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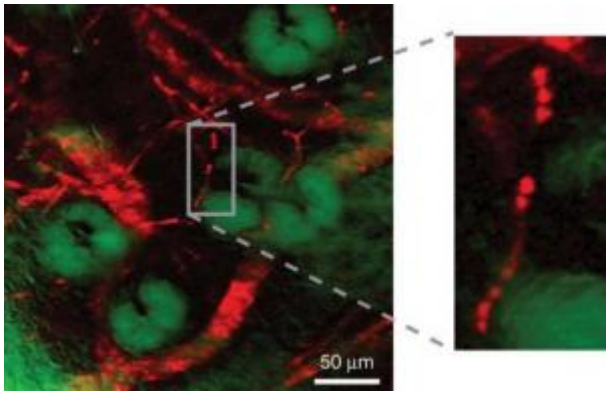


Stimulated emission image of the microvascular network in a mouse's ear. The sample shows in red the blood vessel network surrounding green-colored sebaceous glands. Sebaceous glands are microscopic glands located in skin that secrete an oily and waxy matter used to lubricate the skin and hair of animals. A technique called confocal reflectance was simultaneously used to record the green-colored sebaceous glands. The image is based on contrasts of non-fluorescent hemoglobin molecules. In the zoomed-in image, individual red blood cells are lined up within a single capillary approximately five micrometers in diameter. A micrometer is one-millionth of a meter. (Credit: X. Sunney Xie, Department of Chemistry and Chemical Biology, Harvard University)

ScienceDaily (Oct. 24, 2009) — A team of Harvard chemists led by X. Sunney Xie has developed a new microscopic technique for seeing, in color, molecules with undetectable fluorescence. The room-temperature technique allows researchers to identify previously unseen molecules in living organisms and offers broad applications in biomedical imaging and research.

The scientists' results are published in the Oct. 22 issue of *Nature*. Partial funding for the project was provided by the National Science Foundation (NSF).

Fluorescence is a phenomenon in which an electron in a molecule absorbs energy from light and moves to a higher energy level or excited state. The energy of the light is contained in a unit called a photon.

After a very brief stay at the excited state, the electron returns to its previous energy level, or ground state, by emitting a new photon. The energy of the released photon is discharged in wavelengths of detectable visible light lasting only a few billionths of a second.

Many biologically important colored molecules such as hemoglobin -- an oxygen-transport protein in red blood cells -- absorb light but do not fluoresce. Instead, the electrons in these molecules release their additional but transient energy by converting it to heat.

"Since these molecules do not fluoresce, they have literally been overlooked by modern optical microscopes," Xie said.

To detect non-fluorescent molecules in biological systems, Xie and his team developed a new type of microscopy based on stimulated emission.

Stimulated emission was first described by Albert Einstein in 1917, and was the basis for today's lasers. In a nutshell, it is a process by which an excited-state electron, perturbed by a photon having the correct energy, drops to its ground state producing an additional photon.

Xie's new microscopic technique generates and records a stimulated emission signal by using two carefully timed input and output pulse trains. In the input pulse train, a modulator switches the intensity of the excitation beam on and off at five megahertz, or MHz. The modulation creates a stimulated emission

signal at the same frequency. Each train has an incredibly short pulse duration of approximately 200 femtoseconds. A femtosecond is equal to one billionth of one millionth of a second or 10^{-15} seconds.

The signal produced by the non-fluorescent molecules provides a highly sensitive image of previously "invisible" molecules.

One of the several possible applications of the scientists' invention is mapping in color the delivery of non-fluorescent drugs to their target cells. Another possible use is imaging tiny structures such as blood vessels including individual red blood cells and single capillaries.

The structure and hemoglobin-dynamics of blood vessels play a major role in many biomedical processes. Two example processes are the transition of tumors from a dormant to malignant state and oxygen delivery in the brain.

Current established imaging technologies like MRIs and CT scans either lack the spatial resolution needed to resolve individual capillaries or require external contrast agents.

Fluorescent labels such as the green fluorescent protein, or GFP, are extensively used for observing the activity of biomolecules and distinguishing target molecules in a cell. The GFP labeling technique provides well-defined images. However, the bulky protein can disturb delicate biological pathways, especially when it is larger than the biomolecules it is illuminating.

Xie's team mapped the delivery of a non-fluorescent drug molecule and imaged blood vessels without fluorescent labels.

Their new technique is also capable of imaging non-fluorescent proteins in cells of live *Escherichia coli* bacteria.

"While earlier studies made use of similar pump-probe experiments to provide images of fluorescent molecules with spatial resolution comparable to that of confocal fluorescence microscopy and high temporal resolution, this study, for the first time, makes use of stimulated emission microscopy to image non-fluorescent molecules," said Zeev Rosenzweig, a program director in the NSF Division of Chemistry.

Although potential photo-damage, and the complexity and cost of the system still need to be addressed for the technique to gain wide applicability, "there is no doubt that the study provides a unique way to image a wide range of molecules currently inaccessible to today's state-of-the-art optical microscopes," notes Rosenzweig.

"This is just the beginning," added Xie. "Many interesting applications of this new imaging modality are forth coming."

Additional authors of the *Nature* paper include Wei Min, Sijia Lu, Shasha Chong, Rahul Roy and Gary R. Holtom. Min and Roy are postdoctoral fellows; Lu and Chong are graduate students; and Holtom is a research scientist. All authors are members of Xie's research group.

Funding for the research was provided by the NSF Division of Chemistry, award number CHE-0634788, and the U.S. Department of Energy's Basic Energy Sciences Program, award number DE-FG02-07ER15875.

Adapted from materials provided by National Science Foundation.

http://www.sciencedaily.com/releases/2009/10/091023104704.htm

No Elder Left Behind: Researchers Say Designers Can Help Close Tech Gap

Researchers report that while more older adults than ever are using cell phones and computers, a technology gap still exists that threatens to turn senior citizens into second-class citizens. (Credit: iStockphoto/Amanda Rohde)

ScienceDaily (Oct. 24, 2009) — While more older adults than ever are using cell phones and computers, a technology gap still exists that threatens to turn senior citizens into second-class citizens, according to Florida State University researchers.

Neil Charness, the William G. Chase Professor of Psychology, and Walter R. Boot, an assistant professor of psychology, found that both the attitudes and abilities of older adults pose barriers to adopting new forms of technology and urged designers to consider those barriers when developing new products. Charness and Boot will publish a review of the research on the topic in Current Directions in Psychological Science.

"The technology gap is a problem because technology, particularly computer and Internet technology, is becoming ubiquitous, and full participation in society becomes more difficult for those without such access," said Charness, who along with Boot received a $1.5 million, five-year subcontract from a National Institute of Aging grant to support the Center for Research and Education on Aging and Technology Enhancement (CREATE). Established a decade ago, the center is comprised of researchers at FSU, the University of Miami and the Georgia Institute of Technology, who study ways to increase technology use in order to promote cognition and health in older Americans.

From booking airline tickets to seeking health care information, almost everything is easier, cheaper or faster online. Older adults who may be less mobile in particular stand to benefit from innovations such as online banking. But there is a sharp decline in Internet use after age 65, the researchers said, citing a 2007 Pew Tracking Survey that showed 85 percent of adults in 18-24, 25-34 and 35-44 age groups used the Internet. By contrast, only 39 percent of adults between 65 and 74, and 24 percent of adults between 75 and 84 were Internet users.

Declining cognitive processes, decreased memory capacity and difficulty maintaining attention -- all part of the normal aging process -- can make it difficult for seniors to learn new skills. In fact, Charness said, it takes older adults roughly twice as long as younger people to learn a new word processor under self-

paced learning conditions. That's true even for older adults who have prior experience with another word processor.

The extra time and effort required to learn a new skill are among the reasons why older adults are generally less motivated than younger people to learn new skills -- particularly if they decide that the potential benefits of the new technology are not worth it. In addition, seniors may make a greater number of errors as they interact with technology that was not designed with their capabilities in mind.

Seniors quite literally perceive new technology differently than younger adults do. Changes in acuity, color perception and susceptibility to glare affect the way they see a computer screen. They also have greater difficulty with fine motor control and coordination. However, knowing these constraints, designers can create better products for older adults, the researchers said. Among their suggestions:

- Create cell phones with simplified menus, large fonts and buttons and external noise reduction.
- Design Web sites with high contrast backgrounds and text, larger fonts and minimal scrolling. The sites should provide navigation aids and instructional support.

Computer games -- such as Nintendo's Brain Age -- and software packages that have been developed for and marketed to older adults may also help reverse age-related declines in perceptual and cognitive abilities, the researchers said.

"There is limited but encouraging evidence that these so-called brain fitness software packages make a difference in improving some basic skills, but so far there is little evidence that they improve older adults' quality of life or ability to live independently," Boot said. "That should be the measure of success in evaluating these programs."

Although the technology gap between younger and older adults is expected to lessen over time as more adults "grow up" with computers, the problem will not disappear in future generations, the researchers said. That's because technology will undoubtedly continue to advance rapidly, and age-related declines in cognitive, perceptual and psychomotor skills will make it more difficult for seniors to keep up with the changes.

Don't believe it? Consider that today's seniors grew up with telephones, and yet they have been much slower to adapt to using cell phones. Still, those over 65 are more likely to use a cell phone -- 46 percent of them do -- than use the Internet.

Adapted from materials provided by Florida State University.

http://www.sciencedaily.com/releases/2009/10/091022153637.htm

Memory and forgetting in the digital age

- 24 October 2009 by **Yadin Dudai**

Magazine issue 2731.

Unforgettable (image: Iconica/Getty)

- **Book information**
- *Total Recall: How the e-memory revolution will change everything* by Gordon Bell and Jim Gemmell
- Published by: Dutton
- Price: $26.95

- **Book information**
- *Delete: The virtue of forgetting in the digital age* by Viktor Mayer-Schönberger
- Published by: Princeton University Press
- Price: $24.95/£16.95

JUST as Molière's bourgeois gentleman spoke in prose without being aware of it, most of those who fear forgetting do not realise that they have amnesiphobia. But perhaps this tiny lexical blind spot is not important any more. Amnesiphobics, unite and rejoice: Gordon Bell and Jim Gemmell (and Bill Gates, in his enthusiastic introduction) now inform us that we need never fear forgetting again. Total recall is around the corner. But alas, in such a world, even our phobia of forgetting cannot be forgotten.

Even if we wished to forget, Bell and Gemmell say, we couldn't, as somewhere in the cyberspace cloud engulfing us the engram of our old fears will live for eternity - or at least until the software is updated to a version that can't read the original files.

Total Recall is an extended corporate US manifesto, whose explicit slogan is: "I hate to lose my memories. I want total recall." The subtext is a bit more naive: I want total control over my life, I want immortality. If only I could record and store everything, I would become *Homo eternicus*. This is the same philosophy that feeds the US's mammoth pharmaceutical, food and health industries.

The scheme seems ingeniously simple and technically feasible. To overcome oblivion, say the authors, all you need are sensitive miniature sensors and several terabytes of storage, which are already or soon-to-be affordable. You can then record every minute of your life using video, audio, location and physiological signals, culminating in the commitment of this endless stream of information to your personal MyLifeBits account in your pocket and/or in cyberspace. Proper software will permit you to retrieve the information years later, and it will even pass by default to your progeny for eternity, with the hope that they will pay attention to it.

The information technology capabilities depicted in *Total Recall* are fascinating, yet not really revolutionary any more. We owe this luxury of habituation to the wonders of the electronic universe and to pioneers and visionary entrepreneurs like Bell and Gemmell (and Gates). But in their self-confident manifesto, these cyberspace explorers overlook some attributes of the cognitive universe.

For example, as cognitive psychology and neuroscience demonstrate again and again, two individuals sensing the same input, or the same individual sensing the same input at different times, may understand very different things. So registering bits of episodes is unlikely to really preserve these episodes.

Furthermore, when we perceive the world, we get not only objective input but also the context, including our complex internal physiological milieu and all of our emotional baggage. Again, it is unlikely that a computerised total recall system will be able to register this unique endogenous world and the way it interacts with the outside world to generate the subjective percept.

Most importantly, though, the authors, consumed by their hunt for every last bit of information (and even offering practical advice on how to make an extra buck in the process), forget forgetting.

For the human condition, forgetting is at least as important as remembering - sometimes more so. Without it, we are all bound to lead the miserable life of A. R. Luria's patient Solomon Shereshevsky, who was crippled by his boundless, indelible memory, or his fictional counterpart, Jorge Luis Borges's Funes. No forgetting implies no generalisation, no real present time, no amelioration of trauma, and no weaving of meaningful life narratives.

For the human condition, forgetting is at least as important as remembering
Total recall may be beneficial for businesses and courts, clinics and insurance agencies, even possibly in settling occasional disputes with significant others, but rarely would it be deeply rewarding for the humble self.

As its title suggests, *Delete* is about forgetting, more specifically about the demise of forgetting and the resulting perils. Viktor Mayer-Schönberger is worried by the same things that excite Bell and Gemmell.

He observes how advanced information technology can allow the traces of every experience to chase us forever. Yet evolution has created the brain in such a way that the traces of experience do fade over time, receding into oblivion. Presumably, this offers us some kind of survival advantage - as Shereshevsky and Funes would attest. Mayer-Schönberger presents a scholarly discussion throughout, unlike the PowerPoint style of some chapters in *Total Recall*.

And he comes up with an interesting solution: expiration dates in electronic files. This would stop the files from existing forever and flooding us and the next generations with gigantic piles of mostly useless or even potentially harmful details.

This proposal should not be forgotten as we navigate between the urge to record and immortalise our lives and the need to stay productive and sane.

Yadin Dudai investigates memory, and chairs the Department of Neurobiology at the Weizmann Institute of Science in Rehovot, Israel

Seven questions that keep physicists up at night

- 21:09 23 October 2009 by **Ivan Semeniuk**, Waterloo
- For similar stories, visit the **Cosmology** and **Quantum World** Topic Guides

It's not your average confession show: a panel of leading physicists spilling the beans about what keeps them tossing and turning in the wee hours.

That was the scene a few days ago in front of a packed auditorium at the Perimeter Institute, in Waterloo, Canada, when a panel of physicists was asked to respond to a single question: "What keeps you awake at night?"The discussion was part of "Quantum to Cosmos", a 10-day physics extravaganza, which ends on Sunday.While most panelists professed to sleep very soundly, here are seven key conundrums that emerged during the session, which can be viewed here.

Why *this* universe?

In their pursuit of nature's fundamental laws, physicists have essentially been working under a long standing paradigm: demonstrating why the universe must be as we see it. But if other laws can be thought of, why can't the universes they describe exist in some other place? "Maybe we'll find there's no other alternative to the universe we know," says Sean Carroll of Caltech. "But I suspect that's not right." Carroll finds it easy to imagine that nature allows for different kinds of universes with different laws. "So in our universe, the question becomes why these laws and not some other laws?"

What is everything made of?

It's now clear that ordinary matter – atoms, stars and galaxies – accounts for a paltry 4 per cent of the universe's total energy budget. It's the other 96 per cent that keeps University of Michigan physicist Katherine Freese engaged. Freese is excited that one part of the problem, the nature of dark matter, may be nearing resolution. She points to new data from experiments like NASA's Fermi satellite that are consistent with the notion that dark matter particles in our own galaxy are annihilating with one another at a measurable rate, which in turn could reveal their properties. But the discovery of dark energy, which appears to be speeding up the expansion of the universe, has created a vast new set of puzzles for which there are no immediate answers in sight. This includes the nature of the dark energy itself and the question of why it has a value that is so extraordinarily small, allowing for the formation of galaxies, stars and the emergence of life.

How does complexity happen?

From the unpredictable behaviour of financial markets to the rise of life from inert matter, Leo Kadananoff, physicist and applied mathematician at the University of Chicago, finds the most engaging questions deal with the rise of complex systems. Kadanoff worries that particle physicists and cosmologists are missing an important trick if they only focus on the very small and the very large. "We still don't know how ordinary window glass works and keeps it shape," says Kadanoff. "The investigation of familiar things is just as important in the search for understanding." Life itself, he says, will only be truly understood by decoding how simple constituents with simple interactions can lead to complex phenomena.

Will string theory ever be proved correct?

Cambridge physicist David Tong is passionate about the mathematical beauty of string theory – the idea that the fundamental particles we observe are not point-like dots, but rather tiny strings. But he admits it once brought him to a philosophical crisis when he realised he might live his entire life not knowing whether it actually constitutes a description of all reality. Even experiments such as the

Large Hadron Collider and the Planck satellite, while well positioned to reveal new physics, are unlikely to say anything definitive about strings. Tong finds solace in knowing that the methods of string theory can be brought to bear on less fundamental problems, such as the behaviour of quarks and exotic metals. "It is a useful theory," he says, "so I'm trying to concentrate on that."

What is the singularity?

For cosmologist and Perimeter Institute director Neil Turok, the biggest mystery is the one that started it all, the big bang. Conventional theory points back to an infinitely hot and dense state at the beginning of the universe, where the known laws of physics break down. "We don't know how to describe it," says Turok. "How can anyone claim to have a theory of everything without that?" Turok is hopeful that string theory and a related development known as the "holographic principle", which shows that a singularity in three dimensions can be translated into a mathematically more manageable entity in two dimensions (which may imply that the third dimension and gravity itself are illusory). "These tools are giving us new ways of thinking about the problem, which are deeply satisfying in a mathematical sense," he says.

What is reality *really*?

The material world may, at some level, lie beyond comprehension, but Anton Zeilinger, professor of physics at the University of Vienna, is profoundly hopeful that physicists have merely scratched the surface of something much bigger. Zeilinger specialises in quantum experiments that demonstrate the apparent influence of observers in the shaping of reality. "Maybe the real breakthrough will come when we start to realise the connections between reality, knowledge and our actions," he says. The concept is mind-bending, but it is well established in practice. Zeilinger and others have shown that particles that are widely separated can somehow have quantum states that are linked, so that observing one affects the outcome of the other. No one has yet fathomed how the universe seems to know when it is being watched.

How far can physics take us?

Perhaps the biggest question of all is whether the process of inquiry that has revealed so much about the universe since the time of Galileo and Kepler is nearing the end of the line. "I worry whether we've come to the limits of empirical science," says Lawrence Krauss of Arizona State University. Specifically, Krauss wonders if it will require knowledge of other universes, such as those posed by Carroll, to understand why our universe is the way it is. If such knowledge is impossible to access, it may spell the end for deepening our understanding any further.Turok says that's exactly why the Perimeter Institute exists, to harness the thinking of the world's brightest young minds in an unrestrained environment. By optimising conditions for creative thinking, it may be possible to avoid such an impasse. "We're used to thinking of theoretical physics as accidental," says Turok. "We need to ask whether there's a more strategic way to speed up understanding and discovery."

Perhaps then all those troubled physicists can finally get some rest – or at least switch to more mundane worries.

The "Quantum to Cosmos" festival can be viewed online http://www.q2cfestival.com/

http://www.newscientist.com/article/dn18038-seven-questions-that-keep-physicists-up-at-night.html

Asteroid blast reveals holes in Earth's defences

- 22:54 26 October 2009 by **David Shiga**
- For similar stories, visit the **Comets and Asteroids** Topic Guide

As the US government ponders a strategy to deal with threatening asteroids, a dramatic explosion over Indonesia has underscored how blind we still are http://www.newscientist.com/article/mg20327271.300-asteroid-attack-putting-earths-defences-to-the-test.html to hurtling space rocks.

On 8 October an asteroid detonated high in the atmosphere above South Sulawesi, Indonesia, releasing about as much energy as 50,000 tons of TNT, according to a NASA estimate released on Friday. That's about three times more powerful than the atomic bomb that levelled Hiroshima, making it one of the largest asteroid explosions ever observed.

However, the blast caused no damage on the ground because of the high altitude, 15 to 20 kilometres above Earth's surface, says astronomer Peter Brown of the University of Western Ontario (UWO), Canada.

Brown and Elizabeth Silber, also of UWO, estimated the explosion energy from infrasound waves that rippled halfway around the world and were recorded by an international network of instruments that listens for nuclear explosions.

The explosion was heard by witnesses in Indonesia. Video images of the sky following the event show a dust trail characteristic of an exploding asteroid.

Sudden impact

The amount of energy released suggests the object was about 10 metres across, the researchers say. Such objects are thought to hit Earth about once per decade.

No telescope spotted the asteroid ahead of its impact. That is not surprising, given that only a tiny fraction of asteroids smaller than 100 metres across have been catalogued, says Tim Spahr, director of the Minor Planet Center in Cambridge, Massachusetts. Yet objects as small as 20 or 30 metres across may be capable of doing damage on the ground, he says.

"If you want to find the smallest objects you have to build more, larger telescopes," says Spahr. "A survey that finds all of the 20-metre objects will cost probably multiple billions of dollars."

The White House must develop a policy to address the asteroid hazard by October 2010 under a deadline imposed by Congress. It is likely to be influenced by a report from the National Research Council on the asteroid problem, which is expected by year's end.

http://www.newscientist.com/article/dn18046-asteroid-blast-reveals-holes-in-earths-defences.html

How green is your pet?

- 23 October 2009 by **Kate Ravilious**
- Magazine issue 2731. **Subscribe** and get 4 free issues.
- For similar stories, visit the **Climate Change** Topic Guide

Environmental health hazard (Image: Brand X Pictures/Getty)

1 more image
Editorial: *Cute, fluffy and horribly greedy*

SHOULD owning a great dane make you as much of an eco-outcast as an SUV driver? Yes it should, say Robert and Brenda Vale, two architects who specialise in sustainable living at Victoria University of Wellington in New Zealand. In their new book, *Time to Eat the Dog: The real guide to sustainable living*, they compare the ecological footprints of a menagerie of popular pets with those of various other lifestyle choices - and the critters do not fare well. As well as guzzling resources, cats and dogs devastate wildlife populations, spread disease and add to pollution. It is time to take eco-stock of our pets.

To measure the ecological paw, claw and fin-prints of the family pet, the Vales analysed the ingredients of common brands of pet food. They calculated, for example, that a medium-sized dog would consume 90 grams of meat and 156 grams of cereals daily in its recommended 300-gram portion of dried dog food. At its pre-dried weight, that equates to 450 grams of fresh meat and 260 grams of cereal. That means that over the course of a year, Fido wolfs down about 164 kilograms of meat and 95 kilograms of cereals.It takes 43.3 square metres of land to generate 1 kilogram of chicken per year - far more for beef and lamb - and 13.4 square metres to generate a kilogram of cereals. So that gives him a footprint of 0.84 hectares. For a big dog such as a German shepherd, the figure is 1.1 hectares.

Meanwhile, an SUV - the Vales used a 4.6-litre Toyota Land Cruiser in their comparison - driven a modest 10,000 kilometres a year, uses 55.1 gigajoules, which includes the energy required both to fuel and to build it. One hectare of land can produce approximately 135 gigajoules of energy per year, so the Land Cruiser's eco-footprint is about 0.41 hectares - less than half that of a medium-sized dog.The Vales are not alone in reaching this conclusion. When *New Scientist* asked John Barrett at the Stockholm Environment Institute in York, UK, to calculate eco-pawprints based on his own data, his figures tallied almost exactly. "Owning a dog really is quite an extravagance, mainly because of the carbon footprint of meat," he says.

Eco-pawprints

Then there are all the other animals we own. Doing similar calculations for a variety of pets and their foods, the Vales found that cats have an eco-footprint of about 0.15 hectares (slightly less than a Volkswagen Golf), hamsters come in at 0.014 hectares apiece (buy two, and you might as well have bought a plasma TV) and canaries half that. Even a goldfish requires 0.00034 hectares (3.4 square metres) of land to sustain it, giving it an ecological fin-print equal to two cellphones.

This kind of analysis appeals to David Mackay, a physicist at the University of Cambridge and the UK government's new energy adviser. He believes we should put as much thought into choosing a pet as we do into buying a car. "If a lifestyle choice uses more than 1 per cent of your energy footprint, then it is worthwhile reflecting on that choice and seeing what you can do about it," he says. "Pets definitely deserve attention: by my estimates, the energy footprint of a cat is about 2 per cent of the average British person's energy footprint - and it's bigger for most dogs."

Alternatively, consider the cumulative environmental impact of our furry friends. The US, which tops the list for both cat and dog ownership in absolute terms, is home to over 76 million felines and 61 million canines. Taking the estimated cat population for the top 10 cat-owning countries, the Vales calculate that the land required just to feed these cats is over 400,000 square kilometres. That's equivalent to one-and-a-half times the area of New Zealand. A further five New Zealands are required to feed the pooches living in the top 10 dog-owning countries - which, perhaps surprisingly, does not include the UK.Then there are the other environmental impacts of pets. Every year, for example, the UK's 7.7 million cats kill over 188 million wild animals (*Mammal Review*, vol 33, p 174). That works out at about 25 birds, mammals and frogs per cat. Similar figures have emerged from surveys in the US and Australia. There is also a knock-on effect because cats feasting on wildlife can leave wild predators such as hawks and weasels short of food. Every year the UK's 7.7 million cats kill over 188 million wild animals. That's 25 per cat Dogs are not entirely blameless either. In 2007, Peter Banks and Jessica Bryant from the University of New South Wales in Sydney, Australia, monitored bird life in woodlands just outside the city to assess the impact of dogs being walked there (*Biology Letters*, vol 3, p 611). They showed that bird life in areas frequented by dogs, even when kept on a lead, had 35 per cent less diversity and 41 per cent fewer birds overall. Areas with off-lead dogs seem to suffer even more: ongoing studies in the UK indicate that dogs are aiding the decline of some rare species of bird, such as European nightjars (*Ibis*, vol 149, p 27).

Another major environmental problem, particularly in urban areas, is pet faeces. A study carried out in Nashville, Tennessee, indicated that it is a significant cause of high bacterial levels in local rivers and streams, particularly after heavy rain. As well as making the water unsafe to drink, high bacterial levels can starve waterways of oxygen and kill aquatic life.Cat excrement is particularly toxic. In 2002, it emerged that sea otters along the Californian coast are dying from a brain disease caused by *Toxoplasma gondii*. The parasite, which is found in cat faeces, ends up in rivers and estuaries thanks to cat owners who flush their cat litter down the toilet or allow their cats to defecate outside. Dolphins and whales are also affected (newscientist.com/article/dn14037).So what is an eco-friendly animal lover to do? If you already have a pet, then changing its diet can help. Meat is the key, since its production is so energy-intensive. You can almost halve the eco-pawprint of your dog simply by feeding it many of the same sort of savory foods that you eat, which are likely to be far less protein-rich than most dog foods. As well as quantity, think about quality. "If pussy is scoffing 'Fancy Feast' - or some other food made from choice cuts of meat - then the relative impact is likely to be high," says Robert Vale. "If, on the other hand, the cat is fed on fish heads and other leftovers from the fishmonger, the impact will be lower."Dog owners might also want to avoid walking their dog in wildlife-rich areas, and cat owners could consider keeping Tiddles indoors. "Cats are nocturnal, so the single most important thing people can do to reduce predation is to keep cats in at night," says Michael Woods of the Mammal Society in Southampton, UK.

And if you are thinking of acquiring a pet? "Shared pets are the best - the theatre cat or the temple dogs," says Robert Vale. But if you must own your own, think about getting an animal that serves a dual purpose. He recommends hens, which partly compensate for their eco-footprint by providing eggs. Or there is an even better alternative, if you can stomach it. "Rabbits are good," he says, "provided you eat them."

Kate Ravilious is a science journalist based in York, UK, and the guilty owner of a medium-sized dog

http://www.newscientist.com/article/mg20427311.600-how-green-is-your-pet.html

Meet the superheroes of science

- 22 October 2009 by **Catherine de Lange**

Magazine issue 2731.

This could be you
Read the whole of New Scientist's *Graduate Careers Special at Studentzone*

Catch a bad guy

WHEN the phone rings, Amoret Whitaker drops everything and heads off to a crime scene at a moment's notice. As a forensic entomologist, Whitaker researches the way bugs decompose a body and uses that information to solve crimes. Between cases she works at both London's Natural History Museum and the Body Farm in Tennessee, where she conducts research on cadavers. The job isn't for the faint-hearted, she warns. "You're given information before you get to a crime scene, but it's never the same as seeing it for yourself." And if police are looking for a new lead, a cadaver is taken out of the freezer, which, she says, occasionally entails "collecting frozen maggots off the body".

Sometimes it involves collecting frozen maggots off a body
Keeping a level head is crucial. "However many bodies you've seen, you still have to look at each case with fresh eyes to make sure you collect all the evidence," she says. You also have to be patient as there might be a lot of standing around. "If they are exhuming a body, for instance, you might be there all day waiting for them to get it out of the ground before you can get near it."

When Whitaker isn't looking at maggots or decomposing bodies, she uses the morbidly glamorous nature of her job to encourage young people through the government's "Science: So what? So everything" campaign. "I show them that I'm a scientist doing something exciting that is really useful to society," she says.

Cure a disease

FINDING a cure for diseases like cancer and Alzheimer's is easier said than done. It can take decades and masses of patience. Ask anyone working in drug discovery, though, and they all say the same thing: the potential impact of success makes it worth the wait. "There's always the possibility that

tomorrow you will make something that has a huge impact on everyone's lives," says James Collins, who is working on cancer drugs for his PhD, which is sponsored by Cancer Research UK.

Drug discovery can vary from lab work to direct patient contact in clinical trials, and draws in graduates from a range of backgrounds. Astrophysics graduate Darren Groombridge is a case in point. "I aspired to become an academic researcher, but then I realised I wanted to use my knowledge to benefit society more directly," he says. So he did just that, going on to work as a radiation facilities engineer at the Gray Cancer Institute at the University of Oxford.

The key to success is to address important and ambitious scientific questions - and to be persistent, says Alzheimer's researcher Anthony Fitzpatrick at the University of Cambridge: "The most challenging aspect of my research is that only a fraction of my ideas work. But when they do it's the best feeling in the world."

Prevent a disaster

Back in 1969, a team of scientists discovered that a deadly micro-organism had hitched a ride to Earth on the back of a military satellite, killing every human who had the misfortune to come near it. Luckily, that's just the plot of sci-fi thriller *The Andromeda Strain*. But don't rule out the possibility just yet.

Mike Guest certainly hasn't. He works for aerospace engineers SEA. His job? Preventing any potentially dangerous Martian pathogens from wiping out us earthlings. To do that, Guest is working with the Health Protection Agency and London's Natural History Museum to design a bio-containment facility for a capsule-return mission to Mars. That means making sure any potentially deadly strains on samples are contained, while protecting the samples to preserve them for analysis.

We have to ask though - what are the chances of this actually being used? "It's not massively likely that there is life on Mars, so the chances of picking up something dangerous is very low," says Guest, "but who knows what we might find out between now and sending a Mars return mission in, say, 20 years' time."

Laura Baker also protects us humans, by keeping a watchful eye on some of the most dangerous storms that hit Europe. The aptly named "sting jets" result in very strong surface winds and can cause a lot of damage, says Baker, who is studying the phenomenon for her PhD at the University of Reading. "Only a few cases have been identified so far, so the research is to identify more of them and determine what the important features of these storms are. Ultimately, the aim would be to know enough about them to predict them," Baker says.

You needn't risk your own life chasing tornadoes in a 4x4, either. "My research is all computer modelling, which means things are less likely to go wrong," Baker says. "Utimately, it's something really interesting I can do with maths that has real-life implications."

Whether it's predicting dangerous storms or preventing an alien invasion, a science degree is clearly a useful weapon against impending doom. Luke Alphey is using his to potentially save millions of people - by designing a cunning method of pest control. His company, Oxitec, uses genetically modified insects that mate with pests, but pass on a gene that kills their offspring. "I started in academia with research on *Drosophila* and realised that this type of genetics could be applied to make a major difference in controlling pests all over the world," Alphey says.

His work is now moving from the lab to the field, where it will be used to control the spread of dengue fever. Developing any new technology can be frustrating at times, says Alphey. "With research, the vast majority of things you do don't work," he says, "but we can see that we are heading towards a very real, beneficial impact."

Protect the planet

As we all know, with great power comes great responsibility. So if using your science degree to save the planet just happens to involve travelling to exotic locations, diving among beautiful corals or exploring the Amazon rainforest, then who are you to shirk your duties?

Peter Mumby, a professor of marine ecology at the University of Exeter, is doing his bit for the planet by helping to protect coral reefs from the damaging effects of climate change and ocean acidification. "The ocean is my lab," says Mumby, who spends around four months a year travelling, diving and sailing as part of his work.

"Some of the locations are really remote," he says, "so you have to hire a boat and spend weeks sailing around." On the downside, the weather can get pretty rough, but he says the underwater scenery makes up for it: "I look up and see manta rays and sharks swimming past." How many scientists can say the same of views from their labs? The amount of travel can be excessive, "but it's more a way of life than a regular job", he explains.

Even if your main motivation for doing a PhD is to go and live somewhere exciting, you might get hooked on research. That's what happened to Simon Lewis, a Royal Society research fellow studying how tropical forests are responding to global environmental changes. Lewis enjoyed the two years he spent doing research in the Amazon so much, he now spends a third of the year in Africa working across 10 countries to initiate tropical forest monitoring projects.

Both Mumby and Lewis work with local communities, which means meeting different kinds of people and experiencing unfamiliar cultures. "I meet local people and talk to them about the issues and their priorities," says Mumby, "then I see it translate into a reality and that's really rewarding."

Budding conservationists should start by getting hands-on experience. Volunteer your services even if you have to save up and cover your expenses - few people will turn down free assistance, and you get to build up some invaluable field experience in return.

Making a difference in conservation doesn't just happen at the front line. Lucy Potashnick works for WWF supporting forest and marine conservation work in Kenya, Tanzania and Mozambique. Despite working from a UK office, her support role is crucial to overseas projects that protect dozens of species, from elephants to whale sharks. Potashnick's organisational and time management skills are essential as she has to manage projects, budgets and consultants, while keeping up to speed with what's happening in the field.

However you're saving the planet, passion is essential, says Lewis, especially when in the field. "It will see you through those difficult times where you get ill, have to spend weeks convalescing, then go back out to the forest and carry on."

And remember, Superman might make saving the planet look easy but "conservation isn't successful overnight", says Potashnick. "It can take years to achieve your goals."

Save a child

MOSQUITOES and malaria are usually best avoided, but if you want to beat them, sometimes you have to join them. Ruth Ashton packed her bags and moved to Ethiopia after completing an MSc in control of infectious diseases at the London School of Hygiene and Tropical Medicine. "Adjusting to a new country can be tough, and however much you try, you will always stand out," she says. "But it's usually a positive thing. People are curious to learn about you and are incredibly hospitable."

In the capital, Addis Ababa, Ashton works with Malaria Consortium, a non-profit organisation dedicated to malaria control. Part of her job involves going into schools to collect data about malaria,

which is used to inform policy-makers and optimise disease-control programmes. "There is no typical day," she says. "We will visit 200 rural schools in an area the size of Germany, and test 20,000 children for malaria."

Working out the logistics for four teams involves a delicate balance of priorities due to the seasonality of malaria, the transportation of all the supplies, equipment and staff, and keeping to budget. And let's not forget negotiating the basic road network - which can be "gloriously muddy" - and enduring frequent power cuts.

Nonetheless, Ashton particularly enjoys this hands-on work - visiting the communities to collect data, and being able to use her skills and knowledge to directly benefit others. "That's a reward in itself," she says, "and I get to see spectacular scenery along the way."

Ashton gets paid a local rate salary, which is enough to live on comfortably in Ethiopia, "but wouldn't last long in London and won't make a dent on my student loan". The job is rewarding and fun, but you do need to be independent and resilient, as it can be tough and often requires working in demanding conditions.

If you fancy the challenge, start by getting some international work experience with an NGO or research project. And be prepared to get stuck in to the local culture. "Injera, the staple food of Ethiopia, can be the best or worst thing," says Ashton, "depending on your liking for super-spicy stews on cold, sour pancakes. I'm rather a fan."

Go go gadget

A SUPERHERO is nothing without superpowers or impressive gizmos. Like James Bond's gadget guru Q, "Tom" and "Sarah", who work at the Home Office Scientific Development Branch, can't disclose their names due to the sensitive nature of their work.

Sarah works on devices which put out flames on people, which are crucial for police officer safety. "Fortunately, this hasn't been a major risk for police recently," Sarah says, "but in the past when there were riots where petrol bombs were thrown, fire extinguishers would be used to put out people that were on fire."

The ultimate aim of her job is police protection, and Sarah uses her chemistry background to design and conduct trials of the kit. The job itself is hands-on and the trials - which can involve setting fire to a mannequin with petrol and then putting out the fire - can be very exciting.

While Sarah is busy setting fire to things, Tom is equally busy "breaking stuff". He is responsible for keeping intruders out of secure government buildings or systems, and does this by trying to destroy them first.

"We subject secure doors, locks, and safes to physical attack to make sure that they're going to be good enough for any situation they might be put in," he explains.

An unusual application for a physics degree, but one which offers a lot of variety - between trials Tom is office based, but the trials themselves are in the field.

The real rewards come when the research gets put into practice, says Tom. "When we stop our first terrorist with something I've tested, I'll be happy."

When we stop our first terrorist with something I've tested, I'll be happy

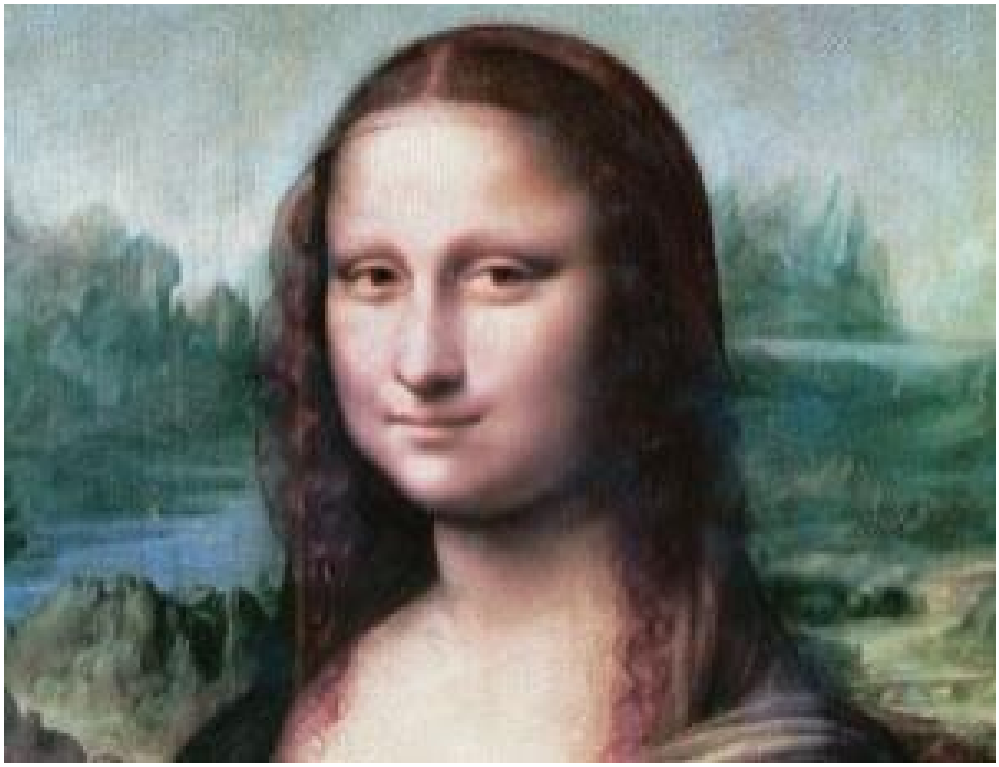
If you prefer heroes with superpowers rather than gizmos, meet Ulf Leonhardt. It's fair to say he gets some strange looks on telling people that he is inventing an invisibility cloak. "I need to explain that this is not magic, but based on familiar ideas, such as optical illusions and the bending of light," he says.

Perfect invisibility is impossible in practice, but practical invisibility can be achieved using concepts like curved space, explains Leonhardt. There are other applications to the research too, like clever schemes to protect coastlines against extreme water waves. "I like imaginative research that is inspired by stories or allegories, but is also practical. And I like that I can tell my science to my children, and they can follow the main ideas and find it cool."

http://www.newscientist.com/article/mg20427312.400-meet-the-superheroes-of-science.html

Mona Lisa's smile a mystery no more

- 20:09 21 October 2009 by **Ewen Callaway**



Is she smiling or serious? It turns out she's sending mixed signals (Image: Wikimedia Commons)

If you have been puzzled by Mona Lisa's smile – how she's radiant one moment and serious the next instant – then your worries are over. It happens because our eyes are sending mixed signals to the brain about her smile.

Different cells in the retina transmit different categories of information or "channels" to the brain. These channels encode data about an object's size, clarity, brightness and location in the visual field.

"Sometimes one channel wins over the other, and you see the smile, sometimes others take over and you don't see the smile," says Luis Martinez Otero, a neuroscientist at Institute of Neuroscience in Alicante, Spain, who conducted the study along with Diego Alonso Pablos.

This isn't the first time scientists have deconstructed Leonardo da Vinci's masterpiece. In 2000, Margaret Livingstone, a neuroscientist at Harvard Medical School with a side interest in art history, showed that Mona Lisa's smile is more apparent in peripheral vision than dead-centre, or foveal, vision. And in 2005, an American team suggested that random noise in the path from retina to visual cortex determines whether we see a smile or not.

Visual pathways

To get a fuller picture of the reasons behind Mona Lisa's vanishing smile, Martinez Otero and Alonso Pablos varied different aspects of the Mona Lisa that are processed by different visual channels, and then asked volunteers whether they saw a smile or not.

To start with, the duo asked volunteers to look at the painting in varying sizes from varying distances. When standing far away or when viewing a tiny reproduction of the portrait, the volunteers had trouble making out any facial expression.

When they moved in closer, or viewed a larger copy of the painting, they began to see the smile – and the larger the picture more likely they were to see it. This suggests that retinal cells that process dead-centre vision convey information about the smile just as well as the cells that contribute to peripheral vision.

Next, Martinez Otero's team compared how light affects our judgement of Mona Lisa's smile. Two kinds of cells determine the brightness of an object relative to its surroundings: "on-centre" cells, which are stimulated only when their centres are illuminated, and allow us to see a bright star in a dark night; and "off-centre" cells, which fired only when their centres are dark, and allow us to pick out words on a printed page.

Light and darkness

Martinez Otero jammed these channels by showing another set of volunteers either a black or white screen for 30 seconds followed by a shot of the Mona Lisa. Volunteers were more likely to see Mona Lisa's smile after they had been shown the dark screen. This would have muted the off-centre cells, leading Martinez Otero to conclude that it is these the on-centre cells that sense the Mona Lisa's smile.

Eye gaze also affects how volunteers see the smile, Martinez Otero says. His team used software to track where in the painting 20 volunteers gazed while they rated whether or not Mona Lisa's smile became more or less apparent.

With a minute to gaze at the painting, volunteers tended to focus on the left side of her mouth when judging her as smiling – further evidence that dead-centre vision picks out the smile. That can't be the whole story, though, because when volunteers had only a fraction of a second to discern her smile, their eyes tended to focus on her left cheek, hinting that peripheral vision plays a role, too.

So did Leonardo intend to sow so much confusion in the brains of viewers, not to mention scientists? Absolutely, Martinez Otero contends. "He wrote in one of his notebooks that he was trying to paint dynamic expressions because that's what he saw in the street."

The research was presented at the Society for Neuroscience's annual meeting in Chicago this week.

http://www.newscientist.com/article/dn18019-mona-lisas-smile-a-mystery-no-more.html

Beyond GDP: We need a dashboard for the whole economy

- 21 October 2009 by **Mike Holderness**

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Nations grow both socially and economically but current indicators reflect only the economic (Image: Jeff Hutchens/Getty)

HOW much political power can one number exert? Gross domestic product (GDP) is a strong candidate for the world's most potent numerical indicator. Politicians use it to rank states in order of production, and to guide policies to maintain their place in the pecking order. Its year-on-year changes dictate whether an economy is "in recession", which in turn influences what you pay for the loan to buy your home or run your business - and, indeed, the price of fish.

