composer and musical theorist Leonard Meyer implied as much when he wrote (in a passage Margulis includes in her paper): "Listening to music intelligently is more like knowing how to ride a bicycle than knowing why a bicycle is ridable."

http://www.miller-mccune.com/culture-society/with-music-ignorance-may-be-bliss-11485/

'Toughness' on Crime Linked to Racial Resentment

By: Tom Jacobs | March 24, 2010 | 16:38 PM (PDT) |

A new analysis finds racial resentment is a major reason behind Americans' support for harsh sentences for criminals.

The era of punitive punishment, in which campaign promises to get tough on crime lead to ever-stricter laws and harsher sentencing guidelines, may become a victim of the economic downturn. That's the implication of a newly published *New York Times* story, which described the state of California's attempt to save money by reducing its prison population.

But how did the "lock them up and throw away the key" ethos come to dominate America's approach to crime and punishment in the first place? Criminologists James Unnever of the University of South Florida-Sarasota and Francis Cullen of the University of Cincinnati weigh three different theories in the latest issue of the journal *Criminology*.

They conclude that while a variety of beliefs and emotions undergird the electorate's support for policies that emphasize punishment over rehabilitation, the most glaring issue is one few people want to discuss: race.

"Racial resentments are inextricably intertwined in public punitiveness," write the researchers, who describe a process in which racially prejudiced people meld their fear of crime with their resentment of a group they dislike. This results in an "inability of Americans to empathetically identify with those who will be caught up into mass-incarceration movements," since the people being imprisoned are those they instinctively dislike anyway.

Noting that state and federal prison populations in the U.S. have increased seven-fold since the early 1970s, Unnever and Cullen tested three theoretical models that attempt to explain this shift in public attitude. They used detailed data from the 2000 National Election Survey, which includes interviews with 1,620 Americans in which they described their views on a variety of social issues.

Specifically, the researchers looked at the Escalating Crime-Distrust Model, which states people perceive that crime rates are increasing, and they've lost their faith in the police and court system to protect them;

the Moral Decline Model, in which people view crime as a symbol of societal disintegration and support punishment "as a conduit for re-establishing a sense of social cohesion;" and the Racial Animus Model. They measured respondents' racial resentment by their responses to four statements, including the assertion that black people don't deserve "special favors."

"Our findings reveal that punitive sentiments can emerge from diverse sources," they write. A sense that crime is getting out of control (which is reinforced by so many nightly local newscasts) compels people to support harsh punishment of perpetrators, as does the belief that society is in a state of moral decline.

But even after taking those two factors into account, racial animus is "one of the most salient and consistent predictors" of support for strict punishment for criminals. To the researchers, this suggests "a prominent reason for the American public's punitiveness — including the embrace of mass imprisonment and the death penalty — is the belief that those disproportionately subject to these harsh sanctions are people they do not like: African Americans."

The research "clearly documents that public opinion about crime and its control is driven by racial animus," the researchers write. They add that, for decades (perhaps since the race riots of the 1960s), when many Americans think about crime, "the picture in their head illuminates a young, angry, black, inner-city male who offends with little remorse."

That's not the mental image of a kid who made some bad choices and can be rehabilitated. Rather, it's the reinforcement of a pre-existing set of prejudices. (Unnever and Cullen do not consider it a coincidence that black Americans "are generally not supportive of a punitive approach, especially capital punishment.")

It wasn't until the very end of the health care debate, when protesters shouted racial slurs at pro-reform members of Congress, that the mainstream media considered the idea that antipathy to expansion of health coverage might have a racial component. Perhaps the next time crime re-enters the public policy debate, this elephant in the room can be identified in a timelier manner.

http://www.miller-mccune.com/culture-society/toughness%E2%80%99-on-crime-linked-to-racial-resentment-11386/

An ePassport is a Fiendishly Slippery Thing

By: Michael Scott Moore | March 24, 2010 | 05:00 AM (PDT) |

No sooner are new electronic identification methods out on the street than do electronic tricksters (and presumably cyber bad guys) hack them.

When America and the EU introduced "ePassports" in the mid-2000s, the documents had no security, not even basic encryption, which meant that the holder's details were being offered up to the world at large.

The passports had RFID chips to let machines read basic information, including photos and fingerprints, and for the first time in history, a traveler — at least in theory — could have his identity details "skimmed" by any hacker wielding a fairly cheap RFID receiver.

Use of RFID, or radio-frequency identification, has exploded over the last few years. The chips turn up in everything from retail items to house pets to electronic toll passes (EZPass, FasTrak). "We can use RFID to identify something or someone," says Gildas Avoine, a computer scientist in Belgium who has criticized the new European ePassports, "or we can use RFID to authenticate – meaning to identify with proof of identity. If we use RFID for a supply chain, or for cattle, or for pets, and so on, what we want is just to identify. Not proof, just to identify."

But authentication can be fiendishly difficult. Hackers had such an easy time skimming first-generation ePassports that Western governments added a layer of security in mid-2006. Now the RFID readers need a password to read the owner's data. Most passports issued after 2006 — when European countries introduced ePassports under American pressure — have "Basic Access Control," an encryption method that requires a code from the reader for the microchip to unscramble its data.

Fair enough, but Avoine showed the codes could be interpolated from characters printed in the passports themselves. That meant a man with a scanner walking down the corridor of a train might not manage to skim your private details, but a pickpocket who swiped your passport and brought it home might manage to crack the chip and make a counterfeit.

A test by the London *Times* in 2008 confirmed this weakness. The newspaper hired computer scientist Jeroen van Beek at the University of Amsterdam to test new and supposedly fake-proof British ePassport

technology. (The United States pressured all EU governments to adopt them after the 9/11 attacks in 2001.)

"Using his own software, a publicly available programming code, a £40 card reader and two £10 RFID chips," writes the Times, "Mr van Beek took less than an hour to clone and manipulate two passport chips to a level at which they were ready to be planted inside fake or stolen paper passports."

What he did, specifically, was skim data from two British passport chips, then replace the image files with digital photos of Osama bin Laden.

The British government argued at the time that safeguards already built into the system would detect Mr. Van Beek's (and other) cloned chips at any European border. But those safeguards weren't mandatory until June 2009, when the EU started to use an authentication method called Extended Access Control, which means passports issued before mid-2009 are still easy to hack.

American passports now come with a so-called Faraday cage — a metal mesh inside the cover that blocks the RFID signal as long as the passport stays closed. "The passport never emits by itself," says Avoine, the Belgian computer scientist. "So the reader sends an electronic signal to the passport, and the passport answers. With a Faraday cage you are no longer able to reach the RFID tag in the passport" until someone opens it up.

In the meantime, though, state and federal government agencies in the U.S. have started to issue both driver's licenses and "passport cards" (for travel to Canada and Mexico) tagged with RFID. Since the cards have no covers to close, they're easy to skim, and in early 2009, a British hacker named Chris Paget rigged up a receiver in his car with $250 worth of equipment, and drove around San Francisco for about 20 minutes.

He picked up RFID codes — in this case unique numbers assigned to the chips like digital Social Security numbers — from two passport cards carried by strangers on the street. Then he posted a video of his hacking mission on the Web.

Avoine says Paget's ride around the block simply shows what RFID chips are good for. Secure and verifiable human "authentication" may be difficult; electronic human retail is another matter. "The passport card emits this number," he said, "and perhaps we cannot link this number with a person," without a database to serve up personal details, which may have its own security problems. "But it's an issue anyway, because we can track someone. We cannot get their personal information, but we can track their movements."

http://www.miller-mccune.com/culture-society/an-epassport-is-a-fiendishly-slippery-thing-11172/

Are Hand Sanitizers Better Than Handwashing Against the Common Cold?

New research suggests that hand sanitizers containing ethanol are much more effective at removing rhinovirus from hands than washing with soap and water. (Credit: iStockphoto/Janine Lamontagne)

ScienceDaily (Mar. 24, 2010) — A new study suggests that hand sanitizers containing ethanol are much more effective at removing rhinovirus from hands than washing with soap and water. Sanitizers containing both ethanol and organic acids significantly reduced recovery of the virus from hands and rhinovirus infection up to 4 hours following application.

The researchers from the University of Virginia School of Medicine, Charlottesville and Dial Corporation, Scottsdale, Arizona detail their findings in the March 2010 issue of the journal *Antimicrobial Agents and Chemotherapy*.

Rhinovirus is the known cause of approximately 30 to 35% of common cold cases in adults. Hand-to-hand contact is one of the main avenues of transmission contributing to the spread of rhinovirus infections. In the study researchers compared the effects of hand washing with soap and water and an ethanol-based hand sanitizer by contaminating the fingers of healthy volunteers with rhinovirus and then randomly grouping them and administering one of six hand treatments.

The experiments ranged from a control group who had no treatment, several groups who washed their hands for differing amounts of time (some with soap, some without), and several who used varying amounts of hand sanitizer. Results showed that the ethanol hand sanitizer removed approximately 80% of detectable rhinovirus from hands and was much more effective than no treatment, water alone, or soap and water. Soap and water removed rhinovirus from 31% of hands.

Further, researchers added organic acids to the ethanol-based sanitizer and analyzed its ability to provide persistent antiviral activity against rhinovirus following application. Results showed that the sanitizer containing both organic acids and ethanol inactivated the virus on hands and prevented infection 2 to 4 hours following application."The ethanol-containing hand disinfectants were significantly more effective than hand washing with water or with soap and water for removal of detectable rhinovirus for the hands in this study," say the researchers. "Furthermore, a formula containing organic acids and ethanol resulted in residual activity that significantly reduced virus recovery from the hands and rhinovirus infection for up to 4 hours after application."

Story Source:

Adapted from materials provided by American Society for Microbiology.

Journal Reference:

1. R. B. Turner, J. L. Fuls, N. D. Rodgers. **Effectiveness of Hand Sanitizers with and without Organic Acids for Removal of Rhinovirus from Hands**. *Antimicrobial Agents and Chemotherapy*, 2010; 54 (3): 1363 DOI: 10.1128/AAC.01498-09

http://www.sciencedaily.com/releases/2010/03/100323223948.htm

Indian Spice May Delay Liver Damage and Cirrhosis, Study Suggests

Indian turmeric powder. (Credit: iStockphoto/Nilesh Bhange)

ScienceDaily (Mar. 24, 2010) — Curcumin, one of the principal components of the Indian spice turmeric, seems to delay the liver damage that eventually causes cirrhosis, suggests preliminary experimental research in the journal *Gut*.

Curcumin, which gives turmeric its bright yellow pigment, has long been used in Indian Ayurvedic medicine to treat a wide range of gastrointestinal disorders.

Previous research has indicated that it has anti-inflammatory and antioxidant properties which may be helpful in combating disease.

The research team wanted to find out if curcumin could delay the damage caused by progressive inflammatory conditions of the liver, including primary sclerosing cholangitis and primary biliary cirrhosis.

Both of these conditions, which can be sparked by genetic faults or autoimmune disease, cause the liver's plumbing system of bile ducts to become inflamed, scarred, and blocked. This leads to extensive tissue damage and irreversible and ultimately fatal liver cirrhosis.

The research team analysed tissue and blood samples from mice with chronic liver inflammation before and after adding curcumin to their diet for a period of four and a period of eight weeks.

The results were compared with the equivalent samples from mice with the same condition, but not fed curcumin.

The findings showed that the curcumin diet significantly reduced bile duct blockage and curbed liver cell (hepatocyte) damage and scarring (fibrosis) by interfering with several chemical signalling pathways involved in the inflammatory process.

These effects were clear at both four and eight weeks. No such effects were seen in mice fed a normal diet.

The authors point out that current treatment for inflammatory liver disease involves ursodeoxycholic acid, the long term effects of which remain unclear. The other alternative is a liver transplant.

Curcumin is a natural product, they say, which seems to target several different parts of the inflammatory process, and as such, may therefore offer a very promising treatment in the future.

Story Source:

Adapted from materials provided by BMJ-British Medical Journal, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Anna Baghdasaryan, Thierry Claudel, Astrid Kosters, Judith Gumhold, Dagmar Silbert, Andrea Thüringer, Katharina Leski, Peter Fickert, Saul J Karpen, Michael Trauner. **Curcumin improves sclerosing cholangitis in Mdr2$^{-/-}$ mice by inhibition of cholangiocyte inflammatory response and portal myofibroblast proliferation**. *Gut*, 2010; 59: 521-530 DOI: 10.1136/gut.2009.186528

http://www.sciencedaily.com/releases/2010/03/100323212150.htm

Cup Plant Is Potential New Biomass/carbon Storage Crop

South Dakota State University plant breeder Arvid Boe examines a native perennial called cup plant. Boe and his colleagues are looking at cup plant as a possible biomass crop that could also store carbon in its root system and add biodiversity to biomass plantings. (Credit: South Dakota State University Research News)

ScienceDaily (Mar. 24, 2010) — South Dakota State University research is exploring a native perennial called cup plant as a potential new biomass crop that could also store carbon in its extensive root system and add biodiversity to biomass plantings.

Researchers are exploring whether cup plant could be grown in low, moist prairies generally unfit for cropland. It would be grown and processed along with native grasses grown for biomass.

"We anticipate down the road there's going to be a need and maybe even a market for plants that can store carbon under ground and be part of a biomass production system," SDSU professor Arvid Boe said.

Boe, a plant breeder, is the lead investigator on a grant of $324,336 from the U.S. Department of Energy channeled through the SDSU-based North Central Sun Grant Center. Project goals include studying genetic variation and developing molecular markers in cup plant populations from the eastern Great Plains; developing new cultivars that can be grown in combination with other biomass crops; determining best practices such as seeding rate, row spacing, harvest timing and nutrient management so that producers will know how to grow the plant; determining life histories of insect pests; and determining biochemical composition.

Boe said cup plant, or Silphium perfoliatum, is a member of the sunflower family found in moist low ground in the eastern Great Plains, where it can grow more than 7 feet tall. It has large seeds and good seedling vigor, and it yields a lot of biomass.

"It's conspicuous in the prairie as a very productive forb in a tallgrass prairie where you have your major grasses such as big bluestem, switchgrass and prairie cordgrass," Boe said. "We haven't come up with too many things to grow with our grasses to add biodiversity to these biofuel mixtures that we're anticipating growing down the road. It's very compatible with such things as switchgrass and prairie cordgrass and big bluestem."

Boe said scientists don't envision planting entire fields of cup plant. Instead they view it as one in a mix of biomass species that would be seeded in zones best suited for them, just as in the original tallgrass prairie. Boe and his colleagues -- borrowing a term used years ago by conservationist Erling Jacobson of the U.S. Department of Agriculture's Soil Conservation Service -- speak of "sculpting the landscape" with native grasses best suited to different locations in the prairie.