But look under the hood at the factors that feed into the calculation of GDP and you'll see some strange goings-on. For one thing, it's full of virtual production and trading. People who own their houses, for example, are deemed to pay themselves rent, which is included in GDP; it has to be this way, to keep the books tidy.

Then there are the important transactions that are not included. No attempt is made to value the services provided by the state, for example. Fees charged by private hospitals are included, but when it comes to state-run hospitals only the goods and services they buy in are deemed to contribute to GDP.

Also unaccounted for is activity in the "informal" economy. As well as dubious or downright illegal activities, this includes things people make and do for themselves, their families and their neighbours without cash necessarily changing hands.

Crucially, existing measures of GDP also fail to reflect the fact that some of the activity that contributes to GDP does harm rather than good. This distortion can encourage false choices - between

promoting GDP and protecting the environment, for example. So jammed roads increase GDP through the increased sales of fuel that is wasted, but do nothing for people's quality of life. And for anyone concerned about air quality, statistics which ignore air pollution produce an inaccurate estimate of public well-being.

This clash between the economic measures of socio-economic phenomena and public perception of the same phenomena spurred President Nicolas Sarkozy of France into action. Early last year, he asked economists Joseph Stiglitz of Columbia University in New York, Amartya Sen of Harvard University and Jean-Paul Fitoussi of Sciences-Po (the Institute of Political Studies) in Paris, France, to set up the Commission on the Measurement of Economic Performance and Social Progress (CMEPSP).

The commission's report was published last month, and the onset of global recession - as determined by old-style GDP - means it is likely to be read more widely than it might otherwise have been. The report itself says that some members of the commission believe one reason the economic crisis took many by surprise is that "our measurement system failed us and/or... market participants and government officials were not focusing on the right set of statistical indicators". As a result, accounting systems "did not alert us that the seemingly bright growth performance of the world economy between 2004 and 2007 may have been achieved at the expense of future growth".

The report's 12 recommendations centre on changing the emphasis from measuring economic production to measuring human well-being, on the problems of defining well-being and - perhaps the thorniest of issues - how to measure environmental sustainability. The report notes that this last goal will require indicators of crises such as those linked to climate change or to the depletion of fishing stocks.

Measuring quality of life directly is not going to be easy. In passing, the report cites such gems as the finding that women in Columbus, Ohio, surveyed about their feelings, or "affect", while carrying out different activities, felt better walking than when they were having sex. Puzzlingly, the same researcher, Alan Krueger of Princeton University, has also discovered that "the correlation between life satisfaction and net affect is only 0.44": people's description of their separate experiences does not predict very well how they feel about their lives.

Yet "hedonology", as the study of pleasure is called, remains more interesting than the accountant's standard way of measuring well-being, which is to ask about our willingness to pay cash for an equivalent experience. Other efforts, such as the UN's Human Development Index are, say the commission's authors, too closely tied to GDP.

And what shall it benefit you to have cash or hedonic experiences now, if you know it will soon be all over? Proposing a sustainability index brings us up against the core of standard economics, from Adam Smith in the 18th century, right up to the present day: the zero value normally ascribed to natural resources.

Environmental groups promote the idea of the "carbon footprint" or general "resource footprint" as an index of sustainability. But it has been left to the World Bank, often seen as conservative, to develop a more radical measure it calls Adjusted Net Savings, which treats resources as capital.

The authors of the CMEPSP report stress that treating resources as assets or capital goods "does not mean at all that we consider that these assets should all be privately owned or submitted to market forces". Rather, many of them are "collective assets that cannot be managed efficiently by market mechanisms". Have we returned to the 17th-century English activist Gerard Winstanley's insistence that resources are "a common treasury for all to live comfortably upon"?

Any index of sustainability is bound to have little in common with the after-the-fact accounting that produces GDP, because it is, essentially, modelling the future. Here, we collide with the most miserable tool in the box of economics tricks: the measure of people's pessimism known as the discount factor.

If I offer you either £5 today or £10 one year hence, you are likely to take the £5. On this basis, your discount factor with respect to me is 50 per cent per year. Even using a modest 5 per cent discount factor for future environmental damage, a million units of damage done 100 years in the future has a net present value of few thousand units. The future simply disappears from capitalism's books.

Whatever index is used, reducing an entire economy's performance - and especially its sustainability - to a single integer is bound to lose a great deal of information. The CMEPSP report therefore envisages a "dashboard" of measures. As it argues, "a meter that weighed up in one single value the current speed of the vehicle and the remaining level of gasoline would not be of any help to the driver".

The report nevertheless acknowledges that if politicians do accept an alternative index, it will have immense power to drive policy. And prospects for acceptance turn out to be good. On 8 September, the European Commission issued a communication committing itself to "working to complement GDP and National Accounts (which presents production, income and expenditure in the economy) with environmental and social accounts". The European Commission has already adopted many of the report's proposals.

An alternative economic index will have immense power to drive policy
Despite such hopeful signs, GDP isn't going to go away any time soon. The ratio of GDP to national debt may be meaningless, but it looks seductively like real accounting. Currency traders won't feel well-informed if they express national debt as a multiple of happiness or green prudence. Producing useful tools for guiding policy - never mind ideal ones - is going to take a while. But at the very least, exploring the CMEPSP report's recommendations will promote an interesting social and scientific discussion of what "sustainable" and "happy" mean to each of us.

Profile

Mike Holderness is a writer and editor. He has written reports for the Royal Society, including *The weather turned upside-down? Abrupt Climate Change: Evidence, mechanisms and implications*, and edited the final report of the Information Society Forum for the European Commission

*www.newscientist.com/.../mg20427311.200-**beyond-gdp-we-need-a-dashboard-for-the-whole-economy**.html*

Phantom storms: How our weather leaks into space

- 06 October 2009 by **Jon Cartwright**

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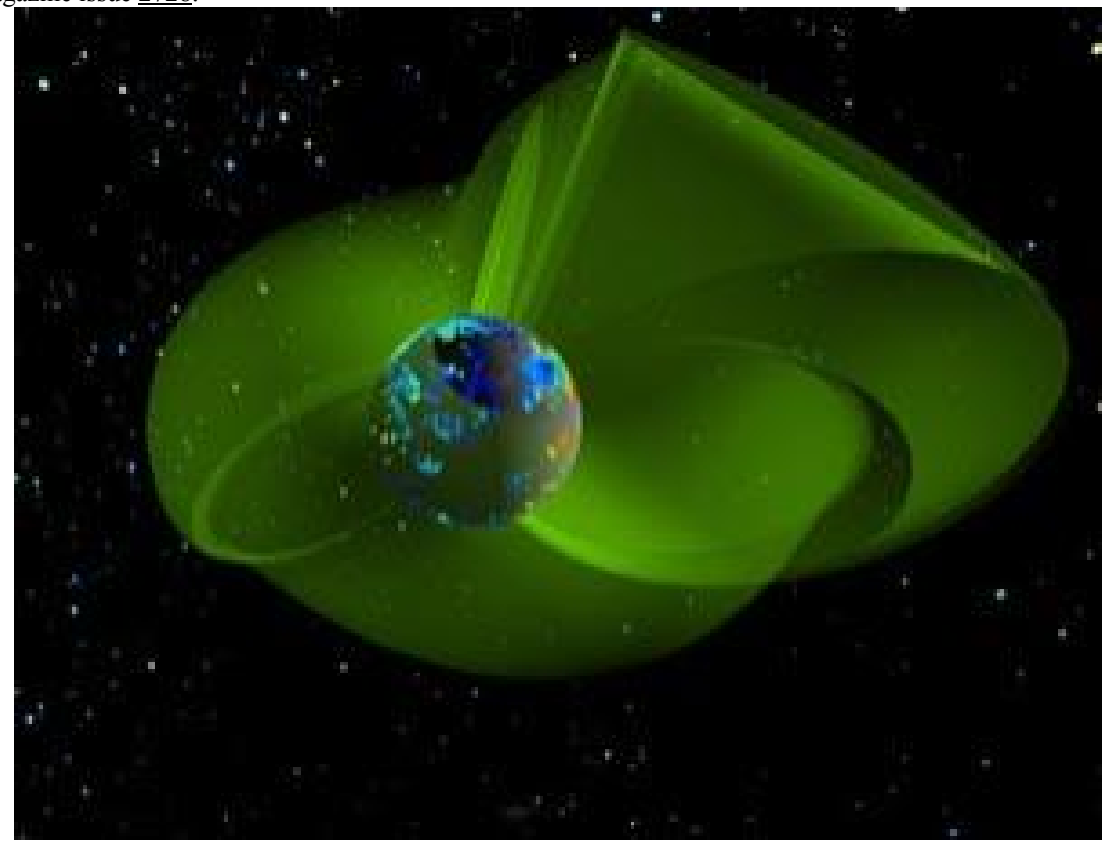


Electron disturbances in the upper atmosphere. Terrestrial weather as well as solar activity may be exerting an influence on this region. (Image: NASA/GSF)

1 more image

WHETHER it's showering spacecraft with lethal radiation, filling the sky with ghostly light, or causing electrical surges that black-out entire cities, space weather is a force to be reckoned with.

Thankfully, all is calm in space on the day that I speak to Bill Murtagh at the US National Oceanic and Atmospheric Administration in Boulder, Colorado. "Last week we saw a moderate storm, and that was about the most interesting event in months," he reassures me. "It's pretty quiet today."

And Murtagh should know - his job is to forecast space weather, which comprises any disturbance in near-Earth space, including the upper reaches of the Earth's atmosphere where satellites roam. Many of the serious events involve disturbances in the charged portion of the atmosphere, known as the ionosphere, which stretches from 80 to 1000 kilometres above sea level. The finger of blame has always been pointed at the sun, which bombards the Earth with a stream of charged particles in the form of the solar wind. During the last three years, though, the sun's cycle of activity has hit a trough, and as Murtagh observes, space weather is temporarily calm.

Yet if the sun really is the only cause, things haven't been quite as quiet as we might have expected. Despite the solar lull, activity in the ionosphere still hots up occasionally - with ghostly tides of charged particles that throw GPS systems out of whack and block radio communication. It seems that

as much as one-fifth of this space weather cannot be blamed on the sun after all. If the cause of these charged-particle surges is not above the atmosphere, it must be somewhere below. But where?

Pinning down their exact origin is a tough challenge. Since the 1960s, at least, reports have suggested apparent links with earthquakes. In Taiwan, researchers claim the majority of tremors between 1999 and 2002 appeared to attract or repel the ionosphere from its normal altitude. Exactly how an earthquake could trigger changes high in the atmosphere remains unclear, leaving many sceptical of a connection.

Other reports feature space-weather events occurring in tandem with terrestrial weather events that occur in the two lower layers of the atmosphere,the troposphere and the stratosphere, which lies between 15 and 50 km above sea level. A link here had always seemed plausible, since the lower atmosphere holds so much energy that just a small leak into the upper atmosphere could have a big effect. As far back as 1950, Chinese researchers reported that the ionosphere seemed to distort during the approach of a typhoon. More recently, US studies reported that the ionosphere appears to become distorted during the southern El Niño weather pattern.

Unfortunately, none of these observations has been repeated often enough to convince sceptics that they are anything more than coincidence. Ionospheric behaviour is so complex, and the data sets so small, that there is a risk of seeing connections that simply aren't there. Henry Rishbeth, one of the pioneers of ionospheric physics at the University of Southampton in the UK, once remarked that the search for links between the ionosphere and the lower atmosphere "has a long history and few real outcomes".

Yet history, it seems, is willing to offer the occasional break. In 2007 Larisa Goncharenko, an ionosphere researcher at the Massachusetts Institute of Technology, was delighted to hear that solar activity was fast approaching its lowest ebb since the 1920s.

Excited at the prospect of collecting data without the usual distracting hubbub of solar wind, she decided to focus on a phenomenon called a "stratwarm" - a sudden warming of the stratosphere above the North Pole, which can last for up to a week.

Crucially, a stratwarm can be accurately predicted a few weeks or so in advance. That would give Goncharenko enough time to prepare all 10 of the world's incoherent scatter radars to measure the ionosphere during the event. Such radars bounce signals off of the electrons in the ionosphere. The signal that is scattered back reveals its temperature and the movement of charged particles, among other things.

Such a large-scale experiment spanning the entire globe, she hoped, should quash any doubts that any apparent influence was simply a coincidence - if she was lucky enough to see one at all. And any indication of an interaction between the lower and upper atmosphere would add strength to the possibility that other phenomena, like hurricanes or El Niño, could also have an effect on space weather.

Record stratwarm

With a big stratwarm predicted for January 2008, Goncharenko put the plan in motion. "It turned out to be a record-breaking warming," she says. "We kept asking for the radars to continue operations for as long as they could - pleading, begging and appealing to the inner scientist in every person who had to make the decision."

The first results were clear: during the stratwarm, MIT's own radar station detected a warming at altitudes of around 130 km, and a cooling at higher altitudes, starting at 160 km - both deviating by as much as 80 °C from an average temperature of 230 °C. Unlike sun-driven space weather, which tends

to peak around midday, these changes peaked in the morning and afternoon (*Geophysical Research Letters*, vol 35, p L21103). Somehow, the stratosphere above the North Pole was linked to the ionosphere above Massachusetts, some 100 km higher and 4000 km south.

The MIT results were not alone. In a radar station at the Arecibo Observatory in Puerto Rico, unusual movements were detected in the charged particles in the ionosphere that coincided with the stratwarm event. And at Poker Flat Research Range in Fairbanks, Alaska, the team observed that the wind patterns in the ionosphere above seemed unusually agitated, with vast and rapid changes in the wind speed and direction.

Perhaps the most significant results emerged from the Jicamarca Radio Observatory near Lima, Peru, where its director Jorge Chau observed unusual patterns in the movements of charged particles in the ionosphere. During that same January stratwarm, the ions and electrons rose in the mornings and fell in the afternoons, at speeds of over 60 metres per second. Intrigued, Chau looked back at three previous stratwarm data sets. In each case, he discovered similar patterns (*Geophysical Research Letters*, vol 36, p L05101).

That drift of particles is enough to reshape the ionosphere. When Goncharenko and her MIT colleague Anthea Coster examined data on the passage of satellite signals during previous stratwarm events for more clues, she found the density of charge in the ionosphere appeared to vary periodically from half to double its original value due to this drift.

So far, all results from Goncharenko's widespread survey point strongly towards a link between the stratosphere and the upper atmosphere. "In a casino, it's called hitting a blackjack," she says. "In research, it's a successful experiment."

The question remained: how exactly might weather on Earth drive these space-weather events. No process known to atmospheric physics would allow a specific local phenomenon like the stratwarm to propagate all the way from the stratosphere above the North Pole to the ionosphere above the equator.

There was no process known to atmospheric physics that would allow a local phenomenon to propagate all the way from the stratosphere above the North Pole to the ionosphere above the equator
So maybe the stratwarm and the non-solar space weather are just symptoms of a deeper disruption in the atmosphere. Since the 1970s, we have known that a stratwarm is the result of a natural oscillation in the air currents that usually flow in the stratosphere. During a stratwarm, this oscillation, known as a "planetary wave", temporarily disrupts the air circulation above the North Pole, which leads the air to become compressed and heated.

Perhaps it's the planetary wave, and not the stratwarm itself, that triggers the anomalous space weather events. That's the conclusion of Hanli Liu at the US National Center for Atmospheric Research in Boulder, Colorado. Liu has designed computer simulations that he claims reveal the chain of events in the lower and upper atmosphere that link terrestrial weather to space weather.

While the planetary wave only travels in the stratosphere, Liu proposes that as it travels south it amplifies another atmospheric wave, known as the "tidal wave", which is a daily oscillation that arises due to the heating and subsequent cooling of the atmosphere during day and night. The amplified tidal wave then propagates to higher altitudes, including the ionosphere, driving the movement of positive ions and neutral atoms. Importantly, the electrons in the ionosphere are too small to be caught in the collisions, so they are not carried by the wave. The result is a polarised ionosphere, which creates an electric field. When this field interacts with the Earth's magnetic field, the resulting forces cause the charged particles to drift in a direction perpendicular to both fields, which at the equator is either upwards or downwards, depending on the direction of the electric field (see diagram).

As Goncharenko and Coster's observations suggested, this drift can shape how much charged material the ionosphere holds. If the particles move upwards, they reach higher altitudes where the air is less dense, making it less likely that the electrons and positive ions recombine to form neutral particles. The result would be an increase in the amount of charged material in the ionosphere. But if they are forced downwards to lower altitudes, where the air density is greater, recombination becomes more likely and the ionosphere will lose charged material and shrink.

Broken signals

Either result could have serious implications for communications. One of the few ways of transmitting signals across long distances is to bounce short-wave radio waves off the ionosphere, enabling them to reach over the horizon. It's what allows you to pick up the BBC's World Service almost anywhere, or to tune in to ham radio channels from across a continent. If the ionosphere is lurching up or down at 60 metres per second, say, these signals could be disrupted.

More concerning is the possible impact on global positioning systems. GPS receivers make their measurements by timing the arrival of radio signals sent from several satellites in known orbits. From this, a receiver calculates its distance from each satellite, and discerns its own position. But if the ionosphere swells, its refractive index increases, which slows the arrival of any signals that passed through the bulge and could throw off the receiver's measurements by as much as 30 m.

When the ionosphere bulges, it could slow the arrival of satellite signals, throwing a GPS receiver's measurements out by up to 30 metres
For ramblers orienting themselves on a hillside, such an error might be slightly irritating, not a disaster. But GPS also steers ships along rivers, lands planes and guides cruise missiles and smart bombs. In these cases, an error of 30 m could be catastrophic.

There are systems in place to avoid mishaps. The size of the satellite-signal delay also depends on the frequency of the signal, so by comparing two signals of different frequency, some military receivers can estimate the ionosphere's depth and correct its readings.

Few civilian receivers have the capability to estimate the depth of the ionosphere, though. Aerospace companies, for example, typically only deploy this advanced technique at their base stations. If they detect any anomalous activity that might throw off GPS, they issue warnings to planes. That's fine if the ionosphere is relatively level, but errors could still creep in if the ionosphere is bumpy - if there's a bulge directly above the plane but not above the base station, for example. "You can foresee a problem happening in the future," says Coster. The only solution, she says, will be to build better forecasts that account for the impact of stratwarms on space weather.

The movement of particles in the upper atmosphere caused by the planetary wave could also affect the drag on satellites by changing its speed, that could alter a satellite's orbit or throw it off course during a manoeuvre - to avoid space junk, for example. Better forecasts of space weather would add greater precision to these movements.

These matters will be all the more urgent when solar activity revives from its lull. That's because the solar wind feeds the ionosphere by ionising neutral atoms. It's relatively thin at the moment, but it will bloat out again during the next solar cycle - potentially amplifying all space weather events, including those linked to stratwarms.

Climate change

There may be more to worry about than escalating solar activity, though. In the past few years, stratwarms have been at their strongest and longest-lasting since regular records began three decades ago. During a stratwarm in January this year, for example, the air above the North Pole heated by 70 °C above its winter average of -50 °C - exceeding typical summer temperatures. Some speculate that

this trend is a product of climate change, and warn that if it is a reflection of a change to the underlying planetary waves, it could have a big impact on space weather. "This is an open question: the climate implication requires long-term monitoring and modelling studies," Liu notes.

Not everyone, of course, is convinced that the link between stratwarms and space weather is sufficiently robust to revise space weather forecasts just yet. True, Goncharenko has recorded an effect all over the globe and covered many different aspects of space weather, and her observations seem to be supported by previous records of space weather during stratwarm events. But some researchers, like Tim Fuller-Rowell at the University of Colorado at Boulder, want to see the same results repeated many more times before they are convinced. "The question is, how reproducible is it? Is it just another source of variability along with all the other day-to-day changes, or is this a much more predictable, consistent response?"

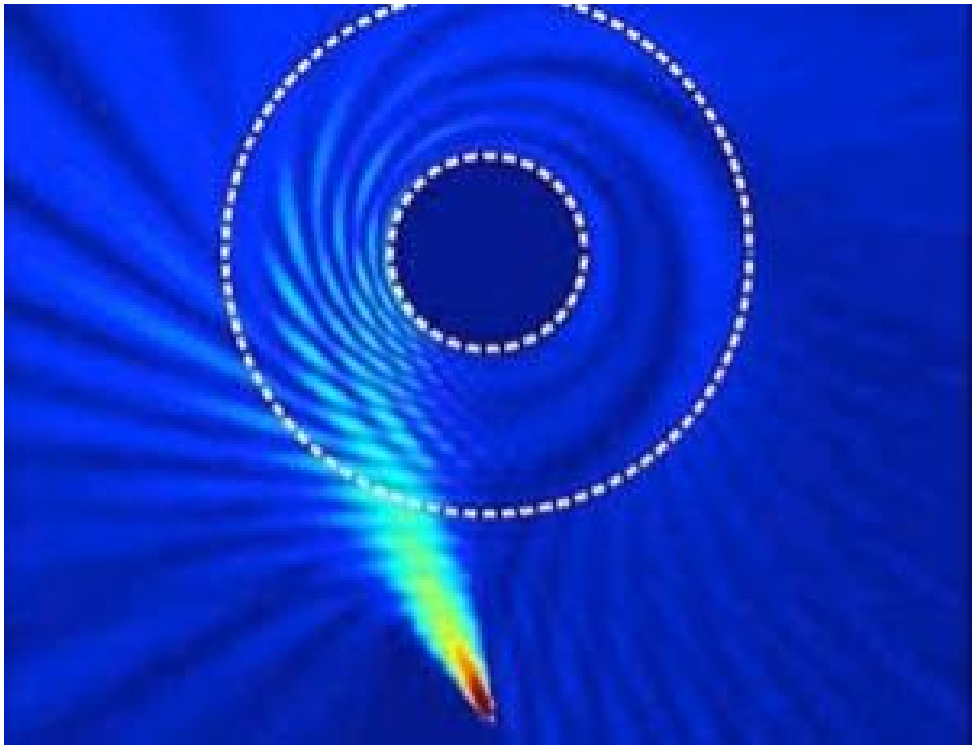
As reliance on satellite technology continues to grow, an answer to these questions cannot come soon enough. Goncharenko has been combing through more sets of past data to verify her results, and so far she hasn't found anything that has shaken her conviction. "One researcher said he remembered several strange cases of ionospheric variations, and asked us to check if there was anything happening in the stratosphere at that time," she recalls. "For every case of odd behaviour in the ionosphere, there was a stratospheric warming - and in 15 minutes he turned from sceptic to believer."

Jon Cartwright is a freelance journalist based in Bristol, UK

http://www.newscientist.com/article/mg20427281.600-phantom-storms-how-our-weather-leaks-into-space.html

First black hole for light created on Earth

- 17:13 14 October 2009 by **Anil Ananthaswamy**



The full-wave simulation result when light is incident to the black hole (Image: Qiang Cheng and Tie Jun Cui)

An electromagnetic "black hole" that sucks in surrounding light has been built for the first time.

The device, which works at microwave frequencies, may soon be extended to trap visible light, leading to an entirely new way of harvesting solar energy to generate electricity.

A theoretical design for a table-top black hole to trap light was proposed in a paper published earlier this year by Evgenii Narimanov and Alexander Kildishev of Purdue University in West Lafayette, Indiana. Their idea was to mimic the properties of a cosmological black hole, whose intense gravity bends the surrounding space-time, causing any nearby matter or radiation to follow the warped space-time and spiral inwards.

Narimanov and Kildishev reasoned that it should be possible to build a device that makes light curve inwards towards its centre in a similar way. They calculated that this could be done by a cylindrical structure consisting of a central core surrounded by a shell of concentric rings.

There's no escape

The key to making light curve inwards is to make the shell's permittivity – which affects the electric component of an electromagnetic wave – increase smoothly from the outer to the inner surface. This is analogous to the curvature of space-time near a black hole. At the point where the shell meets the core, the permittivity of the ring must match that of the core, so that light is absorbed rather than reflected.

Now Tie Jun Cui and Qiang Cheng at the Southeast University in Nanjing, China, have turned Narimanov and Kildishev's theory into practice, and built a "black hole" for microwave frequencies. It is made of 60 annular strips of so-called "meta-materials", which have previously been used to make invisibility cloaks.

Each strip takes the form of a circuit board etched with intricate structures whose characteristics change progressively from one strip to the next, so that the permittivity varies smoothly. The outer 40 strips make up the shell and the inner 20 strips make up the absorber.

"When the incident electromagnetic wave hits the device, the wave will be trapped and guided in the shell region towards the core of the black hole, and will then be absorbed by the core," says Cui. "The wave will not come out from the black hole." In their device, the core converts the absorbed light into heat.

Quick work

Narimanov is impressed by Cui and Cheng's implementation of his design. "I am surprised that they have done it so quickly," he says.

Fabricating a device that captures optical wavelengths in the same way will not be easy, as visible light has a wavelength orders of magnitude smaller than that of microwave radiation. This will require the etched structures to be correspondingly smaller.

Cui is confident that they can do it. "I expect that our demonstration of the optical black hole will be available by the end of 2009," he says.

Such a device could be used to harvest solar energy in places where the light is too diffuse for mirrors to concentrate it onto a solar cell. An optical black hole would suck it all in and direct it at a solar cell sitting at the core. "If that works, you will no longer require these huge parabolic mirrors to collect light," says Narimanov.

Journal references: *Applied Physics Letters* (vol 95, p041106), and "An electromagnetic black hole made of metamaterials" by Tie Jun Cui and Qiang Cheng's (preprint archive)

http://www.newscientist.com/article/dn17980-first-black-hole-for-light-created-on-earth.html

Testicular tumours linked to offsprings' disease

- 18:00 25 October 2009 by **Linda Geddes**

Genetic disease is more likely in the children of older fathers – but why? Part of the answer may be that benign testicular tumours, more common in older men, give rise to sperm containing disease-causing mutations.

Anne Goriely of the University of Oxford and her colleagues took tumour cells from men with benign testicular tumours and looked for specific mutations in the *FGFR3* and *HRAS* genes. These mutations have been linked to rare developmental diseases such as achondroplasia, or "dwarfism", and Costello syndrome, a condition that involves skin deformities and mental retardation. They have also been linked to some stillbirths.

The researchers found the same mutations in the tumour cells, but not in normal sperm-producing cells located nearby. They concluded that the sperm made by these cells contained the disease-containing mutations and that the mutations may be driving the growth of the tumours.

Older men are more likely to have testicular tumour cells, so more of their sperm-producing cells will contain these mutations.

A lot of men have these cells without knowing it because they often fail to develop into discernible tumours. "In most cases we think the body's growth control mechanisms eventually stop the cells from proliferating further, but in occasional cases where additional mutations occur in the clump of cells, a tumour will eventually develop," says Andrew Wilkie also of the University of Oxford, who supervised the work.

He likens them to moles in the skin, which are also benign tumours that stop growing. "But being located in the testicle, these cells also make sperm – causing children to be born with a variety of serious conditions," Wilkie says.

Because all ageing men may be subject to this process, screening is unlikely to be much help.

Journal Reference: *Nature Genetics*, DOI: 10.1038/ng.470

http://www.newscientist.com/article/dn18039-testicular-tumours-linked-to-offsprings-disease.html

Stop giving antipsychotics to people with dementia

- 19 October 2009 by **Irving Kirsch**

Magazine issue 2730.

Antipsychotic medication may not be the answer (Image: Andrzej Krauze)

ARE we too quick to prescribe psychotropic medication for emotional and behavioural problems? Take Alzheimer's disease. In an attempt to reduce their aggressive behaviour, up to 60 per cent of people with Alzheimer's in Europe and North America are prescribed antipsychotic medications such as Risperdal (risperidone) and Zyprexa (olanzapine). The estimated cost of these drugs is £80 million a year in the UK alone.

People given antipsychotics are sedated and become less aggressive or agitated, but compared with placebo the benefits seem modest at best. In 2006, a 42-centre trial in the US found no significant differences between antipsychotic drugs and placebo after 12 weeks. Other trials showed some advantages of drugs over placebo, but these were "modest" (*Cochrane Database of Systematic Reviews*, DOI: 10.1002/14651858.CD003012.pub2).

The risks, however, are large. According to the UK Medicines and Healthcare Products Regulatory Agency, the medication produces a threefold increase in the risk of stroke (www.bit.ly/NN8p0). The drugs also double the risk of dying over a three-year period, according to a study funded by the UK's Alzheimer's Research Trust (*The Lancet, Neurology*, vol 8, p 151).

Last week, 10 dementia groups, including the trust, demanded the UK government publish a long-delayed review of the use of antipsychotic drugs in dementia.

The issue is not that people don't improve when given antipsychotic drugs: they do. But so do patients in trials who are given a placebo, and they improve nearly as much as those given the drug.

This may be good news for Alzheimer's patients, as a strong placebo effect means non-drug treatments may work well. There may be lessons to be learned here from similar treatments for depression - which also responds well to placebo, and only minimally better to drugs.

Traditional psychotherapy, which works for depression, might be little use to cognitively impaired people. But cognitive behavioural interventions have shown benefits: for example, in one small UK study of five patients, such techniques were found to help control aggressive and agitated behaviour (*International Journal of Geriatric Psychiatry*, vol 16, p 45). Exercise - which is even more effective for moderate to severe depression than for mild to moderate depression - has also shown promise for diminishing aggression. A structured walking programme in one nursing home resulted in a 30 per cent decrease in aggression among severely demented patients (*Archives of Psychiatric Nursing*, vol 11, p 21).

A "consensus statement" by 16 practitioners published last year in *The Journal of Clinical Psychiatry* (vol 69, p 889) urged that antipsychotic drugs be used to treat dementia-related agitation and aggression "only when non-pharmacologic approaches have failed". Research on non-drug treatments is thin on the ground, but with millions facing dementia, we urgently need them in our armoury.

Irving Kirsch is at the Department of Psychology, University of Hull, UK. His latest book is The Emperor's New Drugs (The Bodley Head)

http://www.newscientist.com/article/mg20427305.900-stop-giving-antipsychotics-to-people-with-dementia.html

Placebo effect caught in the act in spinal nerves

- 14:41 16 October 2009 by **Ewen Callaway**

The placebo effect is not only real; its ability to deaden pain has been pinpointed to cells in the spinal cord. That raises hopes for new ways of treating conditions such as chronic pain.

The researchers who made the discovery scanned the spinal cords of volunteers while applying painful heat to one arm. Then they rubbed a cream onto the arm and told the volunteers that it contained a painkiller – but in fact it had no active ingredient. Even so, the cream made spinal-cord neural activity linked to pain vanish."This type of mechanism has been envisioned for over 40 years for placebo analgesia," says Donald Price, a neuroscientist at the University of Florida in Gainesville, who was not involved in the new study. "This study provides the most direct test of this mechanism to date."

Indeed, the biggest obstacle to establishing the spinal cord's role in placebo pain relief was measuring its activity with fMRI scanning, says Falk Eippert, a neuroscientist at the University Medical Centre Hamburg-Eppendorf in Germany, who led the study.

Squeezing a scan

FMRI scanning has long been used to image the brain, but the part of the spinal cord that Eippert's team was interested in – the dorsal horn – is minuscule in comparison, and so is harder to image. It also swims around in cerebrospinal fluid, further complicating real-time measurement.The team's first breakthrough was to squeeze an fMRI signal out of the spinal cord. Then they quickly adapted the technique to study placebo pain relief.This meant telling 13 volunteers a white lie. They were told that the researchers were testing how effective a painkilling cream was, with an inactive cream as a control on the trial.In fact, neither cream contained anaesthetic. However, when Eippert's team applied the alleged painkilling cream for the first time, they turned down the intensity of painful heat stimulation to 40 per cent of each volunteer's pain threshold – 46 °C on average. When the team tested the alleged control cream, they kept the temperature set at 80 per cent of the pain threshold – an average of 47 °C.

Because of this "fixing" of the temperatures, the volunteers would think, "'OK, this really seems to work, and it will work when I take it the next time,'" Eippert explains.

Feeling the heat

Later, with an fMRI scanner on, the researchers rubbed "control" and "painkiller" creams onto two different spots on each volunteer's left forearm and applied the same level of heat to each spot, 15 times.The fake "painkiller" cream worked: volunteers said they experienced 26 per cent less pain on the "painkiller"-treated patch of their arm, compared with the "control"-treated area.Meanwhile, the fMRI scanner witnessed the placebo effect. When skin treated with the "control" cream was heated, an area of the dorsal horn located on the left side of volunteers' lower necks lit up, suggesting increased neural activity there in response to pain. However, this signal disappeared in the "painkiller" trials.Eippert's team didn't discover what caused this shift. He speculates that higher brain areas involved in buying into the bogus treatment trigger the release of endogenous opioids – chemicals our brain produces that work like opiates and may temper spinal cord activity.

Now that researchers know the neural hallmark of placebo pain relief, they could use it to develop treatments, cognitive or chemical, that take better advantage of belief, Eippert says.

Journal reference: *Science*, DOI: 10.1126/science.1180142

http://www.newscientist.com/article/dn17993-placebo-effect-caught-in-the-act-in-spinal-nerves.html

Women have 'same heart symptoms'

It is a myth that women have different heart attack symptoms from men, according to Canadian researchers.

A study presented at the Canadian Cardiovascular Congress found no gender differences in symptoms after studying 305 patients undergoing angioplasty.

They say it is a commonly held belief that men and women feel the effects of a heart attack differently.

Dr Beth Abramson, of Canada's Heart and Stroke Foundation, said: "Heart disease is an equal-opportunities killer."

'The Myth'

In 2003 a study by the US National Institutes of Health did suggest that many women never had chest pains and that their symptoms were not as predictable.

WARNING SIGNALS OF A HEART ATTACK
- Pain
- Shortness of breath
- Nausea
- Sweating
- Fear

Martha Mackay, who led the Canadian research, said these latest findings suggested that this simply was not the case.

In the study, researchers found was that the women had all the classic symptoms like chest pain and also tended to have pain in the throat, jaw and neck.

She said: "Clear educational messages need to be crafted to ensure that both women and healthcare professionals realise the classic symptoms are equally common in men and women."

The average age of the people undergoing angioplasty was 63 and nearly 40% of them were women.

'No gender differences'

As part of the angioplasty procedure a balloon is inflated inside the blocked blood vessel to stretch it out.

This can briefly cause pain and discomfort which is the same as the patient would feel if they are having a heart attack.

During inflation, the patients were questioned about their current sensations and an electrocardiogram measurement was taken before inflation and when the balloon was deflated.

A total of 245 (83%) had ischemia or a decreased blood supply in their blood vessel.

No gender differences were found in rates of chest pain or typical acute coronary syndrome (ACS) symptoms regardless of their ischemic status.

Women were significantly more likely to report throat, jaw and neck discomfort, as well as only non-chest discomfort.

The gender effect was increased after controlling for age, urgency, a prior heart attack or a prior angioplasty.

Dr Beth Abramson, of the Canadian Heart and Stroke Foundation, said that while women may describe their pain differently from men, the most common symptom in women was still chest pain.

She said: "Heart disease is an equal opportunities killer - the differences between women and men are negligible.

"Women do tend to present about seven to 10 years later than men when they are older and sicker.

"The first thing most people feel is a heaviness in the chest and we all need to be aware of that."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8322754.stm

Published: 2009/10/25 11:07:08 GMT

Antidepressants 'work instantly'

By Michelle Roberts
Health reporter, BBC News

Antidepressants get to work immediately to lift mood, contrary to current belief, UK researchers say.

Although patients may not notice the effects until months into the therapy, the team say they work subconsciously.

The action is rapid, beginning within hours of taking the drugs, and changes negative thoughts, according to the Oxford University researchers.

These subtle, positive cues may add up over time to lift the depression, the American Journal of Psychiatry reports.

It may also explain why talking therapies designed to break negative thought cycles can also help.

" **We found the antidepressants target the negative thoughts before the patient is aware of any change in feeling subjectively** "
Lead researcher Dr Harmer

Psychiatrist Dr Catherine Harmer and her team at Oxford University closely studied the reactions of 33 depressed patients and 31 healthy controls given either an antidepressant or a dummy drug.

The depressed patients who took the active drug showed positive improvements in three specific measures within three hours of taking them.

These patients were more likely to think about themselves in a positive light, rather than dwelling on their bad points, the researchers said.

They were also more likely to see the positive in others.

For example, if they saw a grumpy person they no longer internalised this to think that they must have done something wrong to upset the person.

New drugs

This was despite feeling no improvement in mood or anxiety.

Dr Harmer said: "We found the antidepressants target the negative thoughts before the patient is aware of any change in feeling subjectively.

"Over time, this will affect our mood and how we feel because we are receiving more positive information."

She said the findings could help scientists looking for new drugs to treat depression.

Dr Michael Thase, a psychiatrist from the University of Pennsylvania, said the findings challenged conventional wisdoms and were potentially "paradigm-changing".

But he said much more research was needed.

"The highest research priority is to confirm that the rapid effects observed in this study are predictive of eventual clinical benefit."

He said it was possible that switching off the negative thoughts was a crucial part of the therapy.

Alternatively, it might merely be a sign that the drug was beginning to work at the cell level in the brain.

Paul Farmer, chief executive of Mind, said: "This research may contribute to our understanding of how our bodies respond to antidepressants, but the changes recorded can't always be felt by patients and it can be some weeks before they begin to feel the symptoms of depression easing.

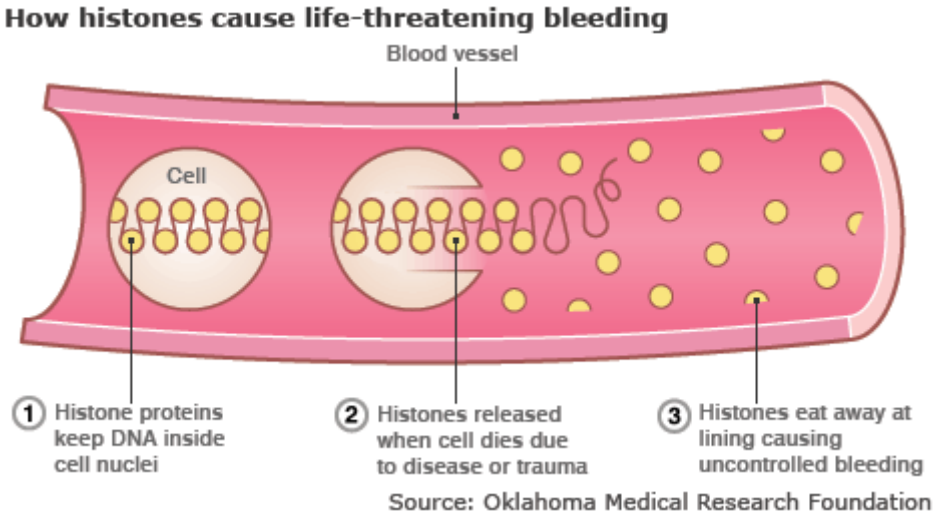
"We must also remember that the side-effects of medication can often be felt straight away long before the benefits really kick in, and this will always affect people's experiences in the initial stages of treatment."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8304782.stm

Published: 2009/10/26 00:37:16 GMT

Antibody 'fixes internal bleeds'

Scientists say they have discovered an antibody that could minimise the major internal bleeding seen in traumas like bullet wounds and car crashes.



The team at Oklahoma Medical Research Foundation (OMRF) has discovered that a protein called histone is responsible for much of the damage.

They say they have found a specific type of antibody that can block the ability of histone to cause damage.

They say it could lead to new ways to treat diseases and serious injuries.

'Life threatening'

Writing in the journal, Nature Medicine, the OMRF researchers found that when mice had a bad blood stream infection (sepsis), their blood contained high levels of histones.

They checked this in primates and humans and found the same result.

The histone protein normally sits in the nucleus of a cell, packed around the strands of DNA.

It regulates the DNA, causing it to fold and form the characteristic double helix.

When the cell is damaged by injury or disease, the histone is released into the blood system where it begins to kill the lining of blood vessels, causing damage, the OMRF researchers said.

This, they believe, results in uncontrolled internal bleeding and fluid build-up in the tissues, which are life threatening.

Dr Charles Esmon, of OMRF who led the research, said: "When we realised that histones were so toxic, we immediately went to work looking for a way to stop their destructive tendencies."

Mouse antibody

Marc Monestier, a colleague at Temple University in Philadelphia, had already discovered a specific type of antibody known as a monoclonal antibody that could block the histones.

It had been observed that patients with auto-immune diseases make antibodies to the proteins in their cell nuclei but it was not known why.

This antibody came from a mouse with an auto-immune disease.

The OMRF team have tested the antibody in mice with sepsis and it does stop the toxic effects of the histones and they recover, the researchers say.

They now want to test it in primates and eventually humans.

Dr Esmon said histones were similar in all mammals because they were such basic building blocks.

So a mouse antibody should work equally well in a human.

He said: "We think it was an adaptation during evolution.

"Millions of years ago, when people and animals got ill, they did not die of heart attacks or car accidents they died of infectious diseases.

"Their immune systems went into overdrive throwing everything at it and we believe the histones in the cell nucleus, part of the basic building blocks of life, were the last resort."

Dr Stephen Prescott, president of OMRF, said: "These findings offer some clues as to why people suffering from one traumatic injury often experience a catastrophic 'cascade' of secondary traumatic events.

"If we can figure out how to control the initial injury, perhaps that will stop the domino effect that so often follows."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8322454.stm

Published: 2009/10/26 00:36:14 GMT

'Freezer plan' bid to save coral

By Matt McGrath
BBC News, Copenhagen

The prospects of saving the world's coral reefs now appear so bleak that plans are being made to freeze samples to preserve them for the future.

A meeting in Denmark took evidence from researchers that most coral reefs will not survive even if tough regulations on greenhouse gases are put in place.

Scientists proposed storing samples of coral species in liquid nitrogen.

That will allow them to be reintroduced to the seas in the future if global temperatures can be stabilised.

Legislators from 16 major economies have been meeting in the Danish capital, Copenhagen, to try to agree the way forward on climate change.

The meeting has been organised by the Global Legislators Organisation for a Balanced Environment (Globe).

Losing the fight

" **It's the last ditch effort to save biodiversity from the reefs which are extremely diverse systems** "
Simon Harding Zoological Society of London

One of the issues they have been considering is what to do with coral reefs, which make up less than a quarter of 1% of the ocean's floor.

Yet the reefs are a key source of food, income and coastal protection for around 500 million people worldwide.

At this meeting, politicians and scientists acknowledged that global emissions of carbon dioxide are rising so fast that we are losing the fight to save coral and the world must develop an alternative plan.

Freezing samples for the future may be a necessary option.

"Well it's the last ditch effort to save biodiversity from the reefs which are extremely diverse systems," said Simon Harding from the Zoological Society of London (ZSL).

"It would take other work to try and reconstruct the reef so that you can start the process of building up a reef again," he said.

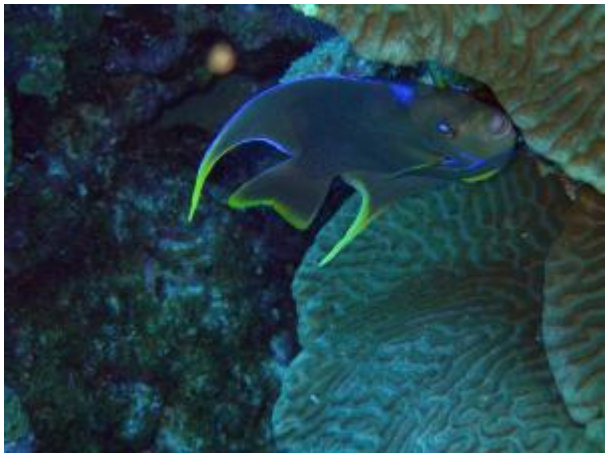
"That is something that needs to be looked at in detail, but we can definitely store the species and save them in that way."

According to recent research, one of the world's most important concentrations of coral - the so-called Coral Triangle in South East Asia - could be destroyed by climate change before the end of this century with significant impacts on food security and livelihoods.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8324954.stm

Published: 2009/10/25 16:01:07 GMT

Flower Garden Banks National Marine Sanctuary Among Healthiest Coral Reefs In Gulf Of Mexico



Blue angelfish. (Credit: NOAA)

ScienceDaily (Oct. 26, 2009) — Flower Garden Banks National Marine Sanctuary is among the healthiest coral reef ecosystems in the tropical Caribbean and Gulf of Mexico, according to a new NOAA report.

The report, "A Biogeographic Characterization of Fish Communities and Associated Benthic Habitats within the Flower Garden Banks National Marine Sanctuary," offers insights into the coral and fish communities within the sanctuary based on data collected in 2006 and 2007. Sanctuary managers will use the report to track and monitor changes in the marine ecosystem located 70 to 115 miles off the coasts of Texas and Louisiana.

"We found that 50 percent of the area surveyed for this report is covered by live coral," said Chris Caldow, a NOAA marine biologist and lead author on the report. "This is significant because such high coral cover is a real rarity and provides critical habitat for many different types of fish and other animals that live in these underwater systems." The sanctuary is also unusual in that it is dominated by top-level predators, including large grouper, jacks, and snappers that are virtually absent throughout the U.S. Caribbean. Researchers looked at the relationship between physical measures of the sanctuary's habitat such as depth, slope and geographic location, and the nature of the fish community in each location.

"Ultimately our goal was to develop a protocol that would detect and track long-term changes in fish and sea-floor community structure," Caldow said. "Once managers are equipped with this information, they can better understand how threats from climate change and other stressors will impact the ecosystem."

The report cautions that despite the sanctuary's relatively healthy condition, it may be more susceptible to environmental impacts than previously thought. For example, scientists observed high levels of coral bleaching and corals severely impacted from hurricane activity.

NOAA prepared the report based on data collected in 2006 and 2007, with input from scientists and managers at Flower Garden Banks National Marine Sanctuary.

On the Web:

Flower Gardens Report: http://ccma.nos.noaa.gov/products/biogeography/fgb/report.html

Flower Garden Banks Sanctuary: http://flowergarden.noaa.gov

Center for Coastal Management & Assessment: http://ccma.nos.noaa.gov

CCMA Biogeography Branch: http://ccma.nos.noaa.gov/about/biogeography/welcome.html

Adapted from materials provided by National Oceanic and Atmospheric Administration.

http://www.sciencedaily.com/releases/2009/08/090813142508.htm

First Hyperlens For Sound Waves Created

The acoustic hyperlens is fashioned from 36 brass fins arranged in the shape of a hand-held fan. Each fin is approximately 20 centimeters long and three millimeters thick. (Credit: Courtesy of Xiang Zhang research group)

ScienceDaily (Oct. 26, 2009) — Ultrasound and underwater sonar devices could "see" a big improvement, thanks to development of the world's first acoustic hyperlens. Created by researchers with the U.S. Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab), the acoustic hyperlens provides an eightfold boost in the magnification power of sound-based imaging technologies.

Clever physical manipulation of the imaging sound waves enables the hyperlens to resolve details smaller than one sixth the length of the waves themselves, bringing into view much smaller objects and features than can be detected using today's technologies.

The key to this success is the capturing of information contained in evanescent waves, which carry far more details and higher resolution than propagating waves but are typically bound to the vicinity of the source and decay much too quickly to be captured by a conventional lens.

"We have successfully carried out an experimental demonstration of an acoustic hyperlens that magnifies sub-wavelength objects by gradually converting evanescent waves into propagating waves," said Xiang Zhang, a principal investigator with Berkeley Lab's Materials Sciences Division and director of the Nano-scale Science and Engineering Center at the University of California, Berkeley. "Our acoustic hyperlens relies on straightforward cutoff-free propagation and achieves deep subwavelength resolution with low loss over a broad frequency bandwidth."

Zhang is the corresponding author on a paper reporting this research in the journal *Nature Materials*. The paper is entitled, "Experimental Demonstration of an Acoustic Magnifying Hyperlens." Co-authoring this paper with Zhang were Jensen Li, Lee Fok, Xiaobo Yin and Guy Bartal.

Zhang and his co-authors fashioned their acoustic hyperlens from 36 brass fins arranged in the shape of a hand-held fan. Each fin is approximately 20 centimeters long and three millimeters thick. The fins, embedded in the brass plate from which they were milled, extend out from an inner radius of 2.7 centimeters to an outer radius of 21.8 centimeters, and span 180 degrees in the angular direction.

"As a result of the large ratio between the inner and outer radii, our acoustic hyperlens compresses a significant portion of evanescent waves into the band of propagating waves so that the image obtained is magnified by a factor of eight," says co-author Fok, a graduate student in Zhang's lab. "We chose brass as the material for the fins because it has a density about 7,000 times that of air, a large ratio that is needed to achieve the strong anisotropy required for a flat dispersion of the sound waves."

Hyperlensing

In the world of optical imaging, hyperlensing is enjoying a hyper rage. Fabricated from metamaterials -- composites of metals and dielectrics whose uniquely engineered structures give rise to extraordinary optical properties -- hyperlenses make it possible to overcome the so-called "diffraction limit" by imaging features that are significantly smaller than the wavelengths of incident light. Zhang called the capturing of information carried by evanescent waves "the Holy Grail of optical information" in 2007, when he and his research group announced a hyperlens made from nanowires of silver and aluminum oxide that was able to use visible light to image objects smaller than 150 nanometers, well below visible light's diffraction limit of 260 nanometers.

Sound waves are also hampered by an intrinsic diffraction limit when deployed for imaging purposes -- objects that can be seen with conventional acoustic imaging are limited by the length of the sound wave. Once again, Zhang and his colleagues have overcome this diffraction limit by employing carefully engineered wave dispersion surfaces. This time they've demonstrated the first broad-band low-loss imaging with large magnification, where evanescent waves carrying information about subwavelength features are gradually converted into propagating waves.

"We provide a paradigm on the design and use of metamaterials to manipulate sound waves down to subwavelength scales," says co-author Li, a former post doctoral fellow in Zhang's group and now an assistant professor in City University of Hong Kong. "The success of our simple metamaterial design opens further possibilities in manipulating sound waves, particularly in transformation acoustics, which is analogous to transformation optics. Curved coordinate mappings could also be used to design novel acoustic devices such as a hyperlens with flat input and output facets."

The current version of their acoustic hyperlens successfully produced 2-D images of objects down to 6.7 times smaller than the wavelength of the imaging sound wave. Now Zhang and his team are up-grading their technique to produced 3-D images. They are also working to make their acoustic hyperlens compatible with pulse-echo technology, which is the basis of both medical ultrasounds and underwater sonar imaging systems.

"Directly applied to current ultrasound pulse-echo technology, the hyperlens would allow the use of lower input frequency, which in turn would increase the penetration depth and allow physicians to see, for example, smaller tumors or finer features of larger objects that could help them identify other abnormalities," Zhang says.

Acoustic hyperlens could be applied to underwater sonar as a focusing device that would allow more complex and precise custom waveforms to be created while still maintaining the power of the propagating source.

Support for this research came from the Office of Naval Research.

Adapted from materials provided by DOE/Lawrence Berkeley National Laboratory, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/10/091025162530.htm

Arctic Sediments Show That 20th Century Warming Is Unlike Natural Variation

Since the mid-20th century, changes seen in Arctic sediments retrieved by UB geologist Jason Briner and his colleagues, are unprecedented in the last 200,000 years. (Credit: Image courtesy of University at Buffalo)

ScienceDaily (Oct. 25, 2009) — The possibility that climate change might simply be a natural variation like others that have occurred throughout geologic time is dimming, according to evidence in a *Proceedings of the National Academy of Sciences* paper published October 19.

The research reveals that sediments retrieved by University at Buffalo geologists from a remote Arctic lake are unlike those seen during previous warming episodes.

The UB researchers and their international colleagues were able to pinpoint that dramatic changes began occurring in unprecedented ways after the midpoint of the twentieth century.

"The sediments from the mid-20th century were not all that different from previous warming intervals," said Jason P. Briner, PhD, assistant professor of geology in the UB College of Arts and Sciences. "But after that things really changed. And the change is unprecedented."

The sediments are considered unique because they contain rare paleoclimate information about the past 200,000 years, providing a far longer record than most other sediments in the glaciated portion of the Arctic, which only reveals clues to the past 10,000 years.

"Since much of the Arctic was covered by big ice sheets during the Ice Age, with the most recent glaciations ending around 10,000 years ago, the lake sediment cores people get there only cover the past 10,000 years," said Briner.

"What is unique about these sediment cores is that even though glaciers covered this lake, for various reasons they did not erode it," said Briner, who discovered the lake in the Canadian Arctic while working

on his doctoral dissertation. "The result is that we have a really long sequence or archive of sediment that has survived arctic glaciations, and the data it contains is exceptional."

Working with Briner and colleagues at UB who retrieved and analyzed the sediments, the paper's co-authors at the University of Colorado and Queens University, experts in analyzing fossils of bugs and algae, have pooled their expertise to develop the most comprehensive picture to date of how warming variations throughout the past 200,000 years have altered the lake's ecology.

"There are periods of time reflected in this sediment core that demonstrate that the climate was as warm as today," said Briner, "but that was due to natural causes, having to do with well-understood patterns of the Earth's orbit around the sun. The whole ecosystem has now shifted and the ecosystem we see during just the last few decades is different from those seen during any of the past warm intervals."

Yarrow Axford, a research associate at the University of Colorado, and the paper's lead author, noted: "The 20th century is the only period during the past 200 millennia in which aquatic indicators reflect increased warming, despite the declining effect of slow changes in the tilt of the Earth's axis which, under natural conditions, would lead to climatic cooling."

Co-authors with Briner and Axford are Colin A. Cooke and Alexander P. Wolfe of the University of Alberta; Donna R. Francis of the University of Massachusetts; John P. Smol, Cheryl R. Wilson and Neal Michelutti at Queens University; Gifford H. Miller of the University of Colorado and Elizabeth K. Thomas, who did this work at UB for her master's degree in geology.

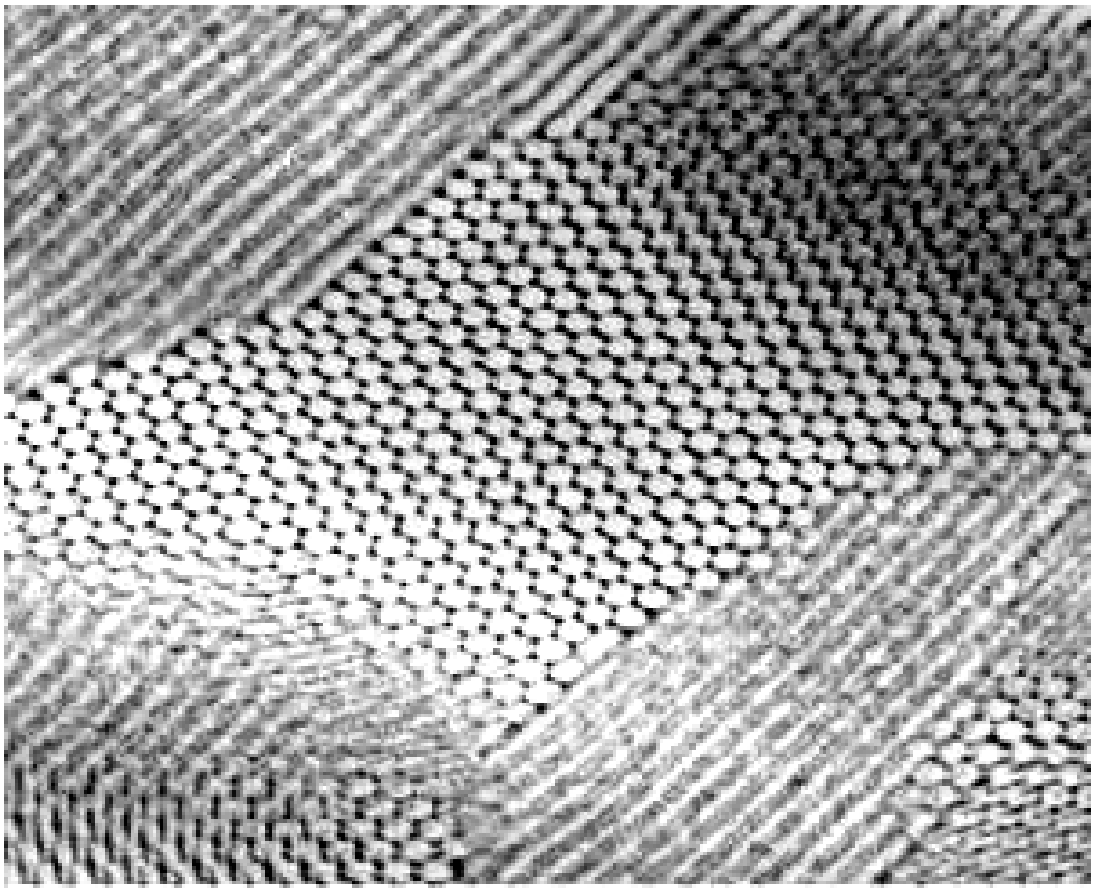
Journal reference:

1. Axford et al. **Recent changes in a remote Arctic lake are unique within the past 200,000 years**. *Proceedings of the National Academy of Sciences*, October 19, 2009; DOI: 10.1073/pnas.0907094106

Adapted from materials provided by University at Buffalo.

http://www.sciencedaily.com/releases/2009/10/091023163513.htm

New Route To Nano Self-assembly Found



This electron micrograph shows a self-assembled composite in which nanoparticles of lead sulfide have arranged themselves in a hexagonal grid. (Credit: Image courtesy of DOE/Lawrence Berkeley National Laboratory)

ScienceDaily (Oct. 25, 2009) — If the promise of nanotechnology is to be fulfilled, nanoparticles will have to be able to make something of themselves. An important advance towards this goal has been achieved by researchers with the U.S. Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab) who have found a simple and yet powerfully robust way to induce nanoparticles to assemble themselves into complex arrays.

By adding specific types of small molecules to mixtures of nanoparticles and polymers, the researchers are able to direct the self-assembly of the nanoparticles into arrays of one, two and even three dimensions with no chemical modification of either the nanoparticles or the block copolymers. In addition, the application of external stimuli, such as light and/or heat, can be used to further direct the assemblies of nanoparticles for even finer and more complex structural details.

"We've demonstrated a simple yet versatile approach to precisely controlling the spatial distribution of readily available nanoparticles over multiple length scales, ranging from the nano to the macro," says Ting Xu, a polymer scientist who led this project and who holds joint appointments with Berkeley Lab's Materials Sciences Division and the University of California, Berkeley's Departments of Materials Sciences and Engineering, and Chemistry. "Our technique can be used on a wide variety of nanoparticle and should open new routes to the fabrication of nanoparticle-based devices including highly efficient systems for the generation and storage of solar energy."

The Art of Self-Assembly

Nano-sized particles -- bits of matter a few billionths of a meter in size, or more than a hundred times smaller than the stuff of today's microtechnologies -- display highly coveted properties not found in macroscopic materials, including optical, electronic, magnetic, etc. The promise of nanotechnololgy is that exploiting these unique properties on a commercial scale could yield such "game-changers" as sustainable, clean and cheap energy, and the creation on demand of new materials with properties tailored to meet specific needs. Realizing this promise starts with nanoparticles being able to organize themselves into complex structures and hierarchical patterns, similar to what nature routinely accomplishes with proteins.

"Precise control of the spatial organization of nanoparticles and other nanoscopic building blocks over multiple length scales has been a bottleneck in the bottom-up generation of technologically important materials," says Xu. "Most of the approaches that have been used so far have involved surface modifications."

Small as they are, nanoparticles are essentially all surface so any process that modifies the surface of a nanoparticle can profoundly change the properties of that particle. Precisely arranging these nanoparticles is critical to tailoring the macroscopic properties during nanoparticle assembly. Although DNA has been used to induce self-assembly of nanoparticles with a high degree of precision, this approach only works well for organized arrays that are limited in size; it is impractical for large-scale fabrication. Xu believes a better approach is to use block copolymers -- long sequences or "blocks" of one type of monomer molecule bound to blocks of another type of monomer molecule.

"Block copolymers readily self-assemble into well-defined arrays of nanostructures over macroscopic distances," she says. "They would be an ideal platform for directing the assembly of nanoparticles except that block copolymers and nanoparticles are not particularly compatible with one another from a chemistry standpoint. A mediator is required to bring them together."

Xu and her group found such a "mediator" in the form of small molecules that will join with nanoparticles and then able attach themselves and their nanoparticle partners to the surface of a block copolymer. For this study, Xu and her group used two different types of small molecules, surfactants (wetting agents) dubbed "PDP" and "OPAP." These small molecules can be stimulated by light (PDP) or heat (OPAP) to sever their connection to the surface of a block copolymer and be repositioned to another location along the polymeric chain. In this manner, the spatial distribution of the small molecule mediators and their nanoparticle partners can be precisely directed with no need to modify either the nanoparticles or the polymers.

"The beauty of this technique is that it involves no sophisticated chemistry," says Xu. "It really is a plug and play technique, in which you simply mix the nanoparticles with the block copolymers and then add whatever small molecules you need."

For this study, Xu and her colleagues added PDP or OPAP small molecules to various blends of nanoparticles, such as cadmium selenide and lead sulfide, mixed in with a commercial block copolymer -- polystyrene-block-poly (4-vinyl pyridine). While she and her group worked with light and heat, she says other stimuli, such as pH, could also be used to reposition small molecules and their nanoparticle partners along block copolymer formations. Strategic substitutions of different types of stimulus-responsive small molecules could serve as a mechanism for structural fine-tuning or for incorporating specific functional properties into nanocomposites. Xu and her colleagues are now in the process of adding functionality to their self-assembly technique.

"Bring together the right basic components -- nanoparticles, polymers and small molecules -- stimulate the mix with a combination of heat, light or some other factors, and these components will assemble into sophisticated structures or patterns," says Xu. "It is not dissimilar from how nature does it."

This research was supported in part by the U.S. Department of Energy's Office of Science and in part by the Army Research Office and National Science Foundation. The nanoparticles were synthesized at Berkley Lab's Molecular Foundry and characterizations of the nanoparticle assemblies were performed at Beamline 7.3.3 of Berkeley Lab's Advanced Light Source. Both the Molecular Foundry and the Advanced Light Source are DOE Office of Science national user facilities.

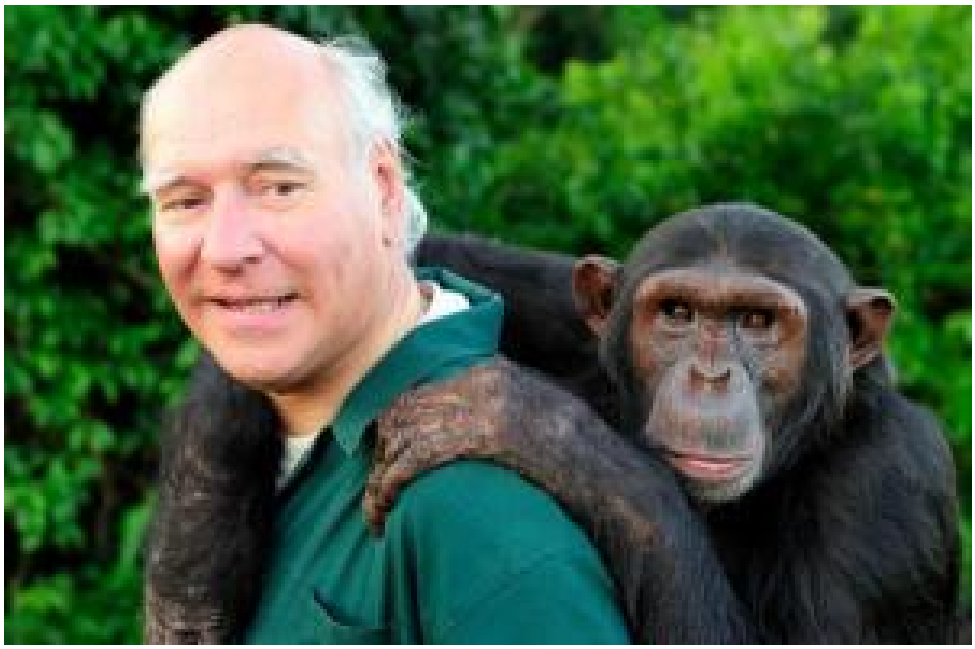
Journal reference:

1. Ting Xu, Yue Zhao, Kari Thorkelsson, Alexander Mastroianni, Thomas Schilling, Joseph Luther, Benjamin Rancatore, Kazuyuki Matsunaga, Hiroshi Jinnai, Yue Wu, Daniel Poulsen, Jean Fréchet and Paul Alivisatos. **Small molecule-directed nanoparticle assembly towards stimuli-responsive nanocomposites**. *Nature Materials*, (in press)

Adapted from materials provided by DOE/Lawrence Berkeley National Laboratory.

http://www.sciencedaily.com/releases/2009/10/091022164245.htm

Color Differences Within And Between Species Have Common Genetic Origin



Body hair difference is more pronounced between chimpanzees and humans than within our own species. Biologists have puzzled over the same genes cause both types of variation, not just with respect to people, chimps and body hair, but for all sorts of traits that differ within and between species. New research shows that, at least for body color in fruit flies, the two kinds of variation have a common genetic basis. (Credit: iStockphoto/Warwick Lister-Kaye)

ScienceDaily (Oct. 25, 2009) — Spend a little time people-watching at the beach and you're bound to notice differences in the amount, thickness and color of people's body hair. Then head to the zoo and compare people to chimps, our closest living relatives.

The body hair difference is even more pronounced between the two species than within our own species.

Do the same genes cause both types of variation? Biologists have puzzled over that question for some time, not just with respect to people, chimps and body hair, but for all sorts of traits that differ within and between species. Now, a study by University of Michigan researchers shows that, at least for body color in fruit flies, the two kinds of variation have a common genetic basis. The research, led by evolutionary biologist Patricia Wittkopp, appears in the Oct. 23 issue of the journal *Science*.

Wittkopp's group explored the genetic underpinnings of pigmentation differences within and between a pair of closely related fruit fly species: *Drosophila americana*, which is dark brown, and *Drosophila novamexicana*, which is light yellow.

"We started by asking which parts of the genome contribute to the pigmentation difference between species," said Wittkopp, an assistant professor of ecology and evolutionary biology. Genetic mapping narrowed the search to two regions that happened to contain genes already known to affect pigmentation. The researchers then focused on one particular gene, known as tan, and used fine-scale genetic mapping to determine that evolutionary changes in that specific gene, not another gene in the same region, have contributed to the pigmentation difference.

To confirm that finding, the team transferred copies of the tan gene from the yellow species into flies of a completely different species, *Drosophila melanogaster*, and then did the same thing with copies of the tan

gene from the brown species. The only difference between the two groups of altered flies was the transferred gene, "and that difference was enough to result in pigmentation differences," Wittkopp said.

Confident that the tan gene was responsible for part of the color difference between species, Wittkopp and coworkers investigated color variation within the brown species. Some flies in that species are noticeably darker than others, and previous experiments have suggested that the basis for the difference is genetic, rather than environmental.

Again using genetic mapping, the researchers found evidence that the tan gene also contributes to color variation among individuals within the brown species. Going a step further, they showed that it is not just the same gene that contributes to color differences within and between species, but also the same genetic changes within this gene. Currently, the team is trying to pinpoint the exact genetic change (or changes) within the tan gene that is responsible for the color shift.

Although this study focused on fruit flies, the work could lead to better understanding of patterns of variation throughout nature, Wittkopp said. "We're using a model system, but when you get down to the basic mechanisms of inheritance---how information is passed from one generation to the next---the process is essentially the same in all living things. While we can't extrapolate about the specific genes involved, it is fair to say that mutations contributing to both variation within species and divergence between species may be a common source of evolutionary change."

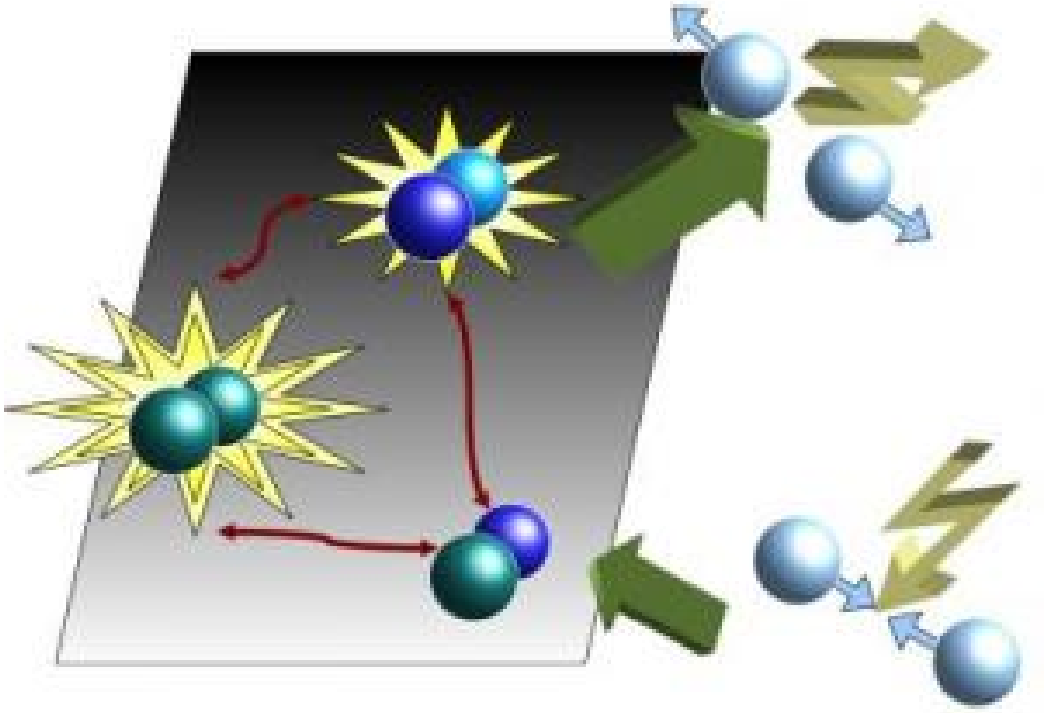
Wittkopp's coauthors on the Science paper were undergraduate students Emma Stewart, Laura Shefner, Gabriel Smith-Winberry, Saleh Akhras and Elizabeth Thompson; graduate student Lisa Arnold; and technicians Adam Neidert and Belinda Haerum.

The researchers received funding from the National Science Foundation, the Margaret and Herman Sokol Endowment for Faculty and Graduate Student Research and the University of Michigan.

Adapted from materials provided by University of Michigan.

http://www.sciencedaily.com/releases/2009/10/091022141123.htm

Physicists Turn To Radio Dial For Finer Atomic Matchmaking



In the sequence of green arrows, a pair of ultracold gas atoms collides, briefly forms a molecule, and flies apart, in the presence of an external magnetic field (not shown) that influences this process. By adding RF radiation (lightning bolts) of the right frequency, the atoms can experience being in many different molecular states (red arrows), providing even more extensive and detailed control of the collision. The size of the yellow bursts indicate the amount of absorption/emission of RF radiation. (Credit: Eite Tiesinga, NIST/JQI)

ScienceDaily (Oct. 25, 2009) — Investigating mysterious data in ultracold gases of rubidium atoms, scientists at the Joint Quantum Institute of the National Institute of Standards and Technology (NIST) and the University of Maryland and their collaborators have found that properly tuned radio-frequency waves can influence how much the atoms attract or repel one another, opening up new ways to control their interactions.

As the authors report in an upcoming issue of *Physical Review A*, the radio-frequency (RF) radiation could serve as a second "knob," in addition to the more traditionally used magnetic fields, for controlling how atoms in an ultracold gas interact. Just as it is easier to improve reception on a home radio by both electronically tuning the frequency on the receiver and mechanically moving the antenna, having two independent knobs for influencing the interactions in atomic gases could produce richer and more exotic arrangements of ultracold atoms than ever before.

Previous experiments with ultracold gases, including the creation of Bose-Einstein condensates, have controlled atoms by using a single knob -- traditionally, magnetic fields. These fields can tune atoms to interact strongly or weakly with their neighbors, pair up into molecules, or even switch the interactions from attractive to repulsive. Adding a second control makes it possible to independently tune the interactions between atoms in different states or even between different types of atoms. Such greater control could lead to even more exotic states of matter. A second knob, for example, may make it easier to create a weird three-atom arrangement known as an Efimov state, whereby two neutral atoms that ordinarily do not interact strongly with one another join together with a third atom under the right conditions.

For many years, researchers had hoped to use RF radiation as a second knob for atoms, but were limited by the high power required. The new work shows that, near magnetic field values that have a big effect on the interactions, significantly less RF power is required, and useful control is possible.

In the new work, the JQI/NIST team examined intriguing experimental data of trapped rubidium atoms taken by the group of David Hall at Amherst College in Massachusetts. This data showed that the RF radiation was an important factor in tuning the atomic collisions. To explain the complicated way in which the collisions varied with RF frequency and magnetic field, NIST theorist Thomas Hanna developed a simple model of the experimental arrangement. The model reconstructed the energy landscape of the rubidium atoms and explained how RF radiation was changing the atoms' interactions with one another. In addition to providing a roadmap for rubidium, this simplified theoretical approach could reveal how to use RF to control ultracold gases consisting of other atomic elements, Hanna says.

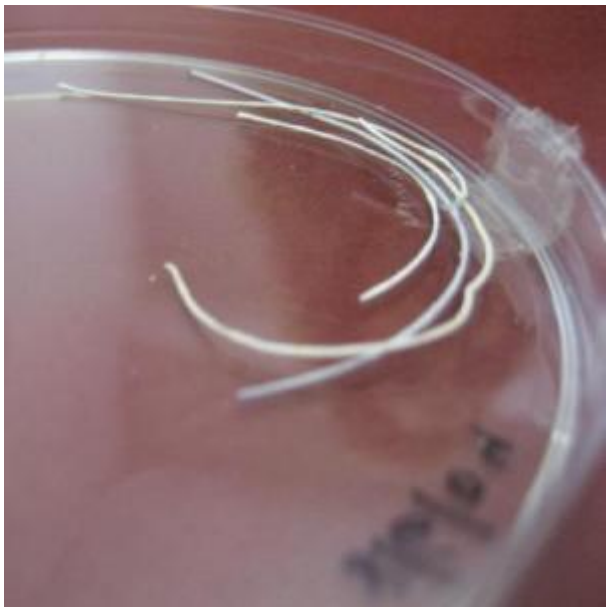
Journal reference:

1. A.M. Kaufman, R.P. Anderson, T.M. Hanna, E. Tiesinga, P.S. Julienne, and D.S. Hall. **Radiofrequency dressing of multiple Feshbach resonances**. *Physical Review A*, (in press)

Adapted from materials provided by National Institute of Standards and Technology (NIST), via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/10/091022153639.htm

Biologically Active 'Scaffold' May Help Humans Replace Lost Or Missing Bone



Composite drug-releasing fibers used as basic elements of scaffolding for tissue and bone regeneration. (Credit: AFTAU)

ScienceDaily (Oct. 24, 2009) — Mother Nature has provided the lizard with a unique ability to regrow body tissue that is damaged or torn — if its tail is pulled off, it grows right back. She has not been quite so generous with human beings. But we might be able to come close, thanks to new research from Tel Aviv University.

Prof. Meital Zilberman of TAU's Department of Biomedical Engineering has developed a new biologically active "scaffold" made from soluble fibers, which may help humans replace lost or missing bone. With more research, she says, it could also serve as the basic technology for regenerating other types of human tissues, including muscle, arteries, and skin.

"The bioactive agents that spur bone and tissue to regenerate are available to us. The problem is that no technology has been able to effectively deliver them to the tissue surrounding that missing bone," says Prof. Zilberman. Her artificial and flexible scaffolding connects tissues together as it releases growth-stimulating drugs to the place where new bone or tissue is needed — like the scaffolding that surrounds an existing building when additions to that building are made.

Scientific peer-reviewed research on this scaffold fiber has appeared in a number of journals, including *Acta Biomaterialia,* and is currently being licensed through Ramot, TAU's technology transfer company.

Active implants

The invention, which does not yet have a name, could be used to restore missing bone in a limb lost in an accident, or repair receded jawbones necessary to secure dental implants, says Prof. Zilberman. The scaffold can be shaped so the bone will grow into the proper form. After a period of time, the fibers can be programmed to dissolve, leaving no trace.

Her technology also has potential uses in cosmetic surgery. Instead of silicon implants to square the chin or raise cheekbones, the technology can be used to "grow your own" cheekbones or puffy lips. But Prof. Zilberman says it's far too early to think of such uses. She first started her work in biomaterials at the UT Southwestern Medical Center at Dallas, Texas, and currently is concentrating on various medical

applications. One of them intends to make dental implants more effective. She envisions applying the invention to organ tissue regeneration in the future.

A question of structure

"Our material is very special," Prof. Zilberman explains. "The fibers not only support body parts like bones and arteries. They're also specially developed to release drugs and proteins in a controlled manner. Our special 3-D matrix can hold together drugs that are particularly vulnerable to breaking down easily. The matrix gives the body shape and form, coaxing it to re-grow and strengthen missing parts," she says.

Until now in vitro results on bone have been good, and some basic unpublished results from animal models have shown excellent promise for bone regeneration, says Prof. Zilberman. "It sounds simple, but it's not. It's quite difficult to develop a process for scaffold formation for bone growth. It's a delicate balance to apply only mild conditions that will not destroy the activity of the growth factor molecules."

Currently Prof. Zilberman has developed both a fibrous artificial scaffold and an organic scaffold which forms a film. The technology could also be applied to peripheral nerve regeneration. "Our fibers provide all the advantages that clinicians in tissue regeneration are calling for," says Prof. Zilberman. "Being thin, they're ideal when delicate scaffolds are called for. But they can also be the basic building blocks of bones and tissues when bigger structures are needed."

Adapted from materials provided by Tel Aviv University.

http://www.sciencedaily.com/releases/2009/10/091019122844.htm

Ethiopia's Climate 27 Million Years Ago Had Higher Rainfall, Warmer Soil

Neil J. Tabor, associate professor of Earth Sciences at SMU. (Credit: Image courtesy of Southern Methodist University)

ScienceDaily (Oct. 24, 2009) — Thirty million years ago, before Ethiopia's mountainous highlands split and the Great Rift Valley formed, the tropical zone had warmer soil temperatures, higher rainfall and different atmospheric circulation patterns than it does today, according to new research of fossil soils found in the central African nation.Neil J. Tabor, associate professor of Earth Sciences at SMU and an expert in sedimentology and isotope geochemistry, calculated past climate using oxygen and hydrogen isotopes in minerals from fossil soils discovered in the highlands of northwest Ethiopia. The highlands represent the bulk of the mountains on the African continent.

Tabor's research supplies a picture of the paleo landscape of Ethiopia that wasn't previously known because the fossil record for the tropics has not been well established. The fossils were discovered in the grass-covered agricultural region known as Chilga, which was a forest in prehistoric times. Tabor's research looked at soil fossils dating from 26.7 million to 32 million years ago.

Fossil plants and vertebrates in the Chilga Beds date from 26.7 million to 28.1 million years ago, Tabor says. From his examination, Tabor determined there was a lower and older layer of coal and underclay that was a poorly drained, swampy landscape dissected by well-drained Oxisol-forming uplands. A younger upper layer of the Chilga Beds consists of mudstones and sandstones in what was an open landscape dominated by braided, meandering fluvial stream systems.Tabor is part of a multi-disciplinary team combining independent lines of evidence from various fossil and geochemical sources to reconstruct the prehistoric climate, landscape and ecosystems of Ethiopia, as well as Africa.The project is funded with a three-year, $322,000 grant from the National Science Foundation. The team includes paleoanthropologists, paleobotanists and vertebrate paleontologists from the University of Texas at Austin, Miami University, Southern Methodist University, the Fort Worth Museum of Science and History, Washington University and the University of Michigan.Tabor presented the research in a topical session at the Oct. 18-21 annual meeting of the Geological Society of America. The presentation was titled "Paleoenvironments of Upper Oligocene Strata, NW Ethiopian Plateau." His co-researcher is John W. Kappelman, Department of Anthropology, University of Texas.

Adapted from materials provided by Southern Methodist University. Original article written by Margaret Allen.

http://www.sciencedaily.com/releases/2009/10/091022182412.htm

Womb transplants 'a step closer'

The first successful human womb transplant could take place within two years, British scientists have said.

London-based experts say they have worked out how to transplant a womb with a regular blood supply so it will last long enough to carry a pregnancy.

Research involving donor rabbits was presented at a US fertility conference.

The charity Uterine Transplant UK is seeking funding of £250,000 after being denied grants by several medical research bodies.

A breakthrough could offer an alternative to surrogacy or adoption for women whose own wombs have been damaged by diseases such as cervical cancer.

Up to 200 women in the UK are said to use surrogate mothers each year.

In the latest research conducted at the Royal Veterinary College in London, five rabbits were given a womb using a technique which connected major blood vessels, including the aorta.

Two of the rabbits lived to 10 months, with examinations after death indicating the transplants had been a success.

'Huge interest'

Richard Smith, consultant gynaecological surgeon at Hammersmith Hospital, told the American Society for Reproductive Medicine conference in Atlanta the team's next step would involve getting rabbits pregnant through IVF treatment.

The technique would then be used on larger animals.

Other research projects in the past have carried out similar experiments on pigs, goats, sheep and monkeys.

" **I think there is a big difference between demonstrating effectiveness in a rabbit and being able to do this in a larger animal or a human** "
Tony Rutherford, British Fertility Society

A human transplant has also been tried once before - in Saudi Arabia in 2000 - but the womb came from a live donor, and was rejected after three months.

Mr Smith suggested it may have failed because surgeons had not worked out how to connect the blood vessels properly.

The UK study involved transplanting the womb with all its arteries, veins and bigger vessels.

"I think there are certain technical issues to be ironed out but I think the crux of how to carry out a successful graft that's properly vascularised - I think we have cracked that one."

A transplanted womb would only stay in place long enough for a woman to have the children she wanted.

And any baby would have to be delivered by Caesarean section as a transplanted human womb is unlikely to be able to withstand natural labour.

Conception would also need to be through IVF because women with a transplanted womb could be at higher risk of ectopic pregnancy.

Mr Smith acknowledged the procedures were seen as "a step too far in terms of fertility management" among the medical profession but said interest from patients was huge.

Tony Rutherford, chairman of the British Fertility Society, said: "I think there is a big difference between demonstrating effectiveness in a rabbit and being able to do this in a larger animal or a human..."

Clare Lewis-Jones, from Infertility Network UK, said "a great deal of thought and discussion" was needed on the issue including the ethical ramifications.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8319698.stm

Published: 2009/10/22 02:22:36 GMT

Low dose radiation 'harms heart'

Low doses of radiation can cause cardiovascular disease, according to work carried out by mathematicians at Imperial College.

They have constructed a model which suggests that the risk would increase as the dose increases.

Studies have shown that nuclear workers exposed to long-term doses of radiation have higher levels of heart disease.

But experts said it was too early to draw such conclusions without the biological research to back it up.

Controversial theory

The team at Imperial College, writing in the journal PLOS Computational Biology, say they explored a novel mechanism that suggests radiation kills monocytes, which travel across the arterial wall to mop up a protein called MCP-1.

" **More research like this is needed if the results of epidemiological studies are to be properly understood, but there is still some way to go before it may be reliably concluded that low-level radiation can increase the risk of circulatory disease** "
Professor Richard Wakeford, University of Manchester

High levels of MCP-1 are thought to cause the inflammation which leads to cardiovascular disease.

Their model was consistent with the rates of heart disease seen in nuclear workers and also predicted the changes in MCP-1 caused by high levels of cholesterol in the diet.

Dr Mark Little, who led the research, said: "For the first time we have shown a mechanism that could explain the kind of cardiovascular disease risks that have been seen in the occupational studies.

"If the mechanism is valid it implies that risks from low-dose radiation exposures like medical and dental X-rays, which until now have been assumed to result only from cancer, may have been substantially underestimated."

Mechanism testable

Professor Steve Jones, of Westlakes Research Institute who formerly worked for British Nuclear Fuels (BNF) and who has published his own research on the links between radiation and circulatory disease in nuclear workers, said the results of the mathematical model were interesting: "As it is based very largely on mathematical modelling, its findings cannot be taken as definitive.

"However it does propose a plausible biological mechanism and, most importantly, a mechanism that is testable by experiment."

Professor Richard Wakeford, of the University of Manchester who also formerly worked for BNF, said: "More research like this is needed if the results of epidemiological studies are to be properly understood, but there is still some way to go before it may be reliably concluded that low-level radiation can increase the risk of circulatory disease."

Professor Dudley Goodhead, former director of the MRC Radiation and Genome Stability Unit, said: "This paper puts forward a highly complicated mathematical model, which makes many assumptions, to explore one possible causal mechanism.

"Such conclusions should not be drawn without laboratory validation of the key assumptions."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8321286.stm

Published: 2009/10/22 23:03:52 GMT

Secrets of frog killer laid bare

By Richard Black
Environment correspondent, BBC News website

Scientists have unravelled the mechanism by which the fungal disease chytridiomycosis kills its victims.

The fungus is steadily spreading through populations of frogs and other amphibians worldwide, and has sent some species extinct in just a few years.

Researchers now report in the journal Science that the fungus kills by changing the animals' electrolyte balance, resulting in cardiac arrest.

The finding is described as a "key step" in understanding the epidemic.

Karen Lips, one of the world authorities on the spread of chytridiomycosis, said the research was "compelling".

" **This is lethal across a broad range of hosts, so it's really important to look at what's happening in other amphibians** "
Jamie Voyles, James Cook University

"They've done an incredible amount of work, been very thorough, and I don't think anybody will have problems with this.

"We suspected something like this all along, but it's great to know this is in fact what is happening," the University of Maryland professor told BBC News.

Skin deep

Amphibian skin plays several roles in the animals' life.

Most species can breathe through it, and it is also used as a membrane through which electrolytes such as sodium and potassium are exchanged with the outside world.

The mainly Australian research group took skin samples from healthy and diseased green tree frogs, and found that these compounds passed through the skin much less readily when chytrid was present.

Samples of blood and urine from infected frogs showed much lower sodium and potassium concentrations than in healthy animals - potassium was down by half.

In other animals including humans, this kind of disturbance is known to be capable of causing cardiac arrest.

The scientists also took electrocardiogram recordings of the frogs' hearts in the hours before death; and found changes to the rhythm culminating in arrest.

Drugs that restore electrolyte balance brought the animals a few hours or days of better health, some showing enough vigour to climb out of their bowls of water; but all died in the end.

Grail quest

Lead scientist Jamie Voyles, from James Cook University in Townsville, said the next step was to look for the same phenomenon in other species.

"This is lethal across a broad range of hosts, whether terrestrial or aquatic, so it's really important to look at what's happening in other susceptible amphibians," she said.

Another step will be to examine how the chytrid fungus *(Batrachochytrium dendrobatidis - Bd)* impairs electrolyte transfer.

"What this work doesn't tell us is the mechanism by which chytrid causes this problem with sodium," said Matthew Fisher from Imperial College London.

"It could be that *Bd* is excreting a toxin, or it could be causing cell damage. This causative action is actually the 'holy grail' - so that's another obvious next step."

The finding is unlikely to plot an immediate route to ways of preventing or treating or curing the disease in the wild.

Curing infected amphibians in captivity is straightforward using antifungal chemicals; but currently there is no way to tackle it outside.

Various research teams are exploring the potential of bacteria that occur naturally on the skin of some amphibians, and may play a protective role.