"We don't necessarily have a mix at any particular area, but we have various species wherever they're best adapted on the landscape. It doesn't make any sense for us to have mix switchgrass, big bluestem and prairie cordgrass together and plant it over a whole field. After five years, the species that are best adapted are going to take over anyway in their particular niche," Boe said.

"We're going to go in and we're going to plant essentially monocultures of these various species where they were in the original tallgrass prairie. There were monocultural stands in the tallgrass prairie, but they were zonal."

Cup plant is probably best suited to the same kind of terrain that switchgrass likes, Boe said, just above the prairie cordgrass zone, and possibly all the way up to the edge of the big bluestem zone.

"It fits the low prairie or moist prairie-type environment that we're shooting for and might even work out pretty well with prairie cordgrass," Boe said. "So we add diversity to that low prairie environment that is marginal land not suitable for cropland and also not a good environment for switchgrass to grow. We're not taking cropland out of production to put cup plant in there. We think it will grow in areas where crops wouldn't survive or couldn't even be planted on a regular basis."

Cup plant is likely to increase biodiversity in a plant community because it attracts a variety of insects and even birds. Goldfinches drink out of the leaves, and the stems provide perch areas for grassland birds.

SDSU professor Paul Johnson, an entomologist, adds that SDSU is also interested in a species of moth called Eucosma giganteana, first described by a scientist in 1881, that seems to have cup plant as its only host plant.

"In South Dakota, the giant eucosma has recently become more than just another interesting prairie insect because of interest in using cup plant as a biomass crop," Johnson said.

Larvae feed in the rapidly growing terminal structures, especially buds, where the damage can be extensive, often leading to complete loss of floral production. The end result can be significant loss of biomass through stunting and loss of vigor in the plants.

"Turning cup plant into a commodity thus converts the giant eucosma into a pest of significant concern," Johnson said.

"It's another case of a native prairie plant becoming a crop and the conversion of a previously neglected native plant predator to a pest."

Johnson is studying the life history of the giant eucosma as part of the SDSU project.

Perennial grasses will always be the base for biomass production, but cup plant is a complementary species, scientists say. Increasing number of species in the mix reduces probability of plant disease and insect pests attacking one species and causing large losses in yield.

Besides Boe and Johnson, other investigators in the project including forage researcher Vance Owens, plant scientist Catherine Carter and biochemist Duane Matthees, all of SDSU; Alex Kahler of Brookings, S.D.-based Biogenetic Services; and professor Ken Albrecht of the University of Wisconsin-Madison, an agronomist. University of Wisconsin research has already looked at cup plant as a perennial silage crop, but exploring it as a biomass crop is new.

Story Source:

Adapted from materials provided by South Dakota State University.

http://www.sciencedaily.com/releases/2010/03/100322091419.htm

Marine Conditions of Aralar Mountain Range of 120 Million Years Ago

A view of Aralar. Txindoki, seen from Araotz. (Credit: María Isabel Millán Sánchez)

ScienceDaily (Mar. 24, 2010) — The Early Aptian (120 million years ago) was an age of intense volcanic activity on Earth, eruptions that emitted large amounts of CO_2 into the atmosphere, thus causing a revolution in the carbon cycle. As a consequence, great changes happened in the whole of the terrestrial system. Researcher María Isabel Millán has studied how these changes happened in the marine environment of the Aralar mountain range (at that time it was under the sea) in the Basque Country, and found more than one surprise. She presented her conclusions in her PhD thesis at the University of the Basque Country (UPV/EHU).

Ms Millán's thesis is entitled *Record of Palaeoceanographic changes during the Early Aptian of the Aralar mountain range*. Given its geological characteristics, Ms Millán suspected that the changes that took place in the Early Aptian period must have left traces in the sediments of the Aralar mountain range, which straddles the Basque provinces of Gipuzkoa and Navarre. She began to study the outcrops in detail. The researcher observed that the materials representing this period in Aralar are more significant than those studied to date, and this was the first surprise of this thesis. While in other parts of the world the sedimentary series of the Early Aptian that can be studied are some 20 metres thick, Ms Millán found up to 1,000 metres in Aralar.

An unparalleled event

One of the principal global changes that took place in the oceans of the Early Aptian was that known as OAE1a (Oceanic Anoxic Event 1a); that is, a sudden reduction in maritime oxygen at the ocean beds. In order to show that this phenomenon also occurred in Aralar, Ms Millán employed a number of methodologies. On the one hand, she used ammonite fossils, which give very precise dates and which have been found in abundance in these sediments. She also made use of analytical techniques for identifying rock enriched with organic material. In fact, when something important happened in the atmosphere or in the ocean during that period, rocks known as black shales were deposited at the bottom of the sea. These rocks were enriched with organic material, leaving remains thereof in the sedimentary

layers. Ms Millán also made use of stable isotopes of carbon, as their proportion depends on the origin and concentration of CO_2 present at the time. It is precisely in the Early Aptian that a huge increase of volcanic-origin CO_2 took place. She found evidence amongst the sedimentary rocks which were significant in terms of an OAE1 event, thus demonstrating that this phenomenon also had taken place in Aralar.

While looking for the OAE1, Ms Millán also came across another event which, to date, has only been found on Aralar. The point here is that she discovered an interval of rock enriched with organic material, which indicates an enormously significant geological event. However, the ammonites found in this interval show that this event does not correspond exactly to the period in which the OAE1 event occurred, but is a somewhat later (younger) event; from the Upper Early Aptian to be exact. Ms Millán believes it could be a sub-event within the more wide-ranging OAE1 one. It would be, therefore, a regional or local event, given that nothing similar has been found anywhere else to date, and it remains to be seen if anything equivalent does, in fact, exist.

Sudden collapse of the reef platform of Madotz

The biocalcification crisis is another of the representative phenomena of the changes in the Early Aptian. Specifically, in Madotz, in the south-east of the mountain range, there was a reef platform, equivalent to, for example, what is found in the coral reefs of Australia today. As the researcher explained, the biocalcification that commonly occurred on the reefs suddenly collapsed on this platform, coinciding with the OAE1a event and probably responding to an acidification of the oceans (as is happening today due to industrial-origin CO_2). This, according to Ms Millán, is a clear reflection of the biocalcification crisis, given that the carbonated composition of the platform was drastically modified.

About the author

María Isabel Millán Sanchez (Málaga, 1979) is a graduate in Geological Sciences from the UPV/EHU. She drew up her thesis under the direction of Mr Joaquín García Mondéjar and Mr Pedro Ángel Fernández Mendiola, Professors at the Department of Stratigraphy and Palaeontology in the Faculty of Science and Technology of the UPV/EHU. To carry out her thesis, she worked with Mr Helmut Weissert at the Federal Technological Institute of Switzerland in Zurich, where she stayed for two periods -- five and two months, respectively.

Story Source:

Adapted from materials provided by Elhuyar Fundazioa.

http://www.sciencedaily.com/releases/2010/03/100322121111.htm

New Method Could Revolutionize Dating of Ancient Treasures

The "Venus of Brassempouy," a tiny ivory figurine, is among artifacts that scientists could analyze with a new method for determining the age of an object without damaging it. (Credit: Wikimedia Commons)

ScienceDaily (Mar. 23, 2010) — Scientists have developed a new method to determine the age of ancient mummies, old artwork, and other relics without causing damage to these treasures of global cultural heritage. Reporting at the 239th National Meeting of the American Chemical Society (ACS), they said it could allow scientific analysis of hundreds of artifacts that until now were off limits because museums and private collectors did not want the objects damaged.

"This technique stands to revolutionize radiocarbon dating," said Marvin Rowe, Ph.D., who led the research team. "It expands the possibility for analyzing extensive museum collections that have previously been off limits because of their rarity or intrinsic value and the destructive nature of the current method of radiocarbon dating. In theory, it could even be used to date the Shroud of Turin."

Rowe explained that the new method is a form of radiocarbon dating, the archaeologist's standard tool to estimate the age of an object by measuring its content of naturally-occurring radioactive carbon. A professor emeritus at Texas A&M University College Station, Rowe teaches at a branch of the university in Qatar. Traditional carbon dating involves removing and burning small samples of the object. Although it sometimes requires taking minute samples of an object, even that damage may be unacceptable for some artifacts. The new method does not involve removing a sample of the object.

Conventional carbon dating estimates the age of an artifact based on its content of carbon-14 (C-14), a naturally occurring, radioactive form of carbon. Comparing the C-14 levels in the object to levels of C-14 expected in the atmosphere for a particular historic period allows scientists to estimate the age of an artifact. Both the conventional and new carbon dating methods can determine the age of objects as far back as 45,000 to 50,000 years, Rowe said.

In conventional dating methods, scientists remove a small sample from an object, such as a cloth or bone fragment. Then they treat the sample with a strong acid and a strong base and finally burn the sample in a small glass chamber to produce carbon dioxide gas to analyze its C-14 content.

Rowe's new method, called "non-destructive carbon dating," eliminates sampling, the destructive acid-base washes, and burning. In the new method, scientists place an entire artifact in a special chamber with a plasma, an electrically charged gas similar to gases used in big-screen plasma television displays. The gas slowly and gently oxidizes the surface of the object to produce carbon dioxide for C-14 analysis without damaging the surface, he said.

Rowe and his colleagues used the technique to analyze the ages of about 20 different organic substances, including wood, charcoal, leather, rabbit hair, a bone with mummified flesh attached, and a 1,350-year-old Egyptian weaving. The results match those of conventional carbon dating techniques, they say.

The chamber could be sized to accommodate large objects, such as works of art and even the Shroud of Turin, which some believe to be the burial cloth of Jesus Christ, Rowe said. He acknowledged, however, that it would take a significant amount of data to convince museum directors, art conservators, and others that the new method causes no damage to such priceless objects

The scientists are currently refining the technique. Rowe hopes to use it, for instance, to analyze objects such as a small ivory figurine called the "Venus of Brassempouy," thought to be about 25,000 years old and one of the earliest known depictions of a human face. The figurine is small enough to fit into the chamber used for analysis.

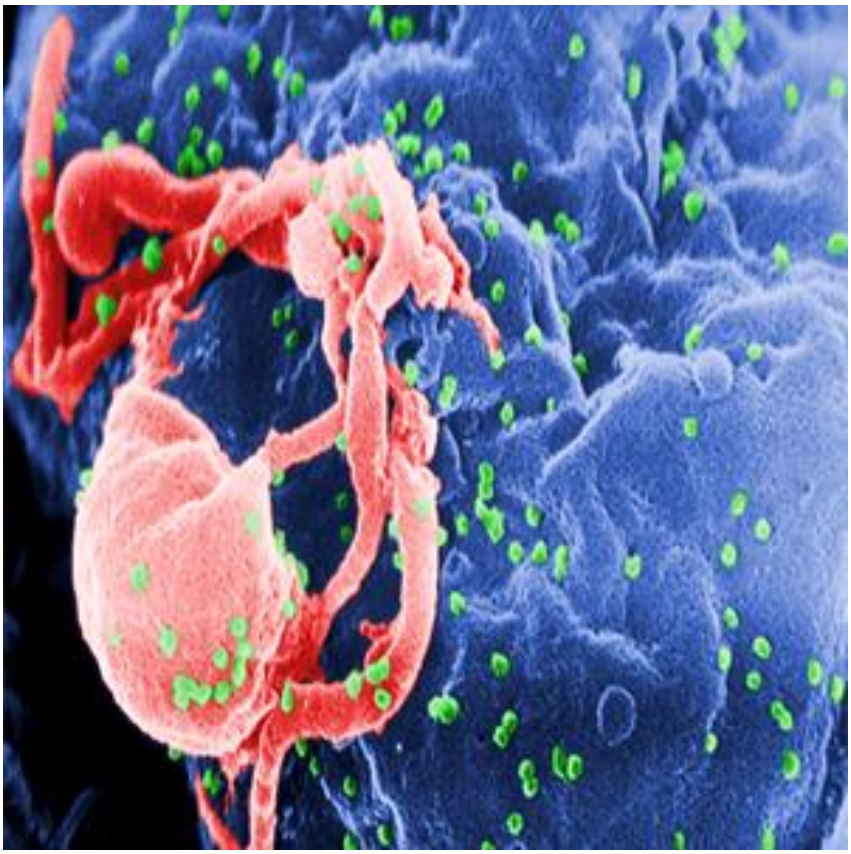
Funding for this project is provided by the National Science Foundation, the National Center for Preservation Technology and Training, and Texas A&M University.

Story Source:

Adapted from materials provided by American Chemical Society, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2010/03/100323105938.htm

HIV Vaccine Strategy Expands Immune Responses



HIV is an extremely variable virus. One of the most daunting challenges for developing an effective HIV vaccine is designing one that stimulates immune responses that will protect an individual from the highly diverse spectrum of strains of the circulating virus. (Credit: Image courtesy of DOE/Los Alamos National Laboratory)

ScienceDaily (Mar. 23, 2010) — Two teams of researchers -- including Los Alamos National Laboratory theoretical biologists Bette Korber, Will Fischer, Sydeaka Watson, and James Szinger -- have announced an HIV vaccination strategy that has been shown to expand the breadth and depth of immune responses in rhesus monkeys. Rhesus monkeys provide the best animal model currently available for testing HIV vaccines.

The research appeared in two back-to-back articles in *Nature Medicine* this week, and outlines a strategy, called "mosaic vaccines," for reducing the spread of HIV, the virus that causes AIDS.

HIV is an extremely variable virus. One of the most daunting challenges for developing an effective HIV vaccine is designing one that stimulates immune responses that will protect an individual from the highly diverse spectrum of strains of the circulating virus. The mosaic vaccine design uses computational methods developed at Los Alamos to create small sets of highly variable artificial viral proteins. These proteins, in combination, provide nearly optimal coverage of the diverse forms of HIV circulating in the world today.

In one of the two papers, Dr. Dan Barouch of Beth Israel Deaconess Medical Center at Harvard University reported very promising results when HIV mosaic vaccines were embedded in specialized vectors -- organisms that transmit pathogens to a host -- that were designed in his laboratory specifically to make strong "Killer T cell" responses. Killer T cells enable our immune system to recognize and kill virally infected cells, and they help clear or contain viral infections.

When this vaccine was used to immunize rhesus monkeys against HIV-1, the most predominant and transmittable type of the virus, the researchers observed up to four-fold improvement in the monkeys' immune response to HIV-1, compared with natural vaccine strains similar to those that have been used in the past. In the other, complementary study, Drs. Norman Letvin and Sampa Santra, also affiliated with the Beth Israel Deaconess Medical Center, and Dr. Barton Haynes of Duke University, used a distinct HIV mosaic vaccine construct that stimulated an immune response emphasizing "Helper T cells" -- the kinds of cells required to stimulate and control many aspects of an immune response. This study also showed an increased breadth and depth of anti-HIV immune responses to the vaccine. Both approaches demonstrated that mosaic vaccines improve the immune response against genetically diverse HIV-1 viruses.