Understanding the genetics of how *Bd* disrupts electrolyte balance might lead to more precise identification of protective bacteria, suggested Professor Lips, and so eventually play a role in curbing the epidemic.

Richard.Black-INTERNET@bbc.co.uk

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8319467.stm

Published: 2009/10/22 17:51:21 GMT

All the Pretty Beach Horses

By: Nick DiUlio

When a few local residents first came upon Spec during the early morning hours of May 24, they knew the horse was not going to survive. With its left hind leg broken and bleeding — snapped in two by what authorities believe was an ATV collision — Spec had crawled nearly a mile during the night and passed out with the rise of the sun. Found lying motionless except for its panting on a beach in Corolla, N.C., the mustang was eventually taken to a local animal hospital, where it was euthanized just a few hours later.

Spec's fate is not altogether uncommon for the horses in a small herd of Spanish colonial mustangs that roam wild on some 12,000 acres of the northern-most beaches of North Carolina's Outer Banks barrier islands. The untamed world of these wild horses has been colliding with encroaching civilization for decades, particularly since the construction of homes along the coastline first began creeping northward throughout the 1980s, and Highway 12 was extended as far north as Corolla.

By 1989, 17 horses had been killed in road accidents, and the numbers have not leveled off. Just two months prior to Spec's death, a stallion named T-Rex had to be euthanized after another beach vehicle collision. And all of this is to say nothing of the seven horses that have been shot and killed since 2001, with no arrests made in any of the cases.

"It's the Wild West up there," says Karen McCalpin, executive director of the Corolla Wild Horse Fund, a nonprofit organization formed in 1989 with the intention of managing, protecting and preserving this herd, which can be found between the town of Corolla and the Virginia state line, 11 miles to the north. "People go up there and drive drunk or recklessly on the beach, and the horses have suffered the consequences."

But the deaths of these horses at the hands of the surrounding human population is just a part of the larger web of complex challenges the herd faces in its struggle for survival.

The Outer Banks was once full of mustangs thought to be descendents of horses brought to North America by explorers in the 16th and 17th centuries. In a 1926 *National Geographic* article, writer

Melville Chater wrote that "between 5,000 and 6,000 of these wild horses roam the sand banks of the North Carolina coast." It is because of their imported history, however, that federal officials do not consider the mustangs a species indigenous to the island.

"The Fish and Wildlife Service considers the horses to be non-native, feral animals and not a natural component of the barrier island ecosystem," the Currituck National Wildlife Refuge's Web site says. "These animals compete with native wildlife species for food and fresh water. Their activities degrade and destroy habitat, which negatively impacts native species."

And this is the crux of the conflict: McCalpin believes the Corolla mustangs present no real threat to indigenous species in their area; the managers of that area, meanwhile, are bound by federal mandate to protect its inhabitants.

Unlike similar wild horse populations on the Atlantic coast — such as the mustangs on Cape Lookout National Seashore, 3,000 federally protected acres at the southern-most tip of the Outer Banks — the Corolla mustangs are not protected by either federal or state regulation. A 1989 Currituck County ordinance makes it a misdemeanor (punishable by a $500 maximum fine) to intentionally harm or interfere with the animals, but that's as far as the arm of the law reaches.

That same ordinance also established the 7,544-acre "wild horse sanctuary" on which the Corolla horses now roam, but the term is a bit misleading. Two fences, one at each end of the sanctuary, span the barrier island from the sound behind it to the sea, keeping the horses from wandering out of the protected area. Seventy percent of the sanctuary is privately owned and has the potential for future development. The remaining acreage is divided between the North Carolina National Estuarine Research Reserve (331 acres), and the Currituck National Wildlife Refuge (2,495 acres), which is run by the United States Fish and Wildlife Service.

"I think the term 'horse sanctuary' is almost tongue-in-cheek. It gives the impression these horses are protected," McCalpin says. "They are not protected." The problem of protection goes beyond simply sheltering the mustangs from human interference and land development. In fact, McCalpin says, those concerns are relatively slight when compared to another overarching challenge: managing the size of the herd.

Because of the nature of the sanctuary, the Corolla Wild Horse Fund has virtually no authority when it comes to the size of the Corolla horse population. The organization is free to care for and manage the herd, but in doing so, it must adhere to the terms set forth in the Currituck Outer Banks Wild Horse Management Plan, written and overseen by refuge managers from the Fish and Wildlife Service and the Estuarine Research Reserve. The plan limits the Corolla herd size to 60 horses. As of the most recent aerial count, 101 Spanish colonial mustangs roam the sanctuary, which means McCalpin's group is expected to reduce the population by more than 40.

"When I came on as director in 2006 and saw that number of 60, I thought, 'There's no way this herd can survive at such a small number,'" McCalpin says.

Gus Cothran is a professor at Texas A&M University and a well-known equine geneticist and expert on feral horse herds. He has studied and written about the Corolla wild horse population and says the genetic health and diversity of the herd is one of the weakest in the country. This, Cothran says, is potentially dangerous for the long-term sustainability of the population, and he has recommended on several occasions the herd be maintained at a minimum of 110 individuals.

"If you want to preserve them, you need to be doing something to keep the numbers as large as possible, because once you cut it down, you're going to lose something you can't get back," Cothran says. "A lot of times the managers who want to cut the numbers down think you can cut them down to 60 and that it will

take little time to get back to a larger number at some point in the future. But that's not really true. You will never regain the original genetic diversity of the herd once it's reduced."

This issue of fading genetic health has been McCalpin's most repeated argument in her recent attempts to have the management plan changed to reflect a larger herd size, but so far, the Currituck County Wild Horse Advisory Board has denied her requests.

"I have asked twice to have [the management plan] changed to reflect a healthy herd size of at least 110, and they have refused to do it," McCalpin says. "But that's because [the Fish and Wildlife Service] is not specifically interested in protecting these horses. They consider them a feral, invasive species and a threat to native wildlife."

Actually, federal officials seem more sympathetic to the horses than McCalpin suggests.Dennis Stewart is a staff biologist at the Alligator River National Wildlife Refuge in nearby Manteo, N.C. "I like the horses. They're part of my history and childhood. So I'm not an anti-horse person in any way. But I'm also a wildlife biologist who works on a wildlife refuge with a mission and a purpose," Stewart says. "Our primary job is to look after certain migratory birds and other listed species. So people can't just point the finger at the refuge and say, 'You need to maintain this horse herd.'

"But I'm an optimist. My cup is half full, and I think the more we communicate and coordinate and talk to each other, the better we'll be. The worst thing would be to just polarize ourselves and go off into our separate camps."Mike Hoff, manager of the Currituck National Wildlife Refuge, echoes the sentiment. He says he and McCalpin have been working together throughout the last two years to try and determine a solution to the increasingly contentious gridlock, which means stepping back from emotion and studying the matter as objectively as possible.

"I think we have a great relationship with [the Corolla Wild Horse Fund]," Hoff says. "We work together on a lot of different issues, and that's why we're now embarking on a study to try and determine the impact [the horses] have so we know how to manage them in the future. We are a science-based organization, and we need to step back and let the science tell us what's going on."

That study is set to begin in the spring of 2010; it will try to determine the impact the Corolla horses have on the indigenous species contained within the Currituck refuge.The man in charge of the study is Chris DePerno, a professor in North Carolina State University's Department of Forestry and Environmental Resources. DePerno says the study will not only investigate the impact of the mustangs but also the influence that feral pigs and white-tailed deer have on the surrounding habitat.

To be sure, DePerno says, the study is in its infancy, with limited funding coming from a $50,000 Fish and Wildlife Services grant, and matching time and support resources provided by his university. The process will take several years and hundreds of thousands of additional dollars."This is going to be piecemeal because these projects take money — serious money — to do well. And to be honest, we may not be able to answer all the questions right now, but this is a piece of the pie," DePerno says.

McCalpin believes the results will prove that the mustangs have a negligible impact on the land, which will bring her one step closer to protecting the herd."It's going to take the support of the state and its legislators to make this happen because unless we can get this comprehensive study completed, U.S. Fish and Wildlife will never agree to change the management plan," McCalpin says. "And I believe that if we're forced to manage this herd at 60, these horses will be gone within a decade. As long as I'm here, I will not manage them at 60. I'll quit first, because I know what will happen."

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Before the Flood

By: Ryan Blitstein

Mike Kline ambles across the highway atop the Park Street Bridge, toward the guardrail overlooking the Roaring Branch River. It's early summer, long after Vermont's mountain snow has melted, so the sometimes-mighty waterway is now just a stream piddling between tree-lined banks and stony riprap.

Though I can barely hear the river above the buzzing motorcycles, Kline tells me locals dubbed it the Roaring Branch for a reason: During storms, huge boulders barrel down the river, slamming against each other to produce a thunderous sound. The boulders and sediment move with so much force, they alter the landscape overnight. "It's actually kind of scary because it's so powerful," says Kari Dolan, one of two Vermont River Management Program staffers along for the ride.

Kline has brought me to Bennington to illustrate what this river — with the help of human stupidity and millions of dollars — has wrought: an island.

It's an ugly land mass in the middle of the river, filled with craggy rock, bushes and Japanese knotweed. The aggradation begins perhaps 200 feet to the north, continuing underneath the bridge and then down the stream, well past the southern side. A few feet away stands a crumbling U.S. Army Corps of Engineers floodwall, constructed mostly from dredged riverbed gravel as part of a process to widen the channel and protect the bridge from flooding.

Instead, the overwidening set in motion events that resulted in this ungodly accidental island, so tall that Kline can almost touch its bushes from the side of the bridge.

A kindly, 50-ish man with a graying moustache under a faded, blue ballcap, Kline rests one arm on his belly, motioning toward the island with the other. "As this builds and builds," he says, "the river can outflank all the levees and berms." Every decade or so, the Roaring Branch floods, sometimes jumping its banks. The next time that happens, the river will likely choke the channel, rise above the highway bridge and head into town. It just might take a few houses with it.

Bennington's flood-threatened bridge is a prime example of a glaring but barely addressed problem: America's rivers flood, and in trying to protect against the threat, Americans and their governments actually make the floods worse. As a result, each year billions of dollars and several lives are lost, with many more upended. Though climate change is intensifying the crisis, at its root are outdated science, leadership deficits, decisions that prize short-term profit above all and the misguided belief that man can indefinitely restrain something as powerful and relentless as water.

Vermont, a state with a smaller population than the city of San Francisco's, has become a leader in the effort to reduce the costs of flooding through unconventional means: ripping out levees to let rivers flood naturally and providing towns with financial incentives to discourage building in floodplains. Cities from Charlotte, N.C., to Portland, Ore., have taken similar actions, and comparable concepts are percolating inside federal agencies. There's no shortage of people who know exactly what's wrong — and how to fix it. But once floodwaters recede, politics and the desire to live on the waterfront trump sound thinking. Here's how a relatively small group of people brought common sense to Vermont.

Anyone with a television is familiar with the devastation wrought by 2005's Hurricane Katrina, but coastal storm damage is only half the problem. Rivers were a major reason flood damages in the U.S., which averaged $3.9 billion per year during the 1980s, doubled during the decade from 1995 to 2004. Government figures don't draw a distinction between coastal and riverine areas, but at least 9 million homes and $390 billion in property are at risk of a flood with a 1 percent annual chance of occurring — and many exposed residents can't afford to buy insurance.

Every part of America with a river running through it seems to have a recent flooding horror story: In June 2008, storms struck the Midwest causing $15 billion in damage and at least 24 deaths in several of the 31 states drained by the Mississippi River. Roads closed in Illinois, rail lines were washed out in Wisconsin. In Cedar Rapids, Iowa, the river crest rose 9 feet above the city's 22-foot-tall levees, a height that the Federal Emergency Management Agency had predicted it would reach just once every 500 years.

In Washington state, late-2007 floods shut down Interstate 5, and waist-deep water forced Seattle firefighters to use rafts to evacuate apartment buildings and houses. For several days during the past two summers, heavy rains closed Indiana's Borman Expressway, a busy interstate and key trucking route to the East and between Canada, the U.S. and Mexico.

American landowners have long piled up riprap (rock used to armor banks) and built crude levees, the sloped walls aimed at holding back rushing water, but modern efforts to tame watersheds began during the 1920s. Following severe events like the great floods of 1927, which drenched areas from Cairo, Ill., down to the tip of Louisiana, and 1937, which put two-thirds of Louisville, Ky., under water, federal agencies, including the Army Corps of Engineers and President Roosevelt's Civilian Conservation Corps, began using big yellow machines to create ever-more-sophisticated structures. This was the era of channelization — construction that eliminated rivers' natural curves, straightening them into artificial canals. The goal was to keep river basins safe for economic development: agriculture, industry, homes, roads, rail lines.

As Kline explained to me on the drive down to Bennington, while we swung around winding roads and kelly green foothills, Vermont was no exception. During the latter half of the 20th century, it spent $20 million annually to keep its rivers straight and under control, only to see structures fail during increasingly common floods. Beginning in the 1980s, the state experienced about one federally declared flooding disaster per year.

"We were trying to feel good about ourselves, but all it was was glorified property protection," Kline says.

Kline moved to Vermont in the early 1990s, after two decades as a Colorado river ecologist working in the standard build-to-protect paradigm. Soon after he arrived, Vermont experienced a series of major

floods, as rivers took back areas wrested by channelization. Once-sleepy summer-home towns and agricultural villages were now home to businesses and full-time residents, so damage was extensive. Repair costs between 1995 and 1998 totaled at least $60 million. In tiny Vermont, that meant an average expense of $100 per resident, roughly three times as much per capita as Hurricane Katrina cost America.

What struck Kline, then the state's lead river scientist, and Barry Cahoon, then its lead river engineer, was a cost-benefit paradox: The state had been spending more and more public resources to protect levees and other flood-control structures, but the cycle of flooding was worsening.

The seeds of reform were sown when the pair attended a course taught by Dave Rosgen, a controversial restoration expert who runs classes through his Fort Collins, Colo.-based Wildland Hydrology Consultants. Rosgen is among the most vocal proponents of fluvial geomorphology, a river science theory that spent decades relegated to academic backwaters. At the time, the field was almost wholly reliant on the traditional water science of hydrology, which does a reasonable job of explaining floods from inundation — when waters slowly rise and damage low-lying structures. Such mainstream thinking, though, puts little emphasis on erosion, the scourge of flash flood-prone states like Vermont. Fluvial geomorphology, which studies how water moves earth in its path, offered a way to understand the recent wreckage.

As Kline describes it, rivers carry water and sediment, such as sand, and nature "wants" those materials to remain in equilibrium with the shape of the streambed. If everything is functioning well, floods spread into flat valley floodplains, which act as pressure valves. A widened channel may sap the river of its power and cause sediment to build up and aggrade. A river constrained by structures adjusts by incising, or digging down into the landscape, adding speed and power to the stream.

During storms, if a river can't access its floodplain, fluvial erosion drags away parts of the riverbank. In the worst case, this causes an avulsion: The bank collapses, and the river obliterates anything in its way.

Kline and Cahoon came to the conclusion that all their dredging and armoring and channelizing just increased rivers' velocities and fueled erosion. In some cases, they could trace current flood damage back to changes made 100 years earlier. But erosion turned out to be just one part of the problem.

Driving around Vermont in a hatchback, with occasional stops to gaze at rivers and levees, is a great way to receive a crash course in why so much of America is so often overwhelmed by floods. Kline's co-instructors on my journey are Dolan, a mountain-climbing ex-Ivy League lacrosse star who's done environmental work in cities from Paris to Nairobi, and floodplain management coordinator Rob Evans, a 30-something family man so in love with his job that he makes geeky, endearing wisecracks about federal disaster funding.

The most troubling aspect of the U.S. floodplain management system is that there is no U.S. floodplain management system. The Army Corps builds levees but relies on local governments to maintain them. (Many do a horrific job.) FEMA manages flood hazard mitigation, except in many farm areas, where the U.S. Department of Agriculture takes the lead. Other agencies, such as the Department of the Interior, play minor roles. No one is in charge. Even at the regional level, cooperation is ad-libbed. In the early 1980s, President Ronald Reagan's administration killed the large-scale authorities — such as the Upper Mississippi River Basin Commission — that coordinated multi-state flood-control plans. Federal districts have different policies and goals, despite residing side by side. Cities with enormous levees inhabit land across the river from towns with no levees at all. Decisions are made lot by lot, town by town, with little consideration for cumulative impact throughout a watershed.

A classic case of inconsistent policy involves the St. Louis area, where levees and dikes aimed at keeping the Mississippi River at bay now prevent the tolerable sort of flooding that might dissipate the river's energy. Outside the city, many agricultural levees were built to withstand a 500-year flood — an event with a 0.2 percent chance (according to FEMA estimates) of occurring in any given year. Yet some levees

inside St. Louis are able to withstand only 100-year floods. If a flood strikes between those two levels, farmland levees will keep the river from spreading out into its floodplain, and water might overtop the city levees.

Last year, the river came within a few feet of such a breach, which could do for some St. Louis neighborhoods what Katrina did for New Orleans.

The lack of flood control coordination is one reason the government has such bad data on flood risks. The Army Corps, which manages about 14,000 miles of public levees, doesn't know how many miles of private levees exist in America; educated guesses put the number somewhere around 100,000 miles. FEMA, part of the Department of Homeland Security, relies on flood hazard maps in Vermont and many other states that are nearly 20 years old, filled with outdated, inaccurate data. Despite a FEMA digital mapping program that spent $1 billion between 2003 and 2008, a recent National Research Council report found that four out of five Americans live in an area where flood maps fail to meet FEMA's data-quality standards. Few maps account for how erosion might alter the landscape or elevate flood risk.

The map problem is gargantuan. The FEMA-administered National Flood Insurance Program, which insures nearly 6 million policyholders for up to $1.1 trillion in value, is based wholly on these substandard maps. The flood insurance program's use of the 100-year floodplain as the safety standard — requiring that anything inside the floodplain be insured — has trickled down to state and local government and become the default.

"People believe that if they're 3 inches outside the 100-year line, they're absolutely safe. They don't realize that a 101-year flood is going to get them," says University of Maryland civil engineering professor and retired Army brigadier general Gerald Galloway.

Though a house inside the 100-year floodplain technically has a 1 percent chance of experiencing a flood this year, it has a 1 in 4 chance of being flooded over the life of a 30-year mortgage. And because the maps are old and climate change engenders severe weather, what used to be a once-in-a-century flood might arrive every few decades. Nevertheless, new construction flourishes within floodplains, spurred by the general longing to live near rivers, developers' hunger for profits and the government's willingness to insure homes guarded by levees in dreadful condition.

"People choose to live near rivers because it's a nice place to live or sometimes because there's no other place for them to live. We have to deal with that," says Mike Grimm, acting director of FEMA's risk reduction division.

Grimm has the stated mission of diminishing flood damage, and his unit doles out more than $200 million per year in mitgation grants, but inside the federal government, he's in the minority. If America has any philosophy with regard to its rivers, it's build, baby, build. Around the time Reagan killed the basin commissions, his administration updated federal water project guidelines to make national economic development their chief objective.

Most federal policy flows in that direction: The USDA spends about 10 times as much on subsidies that encourage farmers to expand cropland as it does on conservation programs that might mitigate flood damage. In urban areas, the Army Corps of Engineers spends tens of millions of dollars constructing levees with huge maintenance costs. FEMA offers residents of hazardous areas low-cost flood insurance. Between 1997 and 2006, federal claims paid on repetitive-loss properties — those with at least two flood insurance claims during the span of a decade — more than doubled to a cumulative $7.9 billion, according to the Government Accountability Office.

"If you didn't insure people to build these things, nobody would be building there," says Peter Paquet, a wildlife and fish manager at the congressionally mandated Northwest Power and Conservation Council. "People get flooded out, get reimbursed by flood insurance and rebuild right back in the floodplain."

For the average state floodplain manager, there's little reason to upset this status quo.

Vermont became a hub for change, in part, because the existing system failed the state so badly. Elected officials there just didn't understand how towns could be following all the federal rules, but taxpayers kept footing huge reconstruction bills after floods.

Kline and Cahoon believed that erosion was a major culprit, and after years of fruitlessly waving their arms in front of policymakers, they finally had enough real-life evidence to make a case. In 1998, the legislature, with the support of then-Gov. Howard Dean's administration, asked them to create what would become the River Management Program.

A new organizational structure brought decision-making under one roof, opening new sources of funding to pair with federal hazard mitigation grants. Because river restoration programs bolster water quality and wildlife preservation, Kline and Cahoon could tap federal funds aimed at those pursuits. They also managed to elevate floodplain management from an environmental issue to a public safety concern.

"You can capture a heck of a lot more public interest whenever you're getting into a situation where a guy is going to lose his farm and fields or the town road is going to fall into the river or a house is teetering on the edge," Cahoon says.

At first, they followed the advice of experts like Rosgen, who believed that if manmade channelizing caused erosion, something more natural should help. They adopted a method called natural channelization, or bioengineering, which restored rivers to conditions closer to their natural state, with vegetation and sinuosity, or curved paths.

After four or five years of expensive stream restoration, however, it became obvious to Kline that the approach was failing. "No matter how much you try to incorporate these natural watershed processes," Kline says, "a static channel is a static channel."

He realized that Vermont's approach — and the ideas of much of America's river science establishment — was simply wrong. The best way to deal with erosion, flooding and all the other problems associated with out-of-control rivers wasn't to manage the river. You just had to give the river enough room to move, change and create its own floodplain, and then get the hell out of the way. "If we leave the rivers alone, in a sense, they'll fix themselves," Kline says.

This seemingly radical approach isn't new. Gilbert White, the father of floodplain management, was advocating human adjustment to river movement as far back as the World War II era. His strategy had just one shortcoming: It was politically infeasible. Long ingrained in the minds of most elected officials, Wildman says, is "the idea that natural systems are a wacko environmentalist approach, and engineered, buildable systems are the solution."

Under Cahoon, who has since returned to field engineering work, and Kline, now leader of the program, the Vermont flood mitigation effort capitalized on a friendly political climate. First, it combined state and FEMA money to map river corridors, thus far measuring the path of erosion in 8,500 miles of rivers and streams. Unlike most FEMA maps, Vermont's indicated not just where the river resides today, but where it's likely to shift in coming decades.

Kline's team then met with regional planning agencies to prioritize towns with the worst repeat flooding damage. Vermont's governance is particularly community-oriented, so that team focused on persuading local officials to adopt stringent zoning regulations to prevent building near rivers. The guinea pigs were Bennington, an old New England college town, and Stowe, a prosperous ski resort area with major pressure for new development.

After a lengthy courting process, both implemented model bylaws written by the River Management Program and passed rules limiting building in what were called Fluvial Erosion Hazard Zones, a far larger danger area than federal standards demand.

Three more towns have followed, with 70 more in the pipeline. Since then, Evans and other members of Kline's unit have helped local officials apply for FEMA funding on flood protection projects. Sometimes, there's nothing they can do but look after existing structures and hold back new river encroachments. Yet many projects will be not just nonstructural, but anti-structural —removing a levee or even reconstructing a floodplain at a lower elevation to release pressure from the river.

In barely five years, Kline has already seen progress. One example: The USDA has cut back its dozens of riprap jobs per year down to just a handful, saving as much as $1 million annually. The state transit agency used to spend hundreds of thousands of dollars maintaining Route 108 near Stowe; now, it spends almost nothing. The best evidence of Vermont's success may be emulation: Next-door neighbor New Hampshire recently asked Kline for advice in copying aspects of his program.

Other states and cities have instituted similar endeavors. In North Carolina last year, Charlotte-Mecklenburg County invested $20 million in local, state and federal money to eliminate structures and property in its floodplain. It was the most visible action of a years-long campaign that includes mapping future conditions and regulating open space to manage the flow of water. In parts of Washington and Oregon, after scientists discovered that dams and levees were damaging fish habitats as well as failing to prevent flooding, governments have refocused on restoration.

All these efforts fit under the mantra of "no adverse impact" — the floodplain manager's equivalent of "first, do no harm" — a renewed effort within the field to restrict development in favor of long-term safety. Such ideas are gaining currency at the federal level, too, albeit slowly. After the 2008 Midwest floods, the Army Corps of Engineers helped create the Interagency Levee Task Force, which is examining long-term mitigation strategies, moving beyond the old default of rebuilding aging levees and erecting new ones. FEMA has begun Risk MAP, another ambitious five-year plan to update floodplain maps with comprehensive data.

"People are seeing, and getting tired of, taxpayer dollars going back into the same types of fixes as before," says George Riedel, deputy executive director of the Association of State Floodplain Managers. "I think people are really now questioning: Why are we doing this? Why are we going back to places that have flooded two or three times?"

Vermont has made so much progress in spreading the gospel of avoidance, many prominent ecologists, engineers and advocates say it might serve as a model for other states — or at least provide them with useful strategies. Yet for every Vermont booster, there's a skeptic dismissive of the claim that Kline has anything to say to the rest of America about rivers. Even Rosgen doubts a regulation-heavy approach could fly elsewhere. "Ideally, you'd take everybody out of the floodplain and let the rivers go back to what they were pre-white settlement. That's not really practical," he says.

To be sure, while erosion causes upwards of $400 million in annual damage nationwide, it's a more pressing problem in Vermont and Appalachia than, say, Southern California. There are also obvious cultural differences between Vermont and much of the rest of the country. Yet Kline's team has repeatedly taken actions that generate political blowback on a big-state scale and effectively faced down detractors.

Back in the car on U.S. Route 7, Kline, Evans and Dolan recount some of River Management's most contentious recent moves. When the developer of a project combining a retirement community, day care center and moderate-income housing wanted to site a storm water retention pond in the river corridor, they said no. When Bennington approved a retirement development dangerously close to the Roaring Branch, the rivers program took the case all the way to the Vermont Supreme Court — and won. They

even stopped an urban farming program for at-risk youth, a sacred cow for left-wing Burlingtonians, from composting in the floodway, helping prompt the state legislature to pass a law exempting compost programs from state regulations. (FEMA is now handling the alleged violations.)

"We get into a lot of these conflicting societal values," Kline says. "The trump card for us is public safety."

Outside Vermont, that card might not be playable. There's a long history of people trying and failing to focus on mitigation or erosion or revamping maps. Most have run into unbreakable political roadblocks, from pro-development small-town mayors to incredulous U.S. senators.

"The issue isn't knowing what the lessons are. The issue is doing something about the lessons," says Galloway, the University of Maryland professor. "A dozen reports have come out and identified exactly what the problem is. But the solutions fall into the 'too hard' box."

Of anyone who's worked on this issue, Galloway has the most cause for frustration. In 1993, devastating floods struck the Midwest. More than 1,000 levees failed, 70,000 homes were damaged and 47 people died, with costs nearing $20 billion. The Clinton administration tasked Galloway with leading a blue-ribbon panel to seek a solution.

Before the Galloway report was even released, Congress embarked on changing federal programs, with an ambitious bill introduced in the Senate in 1994. But after that November's election, the Republican Revolution happened; floodplain management wasn't part of the Contract with America. The laws that eventually passed made narrow modifications.

During the next decade, the government made little progress on Galloway's recommendations. FEMA shut down a program that relocated or demolished erosion-threatened structures. In 1999, Congress directed the Army to create a plan for the Upper Mississippi River basin, but the Corps scaled back so much that the study left out most of what would be the hardest-hit areas during the 2008 floods. In the aftermath of Hurricane Katrina, FEMA instituted several reforms on disaster response, but few to prevent flood damage. The 2007 National Levee Safety Program Act didn't provide enough funding for an overhaul.

Inside the Beltway, the 2008 Midwest floods generated little beyond talk. As the Congressional Research Service dryly concluded in a recent report on flooding, "The fundamental direction and approach of the national policies and programs remain largely unchanged since 1993."

Billions of dollars in federal money remain available for levees and other structural anti-flooding measures. But for states and cities like Vermont and Charlotte that want to prevent flooding without building, funding is more limited. The USDA authorized $145 million for floodplain easements as part of the economic stimulus package, enough for half the applications it received.

"I'd still argue, and I don't see it changing anytime soon, that there's no mechanism in place within the federal programs to reward avoidance," Vermont floodplain manager Evans says.

And flood protection isn't getting much attention from the American public.

"Given everything that's going on with the economic crisis and wars, people just turn off after awhile. It's overload," says Stephanie Lindloff, a senior director at the conservation organization American Rivers. "There's a sense, and it's unfortunate, that when there's the next natural disaster — a hurricane or a levee failure or something like a major flood event — that that might bring these issues more to light."

Kline marches us across an arc-shaped parcel in Rochester that houses a baseball field, a skate park and a school. In the distance, verdant mountains surround white A-frame homes, with fields of corn at river's

edge. It's the polar opposite of the horrific island in Bennington. This isn't a landscape — it's a Winslow Homer painting.

Despite the baking-hot, late-afternoon sun, Kline is bounding down the field toward the riverbed. This farmland is one of the first 10 plots of Vermont's innovative easement program, in which a state land trust purchases channel management rights to a narrow corridor lining a river. Instead of spending money to armor the riverbank against erosion, the farmer gets cash (say, $1,500 per acre), and the state receives authority to enforce the river's ability to move where it wants. Kline is working to acquire dozens more plots just like this.

Though protecting agricultural land is a worthy cause, a key motive behind the easements is to save towns from floods. In Hinesburg, a bedroom suburb of Burlington, the La Platte River flows down out of the mountains and hits a large floodplain where condominium developers were itching to buy land. River Management negotiated an easement that re-established the floodplain, helping to protect the village from violent flows.

Such one-off projects only hint at Kline's more ambitious plans. He's trying to integrate national flood insurance with the river erosion hazard maps in every town in Vermont. He's using incentives to persuade local officials to change: Those who follow state recommendations jump to the front of the line for federal grants. He's working with the Legislature to create parallel policies at other agencies that reward proactive towns.

Now that New Hampshire has followed his lead, he's also hoping to assemble a northeast regional river management partnership that'll capture the interest of the federal government, which, he hopes, will add its own incentives. He and Evans are already pushing FEMA to increase federal matching grants for cities and states that go well beyond minimum regulations.

"Without a better package of incentives for communities, I..." Kline begins, then stops and sighs.

"We worry that we'll be sort of stuck in first gear. Little old Vermont has a hard time making a big dent at the national level. The federal government could play a huge role."

Kline looks out across the field to the other bank, surveying the rows of corn in the purple dirt. Whoever owns this land, or leases it, can grow corn only up to a 50-foot buffer against the river, wherever it may move. As long as the buffer is in place, it's his land. But if a flood scoops a chunk out of the cornfield, it's now the river's property, and the farmer must retreat.

"The whole corridor now belongs to the river," he says. "And you are a guest of the river."

http://www.miller-mccune.com/science_environment/before-the-flood-1515?utm_source=Newsletter80&utm_medium=email&utm_content=1027&utm_campaign=newsletters

40 Years of Muppetology 101

By: Tom Jacobs

In the four decades since its premiere on Nov. 10, 1969, *Sesame Street* has been the subject of enough scholarly studies to give Big Bird a lifetime of nest-making material. Leafing through the literature is like letting the Cookie Monster loose in a Mrs. Fields franchise: You delve in excitedly before realizing there's more here than any single creature can digest.

The nexus between *Sesame Street* and academic research predates the debut of the classic children's show. In 1967, Joan Ganz Cooney, a producer at New York City's "educational" (soon to be "public") television station, Channel 13, wrote a seminal paper titled "The Potential Uses of Television in Preschool Education." Submitted to a receptive Carnegie Foundation in February 1968, the report summarizes the scant research that had been done on young children and television up to that time and described Cooney's interviews with educators and child psychologists, who shared their varied visions of an educational program for 3- to 5-year-olds.

"Nearly everyone I met liked the idea of a daily, hour-long program," she wrote. "Almost all of them wanted the letters of the alphabet and their sounds, as well as numbers, included." One month later, the Children's Television Workshop (later renamed the Sesame Workshop) was founded, with Cooney as executive director. The University of Michigan's Edward Palmer was hired as vice president for research (a position, one can safely assume, that was never created for the *Howdy Doody* show).According to his 1999 *New York Times* obituary, "Palmer's findings indicated that children took delight in watching other children and animals, that they liked music and slapstick, wanted characters to be kind to one another, and were bored by talking adults." Incorporating his results and the insights of child development experts, producers of the nascent program — with the invaluable help of Jim Henson and his Muppets — created its remarkably durable structure.

Given its research base, it's not surprising that academics began studying *Sesame Street*'s impact virtually as soon as it went on the air. In 1972, a summary of this early research was published in the *Journal of Special Education*. The consensus, according to the University of Pennsylvania's Janet Rogers, was that the show was "highly successful" in meeting its goal of preparing children for school. "Children who have watched *Sesame Street* are more interested in what teachers are trying to teach and have superior concentration to that of their peers," she wrote. An early study of nearly 1,000 3- to 5-year-olds conducted by Educational Television Service found that those who had watched the show outperformed their peers in terms of both specific skills and vocabulary, adding that "children who watched the most learned the most."

But more than a few academics played the role of Oscar the Grouch, complaining that the show "was too far removed from structured teaching" or "borrowed too heavily from high-pressure patterns of commercial TV." John Holt, author of *How Children Learn*, wrote a detailed critique of the program for the May 1971 issue of *The Atlantic*. In it, he complained that it "has aimed too low," especially in terms of introducing kids to the concept of writing. Children, he asserted, should be taught that writing is an extension of speech — something that could be done by showing words on the screen as they are being spoken. Cooney conceded this was sound criticism and tweaked the program accordingly, thus establishing the pattern of letting the show evolve as new research produces fresh ideas.

In the 1980s and 1990s, scholars looked at how members of the Sesame Street generation were doing in high school. Two teams of researchers collaborated to interview 570 adolescents, all of whom had been studied as preschoolers. "The most striking finding was that frequent viewers of *Sesame Street* and other child-informative programs at age 5 had higher high school grades in English, math and science than infrequent viewers, even with controls for early language ability and the educational level achieved by parents," Althea Huston of the University of Texas at Austin reported in the May 1998 *Annals of the American Society of Political and Social Science*. The head start provided by Bert, Ernie and the gang was still paying off more than a decade later.In that same paper, Huston and co-author John C. Wright addressed a series of criticisms made of *Sesame Street* and the other educational programs that it spawned. They examined specific elements that discomforted critics — including the notion that the fast pace of such shows produce kids with a reduced attention span — and concluded such fears were not supported by evidence. "On the contrary," they wrote, "heavy viewers of *Sesame Street* are rated as being slightly better prepared for school and as having a more positive attitude toward school than infrequent viewers."

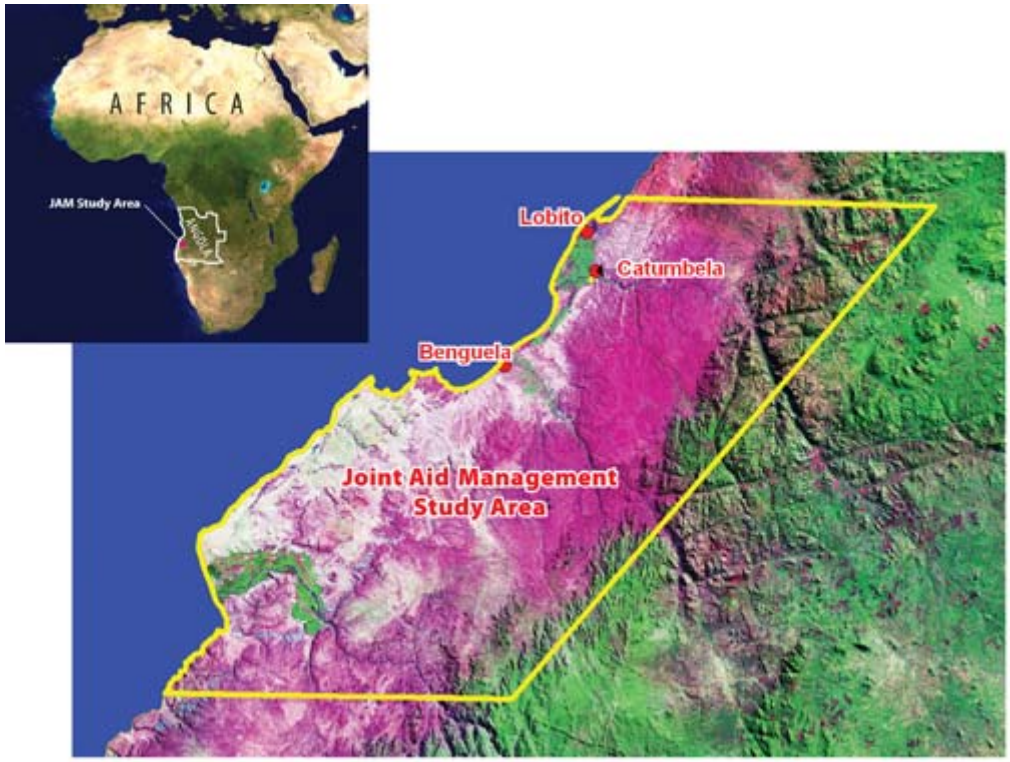
OK, so *Sesame Street* helps teach kids how to read. But will it bring about world peace? The program is currently seen in 120 countries, 30 of which boast specially created versions co-produced by the New York-based company and a local broadcaster. Some of these are in regions with severe ethnic tensions, including the Middle East and Kosovo; appropriately, those series have focused heavily on promoting respect and understanding.So how are they doing? A 2003 study in the *International Journal of Behavioral Development* examined the initial impact of *Rechov Sumsum* and *Shara'a Simsim*, Hebrew- and Arabic-language versions of *Sesame Street* aimed at Israeli and Palestinian children, respectively. The programs simultaneously premiered in April 1998; researchers interviewed children from both Israel and the Palestinian territories before it went on the air, and again after four months of broadcasts.

Not surprisingly, they found that children from both regions "had negative stereotypes about the other culture" as early as age 4. After 16 weeks of *Sesame Street*, "only the Israeli-Jewish children displayed a change in response pattern regarding knowledge of cultural similarities," the researchers reported. In contrast, the Arabic version of the show "did not seem to affect Palestinian children's use of negative stereotyping."In a 2008 follow-up in that same journal, Charlotte Cole, the Sesame Workshop's in-house academic researcher, conceded those results were disappointing. She noted that because the Palestinian programs were shorter (15 minutes rather than 30), and fewer were produced, children in the West Bank and Gaza "saw primarily Palestinian material with only a minimal amount of Israeli content," whereas the Israeli children saw a significant amount of footage created by Palestinians. "Had the producers been able to include more Israeli material in the Arabic program, the outcome might have been very different," she concluded.Cole added that "even though many children had previously expressed intense negative stereotypes about an *adult* member of the other culture, the majority of children (who were regular *Sesame Street* viewers) applied concepts of fairness, and in some instances friendship, to *peer* conflict situations involving Israeli and Palestinian children." She argued that this finding "lends credibility to the worth of programs that are oriented to the child-to-child level," adding that such shows can make an impact "when they are child-relevant, age-appropriate and provide direct and explicit messages." After all, who couldn't love the Falafel Monster?

http://www.miller-mccune.com/culture_society/40-years-of-muppetology-101-1518?utm_source=Newsletter80&utm_medium=email&utm_content=1027&utm_campaign=newsletters

Finding Water from Outer Space

By: Vince Beiser



The Land Cruiser rattles and bumps down a stripe of rutted dirt carving through the brush in this remote corner of southern Angola. Half a mile to the west, the tranquil blue Atlantic glimmers in the African sun. To the east, miles of spiky desert grass fade away to a range of sere mountains. The last village lies miles behind us, the next miles ahead.

In the front seat, Alain Gachet, a plump, boyish 58-year-old, his thick crest of silver hair crammed under a leather Indiana Jones hat, is focused intently on the laptop balanced on his knees. The computer is plugged into a tiny GPS unit set on the dashboard. On the screen, a thin yellow line tracking our progress creeps forward over a map stippled with thousands of differently colored squares.

"Stop here!" Gachet cries suddenly.

The driver brakes in the middle of the track. By the time three South African drillers and I extricate ourselves from the cramped vehicle, Gachet has bounded out, scrambled over a hillock and found a low, clear patch of sandy yellow soil.

"Right here, Freddy," Gachet requests in French-accented English.

Freddy Chambers, the beefy lead driller whose thick salt-and-pepper hair and mustache lend him a passing resemblance to Saddam Hussein, drives a shovel into the earth. Gachet practically vibrates with excitement as he watches. About 2 feet down, muddy gray water starts bubbling into the hole. Both men's faces split into grins.

Gachet fills an empty juice bottle with the cloudy liquid, strains it through a portable filter and drinks. "Fresh water," he says and bursts out laughing.

It's an extraordinary find, not only because the area is so dry, but because underground water this close to the sea would normally be too salty to drink. Gachet knew there would be fresh water in this spot, though; messages from outer space told him so.

Finding more fresh water is one of the paramount challenges of the 21st century. Nearly one-third of the human race lacks reliable access to clean water, according to the International Water Management Institute. Some 3 million people — most of them children — die every year from diseases spread by contaminated water. A 2007 report by the U.N. Environment Program predicts that by 2025, if population growth and environmental degradation continue apace, 1.8 billion people will live in countries with "absolute water scarcity."

A former oil industry geologist, Gachet has developed a path-breaking, high-tech system that could help slake that growing thirst. The key: using satellites high above the Earth's surface to see what's underneath it.

By combining terabytes of space-based photographic imagery, ground-penetrating radar and topographic data — much of which has only recently become available — Gachet creates multispectral maps that are proving excellent guides for finding undiscovered underground aquatic resources. At the height of the Darfur crisis, the United Nations called on Gachet to help find sustainable locations for camps in Chad that now house thousands of refugees. It was the first time such technology had been used in a humanitarian emergency. "Gachet's work was an extremely important contribution at a time when it was not sure that [the U.N.] would be able to provide water for the long term for all refugees," says Marc-Andre Bunzli, a former U.N. official who worked with Gachet in Chad. Since then, Gachet has located water in Darfur itself, as well as in parts of Afghanistan, Iraq and Eritrea.

I joined Gachet last summer for the kickoff of a new project. Joint Aid Management, a South Africa-based humanitarian group, recently began a campaign to provide food and water to some 450 schools scattered over hundreds of miles in war-blasted Angola. Because it costs an average of $10,000 to bore a hole for a well, the group has a major incentive to increase its hit rate. Joint Aid Management brought in Gachet to help them figure out where to dig.

"It's the first time I'm working not in a war zone but in a reconstruction area," Gachet told me when I first met him in JAM's compound, a fenced-off patch of desert full of trucks, housing trailers and a small processed food factory on the outskirts of Benguela, a coastal city in southern Angola. "Emergency situations are very frustrating. You maintain people in camps, but you don't deal with sustainable development. It's crazy, because you create a generation of beggars. Here, I hope the wells can bring prosperity and stability."

This beleaguered southern African nation can certainly use both. Colonized by Portugal for centuries, Angola won independence in 1975 after a lengthy guerrilla struggle — only to plunge almost immediately into an even more devastating civil war. The two main factions became Cold War cat's-paws, with the Soviet Union and Cuba arming the governing Movimento Popular de Libertacao de Angola, and the U.S. and South Africa backing the rebel Uniao Nacional para a Independencia Total de Angola. The fighting ground on for 27 years, until the MPLA finally beat UNITA down. The war left as many as 1.5 million Angolans dead, factories and cities in ruins, and roads and farms infested with landmines.

Today, seven years after the shooting stopped, Angola is still pretty much a basket case. The United Nations ranks it as one of the world's poorest countries despite its enormous natural resources. Twice the size of Texas, Angola is rich in diamonds, gold and other minerals, not to mention enormous oil reserves

that are only beginning to be seriously tapped. New five-star hotels are surging up from the potholed streets of the capital, Luanda, and a tiny elite with connections to President Jose Eduardo dos Santos is reportedly pocketing fortunes in petro-dollars. But there's not much sign of that new wealth elsewhere. An estimated 70 percent of the nation's 13 million inhabitants live on less than one U.S. dollar a day; 35 percent are malnourished. A chronic lack of basic sanitation and health care help give Angola the world's second-highest infant-mortality rate. Those who survive can expect to die before reaching the age of 42.

Lack of clean water is one of the key factors driving those appalling statistics. One day, I visited a children's hospital in Cubal, a small town in the grasslands southeast of Benguela. Cubal consists of a few streets of government offices and shops housed in low cement buildings, surrounded by acres of mud-brick huts roofed with thatch or corrugated tin held down with rocks.

In the spartan hospital, dozens of scrawny, undersized children sprawl listlessly on thin mattresses or lie in the arms of their stoic mothers. One or two cry insistently, but quietly — they don't have the strength to scream. Many have the distended bellies and open sores that indicate extreme protein deficiency. Nearly all have severe diarrhea, an ailment that's typically caused by unclean water and can be fatal if left untreated. Every now and then, outbreaks of water-borne cholera bring in even sicker kids.

How big a problem is water? "Grandissimo," says Sister Milagros Moreno, the redoubtable Spanish nun who has worked in this church-run hospital for 18 years. "Most people get their water from the river. It's very contaminated. Everyone washes their clothes and bathes in it. But people don't have enough wood or gas to boil the water. Wells would be a huge help."

Gachet has been investigating what lies beneath African soil almost his entire life. He was born in northern Madagascar in 1951, the son of French colonial civil servants. His father, a botanist, started taking him on treks into the rainforest when he was 4 years old. That's when Gachet fell in love with rocks. Prehistoric fossils were everywhere. He was fascinated by the story of how the continents had split apart eons ago, leaving the history of their union inscribed in layers of subterranean stone.

As an adult, naturally, he became a geologist. He worked for ELF, the French oil giant, for two decades, helping to find new oil and gas fields from Gabon to Holland's portion of the North Sea. "I've always been involved in exploration," he says. "I tell people where the wealth is, how deep down and how they can reach it by drilling."

But he grew disillusioned working in The Republic of Congo during the civil war of the 1990s. "I was the one who had to co-sign our checks to the government. It was clear the money was going to buy weapons," Gachet says. "I was losing the pride of working for this company."

So he set up his own, which he eventually dubbed Radar Technologies International. In 1996, Gachet was contacted by a mining outfit that wanted to locate the source of the gold their Pygmy workers in The Republic of Congo kept finding in rivers. There were few maps of the area, and aerial photographs were no help; the rainforest canopy was too dense.

Gachet turned to two new pieces of technology. Using an early GPS unit, he followed the Pygmies into the jungle, marking the spot in each river where they pulled out nuggets. Then he bought newly available radar images of the area taken by the American space shuttle. The radar could penetrate clouds and jungle to give Gachet a rough sense of the shape and texture of the land beneath — big clues to its underlying geology. By overlaying those images onto his GPS data points, he was able to locate the gold's source. "I had the illumination that I was in front of a completely new way to explore the planet," he says.

That "new way" is known as remote sensing — the use of imagery collected from space to find things on the ground. Gachet has integrated a suite of such technologies into his exploratory work. C-band radar used by satellites maintained by Canada and the European Space Agency penetrates the ground to a depth of about 50 centimeters. Japan's JERS-1 satellite provides L-band radar, which goes down as far as 18

meters. NASA's Landsat satellites record images of the Earth using eight different wavelengths, from infrared to visible light. The most recent addition to this arsenal of space-based imagery became available in 2004, when NASA released topographical data gathered by the space shuttle. That has enabled researchers for the first time to create 3-D views of any area on the planet. "It's a fantastic gift from the United States to the world," Gachet says.

Using these technologies, Gachet continues to find oil, diamonds and other subterranean treasures for big corporations. In 2002, while studying radar images of the Libyan desert for Shell, he noticed evidence of huge amounts of moisture underground. After some research, he realized he was looking at leaks from Libya's "Man Made River." One of President Muammar Qaddafi's proudest achievements, this colossal underground pipeline carries water from an aquifer under the Sahara to the desert nation's coastal cities. "Billions of cubic meters of water were being lost into the sand," Gachet recalls. He passed on his findings to the Libyan government and a few months later, was surprised to find himself giving a personal presentation to Qaddafi. Gachet was hoping to win a contract to monitor the pipeline. He never heard back about that — but he did hear from friends that a furious Qaddafi had executed the engineers in charge of the project. (The Libyan embassy would not comment when I asked about this incident.)

That was the beginning of a new chapter for Gachet. "I thought, 'You are finding leaks,'" he says. "'That means you can find groundwater that no one else can see.'" He began building a system, dubbed WATEX, to find water by remote sensing.

The process involves mapping the geology not just of the targeted area but of the entire watershed that feeds into it. Topographical data is an essential ingredient, allowing Gachet to see slopes that water would run down and flat areas where it might pool. Ground-penetrating radar shows fractures and natural dikes that affect the course of water's flow. Radar has a critical shortcoming, though, when it comes to reading the ground's surface: It makes a rough, pebble-strewn surface look the same as one containing significant moisture. One of Gachet's key breakthroughs was figuring out a process for telling the difference between the two.

Gachet's WATEX was well developed by 2004 when he got a call from a friend working with the U.N. High Commissioner for Refugees. "He said," Gachet recalls, "'We have 250,000 refugees along the border between Sudan and Chad; they are dying like flies. Can you help? Quickly?'" Gachet agreed and spent the next four months working up a map of some 80,000 square kilometers of the area.

Gachet does most of the work on computers in his home office in a 15th-century chateau in southern France. But to be sure of his results, he has to get his feet in the mud. Later that year, a U.N. plane dropped him in the eastern Chadian city of Abeche. From there, he and a driver set out by Land Rover to the desert refugee camps.

"It was the most terrible thing I ever faced in my life," Gachet recalls. "Children with bullet wounds. The dead being collected in trucks."

Gachet spent days inspecting the areas WATEX indicated contained moisture. He marked the ones that panned out with a pile of rocks and his own handprint in white paint. Along the way, he and his driver strayed into a minefield, got lost in a sandstorm and ran so low on food they had nothing to eat but onions and locusts. "He's a very courageous guy," says Firoz Verjee, a water researcher at George Washington University's Institute for Crisis, Disaster and Risk Management who has worked with Gachet. "He'll outdo you on risk every time."

The mission was a success. The UNHCR used Gachet's data to help select sites for four new refugee camps and rule out seven others. Five years later, "we are still using his excellent maps," says Christian Guillot, UNCHR's head of water issues for eastern Chad.

On the strength of that job, Gachet was contracted by the U.S. Agency for International Development to map all of Darfur —another 135,000 square kilometers. According to Abdalla Abdelsalam Ahmed, who holds the U.N. Educational, Scientific and Cultural Organization chair in water resources at Khartoum's Omdurman Islamic University, the WATEX data increased the drilling success rate from 33 percent to more than 90 percent, halving associated costs and significantly speeding up work. The amount of water found near the biggest refugee camps is enough for several million people. At least 300 wells have been dug based on Gachet's water-target map.

In Angola, Gachet had to start practically from scratch. "Much of the geological information was destroyed during the fighting, and there's no rainfall data, because who cared about collecting that during the war?" he says.

So from his desk in Provence, he used remote sensing to build his own geologic map of 5,000 square kilometers of southwestern Angola. It shows the various rock layers, soil types and fissures, and how all those factors conspire to direct the underground flow of water from inland rainfall and rivers toward the coast. Once his multidimensional map was ready, he hit the ground to see how accurate it was.

The coastal plain where most of Joint Aid Management's schools are located is semi-arid, an area reminiscent of Southern California, with rolling, dun-colored flatlands and hills stubbled with wiry grasses, bushes and cacti. There's certainly some water here; a number of rivers and streams cut through on their way to the sea. In each one we pass in the Land Cruiser, children swim, women wash clothes and men bathe, and, often, clean their prized motorbikes. Goats, pigs, cows and dogs roam on the banks, relieving themselves where they will. It's an exuberant, colorful scene — but it makes for tremendously unsanitary water.

Under such circumstances, wells are the best bet for drinking water — preferably wells deep enough to be free of contamination by animal and human waste and other toxins. The tricky part is figuring out where to dig them. "In most places, we literally drive around for days looking for promising spots to drill," says Chambers, the South African driller.

Gachet is spending a full week exploring the area to confirm and fine-tune his findings. He scrambles up and down hillsides like a merry mountain gnome, breaking off bits of stone with his ever-present hammer, determining the area's geologic makeup. He notes verdant strips of trees and grasses running through the scrubby flatlands — evidence that the underground water-carrying fracture he expected to find is indeed there. Whenever a village appears in an area where his map indicates there's an underground aquifer, he investigates. More often than not, the locals have already dug some kind of well, proving the existence of the aquifer.

In one little copse of scraggly trees, for instance, we find a circle of stones, cemented together and with two railroad tracks set across the top. A barefoot man in shorts and a T-shirt is hauling up bucketloads of water by hand to fill a collection of plastic jerry cans. Later he'll lug them back to his village of mud-and-thatch huts about a mile away. In another unpromising patch of scrubland, we encounter a handful of women, several with infants lashed to their backs with colorful cloths, washing clothes in plastic tubs. The water they're using comes from a well that is nothing more than a hole at the bottom of a hand-dug crater. Gachet scurries down to sample the water, much to the women's surprise and amusement. Each of these grains of information — well location, water quality, type of stone — is added to the WATEX database, constantly refining Gachet's picture of the area.

Gachet isn't the only researcher using satellites as modern dowsing rods. Farouk El-Baz, a researcher at Boston University, made headlines in 2007 when he announced that, using remote sensing techniques similar to Gachet's, he had discovered what appeared to be a vast lake of water hidden beneath the blood-soaked sands of Darfur.

The Egyptian-born El-Baz has a serious track record. He spent the late 1960s training NASA astronauts on lunar and earth geology. Since then, he's turned his attention to finding water in deserts, studying wastelands from the Arabian Peninsula to India. Several years ago, he discovered a massive underground aquifer in Egypt that today irrigates 150,000 acres of farmland.

El-Baz's purported lake could have enormous ramifications because Darfur's chronic and worsening water shortage is one of the key factors setting the locals at each other's throats. Soon after announcing his discovery, El-Baz met with top Sudanese and Egyptian government officials as well as U.N. Secretary General Ban Ki Moon. All concerned promised to back a major effort, grandly titled "1,000 Wells for Darfur," to develop this underground aquatic resource.

But two years later, not a single hole has been drilled. El-Baz says the ongoing fighting has kept him from taking a technical team to do the on-site geophysical research required to confirm the water really is there, and if so, precisely where. (Gachet, incidentally, thinks El-Baz is mistaken, and that the lake has long since dried up.) In the meantime, much of the initial enthusiasm around the project seems to have evaporated. The Egyptian government, which had promised to drill 40 wells in the lake area, is now looking elsewhere. The United Nations was willing to help, El-Baz says, but no one ponied up funds. The "1,000 Wells for Darfur" Web site has been taken down. The only firm commitment is from the Sudanese government, which has promised to dig a grand total of five wells. At best, El-Baz says, it will be a year before any drilling begins.

That story points out the limitations of the work El-Baz and Gachet do. They may be able to find water — but the water might not be where it's needed. El-Baz's purported lake is in Sudan's northern desert, nearly 200 miles from population centers. Even if there is water there, the wells to tap it will be fantastically expensive — about $500,000 each, El-Baz estimates. "There's no road anywhere near the place," he explains. "They will need to bring in everything — quarters, water, equipment, food."

Politics is at least as big an obstacle as logistics and cost. One of the lake project's most enthusiastic backers, El-Baz says, is Sudanese President Omar al-Bashir — whom the International Criminal Court recently indicted on charges of committing atrocities against the people of Darfur. The indictment raises a question: What would Bashir actually do with the water?

"New water resources provide as many perils as hopes depending on the politics of how the water is controlled," Darfur expert Alex de Waal wrote in a recent paper for the Social Science Research Council about El-Baz's underground lake. Those resources could be used for the benefit of all, "[but] given the opportunity, Khartoum is likely to utilize [them] to reward its local allies with ownership of the most productive new farms." De Waal's conclusion: "The aquifer is no solution to the region's crisis, and if mishandled could even worsen the conflict."

Even in the absence of such ugly politics, the overall lack of development in much of sub-Saharan Africa means that just finding and drilling a well isn't enough. "We have a systematic problem of wells not being maintained," says Anthony Jones, JAM's program director for southern Africa. "We come in, drill a well, install a hand pump. But a year or two later, the pump breaks, and the local people don't know what to do. So they go back to hand-dug wells and other less-safe water resources."

The remote sensing work isn't cheap, either. Gachet volunteered his time on the ground in Angola but did charge JAM $50,000 for creating the water-target map.

In short, Gachet's WATEX system is no silver bullet for the developing world's water woes. But it can certainly help. "The technology far surpasses our expectations," says Jim Lutzweiler, JAM's head of strategic development. "It's like moving from a Toyota to a Mercedes, in terms of the amount of detail it provides. It's going to increase our hit rate tremendously."

And WATEX has applications beyond simply targeting wells or even finding new sources of water in emergency situations. It can support long-term development. The system can, for instance, identify the best places to build dams across wadis, capturing the rains that briefly flood arid places — eastern Chad, for example — every winter. It can also identify agriculture-friendly soil types and economically valuable mineral deposits. "It's expensive, but it's a great development tool," Jones says. "I can see it being very useful to us in terms of figuring out where schools and towns should be."

Gachet is thinking bigger. He's planning trips to the U.S. to try to drum up interest from major foundations and other potential backers to apply WATEX on a massive scale. "We could create a consistent picture of all of Africa and make the results available to anybody," he says. "WATEX should allow us to avoid future wars linked to water."

That goal is perhaps a tad ambitious. Remote sensing is, after all, just a tool for finding water, and tools can always be misused. But put to work properly, this one can make a critical difference.

In Cubal, after showing me the hospital, Sister Moreno gives me a tour of the rest of the compound. It includes a sizeable church and an elementary school full of children in unmatched but uniformly spotless white shirts. In the school's courtyard, a group of boys and girls cluster around one of the key resources that keeps them healthy when so many other local children aren't. One by one, they wash their hands under the trickle dribbling out of the metal pipe of a hand-pumped well, then cup them for a drink of clean, fresh water.

http://www.miller-mccune.com/science_environment/finding-water-from-outer-space-1514?utm_source=Newsletter80&utm_medium=email&utm_content=1027&utm_campaign=newsletters

Mothering matters, but grandmothering counts too

- 14:57 28 October 2009 by **Jessica Hamzelou**
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Safeguarding genes (Image: Hola Images/Getty)

Why women evolved to live so far beyond their reproductive years is a mystery long debated. Now there is new evidence backing the "grandma hypothesis" – that they stick around to invest in their grandchildren, safeguarding the genes they share.

Leslie Knapp and her team at the University of Cambridge reasoned that if the hypothesis is true, how much grandma invests in her grandchildren should depend on the proportion of genes they share. So they came up with a way to test this.

Due to the way X chromosomes are transmitted, grandmothers share an equal amount of DNA with their daughter's sons and daughters, but a smaller proportion of DNA with their son's son than with their son's daughter. So the team reasoned that paternal grandmas might invest less in these grandsons than these granddaughters, which in turn might have a measurable effect on life expectancy.

Boys beware

Knapp's team examined historical records from seven countries, including England, Japan and Ethiopia, which ranged from the 17th century to today. "We wanted to test whether the effect was independent of culture," says Knapp.

For kids who grew up in the same village or lived in the same home as their grandma, they noted if she was paternal or maternal and when the children died.

Sure enough, the researchers found that in all seven countries, males died earlier if they had grown up with their paternal, rather than their maternal, grandmother. This was not true for the girls.

Grandmas might differ in levels of investment in their grandchildren through food provision or teaching, says Knapp.

Future focused

The genes on the X chromosome only make up about 8 per cent of our genes – and so aren't the only ones that grandmas have an interest in protecting. However, Knapp points out that "the X carries genes known to be involved in fertility and intelligence, which are important for future reproductive success".

Before all you grandsons out there start firing dirty looks at your dad's mother, the findings don't mean that granny thinks any less of you. There's no evidence that paternal grandmas have a conscious preference for their sons' daughters, says Knapp.

Cheryl Jamison, a sociologist at Indiana University in Bloomington, calls the research "fascinating". She also emphasises that the genes on the X chromosome are just some of the many factors that drive grandmothers' behaviour towards their grandchildren. Culture and environment, as well as genes found on other chromosomes, must also play a role.

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http://www.newscientist.com/article/dn18065-mothering-matters-but-grandmothering-counts-too.html

Real sea monsters: The hunt for predator X

- 10:55 27 October 2009 by **James O'Donoghue**
- Magazine issue 2732.

Plesiosaurs were one of the most successful marine groups (Image: Christian Darkin/Science Photo Library)

1 more image

EACH summer, a team from the University of Oslo in Norway go hunting for monsters on the island of Spitsbergen. They carry guns in case they get menaced by the world's largest living land carnivore, the polar bear. But it is not bears they are after. They are searching for much bigger quarry, the most formidable predators that ever lived.

Step back 150 million years and Spitsbergen was covered by a cool, shallow sea swarming with marine reptiles. The creatures died out and their fossils became part of an island stuffed full of bones. Nowhere else in the world are so many marine reptiles found in one place.

For a few short weeks the sun never sets and temperatures soar to just above freezing. Knowing that before long the ground will be frozen solid, the researchers dig like crazy. "It's like a gold rush, there are so many fossils waiting to be found," says team leader Jørn Hurum. "The site is densely packed with skeletons. As we speak there are probably more than 1000 skeletons weathering out."

Hurum's Arctic discoveries are part of a remarkable renaissance in interest in the marine reptiles of the Mesozoic era, 251 to 65 million years ago – including this week's announcement of a colossal new marine reptile from the "Jurassic coast" of Dorset in southern England. We now know more about this group of creatures than ever before.

Marine reptiles were among the first vertebrate fossils known to science and were key to the development of the theory of evolution. In the late 18th century the massive jaws of a lizard-like beast were found in a mine in Maastricht in the Netherlands. Later named *Mosasaurus*, the creature helped convince scientists that animals could become extinct, a radical concept in its day. In the early 19th century, ichthyosaurs and plesiosaurs discovered by legendary fossil hunter Mary Anning around Lyme Bay in south-west England helped establish the science of palaeontology. Marine reptiles were among the best-understood extinct creatures of the first half of the 19th century and played a major role in the intellectual debate nurturing Darwin's theory of evolution.

Yet they faded from view as their terrestrial relatives moved to centre stage. It took nearly a century for marine reptile research to emerge from the shadow cast by the dinosaurs. "Scientists thought they knew all there was to know," says plesiosaur expert Leslie Noè of the Thinktank museum in

Birmingham, UK. "The idea was that they weren't worth studying. Nobody would say that now. Our understanding of marine reptiles is phenomenally greater now than it was even 10 years ago."

In the modern world, marine reptiles are few and far between: saltwater crocodiles, turtles and sea snakes are rarities of coastal waters. However, in the ice-free greenhouse of the Mesozoic, reptiles cruised the oceans from pole to pole, occupying the ecological roles now largely filled by whales, dolphins, porpoises, seals and even sharks.

Much like today's marine mammals, marine reptiles evolved from land-living ancestors and were air-breathing. For them, it was a true return to the water. Reptiles evolved around 300 million years ago from amphibian-like ancestors that needed to lay their eggs in water. Reptiles, in contrast, thrive in hot, dry environments.

Among the first to go back were the mesosaurs around 280 million years ago. They were fully aquatic with long, thin bodies, webbed feet and jaws bristling with teeth. They disappeared just a few million years later leaving no known descendants.

Only after the Permian mass extinction 251 million years ago did a full-scale reptilian invasion begin. The extinction was the greatest clear-out of life the world has ever seen and marine life was hit particularly hard: 19 out of every 20 marine species became extinct.

Air-breathers

The empty seas were ripe for colonisation and reptiles were well placed to take advantage. Temperatures were several degrees warmer than today, which suited cold-blooded reptiles very well. Being air-breathing meant they could thrive in the low-oxygen waters of the post-Permian world where fish struggled to survive. Large predatory fish were also few and far between.

Many types of marine reptile evolved during the Mesozoic, but four stand out owing to their abundance, dominance and global distribution: ichthyosaurs, plesiosaurs, pliosaurs and mosasaurs. All four groups were predatory and included the top marine predators of their time. Some species reached truly enormous sizes.

One key to their success was the evolution of live birth, or vivipary. It has been known for decades that ichthyosaurs reproduced in this way, thanks to well-preserved fossils found at Holzmaden quarry in Germany. One exquisite specimen, now in the State Museum of Natural History in Stuttgart, captures an ichthyosaur in the process of giving birth (see photo, above).

Vivipary was probably seen in all large marine reptiles. In 2001, Mike Caldwell of the University of Alberta, Canada, was examining a mosasaur fossil in the Museum of Natural History in Trieste, Italy. "As soon as I popped open that drawer I knew we had an important discovery. In front of me was a mosasaur with embryos – it had tiny little versions of the adults lined up in its belly," he says.

In 2004 came evidence that a group ancestral to the plesiosaurs, the keichousaurs, also gave birth to live young. As a result, researchers now think that plesiosaurs must also have been viviparous (*Nature*, vol 432, p 383)."Live birth allows you to get much bigger because you don't need to come into shallow water or make your way onto land to lay eggs," says Caldwell. "If you can give birth in water then you can colonise the oceans of the planet" (*Proceedings of the Royal Society of London B*, vol 268, p 2397).

The first big success story was the ichthyosaurs, which appear in the fossil record around 245 million years ago. Early ichthyosaurs were eel-like creatures that stayed close to shore, but over the next 40 million years they evolved into streamlined, dolphin-shaped cruisers that raced through the open

oceans, according to ichthyosaur expert Ryosuke Motani of the University of California, Davis (*Nature*, vol 382, p 347).

Some lineages evolved into the biggest marine reptiles that ever lived. In 2004, a team led by Elizabeth Nicholls of the Royal Tyrrell Museum in Drumheller, Canada, excavated a monstrous ichthyosaur from 210-million-year-old rocks in British Columbia. At 21 metres long, *Shonisaurus* was as big as a fin whale, the world's second-largest living animal. "If you blow up a dolphin and make it skinnier then that is probably what *Shonisaurus* looked like," says Motani, who was part of the excavation team (*Journal of Vertebrate Paleontology*, vol 24, p 838). Fragmentary remains suggest that even bigger ichthyosaurs existed around that time.

By the start of the Jurassic period of 200 million years ago, the behemoths were joined by smaller, faster cruisers. In 2002, Motani estimated that *Stenopterygius*, a 180-million-year-old ichthyosaur from Europe, had a cruising speed comparable with tuna, which are among the fastest of all living fish (*Paleobiology*, vol 28, p 251).

The Jurassic was the ichthyosaurs' golden age. They were more abundant than any other marine reptile and were the first group to conquer the deep oceans, as Motani demonstrated through research into the optical properties of their eyes.

In general, eye size and body size are closely correlated in vertebrates: blue whales are the largest living vertebrates and have the biggest eyes, 15 centimetres in diameter.

Many ichthyosaurs bucked that trend. "Ichthyosaur eyes were the biggest of any vertebrate," says Motani. The 4-metre-long *Ophthalmosaurus*, for example, had eyes 23 centimetres across, the size of frisbees, while the eyes of the 9-metre *Temnodontosaurus* were 26 centimetres. Among living creatures, only deep-sea giant squid have eyes of comparable size. Motani argues that giant eyes were an adaptation for diving down 500 metres or more to hunt for squid and other cephalopods, such as the now extinct belemnites.

Montani estimated the visual acuity of ichthyosaur eyes by calculating their light-gathering capacity based on size and focal length. He concluded that they were more sensitive than a typical nocturnal mammal. "At 500 metres down a human would not be able to see a thing but an ichthyosaur would have been able to see moving objects," he says (*Nature*, vol 402, p 747).

At the start of the Jurassic the ichthyosaurs were joined by the plesiosaurs and pliosaurs, which thrived right through until the end of the Cretaceous some 65 million years ago. They were closely related, though they didn't look it: plesiosaurs had long necks, small heads and graceful bodies, while the pliosaurs had massive bodies, short necks and large heads. Both swam using two large pairs of paddles.

Central to the plesiosaurs' biology were their long necks, which in extreme cases could be longer than the rest of the body and tail combined. The neck of *Elasmosaurus* has 72 vertebrae, more than any other animal that we know of. "Long-necked marine animals disappear with the extinction of the plesiosaurs. That way of living just doesn't exist any more," says Noè. Yet long necks were integral to the plesiosaur success story.

Perhaps they were using their long necks to sneak up under schools of fish silhouetted against the sky, suggests marine reptile expert Mike Everhart of the Sternberg Museum of Natural History in Hays, Kansas. "The plesiosaur would have approached from a blind spot as fish can't see well underneath or behind. Then it grabs what it can before the school is alerted." With plesiosaur stomach contents showing fish were a main prey item, this explanation is widely accepted.

However, Noè recently suggested that they were bottom feeders. According to this scenario, the plesiosaur's peg-toothed head rummaged for prey on the sea floor while its body floated above (*Journal of Vertebrate Paleontology*, vol 26, p 105A). Support for this idea came from a 2005 discovery in Queensland, Australia, where Colin McHenry of the University of Newcastle in New South Wales found plesiosaur stomachs full of sea-floor invertebrates (*Science*, vol 310, p 75). McHenry believes that both explanations are correct. "A long neck is a fantastic general-purpose feeding mechanism. It allows you to drift along the bottom and pick out bits that interest you but also gives you the agility to catch fish and squid," he says.

Although plesiosaurs could reach 14 metres, much of their length was taken up by their necks. Overall they were dwarfed by their relatives the pliosaurs, the unquestioned top predators of the Mesozoic seas.

There is some dispute over the identity of the very largest pliosaur, but *Pliosaurus* must come close. It is known from a 3-metre jaw found in Oxfordshire, UK, and Noè estimates that it was up to 18 metres long. "You could put your arm inside its tooth sockets, they are so huge," says Noè, who described the specimen in 2004 (*Proceedings of the Geologists' Association*, vol 115, p 13). He estimates that it weighed as much as 30 tonnes. In comparison, a fully grown *T. rex* was a puny 7 tonnes.

Hurum has found fragments of pliosaurs of similar size in Spitsbergen, two of which – nicknamed "predator X" and "the monster" – could have been as much as 15 metres long. The huge British pliosaur announced this week had a jaw around 2.4 metres long, putting it in the same ballpark as predator X. But it was unlikely to have been as big as *Pliosaurus* itself.

Not only were they huge, they were also formidable. The stomach contents of an 11-metre Australian pliosaur, *Kronosaurus*, which lived 100 million years ago, reveal it ate plesiosaurs, according to as-yet unpublished research by McHenry. Comparisons with living crocodiles suggest *Kronosaurus* had a much more powerful bite than would be expected for an animal with such a long snout.

For unknown reasons ichthyosaurs and large pliosaurs had died out by 90 million years ago, but it didn't take long for their ecological roles to be refilled.

Mosasaurs were a new breed of marine reptile that branched off from the monitor lizard lineage. Knowledge of the mosasaurs goes back to the discovery of *Mosasaurus,* and their fossil record is more complete than for other marine reptiles. Uniquely, we also know of semi-aquatic transitional forms at the base of the family tree.

Perhaps the best of these "missing links" is the 98-million-year-old *Haasiasaurus*, discovered near Ramallah in the Palestinian West Bank. "*Haasiasaurus* could get around on land just as easily as in the water," says Mike Polcyn of the Southern Methodist University in Dallas, Texas, who described the species in 1999 (*National Science Museum, Tokyo, Monographs*, no 15, p 259).

These early mosasaurs went on to evolve into fully marine forms up to 15 metres long. The final evolutionary radiation of sea monsters had begun and competition was fierce. "Mosasaurs were getting into vicious fights with one another," says Everhart. "I've seen broken bones, crushed skulls and huge bite marks." A 5-metre tylosaur from Kansas that he studied in 2008 was killed by a massive bite to its head. The only animal capable of delivering such an injury was a larger mosasaur, says Everhart (*Transactions of the Kansas Academy of Sciences*, vol 111, p 251).

They were getting into vicious fights. I've seen broken bones, crushed skulls and huge bite marks
The very latest mosasaurs showed an interesting evolutionary trend. "Primitive mosasaurs were slender creatures that undulated their bodies like eels," says Johan Lindgren of Lund University in Sweden. "Over time they stiffened their bodies and eventually only swam with their tails, like sharks."

This process peaked with *Plotosaurus*, the most advanced mosasaur we know of. In a stunning example of convergent evolution, *Plotosaurus* had evolved a body shape approaching that of the ichthyosaurs (*Lethaia*, vol 40, p 153).

Known only from the latest Cretaceous, the 8-metre-long *Plotosaurus* hints at the way mosasaurs would have evolved – had they not gone extinct.

At the end of the Cretaceous the mosasaurs, plesiosaurs and pliosaurs joined the dinosaurs in the roll call of another mass extinction. "The great marine reptiles were at the top of a long food chain that collapsed 65 million years ago. There was no longer enough food to keep them alive," says Noè.

The sea monsters had had their day. But a vacuum was waiting to be filled, and 10 million years later *Pakicetus*, a carnivorous mammal that looked a bit like a wolf, took a tentative dip in the water. The invasion of the sea had begun again. But that's another story.

Marine reptile basics

Marine reptiles are often lumped together with the dinosaurs, but like the flying pterosaurs, they are a separate branch of the family tree. Perhaps the best known are the dolphin-like ichthyosaurs and the plesiosaurs, which looked like the mythical Loch Ness monster. But several other groups evolved over the course of the Mesozoic era (251 to 65 million years ago), most notably pliosaurs and mosasaurs. Ichthyosaurs went extinct about 90 million years ago while the others died out with the dinosaurs.

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http://www.newscientist.com/article/dn18047-real-sea-monsters-the-hunt-for-predator-x.html

Multiplying universes: How many is the multiverse?

- 28 October 2009 by **Amanda Gefter**

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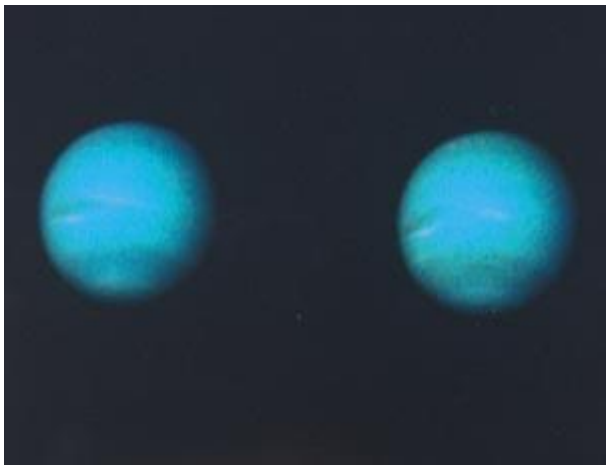


Seeing double. It's getting crowded out there in the multiverse (Image: Time Life Pictures/NASA/Getty)

HOW many universes are there? Cosmologists Andrei Linde and Vitaly Vanchurin at Stanford University in California calculate that the number dwarfs the 10^{500} universes postulated in string theory, and raise the provocative notion that the answer may depend on the human brain.

The idea that there is more than one universe, each with its own laws of physics, arises out of several different theories, including string theory and cosmic inflation. This concept of a "multiverse" could explain a puzzling mystery - why dark energy, the furtive force that is accelerating the expansion of space, appears improbably fine-tuned for life. With a large number of universes, there is bound to be one that has a dark energy value like ours.

Calculating the probability of observing this value - and other features of the cosmos - depends on how many universes of various kinds populate the multiverse. String theory describes 10^{500} universes, but that just counts different vacuum states, which are like the blank canvases upon which universes are painted. The features of each canvas determine what the overall painting will look like - such as the laws of physics in that universe - but not the details.

Thanks to the randomness of quantum mechanics, two identical vacuum states can end up as very different universes. Small quantum fluctuations in the very early universe are stretched to astronomical scales by inflation, the period of faster-than-light expansion just after the big bang. These fluctuations lay down a gravitational blueprint that eventually determines the placement of stars and galaxies across the sky. Small differences in the form of these fluctuations can produce a universe in which the Milky Way is slightly bigger, or closer to its neighbours.

So just how many of these different universes can inflation's quantum fluctuations produce? According to Linde and Vanchurin, the total is about $10^{10^{10,000,000}}$ - that's a 10 raised to a number ending with 10 million zeros (arxiv.org/abs/0910.1589). Suddenly string theory's multiverse of 10^{500} universes is looking rather claustrophobic.

It might be, however, that this number is irrelevant, and that in a world ruled by quantum physics what matters is how many universes a single observer can distinguish. "Before quantum mechanics," says Linde, "we thought that 'reality' was a well-defined word." In classical physics, observers are irrelevant - we simply want to know how many universes exist.

It may not matter how many universes exist - just how many a single observer can tell apart
According to quantum physics, observers affect the systems they measure (see "Restricted view"). If observers are an integral part of the cosmic formula, then it may not matter how many universes exist - just how many a single observer can tell apart. If the observer is a person, that depends on how many bits of information the brain can process. "Based on the number of synapses in a typical brain, a human observer can register 10^{16}," says Linde. That means humans can differentiate 10^{1016} universes, which is much more manageable than the $10^{1010,000,000}$ Linde and Vanchurin found to start with.

But does the human brain really play a role in making predictions in the multiverse? "This goes deep into philosophy," Linde says. "It's a slippery slope."

Cosmologist Alex Vilenkin of Tufts University in Boston is equally ambivalent. "It could be right that what is important is what an observer sees," he says. "But there might be things an observer doesn't see that are still there."

Restricted view

Quantum theory splits the world into two parts: the system under study and the rest of the world, which contains the observer. The system hovers in a ghostly state of near-existence made up of a host of possibilities until the observer makes a measurement - and so reduces this to a single reality.

Cosmology suffers from the paradox that no observer can be outside the universe - so the universe is doomed to spend eternity as nothing more than a vague possibility. The lesson of quantum cosmology is that we can't talk about the universe as a whole, but only what a given observer inside it might measure. Applying that lesson to the multiverse, Andrei Linde and Vitaly Vanchurin suggest that what matters is not the total number of possible universes, but the number of universes a single observer could distinguish.

If that observer is a human, the brain limits the amount of information they can register. But any observer - even an inanimate one such as a galaxy - is limited in the information it can store. These limitations in what observers can measure whittle down the number of universes that come into play in cosmological predictions. That means an observer might make a difference in explaining the value of things like dark energy.

http://www.newscientist.com/article/mg20427323.700-multiplying-universes-how-many-is-the-multiverse.html

Brain scanners can tell what you're thinking about

- 28 October 2009 by **Ewen Callaway**, Chicago
- Magazine issue 2732.

Sharing a flashback (Image: Coneyl Jay/SPL)

WHAT are you thinking about? Which memory are you reliving right now? You may think that only you can answer, but by combining brain scans with pattern-detection software, neuroscientists are prying open a window into the human mind.

In the last few years, patterns in brain activity have been used to successfully predict what pictures people are looking at, their location in a virtual environment or a decision they are poised to make. The most recent results show that researchers can now recreate moving images that volunteers are viewing - and even make educated guesses at which event they are remembering.

Last week at the Society for Neuroscience meeting in Chicago, Jack Gallant, a leading "neural decoder" at the University of California, Berkeley, presented one of the field's most impressive results yet. He and colleague Shinji Nishimoto showed that they could create a crude reproduction of a movie clip that someone was watching just by viewing their brain activity. Others at the same meeting claimed that such neural decoding could be used to read memories and future plans - and even to diagnose eating disorders.

Understandably, such developments are raising concerns about "mind reading" technologies, which might be exploited by advertisers or oppressive governments (see "The risks of open-mindedness"). Yet despite - or perhaps because of - the recent progress in the field, most researchers are wary of calling their work mind-reading. Emphasising its limitations, they call it neural decoding.

The development of 'mind-reading' technologies is raising concerns about who might exploit them They are quick to add that it may lead to powerful benefits, however. These include gaining a better understanding of the brain and improved communication with people who can't speak or write, such as stroke victims or people with neurodegenerative diseases. There is also excitement over the possibility of being able to visualise something highly graphical that someone healthy, perhaps an artist, is thinking.

So how does neural decoding work? Gallant's team drew international attention last year by showing that brain imaging could predict which of a group of pictures someone was looking at, based on activity in their visual cortex. But simply decoding still images alone won't do, says Nishimoto. "Our natural visual experience is more like movies."

Nishimoto and Gallant started their most recent experiment by showing two lab members 2 hours of video clips culled from DVD trailers, while scanning their brains. A computer program then mapped different patterns of activity in the visual cortex to different visual aspects of the movies such as shape, colour and movement. The program was then fed over 200 days' worth of YouTube clips, and used the mappings it had gathered from the DVD trailers to predict the brain activity that each YouTube clip would produce in the viewers.

Finally, the same two lab members watched a third, fresh set of clips which were never seen by the computer program, while their brains were scanned. The computer program compared these newly captured brain scans with the patterns of predicted brain activity it had produced from the YouTube clips. For each second of brain scan, it chose the 100 YouTube clips it considered would produce the most similar brain activity - and then merged them. The result was continuous, very blurry footage, corresponding to a crude "brain read-out" of the clip that the person was watching.

In some cases, this was more successful than others. When one lab member was watching a clip of the actor Steve Martin in a white shirt, the computer program produced a clip that looked like a moving, human-shaped smudge, with a white "torso", but the blob bears little resemblance to Martin, with nothing corresponding to the moustache he was sporting.

Another clip revealed a quirk of Gallant and Nishimoto's approach: a reconstruction of an aircraft flying directly towards the camera - and so barely seeming to move - with a city skyline in the background omitted the plane but produced something akin to a skyline. That's because the algorithm is more adept at reading off brain patterns evoked by watching movement than those produced by watching apparently stationary objects.

"It's going to get a lot better," says Gallant. The pair plan to improve the reconstruction of movies by providing the program with additional information about the content of the videos.

Team member Thomas Naselaris demonstrated the power of this approach on still images at the conference. For every pixel in a set of images shown to a viewer and used to train the program, researchers indicated whether it was part of a human, an animal, an artificial object or a natural one. The software could then predict where in a new set of images these classes of objects were located, based on brain scans of the picture viewers.

Movies and pictures aren't the only things that can be discerned from brain activity, however. A team led by Eleanor Maguire and Martin Chadwick at University College London presented results at the Chicago meeting showing that our memory isn't beyond the reach of brain scanners.

Movies and pictures aren't the only things that can be discerned from brain activity
A brain structure called the hippocampus is critical for forming memories, so Maguire's team focused its scanner on this area while 10 volunteers recalled videos they had watched of different women performing three banal tasks, such as throwing away a cup of coffee or posting a letter. When Maguire's team got the volunteers to recall one of these three memories, the researchers could tell which the volunteer was recalling with an accuracy of about 50 per cent.

That's well above chance, says Maguire, but it is not mind reading because the program can't decode memories that it hasn't already been trained on. "You can't stick somebody in a scanner and know what they're thinking." Rather, she sees neural decoding as a way to understand how the hippocampus and other brain regions form and recall a memory.

Maguire could tackle this by varying key aspects of the clips - the location or the identity of the protagonist, for instance - and see how those changes affect their ability to decode the memory. She is

also keen to determine how memory encoding changes over the weeks, months or years after memories are first formed.

Meanwhile, decoding how people plan for the future is the hot topic for John-Dylan Haynes at the Bernstein Center for Computational Neuroscience in Berlin, Germany. In work presented at the conference, he and colleague Ida Momennejad found they could use brain scans to predict intentions in subjects planning and performing simple tasks. What's more, by showing people, including some with eating disorders, images of food, Haynes's team could determine which suffered from anorexia or bulimia via brain activity in one of the brain's "reward centres".

Another focus of neural decoding is language. Marcel Just at Carnegie Melon University in Pittsburgh, Pennsylvania, and his colleague Tom Mitchell reported last year that they could predict which of two nouns - such as "celery" and "airplane" - a subject is thinking of, at rates well above chance. They are now working on two-word phrases.

Their ultimate goal of turning brain scans into short sentences is distant, perhaps impossible. But as with the other decoding work, it's an idea that's as tantalising as it is creepy.

The risks of open-mindedness

The feats of decoding brain scans to predict someone's thoughts are undoubtedly dazzling (see main story), but "neural decoding" techniques are also limited in how they can be applied. Right now, they only work if someone's brain has already been scanned multiple times, and in very specific circumstances. So can we really call this mind reading? And should we worry about potentially creepy uses for such technology?

To some extent it's a question of semantics, but many researchers, including neuroscientist Russell Poldrack at the University of Texas at Austin, say it's clear that the work done to date is a far cry from what most people think of as mind reading, such as predicting whether a terrorist has plans to detonate a bomb on an aircraft.

Yet even if such applications are a very distant possibility, we should start thinking about the ethical issues now, says John-Dylan Haynes at the Bernstein Center for Computational Neuroscience in Berlin, Germany.

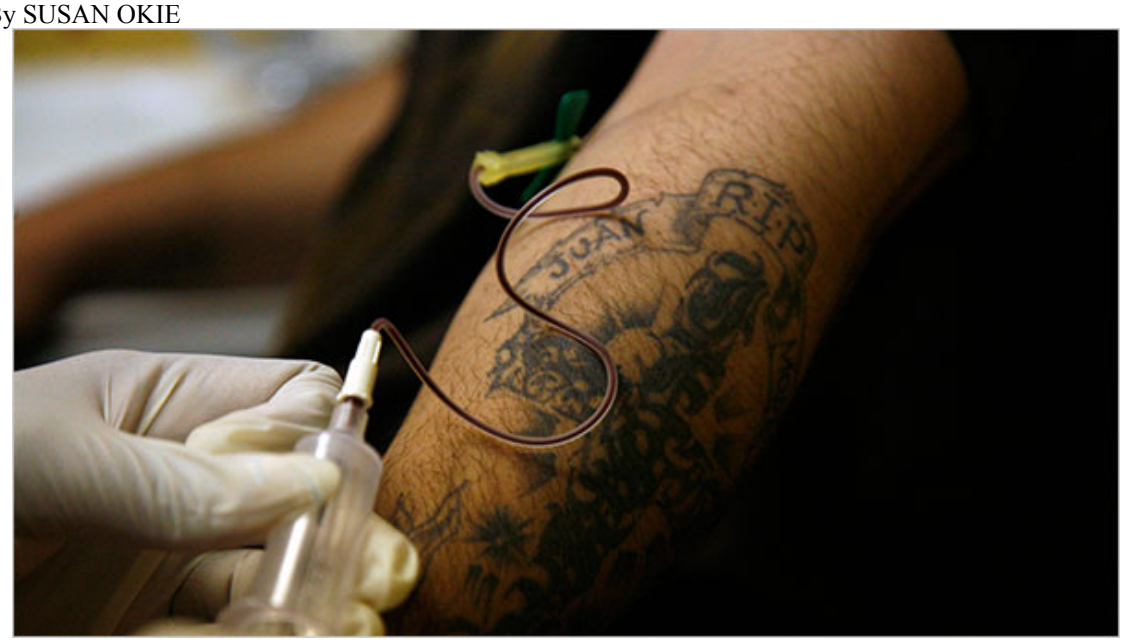
Some companies already claim that brain scans can help to pick out liars and determine whether an advert works or not, and there may be some truth in such claims. Haynes says standards are needed to spell out what neural decoding can and cannot reliably do, so as not to erode public trust in the field.

Neuroscientist Jack Gallant at the University of California, Berkeley, agrees. He says that neural decoding could be a double-edged sword. If his hopes for the technology ever come to fruition, he says, the same machine that reads the thoughts of patients with a neurodegenerative disease may well find more nefarious applications at some point.

http://www.newscientist.com/article/mg20427323.500-brain-scanners-can-tell-what-youre-thinking-about.html

Fighting H.I.V., a Community at a Time

By SUSAN OKIE



WASHINGTON — Federal health officials are preparing a plan to study a bold new strategy to stop the spread of the AIDS virus: routinely testing virtually every adult in a community, and promptly treating those found to be infected.