"This research indicates that mosaic vaccines represent a promising strategy to expand coverage for genetically diverse pathogens such as HIV-1," Korber said. "The next step is to see whether the improved immune response found in Rhesus monkeys will hold up in humans, so small-scale human safety and immune response studies are being launched at Harvard and at Duke to explore that possibility."

Story Source:

Adapted from materials provided by DOE/Los Alamos National Laboratory.

http://www.sciencedaily.com/releases/2010/03/100303131707.htm

Mouse Work: New Insights on a Fundamental DNA Repair Mechanism

New research on a house mouse enzyme, Mus musculus NEIL3, sheds new light on a fundamental DNA repair mechanism. (Credit: iStockphoto/Emily Goodwin)

ScienceDaily (Mar. 23, 2010) — Adding a new link to our understanding of the complex chain of chemistry that keeps living cells alive, a team of researchers from the University of Vermont (UVM), the University of Utah, Vanderbilt University and the National Institute of Standards and Technology (NIST) has demonstrated for the first time the specific activity of the protein NEIL3, one of a group responsible for maintaining the integrity of DNA in humans and other mammals.

Their work, published in the *Proceedings of the National Academy of Sciences,* sheds new light on a potentially important source of harmful DNA mutations.

Since it first was identified about eight years ago, NEIL3 has been believed to be a basic DNA-maintenance enzyme of a type called a glycosylase. These proteins patrol the long, twisted strands of DNA looking for lesions -- places where one of the four DNA bases has been damaged by radiation or chemical activity. They cut the damaged bases free from the DNA backbone, kicking off follow-on mechanisms that link in the proper undamaged base. The process is critical to cell health, says NIST biochemist and Senior Research Fellow Miral Dizdaroglu, "DNA is damaged all the time. About one to two percent of oxygen in the body becomes toxic in cells, for example, creating free radicals that damage DNA. Without these DNA repair mechanisms there wouldn't be any life on this planet, really."

The glycosylases seem to be highly specific; each responds to only a few unique cases of the many potential DNA base lesions. Figuring out exactly which ones can be challenging. NEIL3 and its kin NEIL1 and NEIL2 are mammalian versions of an enzyme found in the bacterium E. coli, which first was identified in work at UVM. The lesion targets of NEIL1 and NEIL2 have been known for some time, but NEIL3, a much more complicated protein twice the size of the others, had resisted several attempts to purify it and determine just what it does. In a significant advance, a research team at UVM managed to clone the house mouse version of NEIL3 (99 percent identical to the human variant), and then prepare a truncated version of it that was small enough to dissolve in solution for analysis but large enough to retain the portion of the protein that recognizes and excises DNA lesions.

Using a technique they developed for rapidly analyzing such enzymes, NIST researchers Dizdaroglu and Pawel Jaruga mixed the modified protein with sample DNA that had been irradiated to produce large numbers of random base lesions. Because glycosylases work by snipping off damaged bases, a highly sensitive analysis of the solution after the DNA has been removed can reveal just which lesions are attacked by the enzyme, and with what efficiency. The NIST results closely matched independent tests by

others in the team that match the enzyme against short lengths of DNA-like strands with a single specific target lesion.

In addition to finally confirming the glycosylase nature of NEIL3, says UVM team leader Susan Wallace, tests of the enzyme in a living organism -- a tailored form of E. coli designed to have a very high mutation rate -- had an unexpected bonus. Measurements at NIST showed that NEIL3 is extremely effective at snipping out a particular type of lesion called FapyGua (2,6-diamino-4-hydroxy-5-formamidopyrimidine) and seems to dramatically reduce mutations in the bacterium, a result that points both to the effectiveness of NEIL3 and the potentially important role of FapyGua in causing dangerous mutations in DNA.

Story Source:

Adapted from materials provided by National Institute of Standards and Technology (NIST).

Journal Reference:

1. M. Liu, V. Bandaru, J.P. Bond, P. Jaruga, X. Zhao, P.P. Christov, C.J. Burrows, C.J. Rizzo, M. Dizdaroglu and S.S. Wallace. **The mouse ortholog of NEIL3 is a functional DNA glycosylase in vitro and in vivo**. *Proceedings of the National Academy of Sciences*, 2010; DOI: 10.1073/pnas.0908307107

http://www.sciencedaily.com/releases/2010/03/100304151252.htm

New Approach to Water Desalination Could Lead to Small, Portable Units for Disaster Sites or Remote Locations

A single unit of the new desalination device, fabricated on a layer of silicone. In the Y-shaped channel (in red), seawater enters from the right, and fresh water leaves through the lower channel at left, while concentrated brine leaves through the upper channel. (Credit: Patrick Gillooly/MIT)

ScienceDaily (Mar. 23, 2010) — A new approach to desalination being developed by researchers at MIT and in Korea could lead to small, portable desalination units that could be powered by solar cells or batteries and could deliver enough fresh water to supply the needs of a family or small village. As an added bonus, the system would also remove many contaminants, viruses and bacteria at the same time.

The new approach, called ion concentration polarization, is described in a paper by Postdoctoral Associate Sung Jae Kim and Associate Professor Jongyoon Han, both in MIT's Department of Electrical Engineering and Computer Science, and colleagues in Korea.

The system works at a microscopic scale, using fabrication methods developed for microfluidics devices -- similar to the manufacture of microchips, but using materials such as silicone (synthetic rubber). Each individual device would only process minute amounts of water, but a large number of them -- the researchers envision an array with 1,600 units fabricated on an 8-inch-diameter wafer -- could produce about 15 liters of water per hour, enough to provide drinking water for several people. The whole unit could be self-contained and driven by gravity -- salt water would be poured in at the top, and fresh water and concentrated brine collected from two outlets at the bottom.

That small size could actually be an advantage for some applications, Kim explains. For example, in an emergency situation like Haiti's earthquake aftermath, the delivery infrastructure to get fresh water to the people who need it was largely lacking, so small, portable units that individuals could carry would have been especially useful.

So far, the researchers have successfully tested a single unit, using seawater they collected from a Massachusetts beach. The water was then deliberately contaminated with small plastic particles, protein and human blood. The unit removed more than 99 percent of the salt and other contaminants. "We clearly demonstrated that we can do it at the unit chip level," says Kim.

While the amount of electricity required by this method is actually slightly more than for present large-scale methods such as reverse osmosis, there is no other method that can produce small-scale desalination with anywhere near this level of efficiency, the researchers say. If properly engineered, the proposed system would only use about as much power as a conventional lightbulb.

The basic principle that makes the system possible, called ion concentration polarization, is a ubiquitous phenomenon that occurs near ion-selective materials (such as Nafion, often used in fuel cells) or electrodes, and this team and other researchers have been applying the phenomenon for other applications

such as biomolecule preconcentration. . This application to water purification has not been attempted before, however.

Potable water is often in high demand and short supply following a natural disaster like the Haiti earthquake or Hurricane Katrina. In both of those instances, the disaster zones were near the sea, but converting salty seawater to potable fresh water usually requires a large amount of dependable electrical power and large-scale desalination plants -- neither of which were available in the disaster areas.

One of the leading desalination methods, called reverse osmosis, uses membranes that filter out the salt, but these require strong pumps to maintain the high pressure needed to push the water through the membrane, and are subject to fouling and blockage of the pores in the membrane by salt and contaminants. The new system separates salts and microbes from the water by electrostatically repelling them away from the ion-selective membrane in the system -- so the flowing water never needs to pass through a membrane. That should eliminate the need for high pressure and the problems of fouling, the researchers say.

Having proved the principle in a single-unit device, Kim and Han plan to produce a 100-unit device to demonstrate the scaling-up of the process, followed by a 10,000-unit system. They expect it will take about two years before the system will be ready to develop as a product. "After that," says Kim, "we'll know if it's possible" for this to work as a robust, portable system, "and what problems might need to be worked on."

The work was primarily funded by a grant from the National Science Foundation, as well as a SMART Innovation Centre grant.

Adapted from materials provided by Massachusetts Institute of Technology. Original article written by David L. Chandler.

Journal Reference:

1. Kim et al. **Direct seawater desalination by ion concentration polarization**. *Nature Nanotechnology*, 2010; DOI: 10.1038/nnano.2010.34

http://www.sciencedaily.com/releases/2010/03/100323161505.htm

Ingredient in Tequila Plant May Fight Osteoporosis and Other Diseases

The agave plant, the source of tequila, also may supply a healthful food additive. (Credit: Erika Mellado, National Polytechnic Institute, Guanajuato, Mexico)

ScienceDaily (Mar. 23, 2010) — The plant that gave the world tequila contains a substance that seems ideal for use in a new genre of processed foods -- so-called "functional foods" -- with health benefits over and above serving as a source of nutrients, scientists reported at the 239th National Meeting of the American Chemical Society (ACS) in San Francisco on March 23. Foods spiked with "fructans" from the agave plant may help protect against osteoporosis by boosting the body's absorption of calcium and could have other health benefits, they said.

"Fructans are considered functional food ingredients because they affect body processes in ways that result in better health and reduction in the risk of many diseases," said Mercedes López, Ph.D., who delivered the report. She is with the National Polytechnic Institute, Guanajuato, Mexico. "Experimental studies suggest that fructans may be beneficial in diabetes, obesity, stimulating the immune system of the body, decreasing levels of disease-causing bacteria in the intestine, relieving constipation, and reducing the risk of colon cancer."

Fructans are non-digestible carbohydrates. They consist of molecules of fructose -- the sugar found in honey, grapes, and ripe fruits -- linked together into chains. Rich natural sources include artichokes, Jerusalem artichokes, garlic and onions, and chicory. Fructans do not occur in tequila, however, because they change into alcohol when agave is used to make tequila, López said.

So-called "inulin-type" fructans from chicory find wide use in the United States and other countries in ice cream, breakfast cereals, baked goods, sauces, beverages, and other foods. Small fructans have a sweet taste, while those formed from longer chains of fructose have a neutral taste and give foods a smooth, pleasant texture. Scientific studies have suggested that fructans stimulate the growth of healthful bacteria in the large intestine in a way that increases the body's absorption of minerals, including the calcium and magnesium important for bone growth.

In the new study, López and colleagues set out to determine what effects agave fructans actually have on bone growth. They tested the effects of agave fructans on laboratory mice, used as stand-ins for humans in such research. Mice fed agave fructans absorbed more calcium from food, excreted less calcium in

their feces, and showed a 50 percent increase in levels of a protein associated with the build-up of new bone tissue.

"These results suggest that the supplementation of the standard diet with agave fructans prevented bone loss and improved bone formation, indicating the important role of agave fructans on the maintenance of healthy bone," López said. "They can be used in many products for children and infants to help prevent various diseases, and can even be used in ice cream as a sugar substitute."

López said her findings suggest that agave fructans could be used in all of the same foods as chicory fructans. One advantage: Agave grows abundantly in Mexico and other countries with climates that do not favor growth of chicory. In addition, the scientists cited hints from past research that agave fructans may have greater health benefits. Agave fructans, for instance, seem to stimulate production of greater amounts incretins than the inulin-type fructans from chicory. Incretins are a group of gastrointestinal hormones that increase in the amount of insulin released by the pancreas. That could be beneficial for individuals with diabetes or high blood sugar levels who are at risk of diabetes, López said. One incretin stimulated by agave fructans is a good satiety enhancer, which would make people feel full on less food.

"We still have a long way to go to determine for which health benefits agave fructans perform better than chicory fructans," López said. "However, the early results are encouraging, and we working on it."

Story Source:

Adapted from materials provided by American Chemical Society.

http://www.sciencedaily.com/releases/2010/03/100323171630.htm

Bird Bones May Be Hollow, but They Are Also Heavy

Bird bones have evolved special features to make them stiffer and stronger than mammal bones, including high bone density, fusion of some bones and altered shape. Studies show that the main bone in the bird wing, the humerus, is quite round in cross-section, making it stronger and more resistant than a flat-sided bone would be to twisting forces encountered in flying. (Credit: Betsy Dumont, UMass Amherst)

ScienceDaily (Mar. 23, 2010) — For centuries biologists have known that bird bones are hollow, and even elementary school children know that bird skeletons are lightweight to offset the high energy cost of flying. Nevertheless, many people are surprised to learn that bird skeletons do not actually weigh any less than the skeletons of similarly sized mammals. In other words, the skeleton of a two-ounce songbird weighs just as much as the skeleton of a two-ounce rodent.

Bird biologists have known this for a long time, but it took a modern bat researcher, Elizabeth Dumont of the University of Massachusetts Amherst, to explain how bird skeletons can look so delicate and still be heavy. The answer is that bird bones are denser than mammal bones, which makes them heavy even though they are thin and sometimes even hollow.

Her findings, supported by bone density measurements, are published in the March 17 issue of *Proceedings of the Royal Society B*. As Dumont explains, "The fact that bird bones are denser than bones in mammals not only makes them heavier for their size, but it may also make them stiffer and stronger. This is a new way to think about how bird skeletons are specialized for flying and solves the riddle of why bird skeletons appear so lightweight and are still relatively heavy. This has never been explained fully and so has never gotten into the textbooks. I'd like to see that change."

Dumont measured the density of the cranium, the upper arm bone or humerus and the thigh or femur bones in song birds, rodents and bats by measuring bone mass and volume. "I found that, on average, these bones are densest in birds, followed closely by bats. Many other studies have shown that as bone density increases, so do bone stiffness and strength. Maximizing stiffness and strength relative to weight are optimization strategies that are used in the design of strong and stiff but lightweight man-made

airframes," she points out. Density is a measure of mass per unit of volume; dense bones are both heavier and stronger, much as a titanium toothpick would be stronger than a wooden one.

Over time bird bones have evolved specializations that maximize stiffness and strength, Dumont says. These specializations include high bone density, a reduction in the total number of bones, fusion of some bones, and changes in bone shape. For example, a long history of studies have shown that the main bone in the bird wing, the humerus, is quite round in cross-section. This makes it stiffer in the same way that a round toothpick is harder to snap than a flat one.

Galileo described bird bones as lightweight in 1683, Dumont says. Her new data help to dispel the common misconception that bird skeletons are lightweight relative to body mass. Instead, bird and bat skeletons only appear to be slender and delicate -- because they are dense, they are also heavy. Being dense, strong and stiff is one more way that birds' and bats' bones are specialized for flight.