The strategy is called "test and treat," and officials say the two sites for the three-year study will be the District of Columbia and the Bronx — locales with some of the nation's highest rates of infection with human immunodeficiency virus.

The officials emphasize that this is just a first step. The goal is not to measure whether "test and treat" actually works to slow an epidemic, but whether such a strategy can even be carried out, given the many barriers to being tested and getting medical care.

On the path from infection to treatment, "we lose people at every single step," said Dr. Shannon L. Hader, director of the H.I.V./AIDS administration at this city's Department of Health.

As many as 5 percent of the adults in the District of Columbia are infected — a rate Dr. Hader says is comparable with those in West Africa — and one-third to one-half do not even know they harbor the virus. (Nationwide, 20 percent to 25 percent of people who are H.I.V. positive do not know of their infections, according to the federal Centers for Disease Control and Prevention.)

And even when infection is diagnosed, "getting people from the field to the doctor is the hardest component," said Angela Fulwood Wood, deputy director of Family and Medical Counseling Service, an agency that operates a mobile H.I.V. testing clinic here. Often, she added, someone who has just tested positive "can walk off that day and decide, 'I'm going to pretend that never happened.' "

In 2006, only about half of Washington residents who had a new diagnosis of H.I.V. saw a doctor about the problem within six months.

The C.D.C. recommends routine, voluntary H.I.V. testing for everyone ages 13 to 64 as a part of regular medical care. But experts say the recommendation is not being followed in many hospitals, clinics and medical practices.

Even when doctors do offer the test to patients, "a significant number refuse," said Dr. Anthony S. Fauci, director of the National Institute of Allergy and Infectious Diseases, which is to pay for the test and treat feasibility study.

Researchers planning the study have been meeting with hospital and health officials in Washington and the Bronx to discuss making H.I.V. testing a routine part of visits to doctors, clinics and emergency rooms.

Dr. Fauci said testing might also be widely offered in nonmedical settings. "When you have a campaign like this, you've got to pull out all the stops," he said. "How are we going to get everybody? Should we have testing in Wal-Mart? Should we have testing at Nathan's hot dog places?"

The test and treat approach is part of a broader shift toward using medicines for H.I.V. to prevent infection. When an infected person starts taking one of the standard three-drug regimens, the level of the virus in blood and other body fluids drops rapidly, often to undetectable levels.

Doctors in developed countries now routinely test all pregnant women for H.I.V. because treatment prevents an infected woman from transmitting the virus to her fetus. In July, researchers conducting a large randomized trial in Malawi reported that giving the antiretroviral drug nevirapine to breast-feeding infants of infected mothers, or giving the mothers a three-drug regimen, protected the babies from infection through breast milk.

Studies tracking heterosexual couples in which one person is infected have found that after highly effective drugs for H.I.V. became available, uninfected partners were far less likely to contract the virus. Trials are under way to give H.I.V. drugs as a protective measure to uninfected people at high risk.

Current treatment guidelines do not call for antiretroviral drugs until there is evidence of progressive damage to the immune system — generally, until the number of CD4 cells, the white blood cells attacked by the virus, drops to 350 per milliliter or lower. (A normal count is at least 1,000.)

The guidelines are intended to balance the treatment benefits with the side effects from the drugs and the possibility of fostering drug resistance in the virus. But there is mounting evidence that early treatment keeps infected people healthy longer.

And that could have much wider benefits, researchers say. Last January, Dr. Reuben Granich and colleagues at the World Health Organization published a provocative study using mathematical models to predict the effects of universal testing and immediate treatment on a severe H.I.V. epidemic among heterosexuals. They reported that such a policy, if combined with prevention efforts like promotion of condoms and male circumcision, could virtually eliminate transmission of the virus within 10 years.

So far, despite some ambitious efforts, no city or country has come close to achieving universal testing for H.I.V. and treatment for all those infected. But researchers and public health officials are eager to test the potential of such a strategy for stemming the epidemic.

Among specialists, there is already a move toward starting treatment earlier, said Dr. Raymond Martins, chief medical officer of Whitman-Walker Clinic, the largest provider of H.I.V. care in the District of Columbia.

But in low-income neighborhoods in Washington, some people are reluctant to start treatment, said Ms. Wood, whose H.I.V. testing program and clinic are based in Anacostia, a community in Southeast Washington that has long had high rates of drug abuse and H.I.V. infection, as well as a shortage of health services. Early H.I.V. drugs had multiple side effects, including fat deposits on the upper back that created an unsightly hump. "People saw that when others started taking the medicine, they seemed to get worse," Ms. Wood recalled.

Although the latest drugs have far fewer side effects, many patients still fear that "going on the medicines means I'm starting to get sick," she added. A critical component of test and treat will be conveying the message: "Don't wait until you're sick. Do it early."

In the District of Columbia, heterosexual sex is the most common mode of transmission reported by patients with newly diagnosed H.I.V. Researchers say that makes the city a strong candidate for test and treat, because the strategy is likely to be more effective in preventing spread among heterosexuals than among drug abusers or men who have sex with men.

In New York City, the Bronx has the highest AIDS death rate of any borough, even though Manhattan has a higher rate of cases. Dr. Monica Sweeney, the city's assistant health commissioner for H.I.V. prevention and control, said that was because people in the Bronx tended to wait longer to be tested and get a diagnosis.

In the first half of 2008, Dr. Sweeney said, "more than a quarter of the people who were tested in the Bronx had AIDS by the time they received their diagnosis." By contrast, she added, people who are tested and treated before the immune system has suffered extensive damage "can expect almost a normal life expectancy."

Health officials in both Washington and the Bronx are already in the middle of campaigns to promote H.I.V. testing and increase the number of new patients who get prompt medical care. In the first year of a program called Bronx Knows, begun in mid-2008, 70 percent of residents with a confirmed positive H.I.V. test were sent to doctors and clinics for care, Dr. Sweeney said.

In the District of Columbia in 2006, only 50 percent of those with new diagnoses of H.I.V. saw a doctor for the problem within six months. Community outreach workers who perform testing are now being retrained to focus on getting their clients into treatment.

"If you're doing H.I.V. testing, your job doesn't end with just telling the individual their test results," said Dr. Hader, of the district's Health Department.

At a neighborhood fair a few weeks ago in Oxon Run Park in the southernmost corner of Washington, a worker passed a basket of condoms among the crowd waiting in line for hamburgers, while announcements over a loudspeaker urged attendees to visit Family and Medical Counseling Service's mobile H.I.V. testing unit, inside a brightly painted trailer parked under the trees.

Annie Samuel, a 40-year-old mother of four, smiling and youthful-looking in shorts and a yellow tank top, knocked on the trailer's door. "I've got to get tested," Ms. Samuel said. "I want to be around to see my kids and grandkids."

Beverly Honesty, an outreach worker, seated Ms. Samuel at a table and asked her to sign some forms, then had her swab her gums with a white plastic stick tipped with filter paper to get a sample of cells lining her mouth.

Next, Ms. Honesty inserted the stick into a tube containing a clear solution, part of a rapid test kit that detects H.I.V. antibodies, chemicals made by the immune system that indicate infection with the virus. As they waited for the result, Ms. Honesty quizzed Ms. Samuel about high-risk behaviors and talked to her about unprotected sex, contaminated needles in tattoo parlors and other possible ways of contracting H.I.V. After 20 minutes, she showed Ms. Samuel her result: negative.

Positive results obtained with the kits are reported to the Health Department but are considered preliminary, and must be confirmed by a different test that requires a blood sample.

"There are so many people who test 'preliminary reactive' who never return," said Torena White, who was leading the outreach team that afternoon.

Often, testers following up on such results must repeatedly call clients or send them letters. If someone with a positive test still does not respond, a Health Department worker is dispatched to try to track the person down.

Community testing programs are likely to attract people who suspect that they might have contracted H.I.V. But Ms. Wood said the key to test and treat would be capturing those who did not volunteer for testing because they did not believe they could be infected —"people who are promiscuous at college, the partygoers, the young professionals who go to the club," as she put it.

"Routine testing at either emergency rooms or physicians' offices," she continued. "I think that's our biggest chance of really catching people earlier."

http://www.nytimes.com/2009/10/27/health/27hiv.html?_r=1&nl=health&emc=healthupdateema1

Patterns: For Heart Attacks, Shifts in Gender Gap

By RONI CARYN RABIN

Middle-aged men are at much greater risk of a heart attack than women their age, but new research suggests that the gap may be narrowing.

Some 2.5 percent of men ages 35 to 54 who responded to national health surveys in the late 1980s and early 1990s reported having had a heart attack, compared with 0.7 percent of women the same age. But in more recent health surveys, conducted in 1999 to 2004, the percentages for women rose to 1 percent while dropping to 2.2 percent for men.

The researchers acknowledged that the reported increases and decreases might have been due to chance. But the lead author of the study, published in the Oct. 26 issue of The Archives of Internal Medicine, said the changes reflected an "ominous trend." And the article noted that over the same period, men's scores on a scale that predicts heart disease risk improved slightly, while women's scores worsened.

"I think everyone has been complacent that women are not at very high risk at this age," said the lead author, Dr. Amytis Towfighi, an assistant professor of clinical neurology at University of Southern California. "This is a wake-up call for everyone to pay more attention to cardiovascular risk factors in midlife."

A 2007 study by the same authors found that women ages 45 to 54 were twice as likely as men to report having had a stroke, a finding that challenged conventional medical thinking that women were at lower risk for stroke in midlife than men.

The studies analyzed information gathered by the National Health and Nutrition Examination Surveys, a nationally representative sample of the population that included 5,112 men and women ages 35 to 54 in the 1988-94 survey and 4,594 in that age range in the 1999-2004 survey.

Among men, systolic blood pressure and HDL cholesterol improved over time and smoking rates dropped, the study found. Among women, only HDL improved; smoking rates, blood pressure and total cholesterol profiles remained unchanged. Rates of obesity and diabetes increased in both sexes over time; obesity is more prevalent among women.

http://www.nytimes.com/2009/11/03/health/research/03patt.html?ref=research

Regimens: Omega-3 Fats Fail to Lift Depression in Heart Patients

By RONI CARYN RABIN

Heart disease patients with depression did not benefit if they took supplements containing omega-3 fatty acids in addition to a standard anti-depressant drug, according to a new clinical trial.

The patients were randomly assigned to a combination of sertraline, an anti-depressant, and either omega-3s or a corn oil placebo. After 10 weeks, there was "absolutely no difference" in depression remission rates between the 59 patients taking omega-3s and the 56 patients taking the placebo, said Robert M. Carney, lead author of the study, which appeared in the Oct. 21 issue of the Journal of the American Medical Association.

"It was very disappointing," he said.

The trial was launched because patients with heart disease are at greater risk of dying if they are depressed, Dr. Carney said. Depressed patients are known to have low levels of omega-3s, which are a risk factor for heart disease, as well.

But, Dr. Carney said, studies evaluating the effects of omega-3 supplements on depression so far have produced mixed results.

"In terms of its effects on depression, the evidence isn't strong enough to make any recommendations in my opinion for people with or without heart disease," he said.

http://www.nytimes.com/2009/10/27/health/research/27regimens.html?ref=research

FORTY YEARS' WAR

A Place Where Cancer Is the Norm

By GINA KOLATA

HOUSTON — M. D. Anderson Cancer Center has a mission statement, and everyone who works there, from the president to the cleaning crews, can state it like a catechism: to "eliminate cancer in Texas, the nation and the world."

For the nearly 90,000 patients who will go to the center in Houston this year, that mission cannot be fulfilled soon enough. They and their families arrive at the world's largest freestanding cancer hospital from around the world, often leaving behind jobs and stashing children with relatives for months. Some rent apartments or stay in mobile home parks near the hospital.

They enter through a soaring lobby, with cheery aquariums and exuberant volunteer greeters eager to help in any way. They come looking for hope.

But there is no mistaking what this place is: the front line of the frustrating war on a still largely incurable disease.

Doctors are encouraged to try everything, and when insurers balk, they pick up the phone, repeatedly, hoping to persuade them to pay for what may be unconventional treatments.

The federal government gives more cancer research money to this hospital than to any other, and the hospital has an abundance of specialists in many forms of cancer, including rare ones. Medicare offers more generous reimbursement, and the hospital offers treatments that often go far beyond what can be offered at most other places.

"I tell young physicians who are starting out here that the big limitation is imagination," said Dr. Martin Raber, an oncologist — and a cancer patient himself — at Anderson. "If you are good at what you do and you have great ideas, we will help you find the resources you need to make them happen."

But like a modern version of the tuberculosis sanatorium in Thomas Mann's "Magic Mountain," Anderson is a world where the best that medicine has to offer is often far from enough. The odds are still grim, and while there are exhilarating recoveries, the exhausting, dispiriting road traveled by many patients comes into sharp relief.

They are patients like 35-year-old Mindy Lanoux of San Antonio, who has melanoma that has spread to her liver and lungs, her odds of surviving in the single digits. She has been to the hospital 16 times in nine months, spending a week there each time for treatments so debilitating she wanted to give up. But she

keeps returning, smearing peppermint oil under her nose when she walks in the medical center's door to hide the odor.
"The smell gets to me," Ms. Lanoux said. "It smells like cleaning products and the sickness and the medicines. It takes your brave edge off."
Then she and her father go to her room and start putting her things away. "We don't talk," Ms. Lanoux said. "There is no polite conversation. It is like an army setting up to do battle."

Planet Cancer

With more than 17,000 employees and warrens of color-coded hallways so vast that even employees get lost, M. D. Anderson is its own parallel universe, where nothing matters but cancer. Patients sit in the lobbies and compare notes.
"Everyone in the waiting room talks about 'How did you find yours?' " said June Toland, 71, of Harlingen, Tex., who is being treated for sarcoma, a cancer of connective tissue.
Every patient at Anderson has cancer. Every family member sitting anxiously in the lounges or lingering at a bedside or sleeping in a Murphy bed in a patient's room has had the life-changing experience of being touched by cancer.
"It feels sometimes like the entire world has cancer," said Cindy Davis, a nurse in the breast cancer clinic who has breast cancer herself.
Anderson is a quiet place. No loud pagers. The walls are decorated with vivid photographs of serene scenes, like water views. The muted colors in the hallways, soft cranberry and dull green, are meant to be soothing. There is a special room, Kim's Place, for young people only, cancer patients and their friends ages 15 to 30, giving them a place to gather. There is a library and a cybercafe. It is a place meant to give hope.
Sometimes, as happened with Frances Anderson of Shreveport, La., that hope is realized. She discovered three years ago that she had a brain tumor, but it did not start in her brain. In fact, it is not clear where it started. After being told by a doctor elsewhere that she had four to seven months to live, she ended up at Dr. Raber's clinic, one of the few that specialize in treating patients with cancer throughout their bodies but with no obvious source for the tumors.
At 66, wearing pressed jeans, her short blond hair carefully styled, Ms. Anderson has vision problems from the surgery to remove the brain tumor, and she gets tired. She still has cancer, but she exercises every day and is living with her disease, returning to Anderson every six months for checkups and scans.
Others are not so fortunate. One morning last month, Joe Maxwell, 52, sat in a chair next to his hospital bed, a compression bandage around his now-useless swollen left arm, a large bandage over his left shoulder. He was going home to sit on his deck in Kerrville, Tex., a four-hour drive. He had tried everything Anderson had to offer and decided that, with an estimated two weeks left, he would go home to die.
Mr. Maxwell came to Anderson in January after his doctor told him a bump on his shoulder was a rare tumor, Merkel cell carcinoma, and added, "If you have a rare tumor, you need to go where tumors are not rare."
At Anderson, doctors tried everything they could think of — surgery, round after round of chemotherapy, a clinical trial of an experimental drug. Nothing worked. Finally, the doctors suggested yet another drug.
"We spent a lot of time praying about it and just discussing it," Mr. Maxwell said. "I wanted to go home; I was tired. They gave me a short amount of time and said, 'If you want to go home, now is the time.' "
But leaving late last month was bittersweet. The doctors and nurses "have become our friends and our family," his wife, Kathleen Maxwell, said. Anderson, she added, "has been our life for nine months."
He died 10 days later, early in the morning of Oct. 8.
Even those who finish their treatments and live cancer-free are forever changed by the experience.
Mrs. Toland learned that lesson from her son, George Toland. Twenty-four years ago, when he was 21, he was a sarcoma patient at Anderson. One day he looked at his mother and said, "My life will never be the same."
His mother tried to reassure him, telling him that he would be fine, that he would go on to a perfectly normal life.
But he demurred, saying, "You know, Mother, it's a loss of innocence."
Mrs. Toland knew he was right.
She told him: "Most people lose their innocence in little doses as they go through life. You lost yours all at once."

Battling the Odds

Donald Berry, a statistician who is head of the division of quantitative sciences at Anderson, says part of his role at the cancer center is to provide a reality check.
Yes, it is true, as doctors and nurses there repeatedly say, that treatment has improved. Anti-nausea drugs have all but eliminated the constant vomiting that once accompanied chemotherapy. New drugs are attacking genes that go awry in cancer. Most cancer patients come and go over a period of years, for checkups, scans, treatment if the cancer is still there. In between they go on with their lives.
But there is still little that can be done for most of those whose cancer has spread. And, Dr. Berry said, "that is a fact that doctors at M. D. Anderson can have a hard time facing, understandably so."
Dr. Russell Harris, an associate professor of medicine at the University of North Carolina and a member of a board that evaluates cancer therapies for the National Institutes of Health, said the temptation at major cancer centers like Anderson was to try treatment after treatment.
"Everyone is totally immersed in the idea that death is the enemy," Dr. Harris said. Such a no-holds-barred stance, he added, is spurring a growing debate in the cancer community.
"There is a lot of concern within the oncology community right now, and appropriately so, that people don't completely understand what they are getting into," Dr. Harris said.
An aggressive — and expensive — course of treatment can place a huge burden on patients. Ms. Lanoux knows that all too well. She came hoping for a cure for her advanced melanoma, but got her first dose of reality the day she walked into the main lobby.
She saw patients in wheelchairs, their heads sunken on their chests. She saw patients who had lost their hair, patients wearing sky-blue masks to protect them from infections. And there were the children. She had to avert her eyes. "I still can't look at the kids," Ms. Lanoux said.
"I think we were all trying to be very brave," she said. "But it was like walking into a coffin."
Ms. Lanoux, a small blond English teacher, lives in San Antonio with her husband, also a teacher, a 19-month-old daughter, an 8-year-old daughter and a 12-year-old son. The day she arrived at Anderson, Feb. 9, was the beginning of a difficult journey at the cancer center. She has been coming about every three weeks since, staying for a week at a time.
Her problems began in August 2008 on the way to a beach vacation. She started coughing. Her doctor was not concerned, telling her he thought she had acid reflux because she had had it when she was pregnant. He gave her Nexium. She returned in November at a friend's urging, and her doctor prescribed cough drops and steroids. But she kept coughing.
Finally, in January, when she still could not catch her breath, her doctor ordered a chest X-ray to see if she had bronchitis. The next week, she returned to learn the result. Her husband wanted to go with her, but she told him not to bother, it was probably just bronchitis.
The doctor "came in and said, 'This is the part I hate most about being a doctor,' " Ms. Lanoux recalled.
There was a spot on her lung. A CT scan also revealed spots on her liver. And a biopsy of the spots on her liver revealed what it was. Melanoma. It had spread from an initial lesion — no one could ever find where it started — and was now threatening her life.
Ms. Lanoux's doctor in San Antonio told her to go to Anderson. "She very honestly told me, 'I don't want to try treating you,' " Ms. Lanoux said.
"I think I was in denial until last month," she said. "I had a 10 percent chance to survive five years, and I was going to do it."
She has tried everything. Immunological therapy with side effects so severe it has to be administered in the intensive care unit. It did not work. Then she started biochemotherapy — a combination of three chemotherapy drugs and two immune system hormones to stimulate her body to attack her tumors. It is a controversial treatment, said her doctor, Patrick Hwu, but some patients had lasting remissions.
Not Ms. Lanoux. At least not yet. On a recent sunny fall afternoon, she lay in her hospital bed on the 10th floor, wearing striped pajamas, blinking away tears as she told her story. She had just finished her sixth biochemotherapy treatment. Once again, she said, the therapy had made her feel "barely human."
The effects hit her hard after the second treatment.
"I got home and ordered a wheelchair, a shower seat, a walker," she said. "I am 35 years old and I have a wheelchair, a shower seat, a walker." Just a few years ago she had run a marathon.
"My husband was helping me take a shower," Ms. Lanoux said. "Of course it was awful. You're cold, you can't get enough water on you. I told him I don't want to do this again. Call Dr. Hwu. I'm not going back."
But she relented. Now Dr. Hwu wants her to try an experimental drug that takes the brakes off the immune system and might allow her body to destroy her cancer.

But the drug has not been approved by the Food and Drug Administration and is not available. Dr. Hwu knows it can have serious side effects and may not help Ms. Lanoux. But some who took the drug defied the odds, living for years. Maybe Ms. Lanoux could be one of those survivors, Dr. Hwu thinks.
And how about surgery, he asked her last month. "You can live with half a lung," he said. But she probably would have to have her entire lung removed, he learned. And a surgeon would also have to take out the tumors on her liver. It may not be feasible, Dr. Hwu said, but, he added, "It's definitely something I'm thinking about."
Dr. Hwu struggles with the grim statistics — 8 percent of patients like Ms. Lanoux survive five years. The median survival rate is one year.
"It's hard to see most patients die," Dr. Hwu said. "You look at patients and see yourself and your family. We have to keep focusing on making these treatments better."
On Wednesday, Ms. Lanoux was admitted for her eighth cycle of biochemotherapy. Dr. Hwu was worried.
"I don't think her body will tolerate many more cycles," he said. Already he has had to reduce the doses of some of the drugs and eliminate others.
In the meantime, he makes calls nearly every day, trying to get the experimental drug for Ms. Lanoux.
"We're on the front lines," he said. "We need armor."
"I need this drug, and I need to be able to offer it to her."

A View From Both Sides

As a breast cancer nurse, Cindy Davis thought she knew what her patients were going through. Until she went through it herself.
The first time she had a mammogram, it found cancer. She was 43. But after a lumpectomy, radiation and hormonal treatment with the drug tamoxifen, she was cancer free. The statistics were with her. She had every reason to think the cancer would not come back.
And that helped because she had taken a nursing job in the breast cancer clinic at Anderson, working with many patients pretty much like her — their cancer had been caught early, they would be fine.
Then, last April, nine years after the diagnosis, her cancer came back in a pelvic bone.
"You never think it is going to happen to you," Mrs. Davis said. "I look at the risk factors, and I have none of them. It's like, 'Wait — I did everything right.' "
"I did the denial thing, 100 percent," she said. "And I was angry. No, no, it can't be that. And I was in shock — you've got to be kidding."
As a nurse, she knew all too well there is no cure for breast cancer that has spread beyond the breast. Two-thirds with advanced disease are dead within five years.
"When you know what I know, it's very scary," Mrs. Davis said.
Her chemotherapy began a few days after she learned that her cancer had spread.
"I was scared; I was very scared," Mrs. Davis said. "I know all the possible things that can go wrong."
To her surprise, it was uneventful. Three weeks later, she and her husband went on a cruise. Just before it was over, her hair fell out.
"I got out of the shower and started combing my hair and it was coming out," she said. "I started crying. Everyone says, 'It's just hair. It will grow back.' But as women, that's a big thing to us."
Devastated, she got a wig and, feeling very self-conscious, went back to work. She has been working ever since, taking most of the week off after each chemotherapy treatment to recover from nausea and overwhelming fatigue. So far she has had 17 treatments, with more to come.
She is a nurse by day in the fifth-floor breast cancer clinic, and a patient in the evening, going to the eighth floor for chemotherapy. There she sees many of the women who were in the clinic earlier.
"It's like a club," Mrs. Davis said. The women talk about side effects — mouth sores and damage to the nerves of their feet — and the nausea and the anticipatory nausea.
"I have patients who say, 'I just see a hospital gown and I feel nauseated,' " Mrs. Davis said. "I didn't understand it before."
She also asks patients for help, turning to those who learned they had advanced breast cancer two, three, four years ago.
"I say, 'How do you do it?' " Mrs. Davis said. "They say they pray a lot and they just do it. They get through it one day at a time."
Working at Anderson while being a patient there means cancer is always on her mind.

"You are around it all the time," she said. "It's just so hard to shut it off when you go home. Now I find myself thinking more and more about patients. I pray for them, and they hug me and say they are praying for me."
She ran into a patient's mother recently. The patient, a young woman, had advanced breast cancer and was terrified. Mrs. Davis told her she had advanced breast cancer, too, and she would help. "I am your nurse," she told the young woman.
The mother came up to Mrs. Davis and said: "You have no idea how you have impacted this family. You gave my daughter hope that she could get through this."

An Opponent That Won't Quit

Dr. Raber used to think he understood when his patients told him that their appetite was good or that they were feeling more energetic.
But now, a cancer patient himself, he talks to patients in a very different way.
In the old days, if a patient said she had a good appetite, he would interpret that to mean her appetite was the same as his. Now he asks different questions.
"What did you have for lunch?"
"Crackers and soup."
"What did you have for dinner?"
"Crackers and soup."
"What did you have for breakfast?"
"I don't eat breakfast."
"Patients who say their appetite is fine often are saying it is better than it was," Dr. Raber said. "They are not saying it is anything like the appetite of a healthy person."
The same goes for energy level.
"When I came home from the hospital when I had been really, really sick, I was able to walk down the stairs once a day and up the stairs once a day. After I had been home for a couple of weeks, I could walk up and down maybe twice. If a doctor had asked how was my energy level, I would say, 'Great, much better,' " Dr. Raber said. "The doctor would assume it was the same energy level as his."
Dr. Raber's journey as a cancer patient began in 1996, when he was 48 and physician-in-chief at Anderson. "I was at the top of my game," he said.
A routine exam showed abnormalities in liver function tests. He thought it was nothing, waited six weeks, and had the test again.
The results were still abnormal. His internist suggested a CT scan, but neither Dr. Raber nor his doctor was concerned.
While Dr. Raber was on the table, the radiologist came in and said, "You have a problem." There was a mass near his liver.
"This is serious," he thought. "I figured, 'This is early November. I could be dead by Christmas.' "
His doctor scheduled a biopsy for later that day.
That afternoon, after the biopsy, the pathologist told Dr. Raber he thought it was melanoma.
"I said to myself, melanoma. I could be dead by Thanksgiving," Dr. Raber said.
It turned out to be lymphoma, a tumor of the lymphoid cells of the immune system, which is easier to treat and even cure than liver cancer or melanoma.
But treatment, with chemotherapy and radiation, made it impossible for Dr. Raber to work full time. At best, he could manage a few hours a day. He was ill, he was tired, and, he said, "My brain was scrambled."
He stepped down as physician-in-chief. He no longer saw patients.
Two years later the cancer was back, in the same place. Once again he had aggressive chemotherapy and radiation. Two years after that, his kidneys failed. He spent time in the intensive care unit.
He did not work for a year, spending most of his time on the sofa. His lower body filled with fluid. His 32-inch waist ballooned to 52 inches. His size 9 ½ foot became a 12. All he could wear was a sweatsuit and slippers.
Finally, he went back to work for an hour, two or three times a week. And he went back not as an administrator but as a doctor and a teacher, "an earlier iteration of myself."
In February, he got another cancer, melanoma.
By now he has gotten used to living with cancer.
"It just becomes your life," Dr. Raber said. "You come in, you have tests, you go home, you do your thing, you come back again for treatment.

"I tell patients, 'It used to be that you had cancer, you got treated, you died or you were cured,' " he said. "Now, for most of us, it's a chronic illness. It's not a question of being psyched up: I will have this surgery and then I will be cured. The disease comes back."

He works part time, seeing patients on Tuesday and Thursday mornings and spending a day a week working at a clinic in the county hospital.

"A common question people would ask is 'Are you a better doctor since you've been sick?' " Dr. Raber said. "My first answer is that I thought I was a good doctor before. I was worried about being a worse doctor. Having lived through these biopsies and all these tests, would I be hesitant to order all these things patients need because I had experienced them and knew they were not pleasant?

"Then I realized I am not better, but I am a different doctor," he said. "I talk to patients differently. I understand more of what their situation might be.

"My life was very different than it was before that day in the CT scanner," Dr. Raber said. "It's not the life I thought I would have. But my life is still really good.

"My son is fond of saying, 'It is what it is.' That's true. This is my life. I enjoy it a lot. It works out well for me."

As for winning the war on cancer, Dr. Raber, on the front lines, has his own thoughts. "We are making a lot of progress," he noted.

But "are we there yet?" he asked.

"Not even close."

http://www.nytimes.com/2009/10/25/health/research/25anderson.html?ref=rese

When the Nurse Gets the Flu

By Theresa Brown, R.N.
I'm old enough that I remember the swine flu scare of 1976. I was 11 and my older brother, who was 13, loved telling this joke:

"How did the pig get in the air? Swine flu!"

He must have told that joke a million times, and probably every single time I laughed. But two weeks ago when my family and I were hit with painful coughs, chills and fever, nobody was laughing.

I had worked an eight-hour shift that Saturday and had been feeling odd, not quite right, ever since dinner. I was scheduled to work a 12-hour shift the next day and told myself I only had a cold. But soon I was shaking so badly from chills that I felt unsteady on my feet. After taking my temperature and seeing I had a fever, I swallowed my guilt and called in sick.

The next two days I mostly stayed under a pile of blankets in bed with one of my twin daughters who was sick too. On Tuesday I decided to see a doctor, who asked, ""Did you get hit by the bus?" referring to the fact that influenza tends to come on fast, without warning.Because I work with cancer patients, my doctor did a nasal swab for the novel H1N1 virus, which is commonly called swine flu. It would be several days before we got results, and he told me to drink fluids, take Motrin for my fever, and call him back if I started to feel worse, because it could mean a secondary bacterial infection. Unfortunately for me, the antiviral drug Tamiflu is only helpful if you start it within 12 to 48 hours of the onset of flu symptoms.

By Wednesday, both twins were sick and home from school. Later that day the fever, exhaustion and chills hit my husband. The next few days were a blur of fevers, coughs, body aches and runny noses. Friends dropped off homemade chicken soup and bread. Our 13-year-old son did laundry and cooked some simple dinners, until on Saturday the fever and cough got him, too. By Monday my doctor's office called and confirmed that I had H1N1. The timing was especially unfortunate. My kids had all gotten the swine flu vaccine the Saturday I first felt sick, but they were exposed to me before their bodes had built up full immunity.

In the end I had to miss three 12-hour shifts in one week — an outrageous amount of time for a nurse to be away from work. However, my hospital's H1N1 policy requires that staff who provide direct patient care stay home for at least seven days after the onset of symptoms, or after being fever free for 24 hours, whichever comes later. Hospitals don't want staff members exposing patients or their co-workers to illness, but one of the big worries about the H1N1 pandemic is that it will leave hospitals understaffed at a time when patients need them the most. Before I went back to work I called our employee health office to double check the rules. So many of our oncology patients are immune-suppressed, and I didn't want to put any patients at risk.And I can't shake the feeling that as a nurse I'm not supposed to get sick. I take care of sick people, not get sick myself. Being hit with the H1N1 virus is a role reversal I'm not really comfortable with, and I think a lot of people in health care feel that way. It's a completely irrational feeling, but it's a prevalent attitude, nonetheless.

It's been a tough several days, but I was reminded how really difficult it is to be sick. As I lay in bed feeling like I hated my life, I thought about our patients and how they feel this sick, and worse, for weeks at a time. How do they do it? I wondered. And the answer is that they have no choice. They are fighting for their lives, whereas I, I'm happy to say, was not.So I came back to work tired, and humbled by my illness, but with a renewed sense of empathy for our patients. That first day back I had a patient in his late 60s with pancreatic cancer who needed to work for just 30 more days to retire with full benefits. A 23-year-old got a PET scan that showed lymphoma throughout his chest and in multiple spots on his bones.

At home our laundry piled up, loading the dishwasher was arduous, and by the end we were fighting over the last box of Kleenex, but we're all just fine, and feeling lucky, very lucky, to be so healthy and so well.

http://well.blogs.nytimes.com/2009/10/28/when-the-nurse-gets-the-flu/

Do More Bicyclists Lead to More Injuries?

By Gretchen Reynolds

Getty Images

Recently, surgeons and emergency room physicians at the Rocky Mountain Regional Trauma Center in Denver noticed a troubling trend. They seemed to be seeing cyclists with more serious injuries than in years past. Since many of the physicians at the hospital, a Level I trauma center serving the Denver metropolitan area, were themselves cyclists, they wondered if their sense of things was accurate.

So the doctors began gathering data on all cycling-related trauma admittances at the hospital and dividing them into two blocks, one covering 1995-2000 and the other 2001-6.

The data, which were presented in mid-October at the 2009 Clinical Congress of the American College of Surgeons in Chicago, revealed "some pretty alarming things," said Dr. Jeffry Kashuk, an associate professor of surgery at the University of Colorado School of Medicine, attending physician at the trauma center and an author of the study. Over the years, the severity of the bodily damage, as measured by a standardized injury severity score, had significantly increased. The number of chest injuries rose by 15 percent, while abdominal injuries tripled. The typical length of cyclists' time in the intensive care unit grew. Meanwhile, the average age of the injured riders had risen, from 25 to about 30, and when the researchers plotted the most recent injury sites against a map of the Denver area, they found smatterings of accidents along bike paths, but large clusters downtown.

"What we concluded was that a lot of these people were commuters," Dr. Kashuk said, adding, "If we keep promoting cycling without other actions to make it safer, we may face a perfect storm of injuries in the near future."

There has been an enormous push in recent years to increase bicycle ridership, in hopes of improving both individual health and the environment. Cities like Denver, New York and Portland, Ore., have added bike lanes, given away helmets and otherwise tried to lure more cyclists onto the roads. But the Denver study seemed to indicate that getting more people to ride meant more would be hurt.

But that is not necessarily so, a well-established body of counterintuitive science promises. This research, which has examined bicycle-riding patterns in the United States and in Europe, has found that in virtually every instance, when the number of riders on the road increases, the likelihood of accidents declines. This surprising result is known among its researchers as the "safety in numbers" effect, and it has been repeatedly documented. In Britain, for instance, the number of cyclists soared by 70 percent during the oil

crisis of the 1970s, a 2002 report on cycling safety there pointed out, but the number of annual deaths among cyclists then fell.

Similarly, in the Netherlands, a nation that loves its bicycles, the level of bike use rose 30 percent from 1980 to 1990, while the number of cycling-related deaths declined by a third. Closer to home, when a California public-health expert compiled data about accidents involving cyclists and walkers in major cities in California, he found that, as his 2003 study reported, "the likelihood of an injury is not constant, but decreases as walking or bicycling increases."

How can more cyclists mean fewer accidents? "It seems unlikely that people walking or bicycling obey traffic laws more" just because more of them are on the streets, the author of the California study wrote. "Adaptation in motorist behavior seems more plausible." In other words, when more cyclists show up on the roads, car drivers become used to them and respond appropriately. As the British report pointed out, "common events are safe, and rare events are dangerous." Making cycling safer, the report concluded, " requires that it become more popular."

There is a Catch-22 in that proposition, of course, and studies like the one from Denver underscore the issue's complexity. In the early stages of increasing bike ridership, injuries may increase, as may their severity, since drivers will not yet be acclimated to the influx of two-wheeled traffic (and many of the early-adapter riders will not be attuned to the nuances of negotiating in traffic). At the same time, according to surveys conducted over the years by researchers at the Harvard School of Public Health, most people say that the primary reason they do not ride bikes is a concern for safety. So reports about an increase in injuries, even if it were ultimately short-lived, could blunt the rise in ridership, making those who do cycle less safe.

What, then, can be done? No solutions are easy, said Dr. Walter Willett, chairman of the department of nutrition at the Harvard School of Public Health and an avid cyclist who, with others in his department, is studying how best to increase bicycle safety. "It's definitely a good idea to promote bicycle riding for a multitude of reasons, foremost among them better health," Dr. Willett said. "But as with any health-related intervention, there are benefits and side effects."

Transportation experts cannot agree, for instance, about whether to segregate bicycle and automobile traffic, using concrete barriers along bike paths or creating separate bikeways. In the short term, such an approach should protect cyclists. But if if drivers are not given the opportunity to acclimate to riders, will it actually make it more dangerous for bikers in the long run? No one knows. "We need studies; we need data," Dr. Willett said.

In the meantime, as more cyclists are taking to the roads but drivers and cyclists have not yet reached an accommodation, individual responsibility seems the best response. Bicyclists must obey traffic laws, an obvious prescription often flouted, at least according to a study in May of cycling behavior in Midtown Manhattan. It found that many riders ran red lights and illegally ribboned through traffic. Even more egregiously, an April epidemiological study of bicycle fatalities in New York City from 1996 to 2005 reported that alcohol was detected in 21 percent of the cyclists killed.

Finally, do not assume that, should you dutifully follow the rules, you are freed from constant vigilance. Individual driving behavior, no matter how many cyclists ride, will always remain unpredictable, if not perverse. Consider the results of a 2007 study from Britain, which found that, when cyclists skipped wearing helmets, drivers yielded more of the road to them while passing; if the cyclists did don their helmets, the drivers tended to crowd dangerously close.

http://well.blogs.nytimes.com/2009/10/27/do-more-bicyclists-lead-to-more-injuries/

AIDS Vaccine Trial Shows Only Slight Protection

By DONALD G. McNEIL Jr.

The full results from an AIDS vaccine trial in Thailand, released Tuesday, showed that the vaccine's protective effect might be even weaker than researchers first admitted.

However, the complicated six-shot, two-vaccine regimen may have briefly worked better in the first year after it was given, and also may have worked better in Thais at average risk from heterosexual sex, rather than those who used drugs or men who had sex with men. Those offshoot results could open avenues for future research, scientists said.

Meanwhile, the continuing debate over whether the vaccine's slight protective effect found in the study was real or just a fluke got only more complicated.

Last month, researchers from the United States military and the Thai government said their three-year study of about 16,400 Thai men and women suggested that those who received the new vaccine, known as RV144, were 31 percent less likely to become infected.

Although no one would consider licensing such a weak vaccine, the announcement made headlines around the world because no other AIDS vaccine trial in 20 years had protected anyone.

But a controversy soon emerged. Of the roughly 8,200 people who got the vaccine, only 51 became infected, while among the roughly 8,200 who received a placebo, 74 became infected. The authors of the study conceded that the difference was just barely statistically significant.

Rival researchers with whom they shared the full trial data in private soon began grumbling that it could be analyzed in other ways that made the results meaningless.

The full release of data — which took place simultaneously at a medical conference in Paris and online in the New England Journal of Medicine — showed three different analyses.

The previously released one, known as the "modified intent-to-treat" analysis and showing the vaccine to be 31 percent effective, included everyone in the trial except seven people, who researchers later realized were infected before it began. Dr. Anthony S. Fauci, representing the National Institutes of Health, which oversaw the trial, described that analysis as the "gold standard."

A second, the "per protocol" analysis, included only the 12,450 subjects who got the entire vaccine series or the placebo and stayed in the trial to the end. It showed the vaccine to be only 26 percent effective, and there was also a 16 percent chance the results were due to chance. (Five percent is the usual limit in clinical trials.)

A third, the full "intent to treat," included the seven previously infected subjects and also showed the vaccine to be 26 percent effective. It had an 8 percent chance that the results were meaningless.

In an accompanying editorial, Raphael Dolin of Harvard Medical School described the vaccine as "modest" at best and "unlikely to be a public health control measure," though the results suggested further direction for research.

Different statisticians interpreted the results differently.

Philip B. Stark, a professor of statistics at the University of California, Berkeley, said he considered the full intent to treat "the most kosher analysis."

"Once you start modifying, you start introducing new opportunities for confounding the results," he added.

But Donald A. Berry, chairman of biostatistics at the M. D. Anderson Cancer Center at the University of Texas, said he accepted the modified intent to treat analysis the researchers preferred, because it was the endpoint they said early on they would use.

However, in the end, he said, all three results "are really the same, so it doesn't make much of a difference."

But his overall impression, said Dr. Berry — who had no connection to the study or any of its rivals — is that the vaccine does not work. So many trials have been conducted, he said, that even one using injections of water could, just by chance, show a weak effectiveness like this.

http://www.nytimes.com/2009/10/21/health/research/21vaccine.html?ref=research

The Human Body Is Built for Distance

By TARA PARKER-POPE

Does running a marathon push the body further than it is meant to go?

The conventional wisdom is that distance running leads to debilitating wear and tear, especially on the joints. But that hasn't stopped runners from flocking to starting lines in record numbers.

Last year in the United States, 425,000 marathoners crossed the finish line, an increase of 20 percent from the beginning of the decade, Running USA says. Next week about 40,000 people will take part in the New York City Marathon. Injury rates have also climbed, with some studies reporting that 90 percent of those who train for the 26.2-mile race sustain injuries in the process.

But now a best-selling book has reframed the debate about the wisdom of distance running. In "Born to Run" (Knopf), Christopher McDougall, an avid runner who had been vexed by injuries, explores the world of the Tarahumara Indians of Mexico, a tribe known for running extraordinary distances in nothing but thin-soled sandals.

Mr. McDougall makes the case that running isn't inherently risky. Instead, he argues that the commercialization of urban marathons encourages overzealous training, while the promotion of high-tech shoes has led to poor running form and a rash of injuries.

"The sense of distance running being crazy is something new to late-20th-century America," Mr. McDougall told me. "It's only recently that running has become associated with pain and injury."

The scientific evidence supports the notion that humans evolved to be runners. In a 2007 paper in the journal Sports Medicine, Daniel E. Lieberman, a Harvard evolutionary biologist, and Dennis M. Bramble, a biologist at the University of Utah, wrote that several characteristics unique to humans suggested endurance running played an important role in our evolution.

Most mammals can sprint faster than humans — having four legs gives them the advantage. But when it comes to long distances, humans can outrun almost any animal. Because we cool by sweating rather than panting, we can stay cool at speeds and distances that would overheat other animals. On a hot day, the two scientists wrote, a human could even outrun a horse in a 26.2-mile marathon.

Why would evolution favor the distance runner? The prevailing theory is that endurance running allowed primitive humans to incorporate meat into their diet. They may have watched the sky for scavenging birds and then run long distances to reach a fresh kill and steal the meat from whatever animal was there first.

Other research suggests that before the development of slingshots or bows, early hunters engaged in persistence hunting, chasing an animal for hours until it overheated, making it easy to kill at close range. A 2006 report in the journal Current Anthropology documents persistence hunting among modern hunter-gatherers, including the Bushmen in Africa.

"Ancient humans exploited the fact that humans are good runners in the heat," Dr. Bramble said. "We have such a great cooling system" — many sweat glands, little body hair.

There is other evidence that evolution favored endurance running. A study in The Journal of Experimental Biology last February showed that the short toes of the human foot allowed for more efficient running, compared with longer-toed animals. Increasing toe length as little as 20 percent doubles the mechanical work of the foot. Even the fact that the big toe is straight, rather than to the side, suggests that our feet evolved for running.

"The big toe is lined up with the rest, not divergent, the way you see with apes and our closest nonrunning relatives," Dr. Bramble said. "It's the main push-off in running: the last thing to leave the ground is that big toe."

Springlike ligaments and tendons in the feet and legs are crucial for running. (Our close relatives the chimpanzee and the ape don't have them.) A narrow waist and a midsection that can turn allow us to swing our arms and prevent us from zigzagging on the trail. Humans also have a far more developed sense of balance, an advantage that keeps the head stable as we run. And most humans can store about 20 miles' worth of glycogen in their muscles.