Story Source:

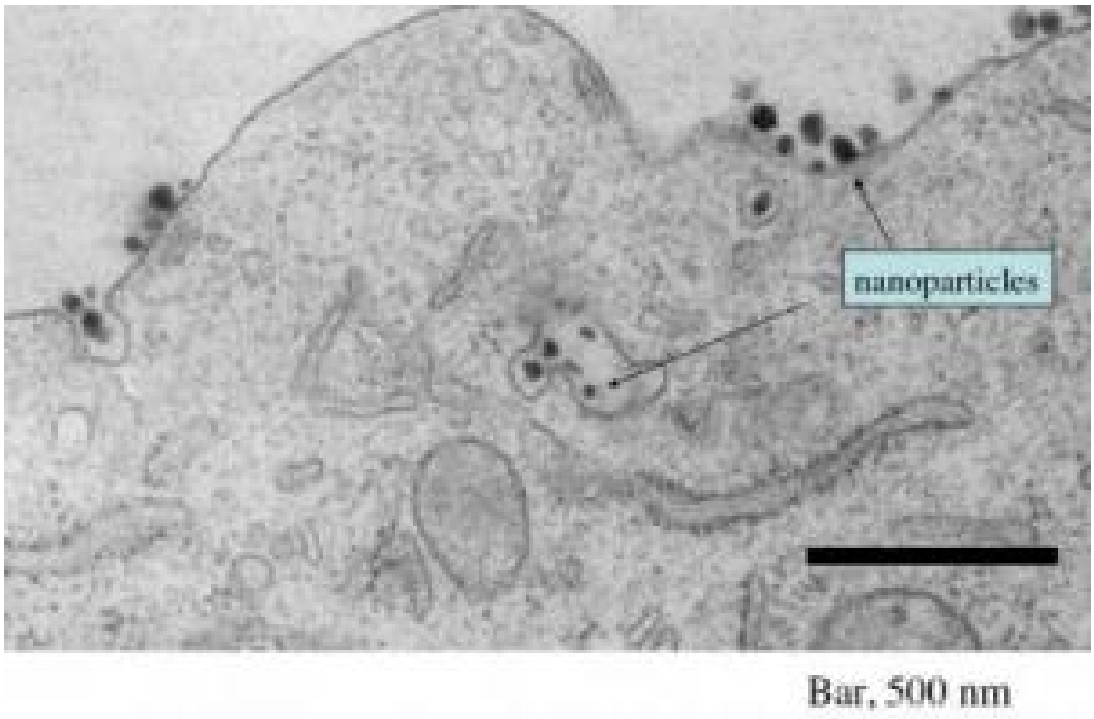
Adapted from materials provided by University of Massachusetts Amherst.

Journal Reference:

1. Elizabeth R. Dumont. **Bone density and the lightweight skeletons of birds**. *Proceedings of The Royal Society B Biological Sciences*, 2010; DOI: 10.1098/rspb.2010.0117

http://www.sciencedaily.com/releases/2010/03/100322112103.htm

Proof in Humans of RNA Interference Using Targeted Nanoparticles



This electron micrograph shows the presence of numerous siRNA-containing targeted nanoparticles both entering and within a tumor cell. (Credit: Caltech/Swaroop Mishra)

ScienceDaily (Mar. 23, 2010) — A California Institute of Technology (Caltech)-led team of researchers and clinicians has published the first proof that a targeted nanoparticle -- used as an experimental therapeutic and injected directly into a patient's bloodstream -- can traffic into tumors, deliver double-stranded small interfering RNAs (siRNAs), and turn off an important cancer gene using a mechanism known as RNA interference (RNAi).

Moreover, the team provided the first demonstration that this new type of therapy, infused into the bloodstream, can make its way to human tumors in a dose-dependent fashion -- i.e., a higher number of nanoparticles sent into the body leads to a higher number of nanoparticles in the tumor cells.

These results, published in the March 21 advance online edition of the journal *Nature*, demonstrate the feasibility of using both nanoparticles and RNAi-based therapeutics in patients, and open the door for future "game-changing" therapeutics that attack cancer and other diseases at the genetic level, says Mark Davis, the Warren and Katharine Schlinger Professor of Chemical Engineering at Caltech, and the research team's leader.

The discovery of RNA interference, the mechanism by which double strands of RNA silence genes, won researchers Andrew Fire and Craig Mello the 2006 Nobel Prize in Physiology or Medicine. The scientists first reported finding this novel mechanism in worms in a 1998 *Nature* paper. Since then, the potential for this type of gene inhibition to lead to new therapies for diseases like cancer has been highly touted.

"RNAi is a new way to stop the production of proteins," says Davis. What makes it such a potentially powerful tool, he adds, is the fact that its target is not a protein. The vulnerable areas of a protein may be hidden within its three-dimensional folds, making it difficult for many therapeutics to reach them. In contrast, RNA interference targets the messenger RNA (mRNA) that encodes the information needed to make a protein in the first place.

"In principle," says Davis, "that means every protein now is druggable because its inhibition is accomplished by destroying the mRNA. And we can go after mRNAs in a very designed way given all the genomic data that are and will become available."

Still, there have been numerous potential roadblocks to the application of RNAi technology as therapy in humans. One of the most problematic has been finding a way to ferry the therapeutics, which are made up of fragile siRNAs, into tumor cells after direct injection into the bloodstream. Davis, however, had a solution. Even before the discovery of RNAi, he and his team had begun working on ways to deliver nucleic acids into cells via systemic administration. They eventually created a four-component system -- featuring a unique polymer -- that can self-assemble into a targeted, siRNA-containing nanoparticle. The siRNA delivery system is under clinical development by Calando Pharmaceuticals, Inc., a Pasadena-based nanobiotech company.

"These nanoparticles are able to take the siRNAs to the targeted site within the body," says Davis. Once they reach their target -- in this case, the cancer cells within tumors -- the nanoparticles enter the cells and release the siRNAs.

The scientific results described in the *Nature* paper are from a Phase I clinical trial of these nanoparticles that began treating patients in May 2008. Phase I trials are, by definition, safety trials; the idea is to see if and at what level the drug or other therapy turns harmful or toxic. These trials can also provide an in-human scientific proof of concept -- which is exactly what is being reported in the Nature paper.

Using a new technique developed at Caltech, the team was able to detect and image nanoparticles inside cells biopsied from the tumors of several of the trial's participants. In addition, Davis and his colleagues were able to show that the higher the nanoparticle dose administered to the patient, the higher the number of particles found inside the tumor cells -- the first example of this kind of dose-dependent response using targeted nanoparticles.

Even better, Davis says, the evidence showed the siRNAs had done their job. In the tumor cells analyzed by the researchers, the mRNA encoding the cell-growth protein ribonucleotide reductase had been degraded. This degradation, in turn, led to a loss of the protein.

More to the point, the mRNA fragments found were exactly the length and sequence they should be if they'd been cleaved in the spot targeted by the siRNA, notes Davis. "It's the first time anyone has found an RNA fragment from a patient's cells showing the mRNA was cut at exactly the right base via the RNAi mechanism," he says. "It proves that the RNAi mechanism can happen using siRNA in a human."

"There are many cancer targets that can be efficiently blocked in the laboratory using siRNA, but blocking them in the clinic has been elusive," says Antoni Ribas, associate professor of medicine and surgery at UCLA's Jonsson Comprehensive Cancer Center. "This is because many of these targets are not amenable to be blocked by traditionally designed anti-cancer drugs. This research provides the first evidence that what works in the lab could help patients in the future by the specific delivery of siRNA using targeted nanoparticles. We can start thinking about targeting the untargetable."

"Although these data are very early and more research is needed, this is a promising study of a novel cancer agent, and we are proud of our contribution to the initial clinical development of siRNA for the treatment of cancer," says Anthony Tolcher, director of clinical research at South Texas Accelerated Research Therapeutics (START).

"Promising data from the clinical trials validates our years of research at City of Hope into ribonucleotide reductase as a target for novel gene-based therapies for cancer," adds coauthor Yun Yen, associate director for translational research at City of Hope. "We are seeing for the first time the utility of siRNA as a cancer therapy and how nanotechnology can target cancer cells specifically."

The Phase I trial -- sponsored by Calando Pharmaceuticals -- is proceeding at START and UCLA's Jonsson Comprehensive Cancer Center, and the clinical results of the trial will be presented at a later time. "At the very least, we've proven that the RNAi mechanism can be used in humans for therapy and that the targeted delivery of siRNA allows for systemic administration," Davis says. "It is a very exciting time."

In addition to Davis, Ribas, Tolcher, and Yen, the coauthors on the *Nature* paper are Caltech graduate students Jonathan Zuckerman (an MD/PhD student doing his MD work at UCLA) and Chung Hang Choi; former Caltech graduate student Christopher Alabi, now a postdoctoral scholar at the Massachusetts Institute of Technology; David Seligson, director of the UCLA Tissue Array Core Facility at the David Geffen School of Medicine; and Jeremy Heidel, who is currently a consultant for Calando Pharmaceuticals.

The work described in the paper was supported in part by the National Cancer Institute and the Daljit S. and Elaine Sarkaria Biomarker Laboratories. Caltech, Davis, and Heidel have a financial interest in Calando Pharmaceuticals.

Story Source:

Adapted from materials provided by California Institute of Technology.

Journal Reference:

1. Davis et al. **Evidence of RNAi in humans from systemically administered siRNA via targeted nanoparticles**. *Nature*, 2010; DOI: 10.1038/nature08956

http://www.sciencedaily.com/releases/2010/03/100321182915.htm

Mysterious Stone Spheres in Costa Rica Investigated

John Hoopes, University of Kansas associate professor of anthropology and director of the Global Indigenous Nations Studies Program, recently returned from a trip to Costa Rica where he and colleagues evaluated ancient stone spheres for UNESCO, the United Nations cultural organization that might grant the spheres World Heritage Status. (Credit: Courtesy of John Hoopes)

ScienceDaily (Mar. 23, 2010) — The ancient stone spheres of Costa Rica were made world-famous by the opening sequence of "Raiders of the Lost Ark," when a mockup of one of the mysterious relics nearly crushed Indiana Jones.

So perhaps John Hoopes is the closest thing at the University of Kansas to the movie action hero.

Hoopes, associate professor of anthropology and director of the Global Indigenous Nations Studies Program, recently returned from a trip to Costa Rica where he and colleagues evaluated the stone balls for UNESCO, the United Nations cultural organization that might grant the spheres World Heritage Status.

His report will help determine if sites linked to the massive orbs will be designated for preservation and promotion because of their "outstanding value to humanity."

Hoopes, who researches ancient cultures of Central and South America, is one of the world's foremost experts on the Costa Rican spheres. He explained that although the stone spheres are very old, international interest in them is still growing.

"The earliest reports of the stones come from the late 19th century, but they weren't really reported scientifically until the 1930s -- so they're a relatively recent discovery," Hoopes said. "They remained unknown until the United Fruit Company began clearing land for banana plantations in southern Costa Rica."

According to Hoopes, around 300 balls are known to exist, with the largest weighing 16 tons and measuring eight feet in diameter. Many of these are clustered in Costa Rica's Diquis Delta region. Some remain pristine in the original places of discovery, but many others have been relocated or damaged due to erosion, fires and vandalism.

The KU researcher said that scientists believe the stones were first created around 600 A.D., with most dating to after 1,000 A.D. but before the Spanish conquest.

"We date the spheres by pottery styles and radiocarbon dates associated with archeological deposits found with the stone spheres," Hoopes said. "One of the problems with this methodology is that it tells you the latest use of the sphere but it doesn't tell you when it was made. These objects can be used for centuries and are still sitting where they are after a thousand years. So it's very difficult to say exactly when they were made."

Speculation and pseudoscience have plagued general understanding of the stone spheres. For instance, publications have claimed that the balls are associated with the "lost" continent of Atlantis. Others have asserted that the balls are navigational aids or relics related to Stonehenge or the massive heads on Easter Island.

"Myths are really based on a lot of very rampant speculation about imaginary ancient civilizations or visits from extraterrestrials," Hoopes said.

In reality, archaeological excavations in the 1940s found the stone balls to be linked with pottery and materials typical of pre-Columbian cultures of southern Costa Rica.

"We really don't know why they were made," Hoopes said. "The people who made them didn't leave any written records. We're left to archeological data to try to reconstruct the context. The culture of the people who made them became extinct shortly after the Spanish conquest. So, there are no myths or legends or other stories that are told by the indigenous people of Costa Rica about why they made these spheres."

Hoopes has a created a popular Web page to knock down some of the misconceptions about the spheres. He said the stones' creation, while vague, certainly had nothing to do with lost cities or space ships.

"We think the main technique that was used was pecking and grinding and hammering with stones," said Hoopes. "There are some spheres that have been found that still have the marks of the blows on them from hammer stones. We think that that's how they were formed, by hammering on big rocks and sculpting them into a spherical shape."

Story Source:

Adapted from materials provided by University of Kansas.

http://www.sciencedaily.com/releases/2010/03/100322143217.htm

How Dinosaurs Rose to Prominence

Central Atlantic Magmatic Province Massive lava flow (top brown layer) sits atop end-Triassic (white) and Triassic (red) layers at a site in Five Islands Provincial Park, Nova Scotia. (Credit: Jessica. H. Whiteside/Brown University)

ScienceDaily (Mar. 23, 2010) — A shade more than 200 million years ago, the Earth looked far different than it does today. Most land on the planet was consolidated into one continent called Pangea. There was no Atlantic Ocean, and the rulers of the animal world were crurotarsans -- creatures closely related to modern crocodiles.

Yet the Earth stood on the cusp of an epic shift in climate, and the reign of the dinosaurs was about to begin. Now, an international scientific team led by Brown University paleobiologist Jessica Whiteside has explained what led to the dinosaurs' rise as the Triassic Period ended. In a paper published in the *Proceedings of the National Academy of Sciences*, the scientists constructed a climate record marking the Triassic-Jurassic boundary by combining fossil evidence of plant and animal extinctions with the carbon signature found in the wax of ancient leaves and wood found in lake sediments intermixed with basalts, marking the volcanic activity.

With those evidentiary threads, the researchers found strong support that massive, widespread volcanic eruptions led to a spike in atmospheric carbon dioxide and other greenhouse gases that wiped out half of plant species and marked the end of the Triassic, one of the five great mass extinctions of Earth history.

The team also established through the fossil record that the abrupt rise in atmospheric gases decimated crurotarsans, which had competed vigorously with the earliest dinosaurs during the Triassic. Thanks to the climatic catastrophe, those early, small dinosaurs were freed from their main competitors to become the dominant force in the animal world.

"The big thing is many people have heard why dinosaurs went extinct," said Whiteside, assistant professor of geological sciences, "but the question why they came to be is much more exciting."What scientists know is that more than 200 million years ago, the supercontinent Pangea broke up when the North American and the African plates began to drift apart. As the two plates parted, creating the basin that would become the Atlantic Ocean, fissures cleaved the area, triggering massive outflows of lava covering more than 9 million square kilometers (3.5 million square miles), an area roughly equal to the continental United States. Scientists call this area the Central Atlantic Magmatic Province (CAMP). The volcanic eruptions lasted about 600,000 years, a length of time that Whiteside estimated in a 2007 paper in *Palaeogeography, Palaeoclimatology, Palaeoecology*.

The researchers zeroed in on rift basins preserving the CAMP to figure out precisely what happened to the climate and to plants and animals. The team, including researchers from Academia Sinica in Taiwan, Columbia University, and the Woods Hole Oceanographic Institution, analyzed fossils and carbon signatures from two ancient basins in the northeast United States -- the Newark and Hartford basins -- as well as a basin in England. At these sites, the researchers found evidence where fossilized sediments from lakes that dotted Pangea before the plates' separation were preserved between lava flows. The team dated the oldest flows to 201.4 million years ago, providing an upper limit to when volcanism began.

Those fossils told a clear tale: For plants, pollen counts combined with the carbon record (the ratio of C^{12} and C^{13}, two carbon isotopes) showed half the flora species in the Triassic perished in the volcanism that marked the end of the period. It also showed a spike in fern spores around the time of the first lava flows, which makes sense as ferns are among the first plant species to return in an environment scarred by volcanism.

For animals, the scientists linked footprints previously found in rocks in the Hartford and Newark basins to establish that crurotarsans perished in the mass volcanism that marked the end of the Triassic. After the lava flows, the "fossil record for crurotarsans is nearly completely gone," Whiteside said. Freed from their main competitor, early theropods -- a category including all meat-eating dinosaurs from velociraptors to *Tyrannosaurus rex* -- became dominant. Evidence for the rise was documented in a paper published in 2002 by Paul Olsen (corresponding author on the PNAS paper) that shows theropod footprints after the mass extinction at the end of the Triassic had become much larger, corresponding to larger body sizes.

Why did the early dinosaurs survive the volcanism that extinguished the Triassic crurotarsans? "They had the blind luck of being unwittingly adapted to get through that climate catastrophe," Whiteside said. "How they did is quite difficult to explain."

While previous research on end-Triassic mass extinctions has been done in other regions, such as Greenland, this paper marked the first time that scientists had gathered and calibrated evidence from the CAMP, said Olsen, a paleontologist who has studied mass extinction events for three decades at Columbia.

"There are dozens of papers claiming to show the connection between carbon isotopes excursions in the CAMP," Olsen said, "but this is the only study that has ever shown isotope excursions from the same place that the lava flows were present."

"It's not that we're the first people to say there's a link" (between volcanism and end-Triassic mass extinction), Whiteside added, "but we're the first people to document it."

Other authors on the paper are Timothy Eglinton from the Department of Marine Geology and Geophysics at the Woods Hole Oceanigraphic Institute, Michael Brookfield at the Institute of Earth Sciences Academia Sinica in Taiwan, and Raymond Sambrotto from the Lamont-Doherty Earth Observatory at Columbia.

The National Science Foundation funded the research.

Story Source:

Adapted from materials provided by Brown University.

Journal Reference:

1. Jessica H. Whiteside, Paul E. Olsen, Timothy Eglinton, Michael E. Brookfield, and Raymond N. Sambrotto. **Compound-specific carbon isotopes from Earth's largest flood basalt eruptions directly linked to the end-Triassic mass extinction**. *Proceedings of the National Academy of Sciences*, 2010; DOI: 10.1073/pnas.1001706107

http://www.sciencedaily.com/releases/2010/03/100322153947.htm

New Bone-Hard Biomaterial for Surgical Screws

Surgeons use interferential screws to fasten cruciate ligaments in the knee. From the left: made of polylactic acid, hydroxylapatite and medical stainless steel. (Credit: Fraunhofer IFAM)

ScienceDaily (Mar. 23, 2010) — Football players, skiers, tennis players -- they all fear a crucial ligament rupture. If the knee ligaments are damaged the patient usually has to undergo a surgery to restore the stability of the joint. In the surgical procedure the torn ligament is replaced by a piece of tendon from the leg, which is fixed to the bone by means of an interferential screw. The problem is that the screws are made of titanium. After a certain time the patient has to undergo a further surgery so that the material can be removed.

Researchers at the Fraunhofer Institute for Manufacturing Engineering and Applied Materials Research (IFAM) in Bremen want to spare cruciate ligament victims and other bone patients this additional procedure. They have therefore developed a screw which is biocompatible and also biodegradable over time.

"We have modified biomaterials in such a way that they can be formed into robust bioactive and resorbable screws by means of a special injection molding process," explains Dr. Philipp Imgrund, head of the biomaterial technology department at IFAM. "Depending on the composition they biodegrade in 24 months."

Biodegradable screws made of polylactic acid are already used in the medical field, but they have the disadvantage that when they degrade they can leave holes in the bone. The IFAM researchers have therefore improved the material and developed a moldable composite made of polylactic acid and hydroxylapatite, a ceramic which is the main constituent of the bone mineral. "This composite possesses a higher proportion of hydroxylapatite and promotes the growth of bone into the implant," says Imgrund.

The engineers at IFAM have developed a granulate from the biomaterials which can be precision-processed using conventional injection molding methods, obviating the need for any post-processing such as milling. The complex geometry is achieved in a net-shape process, producing a robust screw. The properties of this prototype come very close to those of real bone. Its compressive strength is more than 130 newtons per square millimeter, whereas real bone can withstand between 130 and 180. What's more, the injection molding process has a positive side effect. Normally, the powder injection molded part has to be compressed at very high temperatures of up to 1400° Celsius.

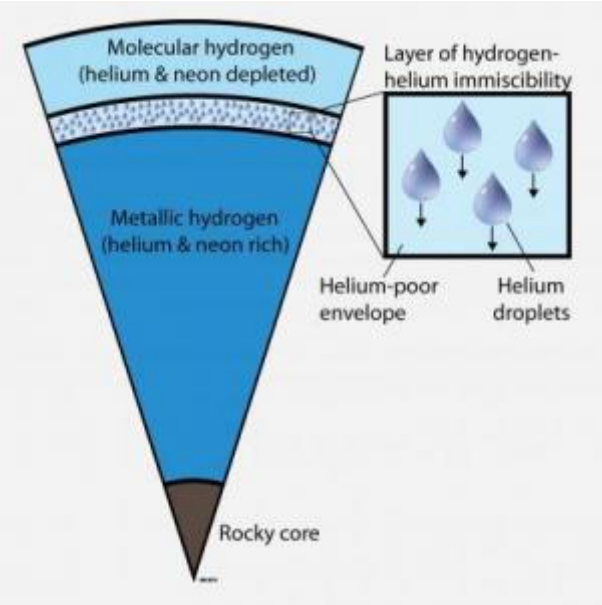
"We only need 140 degrees for our composite materials," says Imgrund. In future the engineers intend to develop other bioimplants using their energy-saving process.

Story Source:

Adapted from materials provided by Fraunhofer-Gesellschaft.

http://www.sciencedaily.com/releases/2010/03/100322111947.htm

Helium Rain on Jupiter Explains Lack of Neon in Atmosphere



A slice through the interior of Jupiter shows the top layers that are depleted of helium and neon, the thin layer where helium drops condense and fall, and the deep interior where helium and neon again mix with metallic hydrogen. (Credit: Burkhard Militzer/UC Berkeley)

ScienceDaily (Mar. 23, 2010) — On Earth, helium is a gas used to float balloons, as in the movie "Up." In the interior of Jupiter, however, conditions are so strange that, according to predictions by University of California, Berkeley, scientists, helium condenses into droplets and falls like rain. Helium rain was earlier proposed to explain the excessive brightness of Saturn, a gas giant like Jupiter, but one-third the mass.

On Jupiter, however, UC Berkeley scientists claim that helium rain is the best way to explain the scarcity of neon in the outer layers of the planet, the solar system's largest. Neon dissolves in the helium raindrops and falls towards the deeper interior where it re-dissolves, depleting the upper layers of both elements, consistent with observations.

"Helium condenses initially as a mist in the upper layer, like a cloud, and as the droplets get larger, they fall toward the deeper interior," said UC Berkeley post-doctoral fellow Hugh Wilson, co-author of a report appearing this week in the journal *Physical Review Letters.* "Neon dissolves in the helium and falls with it. So our study links the observed missing neon in the atmosphere to another proposed process, helium rain."

Wilson's co-author, Burkhard Militzer, UC Berkeley assistant professor of earth and planetary science and of astronomy, noted that "rain" -- the water droplets that fall on Earth -- is an imperfect analogy to what happens in Jupiter's atmosphere. The helium droplets form about 10,000 to 13,000 kilometers (6,000-8,000 miles) below the tops of Jupiter's hydrogen clouds, under pressures and temperatures so high that "you can't tell if hydrogen and helium are a gas or a liquid," he said. They're all fluids, so the rain is really droplets of fluid helium mixed with neon falling through a fluid of metallic hydrogen.

The researchers' prediction will help refine models of Jupiter's interior and the interiors of other planets, according to Wilson. Modeling planetary interiors has become a hot research area since the discovery of hundreds of extrasolar planets living in extreme environments around other stars. The study will also be relevant for NASA's Juno mission to Jupiter, which is scheduled to be launched next year.

Militzer and Wilson are among the modelers, using "density functional theory" to predict the properties of Jupiter's interior, specifically what happens to the dominant constituents -- hydrogen and helium -- as temperatures and pressures increase toward the center of the planet. These conditions are yet too extreme to be reproduced in the laboratory. Even experiments in diamond-anvil cells can only produce pressures at the Earth's core. In 2008, Militzer's computer simulations led to the conclusion that Jupiter's rocky core is surrounded by a thick layer of methane, water and ammonia ices that make it twice as large as earlier predictions.

The two modelers embarked on their current research because of a discovery by the Galileo probe that descended through Jupiter's atmosphere in 1995 and sent back measurements of temperature, pressure and elemental abundances until it was crushed under the weight of the atmosphere. All elements seemed to be as slightly enriched compared to the abundance on the sun -- which is assumed to be similar to the elemental abundances 4.56 billion years ago when the solar system formed -- except for helium and neon. Neon stood out because it was one-tenth as abundant as it is in the sun.

Their simulations showed that the only way neon could be removed from the upper atmosphere is to have it fall out with helium, since neon and helium mix easily, like alcohol and water. Militzer and Wilson's calculations suggest that at about 10,000 to 13,000 kilometers into the planet, where the temperature about 5,000 degrees Celsius and the pressure is 1 to 2 million times the atmospheric pressure on Earth, hydrogen turns into a conductive metal. Helium, not yet a metal, does not mix with metallic hydrogen, so it forms drops, like drops of oil in water.

This provided an explanation for the removal of neon from the upper atmosphere.

"As the helium and neon fall deeper into the planet, the remaining hydrogen-rich envelope is slowly depleted of both neon and helium," Militzer said. "The measured concentrations of both elements agree quantitatively with our calculations."

Saturn's helium rain was predicted because of a different observation: Saturn is warmer than it should be, based on its age and predicted rate of cooling. The falling rain releases heat that accounts for the difference.

Jupiter's temperature is in accord with models of its cooling rate and its age, and needed no hypothesis of helium rain until the discovery of neon depletion in the atmosphere. Interestingly, theoretician David Stevenson of the California Institute of Technology (Caltech) predicted neon depletion on Jupiter prior to the Galileo probe's measurements, but never published a reason for his guess.

Story Source:

Adapted from materials provided by University of California - Berkeley.

Journal References:

1. Hugh F. Wilson and Burkhard Militzer. **Sequestration of Noble Gases in Giant Planet Interiors**. *Physic*

http://www.sciencedaily.com/releases/2010/03/100322101527.htm

Apples for Me, Potato Chips for You: Consumers Buy Healthier Foods for Themselves

ScienceDaily (Mar. 23, 2010) — Feel like Mom is pushing dessert? According to a new study in the *Journal of Consumer Research,* consumers choose foods that are less healthy when they are purchasing for others.

In a series of studies on food choice, author Juliano Laran (University of Miami) discovered that consumers exert more self-control when they make choices for themselves.

In one study, participants were asked to make a sequence of four choices from 16 items that were healthy (items like raisins, celery sticks, and cheerios) or indulgent (items like chocolate bars, cookies, Doritos, ice cream, and doughnuts). Half of the participants were asked to choose four items for themselves, while the others were asked to choose four items for a friend.

"When making choices for themselves, participants chose a balance of healthy and indulgent food items," Laran writes. "When making choices for others, however, participants chose mostly indulgent food items."

The author conducted another study of real consumers exiting a supermarket, which confirmed the earlier results, and showed that consumers bought equally indulgent items when purchasing for their families, friends, or roommates. A final study showed that consumer choices became more balanced after they were made aware of a healthy goal when making choices for others.

The author suggests that education could help consumers make more balanced choices when they are shopping for others. He also suggests that this phenomenon may be affecting public health.

"One of the reasons the population gets more and more obese is that a lot of the food we consume is chosen by other people, like friends throwing a party or parents buying for their children," Laran writes. "Taking responsibility for their own choices instead of letting others choose could help consumers fight against obesity and lead a healthier lifestyle."

Story Source:

Adapted from materials provided by University of Chicago Press Journals, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Laran et al. **Goal Management in Sequential Choices: Consumer Choices for Others Are More Indulgent than Personal Choices**. *Journal of Consumer Research*, 2010; 100303111210059 DOI: 10.1086/652193

http://www.sciencedaily.com/releases/2010/03/100322171024.htm

The Ethical Dog

Looking for the roots of human morality in the animal kingdom? Focus on canines, who know how to play fair

By MARC BEKOFF and Jessica Pierce

Every dog owner knows a pooch can learn the house rules—and when she breaks one, her subsequent groveling is usually ingratiating enough to ensure quick forgiveness. But few people have stopped to ask why dogs have such a keen sense of right and wrong. Chimpanzees and other nonhuman primates regularly make the news when researchers, logically looking to our closest relatives for traits similar to our own, uncover evidence of their instinct for fairness. But our work has suggested that wild canine societies may be even better analogues for early hominid groups—and when we study dogs, wolves and coyotes, we discover behaviors that hint at the roots of human morality.

Morality, as we define it in our book *Wild Justice*, is a suite of interrelated other-regarding behaviors that cultivate and regulate social interactions. These behaviors, including altruism, tolerance, forgiveness, reciprocity and fairness, are readily evident in the egalitarian way wolves and coyotes play with one another. Canids (animals in the dog family) follow a strict code of conduct when they play, which teaches pups the rules of social engagement that allow their societies to succeed. Play also builds trusting relationships among pack members, which enables divisions of labor, dominance hierarchies and cooperation in hunting, raising young, and defending food and territory. Because this social organization closely resembles that of early humans (as anthropologists and other experts believe it existed), studying canid play may offer a glimpse of the moral code that allowed our ancestral societies to grow and flourish.

Playing by the Rules

When canids and other animals play, they use actions such as vigorous biting, mounting and body slamming that could be easily misinterpreted by the participants. Years of painstaking video analyses by one of us (Bekoff) and his students show, however, that individuals carefully negotiate play, following four general rules to prevent play from escalating into fighting.