And the gluteus maximus, the largest muscle in the human body, is primarily engaged only during running. "Your butt is a running muscle; you barely use it when you walk," Dr. Lieberman said. "There are so many features in our bodies from our heads to our toes that make us good at running."

So if we're born to run, why are runners so often injured? A combination of factors is likely to play a role, experts say. Exercise early in life can affect the development of tendons and muscles, but many people don't start running until adulthood, so their bodies may not be as well developed for distance. Running on only artificial surfaces and in high-tech shoes can change the biomechanics of running, increasing the risks of injury.

What's the solution? Slower, easier training over a long period would most likely help; so would brief walk breaks, which mimic the behavior of the persistence hunter. And running on a variety of surfaces and in simpler shoes with less cushioning can restore natural running form.

Mr. McDougall says that while researching his book, he corrected his form and stopped using thickly cushioned shoes. He has run without injury for three years.

http://www.nytimes.com/2009/10/27/health/27well.html?ref=nutrition

One Man's Crusade Against Slavery, Seen From Two Angles

By EDWARD ROTHSTEIN

RICHMOND, Va. — His body may lie a-moldering in the grave, but in what form exactly does his soul go marching on? We may think we know something about John Brown, the abolitionist and stern Calvinist who 150 years ago this month led 21 followers to take over the federal arsenal at Harpers Ferry, Va., expecting to gather weapons to fuel a widespread slave rebellion. His self-proclaimed Provisional Army of the United States took hostages (including a great-grandnephew of George Washington) and killed four innocent citizens. Finally, after being captured by a detachment of Marines led by Robert E. Lee, and tried, Brown and six other insurgents were hanged for treason, though their cause ultimately triumphed.

But in two small-scale but heavily laden exhibitions — one at the New-York Historical Society, drawing on the extraordinary Gilder Lehrman Collection, the other at the Virginia Historical Society in Richmond (the first show devoted to Brown in a city that was the capital of the Confederacy) — it becomes clear that Brown's legacy is nearly as riven now as it was on the eve of the Civil War. His actions still raise unresolved issues about the limits of dissent, the nature of terrorism and the effects of revolutionary violence.

The two exhibitions are also subtly different, reflecting in some respects contrasts that have their origins in the controversies of that earlier era. In New York "John Brown: The Abolitionist and His Legacy," developed by James G. Basker, president of the Gilder Lehrman Institute, and others, states its goal from the start: to examine "John Brown's beliefs and actions in the context of growing national divisions over slavery in the 1850s." We read in the wall text how, in that crucial decade, the passage of the Fugitive Slave Law in 1850 and the Kansas-Nebraska Act four years later, as well as the Dred Scott decision of 1857, "precipitated a firestorm between slaveholding Southerners and free-labor Northerners." Violence even broke out on the Senate floor in May 1856, when Representative Preston Brooks of South Carolina assaulted an antislavery colleague, Senator Charles Sumner of Massachusetts, beating him so badly that it was three years before Sumner returned to the Senate.

Out of that atmosphere, Brown's violence also took shape. We see his fierce intelligence in letters to followers, and read reminiscences of his hanging and its aftermath. There are shadows here, but his legacy is given few ambiguities. It is displayed in documents representing the 13th, 14th and 15th Amendments, which ended institutional slavery and its legal culture. Brown's legacy, the show suggests, finally found fruition in the 1960s civil rights movement (evoked here by a placard carried in a march that the Rev. Dr. Martin Luther King Jr. joined the day he was murdered).

Ultimately, the assessment of Brown that remains is that of Frederick Douglass, who disagreed with Brown's tactics but is quoted here in 1881: "If John Brown did not end the war that ended slavery, he did at least begin the war that ended slavery."

In Richmond in "The Portent: John Brown's Raid in American Memory," something quite different happens. In the South Brown was condemned not only for his abolitionist views but also because he tapped into latent fears of a slave rebellion. Now, of course, the curators, the historians William M. S. Rasmussen and Robert S. Tilton, take the virtues of Brown's abolitionist cause for granted; indeed, the last part of the exhibition is devoted to a series of 22 schematic, affecting prints of Brown's life and his martyrdom by the artist Jacob Lawrence (based on his 1941 paintings). Melville's 1859 poem "The Portent," about Brown's hanging, gives the show its title, presciently calling Brown a metaphysical herald, a "meteor of the war" that was about to begin.

But in Richmond abolition is not the theme; Brown's tactics are. And we can hear the clamor of the debate more clearly. As the show points out, Brown's virtue was not always so transparent, even in the North.

Brown was hailed by Emerson, who said he would "make the gallows as glorious as the cross." Thoreau glorified him as living beyond death. Victor Hugo called him "this liberator, this fighter for Christ," whose hanging ("so great a crime") "would impart to the Union a creeping fissure."

The first biography of Brown, published soon after his hanging, is open here to its title page, where the author, James Redpath, with a typographical shout, dedicated the book to Emerson and Thoreau, "WHO, WHEN THE MOB SHOUTED, 'MADMAN!' SAID, 'SAINT!' "

But at the same time Hawthorne called Brown a "blood-stained fanatic." Lincoln called his raid "absurd" and deplored Brown's "violence, bloodshed and treason." In the major Northern cities "Union meetings" were held to condemn Brown.

A petition signed by 3,500 Bostonians proclaimed, "We deeply sympathize with the people of Virginia." In New York, the exhibition says, there was a huge political meeting: 6,000 people filled the Academy of Music; 15,000 gathered outside; and 20,000 signed a resolution regarding "the recent outrage at Harpers Ferry as a crime."

There were some, clearly, who opposed Brown because he was both violent and an abolitionist, but others opposed him simply because he was violent. One of the remarkable objects on display here is a long pike topped with the blade of a Bowie knife. In March 1857, in preparation for the raid, Brown ordered a thousand such custom-designed weapons from a Connecticut manufacturer, for use by slaves with no experience with guns. The weapon has a primitive power, and helps give some idea of the kind of battles Brown imagined.

The money for such weaponry, as both shows point out, came from abolitionist financiers in New England, brilliant and educated men (including the founder of the Boston Symphony) who may have tried to preserve their ignorance about Brown's specific intentions; they became known as the Secret Six. But could they have been ignorant of Brown's attacks in Kansas in 1856, when he and several of his sons and supporters armed themselves and aimed, in Brown's words, to "strike terror in the hearts of the pro-slavery people"? Brown's group barged into one home, pulling out the father and two older sons, and hacked at them with swords, severing arms and fingers and gouging their bodies.

There is a letter in New York, written to Brown before his hanging by Mahala Doyle, the wife and mother of those murdered. "Altho vengeance is not mine, I confess, that I do feel gratified to hear that you ware stopt in your fiendish career," she writes, pointing out that the Doyles didn't even own slaves.
"O how it pained my Heart to hear the dying groans of my Husband and children," she recalls, noting that her youngest son, whom Brown spared in response to her entreaties, wished he could be at the hanging to help adjust the rope around Brown's neck.

This makes the issues more stark, and in Richmond they become explicit. "Does an individual have the right to carry out violent acts based on conscience?" the exhibition asks in a video surveying the history of the raid. "Does a noble end justify a bloody means?" And given Brown's unwavering belief in his own righteousness and his embrace of the most extreme methods, the show asks, "Is Brown so different from today's bombers from Oklahoma City to Iraq?"

The exhibition does not answer those questions; it is effective enough just to raise them. What makes this case so disturbing is that here we have a cause that is now considered inherently virtuous: the abolition of an institution that had led to untold violence and degradation. Moreover, slavery seemed to be so firmly established that nothing but violence could unseat it.

Brown's vision of a spontaneous slave insurrection might have been fantastical, and his strategic abilities sorely strained, but one judgment (as in New York) is that good grew out of this apparent evil. Like the Union forces in the Civil War, Brown used violence in the service of ending violence.

"I think I did right," Brown told his captors after the raid, and he considered his effort to be "the greatest service man can render to God." The New York exhibition has a letter Brown wrote in prison: "I do not feel myself in the least degraded by my imprisonment, my chain, or the near prospect of the Gallows. ... I go joyfully in behalf of Millions that have no rights that this 'great, & glorious'; 'this Christian Republic,' is bound to respect."

But can we not also be distressed by the implications of Brown's methods, and worry over their enthusiastic embrace over the last 150 years? In his welcome of martyrdom, his visions of apocalyptic retribution and his unshakable belief in his own virtue, Brown is now so familiar a type on the world scene that we cannot resist being horrified by the temptation of terror that he succumbed to, even if, as in this particular case, we welcome its long-sought goal.

"The Portent: John Brown's Raid in American Memory" is on view through April 11 at the Virginia Historical Society, 428 North Boulevard, Richmond; (804) 358-4901, vahistorical.org. "John Brown: The Abolitionist and His Legacy" is on view through March 25 at the New-York Historical Society, 170 Central Park West, at 77th Street; (212) 873-3400, nyhistory.org.

http://www.nytimes.com/2009/10/28/arts/design/28brown.html?ref=design

Prints That Shine Anew: Cassavetes, Bergman and More at MoMA

By DAVE KEHR

More than 25 movies rescued from the ravages of time and neglect will be featured in this year's edition of "To Save and Project," the Museum of Modern Art's annual festival of recently preserved films. Now in its seventh year, the program began on Saturday with a new print of John Cassavetes's devastating 1974 study of emotional instability, "A Woman Under the Influence" (running through Friday), one of several entries this year restored in whole or in part through the good offices of the Film Foundation.

With money provided by the fashion house Gucci and other sources, the Film Foundation, a nonprofit group founded in 1990 by Martin Scorsese and other leading American directors, is also behind the restoration of Antonioni's spare, modernist 1955 "Le Amiche" ("The Girlfriends," screening Thursday), based on a novella by Cesare Pavese. The foundation is also responsible for the reclaimed Technicolor magnificence of Visconti's extravagant period romance "Senso" (1954), with Farley Granger and Alida Valli. "Senso" screens on Monday and Wednesday.

A strong documentary component in this year's lineup includes MoMA's own restoration of Robert J. Flaherty's pioneering 1922 nature film, "Nanook of the North" (showing Saturday), now with its original color tinting intact. Documentaries of a more personal nature are featured in "Mama, Don't Take My Kodachrome Away!" (Nov. 2 and 9), a program of home movies featuring, among other things, intimate glimpses at the lives of Alfred Hitchcock and Joan Crawford, as well as Wallace Kelly's remarkable "Our Day," an artfully rendered "day in the life" of a middle-class family in Kentucky, around 1938.

Hollywood's in-house preservation efforts are represented by four films reclaimed by Sony Pictures Repertory, including Bob Rafelson's 1972 "King of Marvin Gardens" (Friday and Sunday) and Frank Capra's pre-Code melodrama "Forbidden" (1932), with Barbara Stanwyck (Saturday and next Monday). New York Women in Film and Television offers a program of work financed through the Women's Film Preservation Fund: three short films (1959-1962) by the Chicago amateur filmmaker Margaret Conneely, followed by the 1926 feature "Christine of the Big Tops," written by Sonya Levien (Nov. 1 and 4).
The Swedish Film Institute will screen the long-unseen bilingual version of Ingmar Bergman's "Touch" (1971), with Elliott Gould and Bibi Andersson (Nov. 6 and 8). It will also present two silent classics from the golden age of Swedish cinema: Victor Sjostrom's "Phantom Chariot" (1921), on Nov. 7 with live musical accompaniment by the Matti Bye Ensemble; and Benjamin Christensen's "Haxan: Witchcraft

Through the Ages" (1922), on Nov. 8 with the Matti Bye Ensemble and on Nov. 13 with piano accompaniment by Ben Model.

On Nov. 11 and 15 the artist Kara Walker will introduce one of the earliest feature-length animated films, Lotte Reiniger's "Adventures of Prince Achmed" (1926), as restored by the Deutsches Filmmuseum. From France, two political films recall the turbulent 1960s: "Le Joli Mai," in which the filmmakers Chris Marker and Pierre Lhomme question passers-by about their attitudes toward the French-Algerian War (Nov. 13 and 14); and the collective film "Far From Vietnam" (Nov. 12 and 14), with segments by Alain Resnais, Agnès Varda, Jean-Luc Godard and others.

New preservation efforts in Asian films are represented by the restoration, at the University of California, Los Angeles, of Lester James Peries's 1964 feature from Sri Lanka, "The Changing Village" (Nov. 11 and Nov. 12), as well as the Korean Film Archive's rehabilitation of Kim Ki-young's astounding thriller of 1960, "The Housemaid" (Nov. 5 and 16).

The story of a music teacher and his family under attack from a sexually aggressive, pathologically possessive maid, "The Housemaid" has been a decisive influence on the new generation of South Korean filmmakers that includes Park Chan-wook and Bong Joon-ho. Restored with the support of Mr. Scorsese's new global initiative, the World Cinema Foundation, it is a perfect example of why film preservation is so important: here's a major work reclaimed from the past that points to the future.

Most of the screenings of the "To Save and Project" festival are at the Roy and Niuta Titus Theaters, Museum of Modern Art; (212) 708-9400 or moma.org.

http://www.nytimes.com/2009/10/26/movies/26moma.html?ref=design

At MoMA, 'Permanent' Learns to Be Flexible
By TED LOOS

THE European tourists, students with sketchpads and others who throng the painting and sculpture galleries of the Museum of Modern Art every day may not notice anything out of the ordinary in Room 19 on the fourth floor, but visitors who know the place and its paintings well surely do. The walls are still arrayed with large canvases by Abstract Expressionist masters like Willem de Kooning and Franz Kline, but where once these works were surrounded by simple wooden frames, they now hang naked, their rough, paint-splattered edges and rusting staples on view to the world.

"It was convention to have the frames," Ann Temkin explained recently as she walked around the gallery and stopped in front of Kline's "Painting Number 2" (1954). That convention, Ms. Temkin felt, had domesticated the paintings in a way that obscured how radical they were, what a "profound break with the past," and last fall she ordered the frames removed in one of her first acts as the Modern's new chief curator of painting and sculpture.
"Now these strokes explode off the canvas," she said happily, pointing to Kline's signature black slashes. "It has a freedom now."
In the year and two months since she succeeded John Elderfield in the job, Ms. Temkin, 49, has been working to break with the past herself — most surprisingly, perhaps, in her approach to the so-called permanent collection. Ranging from van Gogh's "Starry Night" (1889) and Matisse's "Dance (I)" (1909) to de Kooning's frenzied "Woman, I" (1950-52) and Andy Warhol's "Gold Marilyn Monroe" (1962), this collection — or rather a selection from it that has been on view for decades — has done more than any other to define modern art and shape the public's understanding of its history. The 26 rooms of the Alfred H. Barr Jr. Painting and Sculpture Galleries, which have housed these highlights of the collection on the fourth and fifth floors of the Modern's "new" building since it opened in 2004, might reasonably be regarded as sacrosanct: the heart of the museum and of modern art generally.
But under Ms. Temkin, the permanent collection display is quickly becoming less permanent. Galleries that once changed only when works were loaned out are now subject to frequent renewal. For the first time, media other than painting and sculpture appear frequently throughout the Barr galleries. Artists who never quite made it into official "schools" are getting more play, and schools that the museum once passed up are getting pride of place.
Even small changes, like swapping out a single well-known artist for another, can make for major shifts in the museum's familiar and stately narrative of modernism's progress. The fourth floor, covering the early 1940s to the early 1970s, used to begin with Jackson Pollock's "Stenographic Figure" (1942). Now Louise Bourgeois's sculpture "Quarantania I" (1947-53) sets the tone for the entire era.

"At first I was shocked, and then I was impressed," said Pepe Karmel, the chairman of the art history department at New York University, who spent three years as an adjunct curator in the Modern's painting and sculpture department in the 1990s. In addition to the obviously different message conveyed by introducing such historic galleries with work by a still-living woman, Ms. Bourgeois's rounded stalagmites, Mr. Karmel said, "fit in perfectly with the works by Rothko, Masson and Gorky — all pictures of this biomorphic moment."

Ms. Temkin emphasized that she was not pushing for wholesale change. "I want the visitors who come back again and again to encounter new work, but some of their favorites will be there. We want them to eat their cake and have it, too."

But her larger point, she said, is an art historical one about how a familiar parade of greatest hits is misleading to viewers. "I want to be true to the collection and what really goes on in art — that there's more than you can possibly know, rather than the falsely reassuring view that you can get your head around it all," she said.

"The tradition here has been fluid special exhibitions and the permanent collection is relatively unchanging," she added. "I want a fluidity and constant rhythm of change."

Rethinking the Barr galleries, Ms. Temkin said, combines the pleasures and challenges "of art history and rearranging the furniture." Last spring, for instance, she moved a whole room full of works by Piet Mondrian so that a set of sculptures by Constantin Brancusi would be visible through a doorway, creating a kind of visual echo. "They were both so dedicated to the idea of pure abstraction," she said.

Around a corner from a room of Pop works by the likes of Andy Warhol and Roy Lichtenstein, another room is now devoted to the neo-Dadaist Fluxus movement of the 1960s and '70s, never collected in depth by MoMA. The museum received a 3,000-piece bequest this year, and Ms. Temkin wanted to get it on view right away.

"Rather than being punished for missing the moment, we end up being able to display it in splendid fashion — with a delay of only 40 years," she said. Nose-thumbing Fluxus works, like a neon sign of Picasso's signature by Robert Watts, are now packed floor-to-ceiling into a small space, evoking the movement's playful style.

Even in galleries with familiar themes and many familiar works, Ms. Temkin and her staff have mixed in surprises. "When there are one or two fresh things in a room, it puts viewers on alert," she said. When she helped to reinstall the gallery of early 20th-century Mexican art, for example, Ms. Temkin's deputy Leah Dickerman included a relatively obscure, delicately colored landscape by Juan O'Gorman, "The Sand Mines of Tetelpa" (1942), among works by artists like Frida Kahlo.

"Who knew we had that painting?" said the museum's director, Glenn D. Lowry. "It's a great picture, and we haven't had it on the wall for 25 years."

Although the Modern's five-year-old building affords more display space than the museum has ever had, Ms. Temkin and her staff can fit only some 400 works in the Barr galleries out of 2,800 from before 1975 — "a never-ending resource," as she put it.

This trove has allowed her to make other choices that tweak the traditional take on the modern. This past spring, in a small gallery on the fourth floor, she installed part of "The Migration Series" (1940-41), a suite of 30 paintings by the African-American painter Jacob Lawrence, who gave each work a long, explanatory title.

"I wanted to go against the cliché of high modernism, which was invested in the idea that you don't need words," Ms. Temkin said. "For me, Lawrence is one of the great American artists."

Female artists have a more prominent place in some galleries. In the room devoted to Russian Constructivism — a movement more welcoming to women than others of the early 20th century — Temkin installed six works by Lyubov Popova, one of the few women prominent in the group, and six theater-related prints by Alexandra Exter, an obscure name to most visitors.

Ms. Temkin said she wasn't comfortable attributing their inclusion to feminism per se. "It's more of a generational thing," she said, referring to the fact that younger curators now run the Modern. "There's a desire to expand our account of art history."

"Jacob Lawrence wasn't an 'ism,' and lots of women weren't in 'isms,'" she said, "because the 'isms' wouldn't let them in. You leave out a lot if you only go with big 'isms.' "

Ms. Temkin is developing labels that will explain the themes of rooms in the Barr galleries; currently only individual works have wall texts. She said it was needed as the composition of rooms went beyond official art historical movements: "We can't expect people to read our minds."

Perhaps the most significant change, in the context of MoMA's traditions, is the mixing of media in the galleries. Beginning in the 1960s, MoMA's curatorial departments were rigidly divided: painting and sculpture, drawing, photography and architecture were separate worlds. The painting and sculpture galleries rarely showed works in other media.

Now 75 of the roughly 400 works in the Barr galleries are something other than paintings or sculptures. "This is how contemporary eyes see it," said Ms. Temkin, who was hired by the Modern as a senior curator from the Philadelphia Museum of Art in 2003. "Nowadays artists work in all media."

Mr. Lowry said that with Ms. Temkin's promotion, "these boundaries are dissolving aggressively, and they should. What Ann has done is make a priority an idea that has been percolating for a decade."

Despite the shifts, Ms. Temkin knows that some greatest hits, and some famous chapters of art history, are not optional.

Van Gogh's "Starry Night" isn't going anywhere. Room 2 on Floor 5, with Cubist works by Picasso and Braque, won't be morphing radically. "This is pretty tightly choreographed," she said. "We're the one place in the world where you can see the development of Cubism all together. It would be perverse not to do that."

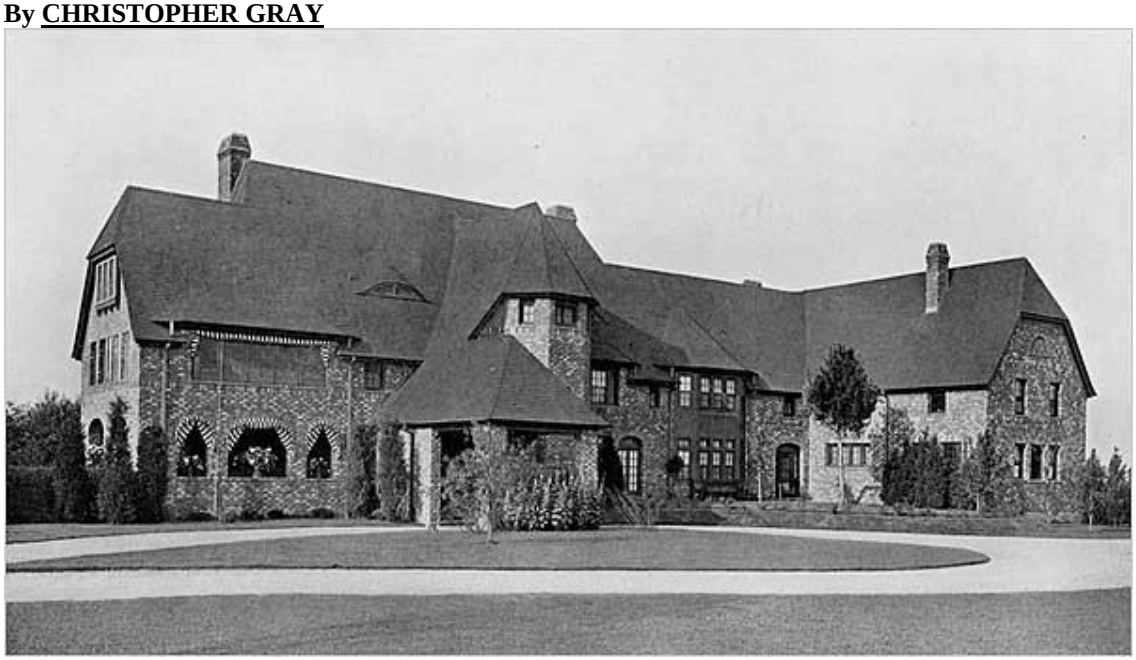
But she is committed to a more experimental approach. "Some things may not work out," she said, but "fear of failure" should not be an obstacle to undertakings like her unframing of the abstract works.

"It was in the spirit of trying things," she added — "not something people associate with the fourth and fifth floors."

http://www.nytimes.com/2009/10/25/arts/design/25loos.html?ref=design

GROSVENOR ATTERBURY
Designing for High and Low

By CHRISTOPHER GRAY



PETER PENNOYER and Anne Walker, the authors of erudite, luxuriously illustrated monographs about lesser-known architects, have now published "The Architecture of Grosvenor Atterbury" (W. W. Norton). This versatile architect ranged from town houses to model tenements, from country estates to loft buildings, with perfect ease. But he was a thinker, particularly interested in how to make not just better mansions, but better cities.

Atterbury was born in 1869, and his interest in architecture was perhaps piqued in 1887 by Sugar Loaf, the country house his parents built in Shinnecock Hills, hard by the emerging swelldom of Southampton. He was about 19 when Stanford White designed the long series of rolling bays, sheltered by a deep shingled roof, and he soon apprenticed with White's firm, McKim, Mead & White, following that with study in Paris. He set out on his own in 1895.
Atterbury quickly developed a country house practice, especially on Long Island. His early dwellings seem as long as aircraft carriers, but as low as submarines, just barely rising from the ground. The shingled house he built for Dr. Albert Ely in Shinnecock Hills undulated, broad and low, under a long tile roof imitating thatch, the whole melting into the grassy site. The pattern of shadows cast by the many facets of the roof of his house for Henry Trevor in Southampton was an architectural inkblot test, the shifting planes sure to evoke a different reaction in viewers' eyes.
In 1897, the sugar manufacturer Henry Havemeyer gave the neophyte a dream commission, to lay out an entire waterfront summer community oriented around artificial canals in Islip, N.Y. The houses that Atterbury designed were spare and square, faced in stucco, like Foreign Legion outposts in the deserts of Morocco. By comparison, his neo-Georgian New York town houses, although in impeccable taste, wind up being wan and tepid.
Curiously, Atterbury's own house, at Lexington and 70th Street, is unique in New York, a charming, idiosyncratic collection of copper bays, oriels, greenhouses and other projections that he plastered on to an old brownstone. The interior was an elegant souk of crushed velvet, linen-fold paneling and salvaged bits of old architecture.
Only late in his career did he create for someone else a town house of distinctive character, the half-timbered double-lot building at 225 East 49th Street. Commissioned by the composer Efrem Zimbalist and his wife, the soprano Alma Gluck, it looks like a small literary or music club.

Town and country houses were the stock in trade for Gilded Age architects, and what sets Atterbury apart from most is his continued interest in housing and other social issues. His 1907 Phipps Model Tenement on East 31st, now demolished, had colossal portals, a checkerboard brick facade and a roof pergola that might have been for the urban elite of Vienna rather than the working poor of New York.
In the same year, and for the same family, he designed the Phipps Natatorium, a public pool in Pittsburgh, in a dizzy polychrome of glazed green tile, marble and terra cotta.
Margaret Sage, the widow of the financier Russell Sage, used $10 million to create a foundation to improve urban living conditions, which then hired Atterbury to design the 142-acre Forest Hills Gardens in Queens. Atterbury and others worked to import the English idea of the garden city, creating a network of curving streets, green parks and compact but civilized building lots. Single, double and multiple houses drew in different economic classes. His 10-house group called Slocum Crescent recalls, in a modest way, the sprawling mansions that were simultaneously on his boards.
Atterbury became convinced that creating humane housing was going to cost money, too much money unless building costs themselves were lowered by scientific research. At Forest Hills he experimented with molded concrete slabs for wall construction, dropping costs by 20 percent, even building test houses on a lot in Sewaren, N.J. He continued such experimentation through his lifetime, although his prefabrication ideas did not catch on.
Mr. Pennoyer and Ms. Walker say in their book that in the 1930s, John D. Rockefeller Jr. "essentially kept him afloat," with commissions on Mount Desert Island in Maine for barns and two achingly beautiful gatehouses, rich with alternating brick and stone coursing, half-timbered facades and steep roofs. Another work in this vein is in Newport, R.I., his entrancing Surprise Valley Farm, a rough stone complex evocative of a rocky alpine village built for Arthur Curtiss James.
By the time Atterbury died in 1956, his practice encompassed a particularly broad range, including the majestic collegiate Gothic sweep of the Trinity-Pawling School in Pawling, N.Y., the Meso-American modernist Pond house in Tucson, and large-scale housing projects.
Mr. Pennoyer says that he and Ms. Walker chose Atterbury for their third book, after works on Warren & Wetmore and Delano & Aldrich, because "he was a romantic who was also a scientist." In this book, both the romance and the science of the man come through.
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http://www.nytimes.com/2009/10/25/realestate/25scapes.html?_r=1&ref=design

Paint 'to thwart chemical attack'
By Paul Rincon
Science reporter, BBC News, Porton Down

Scientists are planning to develop a paint coating for military vehicles which would soak up a chemical warfare agent and then decontaminate itself.

The technology could protect those operating in or around a vehicle after a chemical attack.

It would be adapted from "strippable" coatings currently used to provide temporary camouflage for vehicles.

The development work is being carried out by the UK's Defence Science and Technology Laboratory (DSTL).

Dr Steven Mitchell, from DSTL's headquarters at Porton Down in Wiltshire, said the next generation of coatings could be engineered to absorb chemical warfare agents.

" **Ultimately, what we'd love to do is develop a paint technology that is 'self-disclosing'** "
Dr Steven Mitchell, DSTL

Further down the line, scientists are looking into reactive coatings. These would incorporate catalysts and possibly enzymes allowing the paint to "self-decontaminate".

"Ultimately, what we'd like to create is a coating that changes colour to indicate it's been contaminated, decontaminates itself, then returns to the original colour when it's clean," said Dr Mitchell, acting team leader for hazard management and decontamination at DSTL.

"This is a long-term but not unreasonable ultimate objective."

Currently, strippable - or peelable - coatings are used when a new camouflage is required, changing a vehicle's colour from green to, for example, "light stone" in order to blend with desert terrain.

But even if something is not visible from far away, it may reveal itself by reflecting sunlight; the paint can also alter the vehicle's "glint signature", helping conceal it from hostile troops.

Under the skin

DSTL has been collaborating on the technology with industry partner AkzoNobel Aerospace Coatings.

"There are a number of advantages to this technology. One is its flexibility; it is easy to apply and easy to remove. You can change your colour or your signature in theatre in a relatively straightforward manner," Dr Mitchell told BBC News.

The coating is applied just like normal paint, often using commercially available spray guns.

"It's a single pack emulsion. It looks much like paint you'd find in a DIY store for painting your house. So you could apply it with a paint brush, or you could apply it with a roller. It's really flexible," Dr Mitchell explained.

"That's important for potential use in theatre because you might not have a sophisticated paint spray system available."

On the grounds of DSTL's headquarters, Dr Mitchell demonstrated how to remove the coating from a battlefield ambulance which had been painted for desert camouflage.

The coating on a rear door had been pre-scored with a knife; Dr Mitchell reached up to the raised tab and peeled back the rubbery skin by hand. The coating came away easily and largely in one piece.

While paint remained stuck to some raised areas such as bolts, he said remaining residue could be removed with a water power washer.

Before long, the whole door was stripped to the vehicle's dark green base colour. Dr Mitchell squashed the peeled coating into a lump and dropped it on the grass.

Chemical peel

Some other coatings require a caustic wash to remove, which means care has to be taken when disposing of the waste.

But this one can be disposed of as general waste as long as it is not contaminated.

Dr Mitchell said DSTL was currently working in partnership with industry to develop a version of the coating that would absorb the vast majority of a liquid chemical warfare agent.

"That helps prevent the contact hazard. It also helps prevent people touching the surface and spreading the contamination," he explained.

Liquid decontamination would still be required; some parts of vehicles, such as tracks and running gear, are not suitable for the application of a coating.

"Ultimately, what we'd love to do is develop a paint technology that is 'self-disclosing' - when it becomes contaminated, perhaps it changes colour to tell you it is contaminated with a chemical warfare agent," Dr Mitchell said.

"Maybe we'd also like to put some chemistry into the coating that would then react with and decontaminate the agent itself. And then perhaps even a colour change to tell you that process has been successful and the agent has been destroyed."

However, he stressed that these were long-term research aims: "Clearly, there are a lot of technical hurdles to be overcome to develop something this sophisticated," Dr Mitchell said.

Medals ceremony

Although current research is focussed on chemical warfare agents, scientists have also been looking at approaches that might tackle radiological and biological agents.

Dr Mitchell was demonstrating the strippable coating technology during the opening of a new energy-efficient building at Porton Down.

The Earl of Wessex, Prince Edward, opened the Minerva Building at the site near Salisbury last week.

The earl was given a tour and was presented with examples of DSTL's work, including cutting-edge research designed to counter Improvised Explosive Devices (IEDs).

He also presented Operational Service Medals for Afghanistan to five DSTL staff who recently returned from providing scientific advice on the frontline.

DSTL scientists and analysts are routinely deployed to theatre in support of operations.

The five staff were Matthew Brookes, a programme leader; Jarrod Cornforth, an operational analyst; Robin Hiley, a chief scientist; Chris Morriss, a concepts adviser and Amy de Vries, a research psychologist.

DSTL chief executive Frances Saunders commented: "These members of staff have gone the extra mile while working alongside our armed forces on the frontline, providing life-saving solutions and advice within extremely short timescales."

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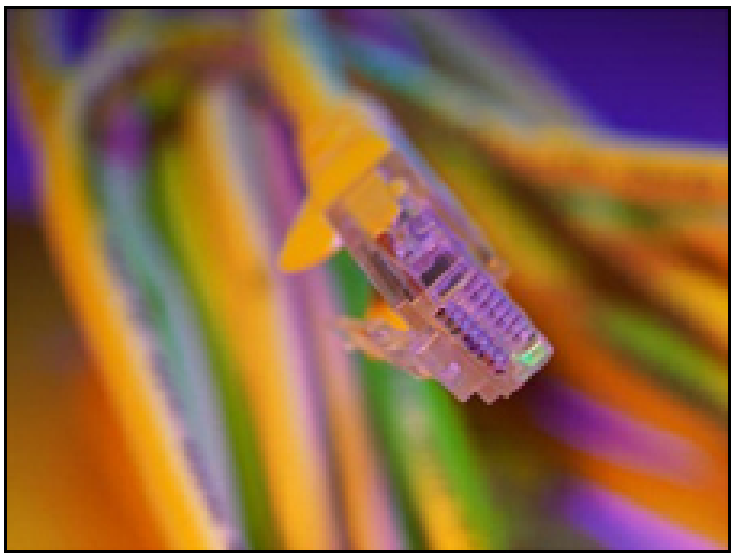
Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8321657.stm

Published: 2009/10/26 10:07:03 GMT

Net set for 'language shake-up'
By Jonathan Fildes
Technology reporter, BBC News

The internet is on the brink of the "biggest change" to its working "since it was invented 40 years ago", the net regulator Icann has said.



The body said it that it was finalising plans to introduce web addresses using non-Latin characters.

The proposal - initially approved in 2008 - would allow domain names written in Asian, Arabic or other scripts.

The body said if the final plans were approved on 30 October, it would accept the first applications by 16 November.

The first Internationalised Domain Names (IDNs) could be up and running by "mid 2010" said the president of the Internet Corporation for Assigned Names and Numbers (Icann).

"Of the 1.6 billion internet users today worldwide, more than half use languages that have scripts that are not Latin-based," said Rod Beckstrom at the opening of Icann's conference in Seoul, South Korea.

"So this change is very much necessary for not only half the world's internet users today but more than half, probably, of the future users as the internet continues to spread."

Relaxed rules

Plans for IDNs were approved at a meeting in June 2008. However, testing of the system has been going on for much longer, said Peter Dengate Thrush, chairman of the board in charge of reviewing the change.

"You have to appreciate what a fantastically complicated technical feature this is," he said.

"What we have created is a different translation system."

The changes will be applied to the net's Domain Name System. This acts like a phone book, translating easily understood domain names such as bbc.co.uk into strings of computer readable numbers known as IP addresses.

The tweaks will allow this system to recognise and translate the non-Latin characters.

"We are confident that it works because we have been testing it for a couple of years," said Mr Dengate Thrush. "We're really ready to start rolling it out."

Some countries, such as China and Thailand, have already introduced workarounds that allow computer users to enter web addresses in their own language. However, these were not internationally approved and do not necessarily work on all computers.

The meeting in South Korea will also discuss its plans to introduce generic Top Level Domains (TLDs), such as .uk or .com.

Last year, the body voted to relax rules on TLDs meaning companies could turn brands into web addresses, while individuals could use their names.

Icann, set up by the US government, was founded in 1998 to oversee the development of the net.

Last month, after years of criticism, the US government eased its control over the non-profit body.

It signed a new agreement that gave Icann autonomy for the first time. The agreement came into effect on 1 October and puts it under the scrutiny of the global "internet community".

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/8326241.stm

Published: 2009/10/26 14:06:38 GMT

Mobile net 'heading for data jam'

The number of people accessing the net on mobile phones could soon outstrip the capacity of networks, experts warn.

Mobile data traffic looks set to rise 25 fold by 2012, said mobile analyst firm Informa.

The boom could present operators with problems as revenues generated by those using such mobile data services will only double over the same time period.

Mobile network experts warn that operators need to take action to avoid imminent data traffic jams.

"Revenues from data are increasing much slower than traffic," said Dimitris Mavrakis, mobile network analyst from Informa. "Where operators are experiencing exploding data traffic, revenues are not following them."

The "decoupling" of revenues from traffic presented operators with a problem, said Mr Mavrakis, because it deprived the phone firms of cash at a time when their networks were in need of upgrading.

" **There's a crunch point coming** "
Graham Carey, Bytemobile

This was compounded, he said, by the fact that hardware to build next-generation mobile networks that can handle high data rates will not be widely available until late 2010.

Graham Carey, a spokesman for network optimisation firm Bytemobile, said the history of mobile networks also made it harder to handle the always-on nature of many smartphones and laptops.

"Radio networks today have been designed to have very short sessions for telephone-type calls," he said.

He added that flat-rate pricing made it hard for mobile operators to recover enough cash to cope.

Such payment plans made it hard to persuade users to be parsimonious with their data browsing.

"As far as users are concerned, they do not see the need to manage their consumption," he said.

"The consumption rate is far outweighing the network improvement rate," he said. "There's a crunch point coming."

Already many mobile networks were turning to optimisation schemes that shrink the size of files that people download.

Typically these involve using software centrally to look at what people are downloading and shrink them where possible. For instance, web pages with a lot of white space can be shrunk with little or no effect on the quality of a site seen by end users.

John Spindler, vice president of product management at network optimisation firm ADC, said operators were also struggling to cope with sudden spikes in mobile data use.

Heavy users of mobile data were not spread equally around an operator's network, he said.

"When you start looking at data applications, if you look at laptops or mobile handsets, a lot of that is not happening on the street corner," he said. "It is happening in conference rooms and convention centres."

"Today the primary use for wireless is happening indoors," he said.

"What's going to happen if carriers do not respond appropriately? They are going to crush the user experience."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/8325634.stm

Published: 2009/10/26 11:25:34 GMT

Leisure centre 'junk food' alert

Vending machines stocked with unhealthy snacks in leisure centres run the risk of fuelling childhood obesity, warn experts.

Crisps and chocolate are on sale where children exercise despite being banned from schools and children's TV, the British Heart Foundation found.

And children's meals on offer at the 35 venues spot-checked were dominated by chips, nuggets, sausages and burgers.

The charity wants stricter regulation over the food choices available.

The report, which was prepared by the Food Commission, looked at leisure centres, bowling alleys, ice skating rinks and park cafes.

" **It's fantastic that these kids are getting fit and having fun at the same time but this is being undermined by venues peddling junk food at them** "
Chief Executive of the BHF Peter Hollins

The average calorie content of vending machine snacks was 203 calories, which would take a seven-year-old 88 minutes of swimming to use up.

Fresh fruit was displayed at less than half of the venues visited, and nutritional information was displayed at just two of the venues visited.

The BHF said this severely limits the child's and parent's ability to assess the nutritional values of the products they are buying.

Junk ban

BHF chief executive Peter Hollins said: "It's fantastic that these kids are getting fit and having fun at the same time but this is being undermined by venues peddling junk food at them.

"Councils and leisure providers need to rigorously reconsider the food options they are providing and make it easier for parents and children to make healthier choices."

The charity is now calling for public and private sector providers to lead the way in ensuring healthy food options are available and easily identifiable.

It says it should be made a requirement that vending machines in publicly owned facilities are stocked with healthier products.

A Department of Health spokeswoman said: "We are fully committed to encouraging the adoption of healthy vending machines across the country and expect local authorities to make sure there are healthy food options available in their leisure centres."

Confectionery, crisps and sugary fizzy drinks have been banned from all school vending machines in England since September 2007.

Judy Hargadon, chief executive of the School Food Trust, said: "Convenience doesn't have to mean unhealthy.

"Many schools are using vending to offer pupils extra choice and independence whilst still keeping their options well-balanced and consistent."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8325859.stm

Published: 2009/10/27 00:04:10 GMT

Call to act on maternal mortality

Health ministers from around the world have agreed that swift action must be taken to reduce the number of women dying during pregnancy and childbirth.

At the UN Population Fund meeting in Addis Ababa the ministers said the number of women dying in this way was actually increasing in some nations.

The ministers seemed to agree that family planning was the most cost-effective way of tacking the problem.

However, no unanimous declaration was adopted at the Addis Ababa talks.

Brain drain

The ministers said the world must act swiftly to stand any chance of reaching the UN's development goal of reducing global maternal mortality rates.

The ministers also recognised that more investment was needed in primary and emergency healthcare to save the lives of both mothers and babies in 15% of birth when complications arise, the BBC's Pascale Harter in Addis Ababa says.

But many governments - like that of the host company Ethiopia - have already invested heavily in training midwives only to have them work abroad. There are said to be more Ethiopian midwives working in Chicago now than in Addis Ababa, our correspondent says.

She adds that the Hamlin college of midwives in Ethiopia, however, is about to graduate its first intake of students and it believes it may have come up with a solution to the brain drain.

"We are actually hand-picking girls. Some of these girls wouldn't have the opportunities to go onto further education. We draw up a contract with their families that we will give them a full scholarship and if they work for six years post graduation back in their own area," says Annette Bennett, the college's dean.

"And many of them are really excited to be given this opportunity to then go back and work with their communities. They come from where the hardships are," she says. But to really meet demand in countries like Ethiopia both government and aid donors would need to commit more money to this kind of primary healthcare, our correspondent says.

And yet while donor aid to fight HIV/Aids more than doubled earlier this decade, aid for primary healthcare dropped by nearly half, she adds.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8327144.stm

Published: 2009/10/26 23:22:06 GMT

HPV jab girls are 'sex cautious'

Eight in 10 girls say that having the HPV jab makes them think twice about the risks of having sex, a poll finds.

The findings may go some way to dispel concerns that the cervical cancer vaccine could make girls more likely to start having sex younger, say experts.

But 14% of the 500 girls surveyed and who had been offered the vaccine said they might take more sexual risks because of it.

The findings are published in the British Journal of Cancer.

One in five of the 12 and 13-year-olds polled by the University of Manchester team thought the vaccine was embarrassing because it is for a sexually-transmitted infection - human papillomavirus, or HPV.

" **Despite the scare-stories, this research suggests that the HPV vaccine could make the majority of girls more cautious about sex** "
Dr Lesley Walker of Cancer Research UK

But, 79% of the girls said having the vaccination reminded them of the possible risks of sexual contact and 93% said it showed they were serious about their own health.

The survey was funded by GlaxoSmithKline, which makes the Cervarix vaccine currently used in a national immunisation programme.

The girls, from the Manchester area, were questioned before the vaccine was available nationally.

It is the first survey to focus on girls' views of the vaccine rather than asking their parents for their thoughts.

Almost four in five girls said they discussed the decision to have the vaccine with their parents and, of those girls whose parents refused the vaccine, 42% actually wanted it.

But one in 10 girls receiving the jab did not want it.

High uptake

Dr Lesley Walker, director of cancer information at Cancer Research UK, said: "Despite the scare-stories, this research suggests that the HPV vaccine could make the majority of girls more cautious about sex.

"The HPV vaccine is an important step towards preventing cervical cancer in the UK but it will only be truly successful if uptake is high.

"It's important that girls also get appropriate sex education so that they're all aware of the risks of sex."

Each year around 2,800 British women are diagnosed with cervical cancer and more than 1,000 die from the disease.

Some 70% of 12-to-13-year-olds in England have been fully vaccinated against cervical cancer in the first year of the programme.

A Department of Health spokeswoman said attitudes may have changed since the vaccination campaign was rolled out.

She said: "We would always recommend involving the girl's family in the decision on whether to have the vaccine."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8326026.stm

Published: 2009/10/27 00:02:11 GMT

Vive la différence of languages

- 25 October 2009 by **Andrew Robinson**

Magazine issue 2731.