Communicate clearly. Animals announce that they want to play and not fight or mate. Canids use a bow to solicit play, crouching on their forelimbs while standing on their hind legs (above). Bows are used almost exclusively during play and are highly stereotyped—that is, they always look the same—so the message "Come play with me" or "I still want to play" is clear. Even when an individual follows a play bow with seemingly aggressive actions such as baring teeth, growling or biting, his companions demonstrate submission or avoidance only around 15 percent of the time, which suggests they trust the

bow's message that whatever follows is meant in fun. Trust in one another's honest communication is vital for a smoothly functioning social group.

Mind your manners. Animals consider their play partners' abilities and engage in self-handicapping and role reversing to create and maintain equal footing. For instance, a coyote might not bite her play partner as hard as she can, handicapping herself to keep things fair. And a dominant pack member might perform a role reversal, rolling over on her back (a sign of submission that she would never offer during real aggression) to let her lower-status play partner take a turn at "winning". Human children also behave this way when they play, for instance, taking turns overpowering each other in a mock wrestling match. [For more on childhood play, see "The Serious Need for Play," by Melinda Wenner; *Scientific American Mind*, February/March 2009.] By keeping things fair in this manner, every member of the group can play with every other member, building bonds that keep the group cohesive and strong.

Admit when you are wrong. Even when everyone wants to keep things fair, play can sometimes get out of hand. When an animal misbehaves or accidentally hurts his play partner, he apologizes—just like a human would. After an intense bite, a bow sends the message, "Sorry I bit you so hard—this is still play regardless of what I just did. Don't leave; I'll play fair." For play to continue, the other individual must forgive the wrongdoing. And forgiveness is almost always offered; understanding and tolerance are abundant during play as well as in daily pack life.

Be honest. An apology, like an invitation to play, must be sincere—individuals who continue to play unfairly or send dishonest signals will quickly find themselves ostracized. This has far greater consequences than simply reduced playtime; for instance, Bekoff's long-term field research shows that juvenile coyotes who do not play fair often end up leaving their pack and are up to four times more likely to die than those individuals who remain with others. Violating social norms, established during play, is not good for perpetuating one's genes.

Fair play, then, can be understood as an evolved adaptation that allows individuals to form and maintain social bonds. Canids, like humans, form intricate networks of social relationships and live by rules of conduct that maintain a stable society, which is necessary to ensure the survival of each individual. Basic rules of fairness guide social play, and similar rules are the foundation for fairness among adults. This moral intelligence, so evident in both wild canines and in domesticated dogs, probably closely resembles that of our early human ancestors. And it may have been just this sense of right and wrong that allowed human societies to flourish and spread across the world.

http://www.scientificamerican.com/article.cfm?id=the-ethical-dog

Human ancestors walked comfortably upright 3.6 million years ago, new footprint study says

By Katherine Harmon

A comparison of ancient and contemporary footprints reveals that our ancestors were strolling much like we do some 3.6 million years ago, a time when they were still quite comfortable spending time in trees, according to a study which will be published in the March 22 issue of the journal *PLoS ONE*.

Anatomical fossils have given scant confirmation about when our ancestors developed a fully modern gait. Although some researchers have argued that the 4.4 million-year-old ancient human *Ardipithecus ramidus* ("Ardi") described in October 2009 was adept at walking on her hind legs, many disagree.

So rather than quibbling over badly crushed—and often missing—fossil bones, the researchers behind the new study turned much of their focus back to the famous Laetoli footprints, which were discovered more than 30 years ago in what is now Tanzania. Likely left by *Australopithecus afarensis*, the same species as "Lucy," these prints show an upright gait, but it has remained controversial just how fluid and modern this creature's walk would have been.

"Based on previous analyses of the skeletons of *Australopithecus afarensis*, we expected that the Laetoli footprints would resemble those of someone walking with a bent knee, bent hip gait typical of chimpanzees, and not the striding gait normally used by modern humans," David Raichlen, an assistant professor in the Department of Anthropology at the University of Arizona in Tuscon and lead author on the study, said in a prepared statement.

To test this assertion, Raichlen and his colleagues created a sandy test bed for contemporary subjects to walk across—both normally and then in a bent, chimpanzee-like manner. The researchers used a laser scaner to construct 3-D models of all of the footprints to compare with the Laetoli tracks.

"To our surprise, the Laetoli footprints fall completely within the range of normal human footprints," Raichen said. The upright, modern walkers' prints had heal and toe-print depths that were relatively equal, as the Laetoli prints do, but those locomoting more like chimpanzees—as ancient humans have been proposed to have done—produced toe prints that were much deeper and did not match the Laetoli patterns.

"This more human-like form of walking is incredibly energetically efficient, suggesting that reduced energy costs were very important in the evolution of bipedalism," Raichlen said.

Image courtesy of iStockphoto/meltonmedia

http://www.scientificamerican.com/blog/post.cfm?id=human-ancestors-walked-comfortably-2010-03-20

Expert Systems Fight Poverty

Appropriate information and communications technologies, combined with community involvement, can save lives

By Jeffrey D. Sachs

In his wonderful new book *The Checklist Manifesto* (Metropolitan Books, 2009), surgeon and author Atul Gawande explains how successful surgery depends on the complex interactions of surgeons, nurses, anesthetists and other specialists, who must possess not only highly specialized skills but also the ability to work as a team in the face of rapidly arising challenges. The same applies to an airliner's pilot, co-pilot and crew. Special tools such as checklists, decision trees and artificial intelligence built into instrumentation are key.

Information technology empowers complex group processes in striking new ways, but the breakthroughs are especially exciting in very low income settings. There mobile telephony and wireless broadband are ending the grinding isolation of rural communities and enabling workers—even those with fairly rudimentary training—to interconnect more successfully and to tap into expert systems and artificial intelligence.

On a recent trip to Africa, I saw two simple but powerful examples of lifesaving protocols enabled by mobile phones. In the Ghanaian village of Bonsaaso, part of the Millennium Village Project, a simple phone-based system is lowering maternal mortality during childbirth. Community health workers (CHWs) with basic training, a skilled midwife, an ambulance driver and a receiving hospital use mobile phones to coordinate as a team. Ever more deliveries now take place in the clinic rather than at home; in the event of complications, the mother is whisked to a receiving hospital about 10 miles away. Mobile phone connectivity among community, clinic, ambulance and hospital makes possible a once unthinkable degree of coordination.

In the Kenyan village of Sauri, also part of the Millennium Village Project, CHWs are pioneering the application of expert systems for malaria control. In the past, suspected malaria patients had to walk or be carried to a clinic, often miles away, have a blood smear read under a microscope by a trained technician and, if positive, receive a prescription. With clinics few and far between and with trained technicians and microscopes even scarcer, untreated, lethal malaria ran rampant.

In the new approach, CHWs visit households on the lookout for fevers that may signify malaria. They carry rapid diagnostic tests that examine a drop of blood for the presence of the malaria pathogen. Then they send an SMS (short service message) text with the patient's ID and the test results. Seconds later an automated text response informs the health worker of the proper course of treatment, if any. The system

can also send reminders about any follow-up treatments or scheduled clinic visits for the patient. The new system of malaria control includes insecticide-treated bed nets made to last for five years and a new generation of combination drugs based on a traditional Chinese herbal treatment, artemisinin.

This full set of tools constitutes a remarkably effective malaria-control system. Already a partial deployment of the system is reducing the malaria burden dramatically in several parts of Africa. Modest international financial support could greatly accelerate the deployment of the full system, and if it were scaled up throughout Africa, hundreds of thousands of lives could be saved annually at around $7 per person a year in the malaria-transmission zones.

India is similarly scaling up rural public health by deploying advanced information technologies, CHWs and improved management systems. In the past, public health data became available only after rounds of surveys three years apart, and those results were used mainly for research purposes. Now key data will increasingly be available after only hours or days and will be used for real-time health system management.

Checklists, teamwork and telecommunications-based expert systems can revolutionize rural farm yields, disease control, business networks, rural finance, education systems, and much more. Soon farmers will be able to enter local data for advice on specific soil needs, timing on the planting season, drought and rainfall forecasts, market prices and logistics. Mobile-phone-based banking and payments services will penetrate even the most remote regions. With development aid directed toward these new systems, the world's capacity to reduce poverty, hunger and illness—and the violence that accompanies them—will become more powerful and effective than ever.

http://www.scientificamerican.com/article.cfm?id=expert-systems-fight-poverty

How to Erase Fear--in Humans

To get rid of a bad memory you may need to relive it first

By Daniel Lametti

"Memory", wrote Oscar Wilde, "is the diary that we all carry about with us". Perhaps, but if memory is like a diary, it's one filled with torn-out pages and fabricated passages.

In January, a group of New York University neuroscientists led by Daniela Schiller reported in the journal *Nature* that they had created fearful memories in people and then erased them. Besides being rather cool, the result provides new insight into how to treat traumatic memories in people.

The research was based on the work of neuroscientist Joseph LeDoux, a coauthor on the paper. Ten years ago, while experimenting with rats, Ledoux made a discovery that changed the way neuroscientists view memory from that of Wilde's tidy diary to something more along the lines of a James Frey memoir.

In that experiment, Ledoux conditioned rats to fear a bell by ringing it in time with an electric shock until the rats froze in fear at the mere sound of the bell. Then, at the moment when the fear memory was being recalled, he injected the rats with anisomycin, a drug that stops the construction of new neural connections. Remarkably, the next time he rang the bell the rats no longer froze in fear. The memory, it seemed, had vanished. Poof!

Ledoux concluded that the neural connections in which memories are stored have to be rebuilt each time a memory is recalled. And during rebuilding—or reconsolidation, as he termed it—memories can be altered or even erased. Neuroscientists now believe that reconsolidation functions to update memories with new information—something of an unsettling idea, suggesting that our memories are only as accurate as the last time they were remembered.

Since the discovery, scientists have been searching for ways to use similar methods to alter the fear memories that cause posttraumatic stress disorder (PTSD). This, however, has proven difficult. Test subjects participating in research experiments are, of course, not lab rats, and scientists can't simply inject them with drugs as they please. But in her new paper, Schiller and her team may have discovered a noninvasive method to bring Ledoux's memory-erasing experiment to humans.

Psychologists have known for some time that it is difficult to treat fearful memories with therapy. Humans, like rats, can be trained in a laboratory to fear an innocuous stimulus—a sound or a color—by pairing it with a shock. But even after a form of laboratory therapy known as extinction training, where the stimulus is repeatedly presented without a shock to extinguish the fear, most subjects still show a rebound in the fear response a few hours later. Similarly, PTSD patients often show symptoms after years of therapy.

In both the laboratory and on the psychologist's couch, trauma therapy likely fails because it simply creates new competing memories without actually altering the fear memory causing the problem. Schiller

reasoned that she might be able to make extinction training—"lab therapy"—more effective by triggering reconsolidation first, allowing traumatic memories to be altered with new, less fearful information.

To do this, she created fear memories in 65 test subjects by flashing yellow and blue squares at them, pairing some of the yellow squares with a mild shock to the wrist. After conditioning, the appearance of a single yellow square was enough to raise her subjects' skin conductivity—a fear response typically caused by an increase in sweat production.

She then divided her subjects into three groups: A third were simply given lab therapy; they repeatedly viewed yellow and blue squares without shocks until they failed to break a sweat. The rest had the fearful memory triggered first by the sight of a single yellow square, and then got lab therapy after a lag of either six hours or ten minutes. Importantly, since reconsolidation takes about ten minutes to kick in after a memory is recalled, and lasts for a couple hours, only the ten-minute group would be in the process of reconsolidating the memory at the start of lab therapy. This timing, Schiller hypothesized, was everything: the ten-minute group would actually rewrite old memories, while the others would merely create new memories.

The next day, as expected, the memory had returned in some subjects—the yellow square still caused them to sweat—but the fear response did not return in any of the subjects whom she had triggered reconsolidation in ten minutes before therapy. Just as in Ledoux's rats, the memory had vanished. Poof!

To test how permanent the effect was, one year later, Schiller tracked down about a third of the original test subjects and got them to come back into the lab so she could again flash colored squares in their faces. The subjects that she hadn't triggered reconsolidation in ten minutes before lab therapy still broke a sweat in the presence of the yellow square—a nice demonstration of just how hard it is to eliminate a fearful memory. But the subjects that she had triggered reconsolidation in ten minutes before therapy still didn't break a sweat when they saw the yellow square; in these subjects, the fear memory had been permanently erased.

Schiller believes that by timing lab therapy so that it was initiated precisely when the memory was being reconsolidated—when the neural connections it was stored in were open to change—therapy did not simply create new memories, but actually rewrote the original memory with one that didn't include a fear response.

Real life fear memories, which involve multiple senses, are much more complex than memories created by scientists in a laboratory. But the results of the experiment do make the important suggestion that in order for PTSD therapy to be effective, the traumatic memory may have to be fully remembered first. This means, of course, that if you want to overwrite a frightful mugging with a day at the beach, you may have to relive every last detail of the mugging—a reality that might make reconsolidation-based PTSD therapy rather, well, traumatic.

http://www.scientificamerican.com/article.cfm?id=how-to-erase-fear-in-humans

Beep!

By VIRGINIA HEFFERNAN

The beep is an ingenious creation. Like the railroad toot but unlike an old telephone ring, beeps have both a distinct start and finish, marked by the twin plosives "b" and "p," and an elastic center that can generously expand and contract like an accordion: *beeeeeeeep*. You can create Morse code in beeps. Beeeep beep beep beep. Beep. Beep. Beep beeeep beeeep beep.

"The beep is a purely human-made, electrical sound," Jonathan Sterne, a professor of communication studies at McGill University, told me by e-mail. Plants don't beep, nor weather, nor animals. (The beep-beeping Road Runner of Warner Brothers is an exception.) If you hear a beep, you know that a person, or more likely his artifact, is signaling. There's no wondering, Is that a beep or a nightingale? Is that a beep or a tornado? Beeps are also not voices or music.

And still, sonically exotic as they may be, beeps are now easy to make; they are cheap and light. No wonder they have become ubiquitous. Everything beeps. E-mail beeps. Text messages. Trucks in reverse. Hospital monitors. Spaceships on TV. Call waiting. Stoves, dashboards, cameras, clocks. Coffee machines. Dishwashers. Elevators. Toys. Robots. Toy robots.

All these beeps have a single message, as Max Lord, an interactive designer who specializes in audio technology, told me by e-mail. "Beeps mean, 'Pay attention to me,' " he wrote.

In Dennis Lehane's novel "Mystic River," a cop lies in bed listening to the world beep. He notices the beep of the "ceiling fan, microwave and smoke detectors and the humming beep of the fridge." "It beeped on the computers at work. It beeped on cellphones and Palm Pilots and beeped from the kitchen and living room and beeped a constant beep-beep-beep on the street below and down at the station house and in the tenements of Faneuil Heights and East Bucky Flats."

"When the" — bleep, he wonders — "did that start happening?"

When, indeed? The short answer is 1929. That's the birth date the Oxford English Dictionary gives for the onomatopoeic word "beep." Prewar beeps must have been produced by car horns, though sonar, electric elevators and clown horns may have beeped or protobeeped even before the 1920s. Other car horns of the period, and now especially those of big cars, are usually heard to "honk."

Beeps as the sound of cute cars — that makes sense. A small, zippy, nuisancey thing chirping, " 'Scuse me, could you move *a smidge*? Thanks!" That's a beep.

As a source for beeps, car horns gave way to piezoelectric technology, a breakthrough used increasingly after World War II in labs, hospitals and military operations. With the arrival of the transistor, small piezo buzzers could be made to beep in devices like electronic metronomes and game-show buzzers. "Finally, product designers had an efficient, low-power way to make any device emit a tone," Lord told me. Beeps could now be heard in a range of contexts, but the sound still managed to speak of seriousness and technology.

Today, of course, the beep sound is digitized. Modulated, engineered beeps punctuate and define our experiences with computers and smartphones. Beeps also echo through movies. In an e-mail message, Randy Thom, an Oscar-winning sound designer, explained the role of beeps in film: "The word 'beep' refers mainly to short-duration (less than two-second iterations) sounds that are more or less tonal and are usually associated with high-tech environments ranging from cars to imaginary space-alien laboratories. Beeps are often associated with button pushes, but also high-tech warning or alert systems."

Whether or not we consort with R2D2, consumers must confront a cacophony of beeps. They may make us feel more techy and efficient, but those pleas for attention also exact a toll. Beeps must either be ministered to, shut down or ignored — and all of these responses cost us energy and intelligence. No wonder we lament the julienning of our attention spans in the digital age. Maybe it's the work of ignoring so many beeps that contributes to the feeling that we're chronically remiss, behind and fragmented.

On the other hand, as Sterne pointed out, the Web is "largely a silent medium." We prefer to enjoy our visual and textual experience online in silence. Other than a few chimes and classy sound effects that communicate "everything is working" — the best being Brian Eno's beautiful late-lamented Microsoft start-up sound — a personal computer should produce only the white noise of its fan. Sound design for computers could become like sound design for cars, Benjamin Tausig, a Ph.D. candidate in ethnomusicology at New York University, wrote to me. "The ideal is not necessarily silence, but warmth, smooth operation and possibly even luxury." He's right. For Web tours, nothing beats the untechy ambience of a library reading room: warm, smooth and luxurious — with all the beeps on low or off.

POINTS OF ENTRY: THIS WEEK'S RECOMMENDATIONS

THE BIG BEEP
Did **Marvin Hatley**, composer of the Laurel and Hardy theme song, invent the beep? The arrangement of his 1930 piece — **inspired by the cuckoo clock** — sounds more modern, beepy and uncannily R2D2-like than period car horns or anything else at the time. On YouTube under "**World of Laurel and Hardy: Talkie title cards (1929-1940)**."

BEEPS ON PARADE
Tune into beeps and protobeeps through the ages, on YouTube. **Cuckoo clock:** "Romba cuckoo and quail — 1459." **Car horn:** "1929 Model A Ford." **Road Runner:** "Road Runner — Fast and Furry-ous." **Pop music, 1958:** "Beep Beep by the Playmates." **Star Trek**": "TOS Obsession transporter scene." **R2D2:** "Star Wars: Droids for sell (R2D2 and R5D4 sold by Jawas)." **Pop music, 2006:** "The Pussycat Dolls — Beep ft. will.i.am."

http://www.nytimes.com/2010/03/21/magazine/21FOB-medium-t.html

The Aztecs, through old-world eyes

A Getty Villa exhibit explores how Europeans looked to ancient Rome to understand the Mexican empire.

By Suzanne Muchnic

March 21, 2010

A 1,200-pound stone head of an Aztec moon goddess has moved into the Getty Villa. So have life-size statues of a warrior adorned with eagle feathers, a duck-billed wind god and a demon known as the Lord of Death.

Made between 1440 and 1521 and on loan from Mexico City's National Museum of Anthropology and the Templo Mayor Museum, the massive artworks are among 64 sculptures, paintings and works on paper in "The Aztec Pantheon and the Art of Empire." Opening Wednesday, it's the most surprising exhibition yet to appear at Southern California's bastion of classical Greek and Roman antiquities.

The Villa has raised eyebrows with temporary installations of contemporary art related to its collections and exhibitions. But Aztec art? At a museum devoted to art made many centuries earlier on the opposite side of the world?

"It's probably not what you would have expected at the Getty Villa," says Claire L. Lyons, the Getty's antiquities curator who organized the show with John M.D. Pohl, a pre-Columbian specialist and research associate at UCLA's Cotsen Institute of Archaeology. "But we have long been interested in expanding beyond the classical Mediterranean." "In Search of Biblical Lands: Nineteenth-Century Photography of the Ancient Near East," to appear in 2011, will explore historic sites and pastoral life on the eastern margins of the Mediterranean.

In "Aztec Pantheon," with an eye on its Mexican American audience, the Getty is celebrating the bicentennial of Mexican independence by exploring how Europeans came to understand the Aztecs -- in terms of the Roman Empire. "From the moment Europeans went to Mexico, especially Spanish conquistadors who accompanied Hernán Cortés in 1519 and missionaries who arrived after the conquest, they encountered a culture that was so unfamiliar, the only frame of reference they had was their knowledge of Roman antiquity," Lyons says. "Looking through that lens, they interpreted the Aztecs as the Romans of the New World.

"The idea that a faraway place is equivalent to a distant-in-time place is a very powerful metaphor," she says, adding that the Maya have been compared to the ancient Greeks. And it had particular resonance at a time when Renaissance Europe was smitten with the rediscovery of classical antiquity. Literature of the period likened Mexico's capital, Tenochtitlan, to Troy, Jerusalem and Carthage as well as Rome.

"The comparison guided how the Spanish crown came to grips with its role in the New World," Lyons says. "It was used to justify the imperial mission but also to critique it. Spain itself had been a Roman province, so scholars and clerics could use the native Spanish oppression by the Romans to question what was taking place in the New World."

Powerful sculptures

A group of monumental sculptures will be the visual power center of "Aztec Pantheon." Compelling in artistry and imaginative expression as well as size, they have been plucked from places of honor in Mexico's leading museums.

There's an ancient fertility goddess made of wood and shell, a terra-cotta model of an Aztec temple and a statue of a priest wearing a human skin, also fashioned of terra cotta. Visitors will also find an elaborately carved funerary urn and a 3 1/2 -foot-tall incense burner bristling with agricultural cult images, including the goddess Chicomecoatl, who was compared to the Roman goddess Ceres.

As Bertina Olmeda, curator of the Aztec gallery at the National Museum of Anthropology, puts it: "The pieces that came here are of the first order."

But the linchpin of the exhibition is a relatively modest illustrated book that usually resides in the Medici Library in Florence, Italy. "Historia general de las cosas de Nueva España," better known as the Florentine Codex, is a sort of bible of a disappearing culture created in 1575-77 by Bernardino de Sahagún, a Franciscan friar who taught Latin, rhetoric and Christian theology at a college in Mexico City.

A bilingual description of the Aztecs, in Spanish and the local Nahuatl language, the Florentine Codex reflects the Spaniards' effort to understand the Aztecs, the better to proselytize them. Although missionaries were expected to eradicate all traces of native religion and history, Sahagún set out to document every aspect of Aztec culture by interviewing the elders and persuading them to record their memories and make drawings in their pictograms.

The idea, Lyons says, was to learn enough about Mexico's indigenous people to synthesize Christianity with Aztec beliefs. While the relatively open attitude prevailed, Sahagún's students helped create a text that accompanies more than 2,400 images.

The book was sent to Spain during the Inquisition, when works written in indigenous languages were banned, and later given to the Medici Library. Largely forgotten until the early 19th century, it is available only to specialists and is seldom on public view. "It is an incredible thrill to be able to borrow this iconic work," Lyons says. "This will be the first time it has returned to the New World."

The book has been bound in three volumes. The Getty has borrowed the first volume, which will be open to watercolor illustrations of Aztec deities, some of whom are equated to their Roman counterparts. Huitzilopochtli is likened to Hercules, Tlaculteutl to Venus. Reproductions of other pages also will be displayed.

Lyons gives much of the credit for the genesis of the exhibition to Michael Brand, the director of the J. Paul Getty Museum who abruptly resigned in January, and Thomas Cummins, a Harvard University professor of pre-Columbian and Latin American colonial art and recent visiting scholar at the Getty Research Institute. "A kernel of an idea about parallel pantheons began to grow out of early conversations," she says. "As John Pohl and I explored the concept, what emerged very quickly was an important but little known phenomenon."

Despite a flood of requests for loans to exhibitions honoring Mexico's bicentennial -- including "Moctezuma: Aztec Ruler," recently at the British Museum in London, and "Olmec: Masterworks of Ancient Mexico," coming to the Los Angeles County Museum of Art in October -- the Getty got nearly everything it wanted from the Mexican museums and a few other sources.

The loans were essential to the exhibition, but 22 of the works on paper came from the Getty Research Institute. Many of them are part of the Gutierrez collection, acquired in 1984 from the late collector Tonatiuh Gutierrez. He had amassed a vast trove of research material for a book on the early history and discovery of the Americas.

If Europeans based their knowledge on some of the exhibited prints, they must have had a fanciful, even bizarre, view of Mexico's civilization. One engraving transforms the Aztec god Huitzilopochtli into a winged Satan with a feather headdress and a hairy animal's legs. An encyclopedia of world faiths portrays human sacrifice at Tenochtitlan's Great Temple, with one victim being slain on a platform atop skull-covered walls and another rolling down a steep staircase.

The Getty also has contributed a few Roman bronze objects "to spark ideas," Lyons says. "We don't want people to think there's a relationship or an influence across thousands of miles and 1,500 years." The point is to compare similar forms and subjects through the ages.

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http://www.latimes.com/entertainment/news/la-ca-aztecs21-2010mar21,0,6456017.story

Silk Road treasures

Mummies and other artifacts found along the fabled route in China are the stars of a new exhibition at the Bowers Museum in Santa Ana.

By Scarlet Cheng

March 28, 2010

The Taklimakan Desert in northern China is one of the largest in the world -- vast and inhospitable, and its howling winds were once thought the cries of ghosts and demons. Yet since ancient times, travelers have braved its edges, some engaging in the East-West trade that eventually earned the routes a fabled name, the Silk Road.

This weekend, the Bowers Museum opens an exhibition featuring about 150 artifacts from the area, "Secrets of the Silk Road: Mystery Mummies of China" (through July 25). The stars of the show are two mummies and the trappings of a third, already celebrities in the world of archaeology. Found in burial sites of different eras, they are Caucasoid -- a discovery that has been unsettling for Beijing, resulting in long-standing bans on their export.

"The Bowers has pulled off a real coup," says Victor Mair, professor of Chinese language and literature at the University of Pennsylvania and a consultant to the exhibition. It is the first time any Chinese mummies have been shown in the U.S. Two of them actually predate the Silk Road, which began during the Han dynasty (206 BC-AD 220).

"The Beauty of Xiaohe is the most spectacular of all the mummies," says Mair. "She's very beautiful, placid, with long eyelashes and wearing a very jaunty hat with cords wrapped around it and feathers stuck in it. Take one look and one is captivated by her."

That is, if you like desiccated figures. Her skin is shrunken around the skull, although she is remarkably well preserved -- with long, auburn tresses -- for being 3,800 years old. Then there is a baby in swaddling and a bright blue felt cap from the 8th century BC. Stones cover his eyes, and a kind of baby bottle made from a goat's udder will be displayed with him.

The newest of the mummies -- or at least the trappings, since his body isn't coming to Santa Ana -- is Yingpan Man, dating to the 3rd to 4th century. His face was covered with a mask with a gold band across the forehead, and he wore a wool robe bearing designs of animals, trees and muscular youths that reflect Western influences, says Elizabeth Barber, a prehistoric textile expert who wrote for the exhibit catalog.

Last year, Bowers President Peter Keller and board member Anne Shih went to China to arrange for loans from the Xinjiang Uygur Autonomous Region Museum and the Xinjiang Institute of Archaeology. In addition to selecting the figures, they culled a host of other items from the Silk Road.

Textiles in the exhibit, some only in fragments, are among the most astonishing for their state of preservation, workmanship and bright colors. "They've been preserved so well because the dry, salty sand sucks the water out of everything," says Barber. "Also, the salt in the sand preserves the colors."

The cosmopolitan nature of the Tang Dynasty era (618-906) is reflected in figurines with large noses and full beards, such as the robust figure of a *"hu"* (foreigner) in a long robe.

Tang nobility enjoyed the finer things: Witness a pair of fiber shoes with upturned toes, a painted round fan and a couple of eyeshades -- hammered bronze eyepieces with multiple pinholes punched into them, to allow wearers to withstand the sun's glare. There also are preserved food items, including a spectacular little chrysanthemum-shaped dessert and a spring roll section (yes, with the filling inside).

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http://www.latimes.com/entertainment/news/la-ca-silk-2010mar28,0,7408004.story

U.S. embassy: An outpost as a signpost

The design competition for the new U.S. embassy in London has opened a broader discussion into how America sees itself.

By CHRISTOPHER HAWTHORNE

Architecture Critic

March 21, 2010

The two stories that have dominated the architectural press over the last few weeks -- the unveiling of a winning design for a new American embassy in London, and the death, in a downtown Los Angeles traffic accident, of the 76-year-old Austrian architect Raimund Abraham -- have more in common than just a spot on the calendar.

Both are directly connected to the same set of questions: How should an architect approach the task of designing a building to represent his home country abroad? What happens if the result -- implicitly or explicitly -- is critical of that country's past, politics or most cherished values?

Thanks to the punishingly high standards he set for himself -- not to mention a less-than-sunny way with potential clients -- Abraham, who was born in Austria and moved permanently to the United States in the mid-1960s, completed few buildings in his long career. He was far better known as a teacher and the creator of primitive, hauntingly powerful architectural drawings.

But his modest output did include one truly remarkable building: the Austrian Cultural Forum, a knife-thin, 24-story tower that opened in 2002 in midtown Manhattan as an outpost for exhibitions and discussions about Austrian culture and politics. Abraham's design for the Forum prevailed in a competition that drew entries from 226 Austrian firms -- essentially "every born Austrian architect who could walk," as Abraham put it at the time. It called for a tough, unforgiving piece of architecture: a 280-foot-tall, 25-foot-wide building squeezed between taller neighbors on East 52nd Street. Abraham famously compared its sharp-edged facade to the falling blade of a guillotine.

What, then, does the building say about Austria? It conjures a combination of severity and visionary

thinking in that nation's culture and suggests a range of influences miles away from "The Sound of Music": the work of Sigmund Freud; the angular, brooding paintings of Egon Schiele; and the stripped-down architecture of Adolf Loos, to name three. It also seems to hint at the far darker precedents of Hitler and the Holocaust.

It would be easy to caricature the building as a bitter expatriate's attempt to express frustration with his home country -- and, indeed, Abraham, dismayed by the rise of the late right-wing politician Joerg Haider, among other developments, renounced his Austrian citizenship just weeks before the Forum was completed.

But if the design is plagued by doubt about Austria's political history and its place in the world, it is precisely that doubt that gives the building its honesty and forthrightness and therefore its power. Whether that same level of honest self-examination is even possible in a contemporary American embassy is debatable, of course. The Austrian Cultural Forum had many urban and architectural constraints to deal with, given its almost comically narrow site, but it is also a cultural rather than diplomatic outpost and thus capable of pursuing architectural innovation, even radicalism.

Abraham's building also gains much of its energy from its engagement with the wider city, particularly in the slightly menacing way it looms out over the sidewalk. We now build American embassies, by contrast, deep within concentric circles of blast protection.

Still, the competition for the London embassy has stirred up many of the same questions that surrounded Abraham's proposal. And they have grown only louder since the winning design, by the Philadelphia firm KieranTimberlake, was announced Feb. 23.

The following day it was revealed that the two British members of the jury for the embassy competition, architect Richard Rogers and developer-art collector Peter Palumbo, had disagreed strongly with their colleagues' decision -- and had sent a letter to the State Department arguing that the KieranTimberlake entry, which calls for an elegant and energy-efficient if rather unassuming glass cube, was simply not ambitious enough. Rogers and Palumbo wrote that another design, by Thom Mayne and his Santa Monica firm, Morphosis, was, as a report in the Guardian newspaper put it, "touched by genius" and should have prevailed.

Second thoughts

At first, the dissent from Rogers and Palumbo appeared mostly symbolic: a joint complaint from two influential players used to getting their way in the London architecture world. The Morphosis design they praised, after all, calls for a sagging embassy that is practically collapsing in on itself. For all its boldness and unsettled power, it seems to symbolize a wounded America struggling to hide from a growing number of antagonists behind a series of jagged concrete walls.

There's no way the American government would ever actually build that design, is there? Perhaps not: Like many influential but losing competition entries in architectural history, the Morphosis proposal may simply be a vehicle for advancing certain ideas that students and fellow architects will study in years ahead.

Still, the controversy over the Morphosis design has had the secondary effect of redefining the KieranTimberlake entry as generic and unimaginative. And this is, if not entirely unfair, then at least based on a limited definition of architecture and architectural symbolism.

The profession is now emerging from a frenzied decade in which architects, critics and clients alike disappeared down the rabbit hole of formalism, convincing ourselves that architecture's highest achievement is to produce stunning shapes that mean nearly as much to somebody seeing a building in a magazine spread or online as walking through it. One direct result of this obsession was the false sense that the only way for an architect to pursue an idea or a theme was through shape-making -- or at least through some combination of form, scale and material palette.

There are, of course, many other ways for buildings to express values and priorities. The KieranTimberlake embassy design is restrained in a formal sense, yes: Its glass cube, wrapped in a flexible, translucent material called ETFE (and rising behind a water feature that bears an unfortunate resemblance to a moat), may either look crisply elegant or like a typical office block, depending on how it's executed.

But that restraint, coupled with the building's deep interest in energy-efficiency and in using landscape design to reach out to the surrounding neighborhood, make it in many ways as chastened a piece of architecture as Abraham's building in New York. Rather subtly -- too subtly for Rogers and Palumbo, clearly -- it makes the argument that the best way for the U.S. to change its image abroad is by toning down its rhetoric and acknowledging that its days standing astride over the world, and madly draining its energy reserves, are over.

If you look at the embassy competition from that point of view, the Morphosis design represents an odd approach to self-examination. If Mayne means it as an apology for the brash, self-aggrandizing way the U.S. has behaved in the world in the last decade or so -- and I believe he does -- his proposal is itself brash and self-aggrandizing from top to bottom.

Many architects and a handful of critics have complained that the embassy competition proved a disappointment -- not just the winning design but the finalists as a group, which also included entries from the firm Pei Cobb Freed and from Richard Meier and his L.A.-based partner Michael Palladino.

But just as disappointing has been the narrowness of the terms we've set in the last couple of weeks for talking about the four finalists -- particularly the KieranTimberlake proposal, which precisely for its stillness and formal efficiency has been wrongly pigeonholed as empty of ideas.

A building that really wanted to suggest a new tack for American diplomacy, or productively rethink the symbolic language of American architecture abroad, would rely on anything but noisily aggressive forms, wouldn't it?

That in the end suggests the key difference between Abraham's building and the Morphosis embassy proposal. The first design ruthlessly and efficiently takes a blade to nationalistic fervor. The second goes for explosive, hard-edged spectacle in the guise of self-analysis.

If it's a portal to a national subconscious we're looking for, I'll take door No. 1.

christopher.hawthorne@latimes.com

http://www.latimes.com/entertainment/news/la-ca-notebook-arch21-2010mar21,0,2014498.story

Lonely, under pressure

By Jeannine Stein

Los Angeles Times Staff Writer

March 22, 2010

Loneliness doesn't just cause wear and tear on the psyche — it may also affect blood pressure.

University of Chicago researchers surveyed 229 people ages 50 to 68 who were part of the Chicago Health, Aging and Social Relations Study, a multi-year study of white, black and Latino men and women. Participants were asked to rate their feelings about statements such as "I lack companionship," "I feel in tune with the people around me" and "My social relationships are superficial." Other features about the participants were noted, such as smoking status, physical activity levels, body mass index and cardiovascular health.

The participants were monitored for five years. People who ranked as feeling most lonely had blood pressure levels 14.4 points higher than those who felt the least lonely. Increases in systolic blood pressure were cumulative, so those who had higher levels of loneliness at the beginning of the study had greater blood pressure increases over the years.

The findings held true when researchers accounted for factors such as age, race and ethnicity, gender, cardiovascular risk factors and depression.

The study appears in the March issue of the journal Psychology and Aging.

jeannine.stein@latimes.com

http://www.latimes.com/features/health/la-he-capsule-20100322,0,3583762.story

Depressed parents' negative effects on kids are combatable

Awareness of the toll has prompted more research into how to lessen it.

By Marilyn Elias

Special to The Times

March 15, 2010

Gary McMane, 50, of Fontana, is convinced that his own depression has taken a toll on the three children he adores. "They're all good kids, and good in school, but I know it's had a terrible effect on them."

His 22-year-old daughter hangs on to her high school boyfriend as a security blanket, he says, and his 17-year-old son seems seriously depressed. Further, he adds, the 13-year-old boy is overly sensitive, feeling compelled to "rescue" anyone who is hurt. Granted, such perceptions are filtered through McMane's own feelings of guilt and responsibility — and his kids might not agree — but he's right to worry.

Although their father's depression may not be the cause of all these qualities, evidence is mounting that growing up with a depressed parent increases a child's risk for mental health problems, cognitive difficulties and troubled social relationships. The research on how a depressed parent affects kids has slowly accumulated for about 20 years, "but it's really taken off in the last few years," says Vanderbilt University psychologist Bruce Compas.

The harmful effects on children were summed up last year in a report by the National Research Council and Institute of Medicine. Problems begin early, as the infants of depressed mothers cry more than other

babies. They have greater fear of strangers and less tolerance for frustration, according to the report. Starting in preschool, kids with depressed parents are more likely than classmates to have attention deficit hyperactivity disorder. Across all stages of childhood, they have more behavior problems at school and higher rates of depression and anxiety disorders.

By adolescence, children with depressed parents have poorer social relations than the teens of parents who aren't depressed, and they're more likely to be dependent on alcohol and drugs, the federal report indicates. Depression in parents also is linked to poorer academic performance, according to studies in the report.

And some harmful effects of growing up with a depressed parent appear to linger well into adulthood. A 20-year study following the children of depressed parents and a comparison sample of kids whose parents had no mental disorders found that those with depressed parents suffered about triple the rate of anxiety disorders and depression by their 30s, were in poorer health than peers and much more likely to be dependent on drugs and alcohol. The study, believed to be the longest ever done on kids of depressed parents, was published in the American Journal of Psychiatry in 2006.

These effects may not only be long-lasting but also far-reaching. Serious depression affects about one in five American parents, and 15.6 million children live with an adult who has had major depression in the last year, according to government data.

But as knowledge about the effects of parental depression has grown, so too has research into how to combat those effects. Studies suggest, for example, that changing destructive parenting practices and teaching children good coping strategies can make a big, positive difference in kids.

"We can reverse the effects of parental depression," says William Beardslee, a professor of child psychiatry at Harvard Medical School. He's also chief of a Boston Children's Hospital program on preventing depression in families and co-wrote the National Research Council report.

Depression can hamper parenting in two key ways, that report says.

Adults may withdraw from their children, not interacting with them much because their own suffering is so acute. Some of these kids may be subjected to true neglect if a parent is very withdrawn and there are no other adults around to be there for the kids. At the opposite extreme, depressed parents can become overly intrusive or authoritarian, trying to control everything about their child. They may even lash out harshly, possibly becoming child abusers.

Parents who can change these destructive patterns may ultimately prevent their children from continuing a negative cycle with yet another generation.

Trouble starts early

Adult depression can have an effect even before active parenting begins.

Depressed pregnant women smoke and drink more than pregnant women who aren't depressed, research has shown, increasing health risks for the developing fetus. They're also in poorer health, seek less prenatal care and produce more stress chemicals that reduce fetal growth. Even controlling for other factors linked to premature birth, depressed women are almost twice as likely as others to deliver a premature baby, and this risk increases with the severity of depression symptoms.

Then comes the effect on newborns.

About one in 11 infants has a mother with major depression, according to a research update report last December by Harvard University's Center on the Developing Child. Healthy emotional and brain development depends on a "serve and return" interaction, just like a tennis game. Tots engage parents' attention, prompting parents to respond with words or facial expressions, which stimulate more infant

communication.

If caregivers are withdrawn or hostile, this shuts down the game and may even alter the architecture of the child's brain.

EEG brain scans show the children of depressed moms have patterns of brain activity similar to those found in adults with depression. Among these children, the patterns are most pervasive if the depressed mother was withdrawn from her infant and also if she was seriously depressed in the child's second and third year, when the brain systems that generate these waves are developing rapidly. That means the child of a depressed parent may become vulnerable to depression very early in life, at least in part through how parenting affects the brain.

Although most research on parental depression has focused on mothers, newer studies are looking at fathers and finding similar effects for children.

"Depression is just wicked. It takes away the enthusiasm and energy you need to be a good parent. And on top of that, it distorts your thinking," says Diana Barnes, a Tarzana psychotherapist who treats parents with postpartum depression.

Babies clamor for a parent's attention and, when parents don't respond, they'll mimic the flat adult expression they see before them as a way to engage, Barnes notes. "Then a mom will say, ‘The baby doesn't like me' — I hear it all the time. Or they'll see normal infant behavior as ‘difficult' or ‘fussy' and see the baby as a problem child."

Many women with postpartum depression have grappled with mental health problems earlier in life. That was true for 42-year-old Walker Karraa of Sherman Oaks, who had been on and off depression medications for years. She struggled through severe, untreated depression during pregnancy and the first three months with her now 9-year-old son, Ziggy. Then she got treatment and began to improve.

Karraa had a "do over" opportunity with 6-year-old Miles, her daughter, but this time she was receiving treatment — therapy and antidepressants. "I felt normal; it was totally different than the first time. I was able to sleep and eat and experience joy ...

"To this day, I see differences in my kids' personalities. My son is a lot more prone to worry and anxiety. He struggles with big, big feelings. He feels things on a very deep, empathetic level and is so affected by the feelings of others." Ziggy has tested as highly gifted, is well liked and healthy, says Karraa. But she still worries about him. "There is more lightness to Miles, more joy."

Karraa says she still has some rough days. There are times when she needs to adjust her medicine, and often she can't face social encounters, especially crowds in close quarters. Tony Karraa, Walker's husband, takes Miles to ballet class and frequently ferries the youngsters to birthday parties.

Managing the effects

Both parents openly discuss Walker's depression with their children. "I've started to look at it like diabetes, a medical condition I need to manage," she says, adding that she and her husband emphasize to the kids that they're not to blame for their mother's periodic sadness and that Walker has great doctors helping her. "They've asked, ‘Am I going to get it?' and I tell them, ‘Probably not. But if it happens, people will be there to help you,' " Walker says.

This "we can master things" attitude is the opposite of the helplessness message many kids get from depressed parents, says Kitty Walker, a Santa Monica psychotherapist. "Part of depression is feeling, ‘No matter what I do, I can't make things better.' This is learned helplessness. Kids model on it, and it can program them to become pessimists who feel helpless and eventually depressed themselves."

Not only do children fare better if they are taught not to blame themselves for a parent's depression, they

also flourish when caregivers can give them plenty of attention, says Beardslee.

Effects on kids tend to be more damaging if the family is poor, if there's marital conflict or if a depressed mother is the sole parent, according to the federal report. Financial strain can prevent parents from getting treatment, and the other family stressors add to the strain children may feel.

Even when parents are mindful of how their emotional problems may affect children, it can be hard to maintain consistent expectations and discipline as symptoms fluctuate from day to day. "It's important to have this consistency, this sticking to your guns, being firm and loving at the same time," says Beardslee.

Ruth Hollman, 53, of Los Angeles, has struggled against depression most of her life but feels she has her symptoms under reasonably good control now. "I do have bad days, though, and there's no question I'm inconsistent with the kids. On bad days I'll ignore something they're not supposed to be doing. On better days there's a different rule. Of course I'm concerned. I have tremendous worry that they're going to turn out to be not OK kids."

Her 11-year-old son is in therapy because he has trouble controlling impulses and can be defiant about rules at home. He's been diagnosed with attention deficit disorder and is improving with medication and therapy. "My younger daughter is just blossoming all over the place, but, still, you worry because you don't want your troubles to harm them."

Gary McMane, the Fontana father who believes his depression has hurt his three kids, feels he avoided inflicting serious harm for years by letting them know he needed more alone time on some days. That worked when their mother lived with the children. But when she left the home five years ago after a 20-year marriage, McMane plunged into a black hole. The kids — 9, 12 and 17 at the time — lived with him. "For days I would lie in bed and cry. They kept trying to console me; they just didn't see this coming. For a couple of months I was just disabled."

McMane took a leave from his job as a social worker and joined a men's therapy group that he credits with gradually bringing him back to mental health. "It ‘parentified' my older daughter, though. She felt she had to take care of the younger kids, and to this day she still kind of feels that way," he says. McMane talks with his children openly about what's happened.

He hopes that sensitive parenting — and seeing how he's turned his life around — will help them in the long run.

health@latimes.com

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