The Welsh language is very much alive (Image: Allan Baxter/Getty)

- **Book information**
- *On the Death and Life of Languages* by Claude Hagège
- Published by: Yale University Press
- Price: £20/$30

EVERY year, 25 languages die out, on average. The world has perhaps 5000 living languages - though estimates vary - so by the end of this century there will be only half this number. In North America alone, there were between 600 and 700 languages when Columbus landed in 1492. This number had fallen to 213 by 1962, of which only 89 languages had speakers ranging from children to the elderly. Since then at least 50 more have gone extinct. For example, the last native speaker of Cupeño died in 1987 in Pala, California, aged 94.

Claude Hagège, a professor of linguistics at the Collège de France in Paris, has studied this decline for more than three decades. His academic book, *On the Death and Life of Languages*, which was first published in French in 2000 and has now been translated into English, is a wake-up call, covering languages across the globe, from Cornish to the polyglot brew of Papua New Guinea. Hagège has no doubt that linguistic imperialism is largely responsible for the problem: "The death threat that weighs upon languages today takes the guise of English," he concludes glumly. "And I wager that the wisest anglophones would not, in fact, wish for a world with only one language." However, he also focuses on how a few dying languages, such as Welsh, have been saved by their native-speakers, assisted by governments. The rebirth of Hebrew in Israel receives detailed treatment. Uniquely, Hebrew is a spoken language fabricated from a written language; it has been used by Jewish scholars since biblical times. Modern Hebrew's messianic proponent, the Zionist Eliezer Ben-Yehuda, faced stiff opposition to the plan. A fellow Jew sarcastically told him: "If you only speak a dead language to your children, you will make them idiots!" Still, it's amazing to consider that in the early 20th century, German almost supplanted Hebrew among Jews in Palestine, because of its use in technical schools. Einstein, inaugurating the Hebrew University of Jerusalem in 1923, managed just one sentence in Hebrew, then switched to his native German.

http://www.newscientist.com/article/mg20427311.800-vive-la-difference-of-languages.html?full=true&print=true

'Superspreading' doctors cause most infections

- 28 October 2009
- Magazine issue 2731.

SWINE flu and hospital superbugs may have a common weapon: the dirty hands of doctors and nurses that act as germ "superspreaders".

Didier Guillemot of the Pasteur Institute in Paris, France, and colleagues created a mathematical model of a hypothetical intensive care unit (ICU) with a staff of 22.

They found that staff who saw all patients briefly were better at spreading germs than those who tended a few patients very closely. If just one of the former always failed to wash their hands, it caused more infections than if the entire staff forgot one-quarter of the time (*Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.0900974106).

Hospitals use the consumption of hand-hygiene products to monitor hand-washing, says team member Laura Temime of the National Conservatory of Arts and Trades in Paris. "Our study suggests individual surveillance of hand hygiene would be better."

If the flu pandemic overwhelms ICUs, staff will tend more patients, creating more superspreaders.

http://www.newscientist.com/article/mg20427313.900-superspreading-doctors-cause-most-infections.html

Super slow-motion camera can follow firing neurons

- 09:00 28 October 2009 by **Colin Barras**

Slow motion just got a whole lot slower, with a camera sensor able to film action at 1 million frames per second.

The black and white device is quick enough to capture impulses hurtling through firing nerve cells, and its resolution is good enough to film the microsecond-long pulse-like nerve signals that speed through networks of neurons at up to 180 kilometres per hour.

Capturing frames that last one-millionth of a second requires great sensitivity to light, as well as precise timing. The device uses an array of single-photon detectors, or SPADs, each hooked up to a tiny stopwatch. The stopwatch records when the SPAD is hit by an incoming photon, with an accuracy of around 100 picoseconds.

Wider view

Each SPAD and its timer together act as a single-pixel camera, a setup that has been used for several years, says Edoardo Charbon at the Delft University of Technology in the Netherlands.

Charbon is the coordinator of the pan-European Megaframe project, which is the first to make a silicon chip that combines many such devices into a image sensor. The chip works like the one in a digital camera and so can snap whole objects, not just tiny spots like individual SPADs. The current chip contains an array of 1024 SPADs and stopwatches: "No one has operated so many on a single chip before," says Charbon.

Short exposure

Each Megaframe image is captured in just a few nanoseconds, and the device itself can capture one image per microsecond, or 1 million frames every second. "If every pixel was hit by a photon every microsecond, then you could measure 1024 million photons per second – that's one gigameasurement every second," says Charbon. In reality, however, not enough photons collide with SPADs to give such resolution.

The sensor could be fitted with a conventional camera lens, for example in mobile gadgets, says Charbon. But for now the team has attached it to a microscope to capture the firing of neurons. They use a technique called fluorescence lifetime imaging microscopy. It exploits the fact that, when illuminated, some molecules absorb photons before discharging the energy shortly afterwards in a second photon of another colour.

The Megaframe sensor detects those emitted photons and measures how long they take to appear after the initial photon is absorbed. This can reveal the properties of the emitting molecule. "The distribution varies in a predictable way depending on the local environment – for instance, the calcium concentration," Charbon says.

Because the ion channels in neurons fire when there is a build-up of calcium around them, the technique offers a way to monitor neuron activity. And because the chip can handle up to 1024 photons at the same time, it can record a moving image of the neuron to show exactly how a nerve signal travels through it.

Speed of thought

Using the Megaframe chip to capture a million images a second, it will be possible to "film" the impulses moving around a small network of neurons, says Charbon.

Carl Petersen at the Swiss Federal Institute of Technology in Lausanne used a previous generation of the chip, containing fewer SPADs, to "film" similar processes. "This new chip will be extremely useful," he says.

Neuroscientist Alessandro Esposito at the University of Cambridge is excited about the new perspectives Megaframe could provide.

He says the new chip can map events so fast-moving that currently they can only be recorded by electrical measurements which give no spatial information. "The Megaframe impact on lifetime sensing will be momentous," he says. It could, for instance, lead to a better understanding of the molecular basis of cancer.

http://www.newscientist.com/article/dn18051-super-slowmotion-camera-can-follow-firing-neurons.html

Lost limb leads to flexible new body image

- 17:15 27 October 2009 by **Jessica Hamzelou**
- For similar stories, visit the **The Human Brain** Topic Guide

Not only can people who have lost a limb continue to sense its presence, they can also move their phantom limb in ways that would be anatomically impossible with the real limb. With practice, they can even learn to envisage their bodies as having changed to an entirely unnatural shape.

Lorimer Moseley of the University of New South Wales in Sydney, Australia, and Peter Brugger of University Hospital Zurich, Switzerland, investigated seven amputees who sensed a phantom arm.

In one task, the amputees were shown pictures of a hand and were asked to say if it was a left or right hand. Because the hand was shown in an awkward position, the subjects had to imagine moving their phantom hand into the position shown. In a second task, they were shown pairs of pictures of a hand in two different positions, and asked to imagine making their phantom hand move from one to the other.

In both tasks, it was quicker to make the necessary movement by doing something that would be impossible with a real hand, such as bending it back through the wrist. So by timing their subjects' responses, Moseley and Brugger could tell whether they were moving their hand in an anatomically correct or anatomically impossible way.

Mind over matter

After practising, four of the seven subjects learned how to move their phantom limbs in "impossible" ways, and were able to say how their wrist allowed them to do this. The joints they described not only allowed them to move their phantom arms in strange ways, but also got in the way of normal movement. Essentially, they constructed a new body image of their phantom limb. "The brain truly does change itself," Moseley and Brugger say.

"The idea that just thinking about movements can change body image is quite surprising," says Henrik Ehrsson, a neuroscientist at the Karolinska Institute in Stockholm, Sweden.

Brugger hopes the findings can be used to help patients with phantom-limb pain. An amputee might feel as if their phantom hand is always clenching a metal bar, causing pain. The discovery that phantom limbs are highly flexible ups the chance that amputees can learn to get out of such painful positions.

Journal reference: *Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.0907151106

http://www.newscientist.com/article/dn18052-lost-limb-leads-to-flexible-new-body-image.html

US FDA says omega-3 oils from GM soya are safe to eat

- 16:37 27 October 2009 by **Andy Coghlan**

Omega-3 fatty acids can be obtained from GM soybeans (Image: Carroll & Carroll/Getty)
Good news for fish stocks at last. A genetically modified soybean that produces oil containing omega-3 fatty acids – recommended for heart and brain health – could supplement fish as a source of these nutrients.

Last week, the US Food and Drug Administration made public its ruling that the oil produced by GM soybeans is safe to eat, meaning food companies can begin testing it in products such as margarine.

Developed by biotech giant Monsanto, the soybean is the first GM plant that has claimed health benefits for consumers, not just economic benefits to farmers. Two other companies, BASF (PDF) and Du Pont, say they are not far behind.

BASF has developed GM canola plants that produce similar oils, while Du Pont makes them by fermenting micro-organisms, and says it plans to launch its first "omega-3" pill early next year.

Death watch

Omega-3 fatty acids have been estimated to reduce the risk of heart attack and stroke by up to 26 per cent, and of sudden cardiac death by 45 per cent. Earlier this year, a study by the Harvard School of Public Health concluded that a lack of omega-3 in the diet is the sixth leading cause of preventable deaths in the US (*PLoS Medicine*, DOI: 10.1371/journal.pmed.1000058).

A review of 97 studies in 2005 concluded that omega-3s are as effective at reducing the risk of heart attacks and strokes as statins, the leading class of cholesterol-lowering drugs.

Some plants, such as linseed, naturally produce an omega-3 called alpha-linolenic acid (ALA), and one way to increase the amount of omega-3 in our diet is to eat these plants or margarines and other foodstuffs that contain added ALA.

However, only a tiny amount of ALA is converted by the body into a fatty acid it can use, prompting some nutritionists to say the labelling on omega-3-enhanced margarines is misleading.

Fish oils are rich in two related omega-3s, docosahexaenoic acid (DHA), which is important for nerves and the brain, and eicosapentaenoic acid (EPA), which is vital for cardiovascular health.

Gene tricks

BASF has inserted five genes from algae that naturally make EPA and DHA into the canola genome. Its product is still in development.

Monsanto has taken a different approach. It inserted two genes into the soybean genome, one from a plant related to primrose and one from a fungus. The modified soybean produces stearidonic acid, or SDA. Like ALA, SDA is converted into EPA in the body, but in much higher proportions – about a third, Monsanto says.

"To get 1 gram of EPA, you'd have to eat about 3 to 4 grams of SDA, and about 14 to 20 grams of ALA," says David Stark of Monsanto. However, Stark acknowledges that hardly any of the SDA is converted into the DHA needed for brain health.

Good for fish

The modified plant oils could ease the pressure on fish stocks, currently the principal source of omega-3 fatty acids.

At present, there is no official recommended daily intake of omega-3s. According to GOED Omega-3, an umbrella group for manufacturers of omega-3-containing products, the optimal intake is only reached in fish-eating nations such as Japan and Iceland, with typical per-capita consumption in western nations a fifth of this level.

Monsanto claims that meeting GOED's recommended intake in western nations could require as little as 400,000 hectares of its soybean crops. Less than half a hectare, it says, would provide the same amount of EPA as 10,000 servings of salmon.

One worry is that farmers may clear tropical rainforests to grow the oil-producing plants. But Solae of St Louis, Missouri, which will be commercialising the GM soybean, says that the crops are more suited to the temperate climate of North America.

Jack Winkler, head of the Nutrition Policy Unit at London Metropolitan University, is enthusiastic about the prospect of plant-derived omega-3s. "There are not enough fish in the sea to provide people with the EPA and DHA that we need. [This] is a very positive way forward."

Daniel Pauly, a fisheries specialist at the University of British Columbia in Vancouver, Canada, also welcomes the move. "Our stressed marine ecosystem would benefit from an alternative to fish oil as a source of omega-3s," he says.

However, in Europe at least, the new sources of omega-3s may encounter public resistance. Helen Wallace of GeneWatch UK, a lobby group in Buxton, Derbyshire, says: "It will be interesting to see if people in the US believe the benefits exist." Europeans have traditionally been wary of genetically modified crops and Wallace says they are also suspicious of medical claims about food. All this makes the future uncertain for the products in Europe.

http://www.newscientist.com/article/dn18049-us-fda-says-omega3-oils-from-gm-soya-are-safe-to-eat.html

Industrial robot hones virtual autopsies

- 27 October 2009 by **Paul Marks**

Magazine issue 2731.

Getting under the skin, virtually (Image: University of Bern)

1 more image
Editorial: *Surgical robots at large in the path lab*

THE small industrial robot that dominates the room is in many ways much like any other. A robotic arm smoothly wields grippers and probes - always accurate and never tired. But rather than working on cars or computers, this robot is processing human corpses.

A team of forensic pathologists at the University of Bern in Switzerland reckon it could make autopsies more accurate and also less distressing for families.

The researchers are already pioneers of virtual autopsies, or "virtopsies", which use non-invasive imaging of a body inside and out rather than the radical post-mortem surgery typically used to determine cause of death.

Now they are using a robot, dubbed Virtobot, to carry out parts of that process, making it more reliable - and standardised.

Their virtopsies combine 3D imaging of a body's surface with a CT scan of its interior anatomy. The result is a faithful, high-resolution virtual double of the corpse (see diagram). This double can be used to accurately determine what killed someone. And it's a more tactful approach: only needle biopsies are used to sample tissues, leaving a body essentially undamaged.

This virtual body-double can be used to accurately determine what killed a person
"Currently, organs are taken out and sliced for analysis of tumours and lesions, but if something is overlooked you have no chance of seeing it again," says team member Lars Ebert. "All you have afterwards is a huge pile of organ slices."

By automating virtopsies, he now hopes to free the post-mortem from the influence of the unavoidable human failings of pathologists, which can affect conclusions about cause of death.

"Too much of an investigator's autopsy results depend on their ability to describe in a report what they see - and they may overlook things," says Ebert. "We want to make the whole procedure more objective and generate digitally stored data that can be re-examined 20 or 30 years later."

The current virtopsy procedure begins with a surface scan of the body. When a corpse is placed on the table in front of it, the robot places markers on the skin that help calibrate the surface scan and match it up with later internal scans. It then captures a 3D colour model of the body to a resolution of just 0.02 millimetres, using stereoscopic cameras and a projector that casts a mesh pattern onto the body (see picture, above).

This model can be twisted and turned on a computer screen, revealing injuries, tattoos and other identifying marks in detail. Being able to process those traces digitally is a boon. In one case, recording the pattern of a car fender stamped onto a person's skin helped reconstruct the accident that killed them. Furthermore, scanning without robot assistance is a cumbersome process in which someone must carefully position an unwieldy tripod at different points around the body. Virtobot, able to control its movements with great precision, simply glides over the body to build up the 3D picture.

After the surface scan, the table on which the body lies slides through a CT scanner, which takes high-resolution X-ray slices of the entire body, providing a way to see damage or disease in organs or bones. In the case of a car-crash victim, being able to see the patterns of breakage, and damage to bones, can also help work out exactly what happened.

Finally, after analysis of the 3D model and the internal and external scans, a needle biopsy can be used to gather samples from inside the body if further information is required. Wielding a fine needle, the system uses live CT-scan images to grab a biopsy sample from precisely where it is needed. That might be a sample of fluid from the lungs of a victim of drowning, or a piece of liver to look for signs of disease or toxins.

Such biopsies normally require someone to expose their hand to the scanner's X-rays. A robot has no such worries. And, like the robots used in surgery on the living, it is more than capable of using small tools with great precision.

Despite its impressive dexterity, Virtobot wasn't built with surgery in mind. Robots used for precision surgery on the living must let surgeons maintain absolute control at all times, for safety reasons. Once given a task, Virtobot can be left largely to its own devices.

"These people are already dead, so there is no way we can injure them further," says Ebert. "That means we can use a cheaper industrial robot, drawn from the automobile industry."

So far, Virtobot has aided virtopsies in 52 real cases, including 26 road deaths, 10 by impacts from a blunt object, six knifings, five shootings, and two throttlings (*The International Journal of Medical Robotics and Computer Assisted Surgery*, DOI: 10.1002/rcs.285).

In 19 cases, 3D surface scans were used to make virtual reconstructions of the attack or accident accurate enough to be admissible in the Swiss courts. However, the president of the UK's Royal College of Pathologists, Peter Furness, says that much longer term comparisons of virtopsies with conventional procedures are still needed. "The circumstances where this might be valuable are not well defined, the reliability of the approach is unclear and the cost can be considerable," he says, adding that studies to work out just when a conventional autopsy is essential are under way.

http://www.newscientist.com/article/mg20427316.400-industrial-robot-hones-virtual-autopsies.html

The truth about the disappearing honeybees

- 26 October 2009 by **Marcelo Aizen** and **Lawrence Harder**
- Magazine issue 2731.

Still pollinating (Image: Sipa Press/Rex Features)

A MOVIE called *Vanishing of the Bees* opened in cinemas across the UK earlier this month. It's a feature-length documentary about the "mysterious collapse" of the honeybee population across the planet - a phenomenon that has recently attracted a great deal of attention and hand-wringing.

The idea that bees are disappearing for reasons unknown has embedded itself in the public consciousness. It is also a great story that taps into the anxieties of our age. But is it true? We think not, at least not yet.

First, the basics. Pollination by bees and other animals - flies, butterflies, birds and bats - is necessary for the production of fruits and seeds in many wild and cultivated plants. More than 80 per cent of the planet's 250,000 species of flowering plants are pollinated by animals.

Agriculture is a large-scale beneficiary of these pollination services, so claims that pollinators are in decline have triggered alarm that our food supply could be in jeopardy, that we may be on the verge of a global "pollination crisis".Claims of such a crisis rest on three main tenets: that bees are responsible for the production of a large fraction of our food; that pollinators are declining worldwide; and that pollinator decline threatens agricultural yield. Numerous scientific papers, many media stories and even a European Parliament resolution in 2008 present each of these as an uncontested truth. But are they?

Our analysis of data from the Food and Agriculture Organization of the United Nations reveals a different perspective on the pollination crisis - one that is less catastrophic than that depicted in the movies (*Current Biology*, vol 18, p 1572, and vol 19, p 915). The first tenet - that bees are responsible for the production of a large fraction of our food - is simply untrue. Pollinators are important for many crops, but it is a myth that humanity would starve without bees.

Pollinators are important for many crops, but it is a myth that humanity would starve without bees About 70 per cent of the 115 most productive crops, including most fruits and oilseeds, are animal-pollinated. These account for nearly 2.5 billion tonnes of food a year, about a third of global agricultural production. However, few of these crops depend on animal pollination completely, owing largely to their capacity for self-pollination.

On top of that, production of many staple foods does not depend on pollinators at all: carbohydrate crops such as wheat, rice and corn are wind-pollinated or self-pollinated. If bees disappeared altogether, global agricultural production would decrease by only 4 to 6 per cent.

What of pollinator decline? Claims of global bee disappearance are based on collections of (often extreme) regional examples, which are not necessarily representative of global trends. These examples tend to come from parts of Europe and North America where little natural or semi-natural habitat remains.

Stocks of domesticated honeybees, the most important crop pollinator of all, have also decreased considerably in the US and some European countries in recent decades. However, these declines have been more than offset by strong increases in Asia, Latin America and Africa. Indeed, the number of managed honeybee hives worldwide has increased by about 45 per cent in the past five decades.

There have also been scare stories about "colony collapse disorder" and the spread of Varroa mites in the US and Europe. Again, these are real phenomena, but they are short-term blips rather than the driving forces of long-term trends. Instead, the long-term declines seem to be consistent with the economic dynamics of the honey industry, which seems to be shifting to developing countries in search of cheaper production.

Finally, does a low abundance of pollinators significantly affect agricultural productivity? It is true that a lack of pollinators, especially bees, can limit the yield of many crops and wild plants. It is also true that the yields of many pollinator-dependent crops have grown more slowly than that of most non-dependent crops. However, contrary to what we would expect if pollinators were in decline, the average yield of pollinator-dependent crops has increased steadily during recent decades, as have those of non-dependent crops, with no sign of slowing.

Overall, we must conclude that claims of a global crisis in agricultural pollination are untrue.

Pollination problems may be looming, though. Total global agricultural production has kept pace with the doubling of the human population during the past five decades, but the small proportion of this that depends on pollinators has quadrupled during the same period. This includes luxury foods such as raspberries, cherries, mangoes and cashew nuts. The increased production of these crops has been achieved, in part, by a 25 per cent increase in cultivated area in response to increased demand for them.

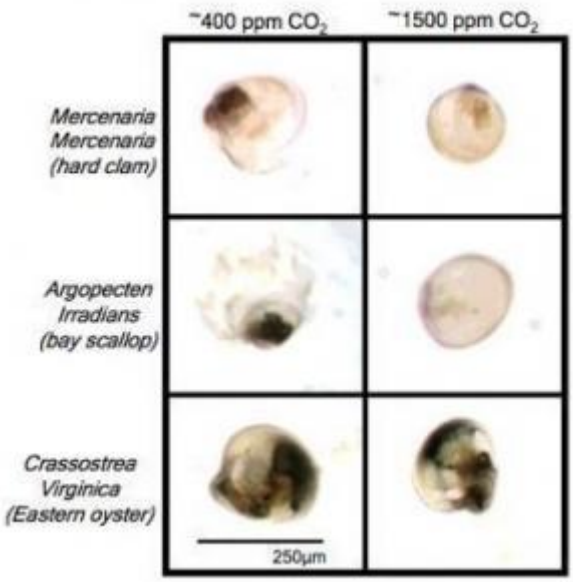
This expansion may be straining global pollination capacity, for two reasons. Demand for pollination services has grown faster than the stock of domestic honeybees, and the associated land clearance has destroyed much of the natural habitat of wild pollinators.The accelerating increase of pollinator-dependent crops therefore has the potential to trigger future problems both for these crops and wild plants. These problems may grow as decreasing yields of raspberries, cherries and the rest prompt higher prices, stimulating yet more expansion of cultivation. So although the current pollination crisis is largely mythical, we may soon have a real one on our hands.

Marcelo Aizen is a researcher at the National Scientific and Technical Research Council of Argentina

Lawrence Harder is a professor of pollination ecology at the University of Calgary in Alberta, Canada

http://www.newscientist.com/article/mg20427316.800-the-truth-about-the-disappearing-honeybees.html?full=true&print=true

Ocean Acidification May Contribute To Global Shellfish Decline



At the end of experiments (~20 days) larvae of the hard clam, bay scallop, and Eastern oyster that were raised in seawater with high carbon dioxide concentration (right column) were smaller and later to develop than larvae raised in seawater with carbon dioxide concentration matching current ocean levels (left column.) (Credit: Stephanie Talmage)

ScienceDaily (Oct. 28, 2009) — Relatively minor increases in ocean acidity brought about by high levels of carbon dioxide have significant detrimental effects on the growth, development, and survival of hard clams, bay scallops, and Eastern oysters, according to researchers at Stony Brook University's School of Marine and Atmospheric Sciences. In one of the first studies looking at the effect of ocean acidification on shellfish, Stephanie Talmage, PhD candidate, and Professor Chris Gobler showed that the larval stages of these shellfish species are extremely sensitive to enhanced levels of carbon dioxide in seawater.

Their work will be published in the November issue of the journal *Limnology and Oceanography*.

"In recent decades, we have seen our oceans threatened by overfishing, harmful algal blooms, and warming. Our findings suggest ocean acidification poses an equally serious risk to our ocean resources," said Gobler.

During the past century the oceans absorbed nearly half of atmospheric carbon dioxide derived from human activities such as burning fossil fuels. As the ocean absorbs carbon dioxide it becomes more acidic and has a lower concentration of carbonate, which shell-making organisms use to produce their calcium carbonate structures, such as the shells of shellfish.

In lab experiments, Talmage and Gobler examined the growth and survivorship of larvae from three species of commercially and ecologically valuable shellfish. They raised the larvae in containers bubbled with different levels of carbon dioxide in the range of concentrations that are projected to occur in the oceans during the 21st century and beyond.

Under carbon dioxide concentrations estimated to occur later this century, clam and scallop larvae showed a more than 50% decline in survival. These larvae were also smaller and took longer to develop into the juvenile stage. Oysters also grew more slowly at this level of carbon dioxide, but their survival was only diminished at carbon dioxide levels expected next century.

"The longer time spent in the larval stage is frightening on several levels," said Talmage. "Shellfish larvae are free swimming. The more time they spend in the water column, the greater their risk of being eaten by a predator. A small change in the timing of the larval development could have a large effect on the number of larvae that survive to the juvenile stage and could dramatically alter the composition of the entire population."

Although levels of carbon dioxide in marine environments will continue to rise during this century, organisms in some coastal zones are already exposed to high levels of carbon dioxide due to high levels of productivity and carbon input from sources on land.

"This could be an additional reason we see declines in local stocks of shellfish throughout history," said Talmage. "We've blamed shellfish declines on brown tide, overfishing, and local low-oxygen events. However it's likely that ocean acidification also contributes to shellfish declines."

Talmage and Gobler hope their work might help improve the success rate of shellfish restoration projects.

"On Long Island there are many aquaculturists who restock local waters by growing shellfish indoors at the youngest stages and then release them in local estuaries," said Talmage. "We might be able to advise them on ideal carbon dioxide conditions for growth while larvae are in their facilities, and offer suggestions on release times so that conditions in the local marine environment provide the young shellfish the best shot at survival."

Adapted from materials provided by Stony Brook University.

http://www.sciencedaily.com/releases/2009/10/091026162546.htm

What Happens When Wild Boars And Fallow Deer Snack On Genetically Modified Corn?

Wild boars. Deer stew, roast of wild boar, venison ragout -- come fall, all varieties of game are in season for gourmets. (Credit: iStockphoto)

ScienceDaily (Oct. 28, 2009) — The German Federal Agency for Nature Conservation funded a study to address two controversial questions: When wild boar and deer, traditional menu items in the fall, eat genetically modified corn, do transgenic residues accumulate in their meat? Do they spread GM corn via their feces? The answer in each case is no, according to scientists at TUM, the Technische Universitaet Muenchen. They recommend, however, that such studies be conducted separately for all GM plants.

Deer stew, roast of wild boar, venison ragout -- come fall, all varieties of game are in season for gourmets. However, ever since the worldwide surge in genetically modified corn, critical consumers' appetites have abated somewhat. After all, it was not clear precisely how wild animals digest transgenic corn and whether or not residues actually accumulate in meat, for example. Molecular biologists from the Technische Universitaet Muenchen (TUM) have shown that there is no need for concern -- also with regard to the inadvertent dispersal of genetically modified corn via wild animal feces.

Only a few weeks ago we could still observe them: whole families of wild boar rummaging in the corn fields in early fall, feasting on corncobs. Corn -- or maize, as it's known to scientists -- is a high-energy delicacy for local game, which is why it is used specifically for winter feeding and to divert animals from farmers' fields. Today, with GM (genetically modified) maize acreage increasing worldwide, biologists are discussing a highly controversial question: What happens when a wild boar takes a snack in a transgenic maize field or when deer feed on imported GM maize in winter? Molecular biologists at the TUM can now provide answers to these questions.

With funding from the German Federal Agency for Nature Conservation, a research team from the TU München examined in detail how fallow deer (dama dama) and wild boars (sus scrofa) metabolize GM maize and whether they inadvertently disperse germinable transgenic seeds in the landscape via their feces. To find answers to these questions, the scientists working for Prof. Heinrich H.D. Meyer from the Chair of Physiology selectively fed fallow deer living in outdoor enclosures and wild boars kept in pens genetically modified corn chaff and grain corn for several weeks in a row. The respective control groups were fed conventional maize over the same time period. All the while the scientists collected samples of feces from every group to be analyzed for germinability at a later point in time.

After completing the experiment, the TUM physiologists took a number of samples from all of the wild animals: from the digestive tract, all internal organs, blood, muscles and other kinds of tissue. They then

applied immunological techniques and polymerase chain reaction to look for transgenic components. They found them only in the digestive tract of GM-fed wild boars: Here they found evidence for small fragments of the gene that had been introduced into the GM maize. However, outside of the gastrointestinal tract the scientists found no trace whatsoever, neither in the tissue of wild boars nor in that of the fallow deer. Hence, there is no need to worry when enjoying a game dish: "The meat of the animals we examined was entirely free of transgenic components," said Prof. Meyer.

Organic farmers and environmentalists are much more concerned about the uncontrolled spread of GM maize via wild animal feces. Yet here, too, Prof. Meyer can ease everyone's worries. His team examined the collected samples of feces for intact maize corns capable of germination. A truly insignificant number makes it through the gastrointestinal passage at all: For wild boars a mere 0.015% of the conventional and 0.009% of the transgenic maize kernels were excreted intact. Only one single maize plantlet could then be grown under standard laboratory conditions, and one further seedling showed abnormal growth. The fallow deer were even tougher on the maize: Not a single intact and thus germinable maize corn could be found in their feces.

However, the digestion process is not as effective for all seeds and all animal species, as the scientists were also able to show. They had additionally fed all examined animal groups with conventional rape. They found not a single intact rape seed in the wild boar feces -- but in those of the fallow deer there were plenty, and 13.6% of those were capable of germination. "This shows that such studies need to be conducted separately for all genetically modified plants," Prof. Meyer concluded.

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Adapted from materials provided by Technische Universitaet Muenchen.

http://www.sciencedaily.com/releases/2009/10/091026162542.htm

Experimental Harmful Algal Bloom Forecast Bulletin For Lake Erie

Harmful algae on the shore of Catawaba Island, Ohio. (Credit: Image courtesy of NOAA)

ScienceDaily (Oct. 28, 2009) — Predicting harmful algal blooms, or HABs, in the Great Lakes is now a reality as NOAA announces an experimental HAB forecast system in Lake Erie. HABs produce toxins that may pose a significant risk to human and animal health through water recreation and may form scum that are unsightly and odorous to beach visitors, impacting the coastal economy. Forecasts depicting current and future locations of blooms, as well as intensity, will alert scientists and managers to possible threats to the Great Lakes beaches and assist in mitigation efforts.

When a harmful bloom in Lake Erie is detected by the experimental system, scientists issue a forecast bulletin to nearby scientists and community managers. The bulletin depicts the HABs' current location and future movement, as well as categorizes its intensity on a weekly basis.

"With this new forecast, we now have an idea of when and where blooms are predicted to occur and can share products with on-the-ground local managers to reduce the human health threats associated with algal toxins," said Sonia Joseph, Michigan Sea Grant outreach coordinator for the NOAA Center of Excellence for Great Lakes and Human Health.

"Having a forecast bulletin for Lake Erie will allow us to study the impacts of excess nutrients on beaches and coastal waters, including impacts of harmful algal blooms," said Jill Lis, environmental health services supervisor for Cuyahoga County, Ohio's Board of Health.

HABs, such as the blue green algae Microcystis, occur in the waters of almost every coastal state and cost in excess of $82 million annually, including public health, fisheries, and tourism losses. Microcystis blooms are increasing in frequency and duration in the Great Lakes, in part due to the invasive zebra mussel that filters Great Lakes water and removes other algae competitors. These blooms can produce a toxin that can cause skin rashes, liver damage, fish kills, and taste and odor issues in drinking water.

The experimental forecast incorporates data from various ocean-observing systems, including commercial and government satellite imagery obtained by NOAA's National Ocean Service, coastal forecast modeling and field data by NOAA Great Lakes Environmental Research Laboratory scientists, and

reports received from resource managers in the field. The information is then synthesized and interpreted to determine the current and future location and intensity of Microcystis blooms.

“The HAB forecasts for Lake Erie are applying the latest science and technology,” said Rick Stumpf, NOAA oceanographer. “Feedback from the Ohio environmental managers and drinking water utilities will allow us to better forecast these blooms, develop useful tools for our end users, and begin to monitor and forecast blooms in other parts of the country.”

The experimental forecast created for Lake Erie and the state of Ohio was based on the detection system that NOAA’s National Ocean Service designed for Florida's Gulf Coast in 2004. This system will serve as a model for other areas of the U.S. impacted by HABs. The system was jointly funded by NOAA’s Oceans and Human Health Initiative and the

Centers for Disease Control and Prevention’s National Center for Environmental Health

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Adapted from materials provided by NOAA.

http://www.sciencedaily.com/releases/2009/09/090917161736.htm

Effort Launched To Find And Control Diseases That Move Between Wildlife And People

Congolese researcher Andre Bauma (with orphaned mountain gorilla Ndakasi) is helping UC Davis look for emerging pathogens in wildlife. (Credit: Mountain Gorilla Veterinary Project/UC Davis photo)

ScienceDaily (Oct. 28, 2009) — In hopes of preventing the next global pandemic and a possible death toll into the millions, UC Davis today launches an unprecedented international effort to find and control diseases that move between wildlife and people.

The global early warning system, named PREDICT, will be developed with funding of up to $75 million over five years and is one of five new initiatives of the U.S. Agency for International Development (USAID) known in combination as the Emerging Pandemic Threats Program. Building on its long-standing programs in disease surveillance and response, USAID is developing these initiatives to help prepare the world for infectious diseases like H1N1 flu, avian flu, SARS and Ebola.

UC Davis' primary PREDICT partners, which have formed a global consortium to implement PREDICT around the world, are: Wildlife Conservation Society, Wildlife Trust, Global Viral Forecasting Inc., and the Smithsonian Institution.

"Predicting where new diseases may emerge from wild animals, and detecting viruses and other pathogens before they spread among people, give us the best chance to prevent new pandemics," said Jonna Mazet, the UC Davis scientist leading PREDICT. Mazet directs the UC Davis Wildlife Health Center within the new One Health Institute at the School of Veterinary Medicine.

The concept of 'One Health' -- that human, animal and environmental health are inextricably linked and should be considered holistically -- is a core principle of the PREDICT team.

"To establish and maintain global pathogen surveillance, we will work directly with local governments and conservation organizations to build or expand programs in wildlife and human health. Together we want to stop the next HIV," Mazet said. "This collaborative approach is key to PREDICT's success."

The PREDICT team will be active in global hotspots where important wildlife host species have significant interaction with domestic animals and high-density human populations. They may include South America's Amazon Basin, Africa's Congo Basin and neighboring Rift Valley, South Asia's

Gangetic Plain, and Southeast Asia. As activities in targeted regions come on-line, the team will focus on detecting disease-causing organisms in wildlife before they spill over into people.

"While no one can predict with certainty where the next pandemic disease will emerge, being ready for early detection and rapid response will minimize its potential impact on our social and economic well-being," said Murray Trostle, deputy director of the Avian and Pandemic Influenza Preparedness and Response Unit of USAID.

UC Davis will bring on emerging-disease authority Stephen S. Morse of Columbia University's Mailman School of Public Health as director of PREDICT. Morse said that, historically, pandemics -- epidemics that spread around the world -- occurred perhaps every 30 to 40 years. "But in our modern world, the chances of novel diseases or even a new pandemic emerging are higher than ever, because of how we live and the extent to which we travel, Morse said. "Our human settlements and roadways push deeper into forests and wild areas where we now raise livestock and poultry; and we transport ourselves, our animals and our food farther and faster around the globe."

Those conditions enable the spread of microbes, especially viruses and bacteria, from animals to humans. Among the 1,461 pathogens recognized to cause diseases in humans, at least 60 percent are of animal origin.

Notable outbreaks of these animal-to-human diseases, or zoonoses (pronounced ZO-oh-NO-sees), include:

- The 1918 influenza pandemic, which was probably caused by a virus that jumped from birds, killed over 50 million people globally;
- The human immunodeficiency virus (HIV), which moved from chimpanzees to people, now infects more than 33 million individuals;
- Severe acute respiratory syndrome (SARS), which emerged in 2003 from southern China "wet markets" where wild animals are sold for food; and
- The recent outbreaks of avian influenza H5N1, or "bird flu."

In a global pandemic today, a quarter of the world's population could be infected and between 51 million and 81 million people could die, with the toll in the United States exceeding 400,000 deaths. World economic losses are estimated to exceed $4 trillion.

Adapted from materials provided by University of California - Davis.

http://www.sciencedaily.com/releases/2009/10/091026180207.htm

Arctic Lake Sediments Show Warming, Unique Ecological Changes In Recent Decades

The adjacent foothills hold lakes that were not scoured by glaciers during late Quaternary glaciations, and thus preserve exceptionally long sedimentary records of climate change. (Credit: Jason Briner, Courtesy Queen's University)

ScienceDaily (Oct. 27, 2009) — An analysis of sediment cores indicates that biological and chemical changes occurring at a remote Arctic lake are unprecedented over the past 200,000 years and likely are the result of human-caused climate change, according to a new study led by the University of Colorado at Boulder.

While environmental changes at the lake over the past millennia have been shown to be tightly linked with natural causes of climate change -- like periodic, well-understood wobbles in Earth's orbit -- changes seen in the sediment cores since about 1950 indicate expected climate cooling is being overridden by human activity like greenhouse gas emissions. The research team reconstructed past climate and environmental changes at the lake on Baffin Island using indicators that included algae, fossil insects and geochemistry preserved in sediment cores that extend back 200,000 years.

"The past few decades have been unique in the past 200,000 years in terms of the changes we see in the biology and chemistry recorded in the cores," said lead study author Yarrow Axford of CU-Boulder's Institute of Arctic and Alpine Research. "We see clear evidence for warming in one of the most remote places on Earth at a time when the Arctic should be cooling because of natural processes."

The study was published Oct. 19 in the *Proceedings of the National Academy of Sciences*. The study included researchers from CU-Boulder, the State University of New York's University at Buffalo, the University of Alberta, the University of Massachusetts and Queen's University in Kingston, Ontario.

The sediment cores were extracted from the bottom of a roughly 100-acre, 30-foot-deep lake near the village of Clyde River on the east coast of Baffin Island, which is several hundred miles west of Greenland. The lake sediment cores go back in time 80,000 years beyond the oldest reliable ice cores from Greenland and capture the environmental conditions of two previous ice ages and three interglacial periods.

The sediment cores showed that several types of mosquito-like midges that flourish in very cold climates have been abundant at the lake for the past several thousand years. But the cold-adapted midge species abruptly began declining in about 1950, matching their lowest abundances of the last 200,000 years. Two of the midge species adapted to the coldest temperatures have completely disappeared from the lake region, said Axford.

In addition, a species of diatom, a lake algae that was relatively rare at the site before the 20th century, has undergone unprecedented increases in recent decades, possibly in response to declining ice cover on the Baffin Island lake.

"Our results show that the human footprint is overpowering long-standing natural processes even in remote Arctic regions," said co-author John Smol of Queen's University. "This historical record shows that we are dramatically affecting the ecosystems on which we depend."

"The 20th century is the only period during the past 200 millennia in which aquatic indicators reflect increased warming, despite the declining effect of slow changes in the tilt of the Earth's axis which, under natural conditions, would lead to climatic cooling," notes the University of Colorado's Dr. Axford.

The ancient lake sediment cores are the oldest ever recovered from glaciated parts of Canada or Greenland. Massive ice sheets during ice ages generally scour the underlying bedrock and remove previous sediments.

"What is unique about these sediment cores is that even though glaciers covered this lake, for various reasons they did not erode it," said study co-author Jason Briner of the University at Buffalo. The result is that we have a really long sequence of sediment that has survived Arctic glaciations."

The study was funded by the National Science Foundation, the Natural Sciences and Engineering Research Council of Canada and the Geological Society of America.

A study published in the journal *Science* last month that involved CU-Boulder researchers and reconstructed past temperatures in the Arctic using ice cores, tree rings and lake sediments concluded that recent warming around the Arctic is overriding a cooling trend caused by Earth's periodic wobble. Earth is now about 0.6 million miles further from the sun during the Northern Hemisphere summer solstice than it was in 1 B.C. -- a trend that has caused overall cooling in the Arctic until recently.

INSTAAR researcher and CU-Boulder geological sciences Professor Gifford Miller was a co-author on both the *PNAS* study and the recent *Science* study.

Adapted from materials provided by University of Colorado at Boulder.

http://www.sciencedaily.com/releases/2009/10/091019162929.htm

Thyroid Surgery Safe For Older Patients, Study Finds

Dr. Melanie W. Seybt, endocrine-head and neck surgeon at the Medical College of Georgia, with patient. (Credit: Medical College of Georgia)

ScienceDaily (Oct. 27, 2009) — Thyroid surgery is safe for older patients, say physicians who found only slight differences in rates of complications and hospital readmissions in a multi-year study.

"We were pleasantly surprised," says Dr. Melanie W. Seybt, endocrine-head and neck surgeon at the Medical College of Georgia and first author of the study, published in the journal *Archives of Otolaryngology -- Head and Neck Surgery*. "We suspected older patients might be admitted to the hospital more often, have more complications and more cancer."

But their study of 428 thyroidectomy patients at MCGHealth Medical Center and the Charlie Norwood Veterans Affairs Medical Center between November 2003 and December 2007, including 44 patients over age 65 and 86 between ages 21-35, showed few differences in the two groups.

Surgeons found:

- They could do outpatient surgery in both groups at essentially the same rate, 45.5 percent in the elderly and 51.2 percent in younger patients
- Similar complication rates, with 12.5 percent of older patients having transient problems with low calcium versus 11.1 percent of younger patients.
- The thyroid growth was suspected to be malignant in 4.5 percent of elderly patients and 2.3 percent of younger patients. Final pathology revealed cancer in 27.3 percent of elderly patients and 18.6 percent of older patients.
- Elderly patients had a slightly higher hospital readmission rate -- 4.5 percent versus 1.2 percent -- but readmissions were related to the transient problems with calcium levels not age-related complications.
- Neither group had post-operative bleeding or permanent vocal cord paralysis.

She hopes the findings will decrease concerns among patients and practitioners about the safety of thyroidectomies in the growing elderly population, noting that thorough preoperative screening, important at any age, likely helped minimize adverse reactions in their older patients.

Although thyroid disease tends to be most common in young women, the number of older patients diagnosed with the problem is escalating, Dr. Seybt says, noting that the oldest patient in this study group

was 84. With a geriatric population that has increased by 90 percent in the last 30 years, according to the U.S. Census Bureau, the numbers are likely to continue upward.

"A lot of our older patients have other problems, such as heart failure, hypertension and restrictive lung disease, so we are very aggressive about getting medical clearance and optimizing control of their other problems," Dr. Seybt says.

She notes that head and neck surgeries generally have less complications and quicker recoveries than procedures in other parts of the body, such as the abdomen or chest. Low calcium levels are a common complication of thyroid surgery because the adjacent parathyroid glands are typically a little stunned by removal of the thyroid gland, she says. To help avoid problems, patients are routinely placed on a three-week tapering dose of calcium but sometimes still have transient problems, most commonly numbness or tingling around the lips and cramping of the hands and feet. Because of the close proximity to the vocal cords, patients also can have transient or permanent hoarseness.

While its exact cause is unknown, thyroid disease tends to run in families and radiation exposure is believed to be a risk factor for thyroid cancer. The increased availability of quality, non-invasive screening such as ultrasound likely means more cases are being identified at every age, Dr. Seybt says.

Laptop-sized ultrasounds are showing up in many physician offices and thyroid nodules also show up when patients have more sophisticated studies of the head and neck, such as an MRI scan, for other reasons. Patients or their doctors often just feel nodules in the neck although they can be oddly asymptomatic until they grow large enough to impact swallowing and/or breathing. While some of these larger growths are very obvious, those that grow downward into the chest or toward the back can be harder to detect. In older patients, many of the growths likely have been there a while, Dr. Seybt says.

Depending on the size of the growth in patients, surgeons at MCG and the VA will use one of three different approaches. These include a standard, several-inch incision at the base of the neck for the largest growth as well as include minimally invasive thyroidectomy, in which surgeons work through an incision about half the size of the norm, and an endoscopic approach, in which video monitoring and a thin, ultrasonic scalpel reduce incision size another half.

Dr. David Terris, chair of the Department of Otolaryngology-Head and Neck Surgery in the MCG School of Medicine and a pioneer of the minimally invasive approaches, showed in the March 2006 issue of *Laryngoscope* that the newer, minimally invasive approaches, which reduce the incision size and recovery time, could be used safely in most patients. Dr. Terris is corresponding author on the current study.

Dr. Terris and Sunny Khichi, a senior medical student at MCG, are study co-authors.

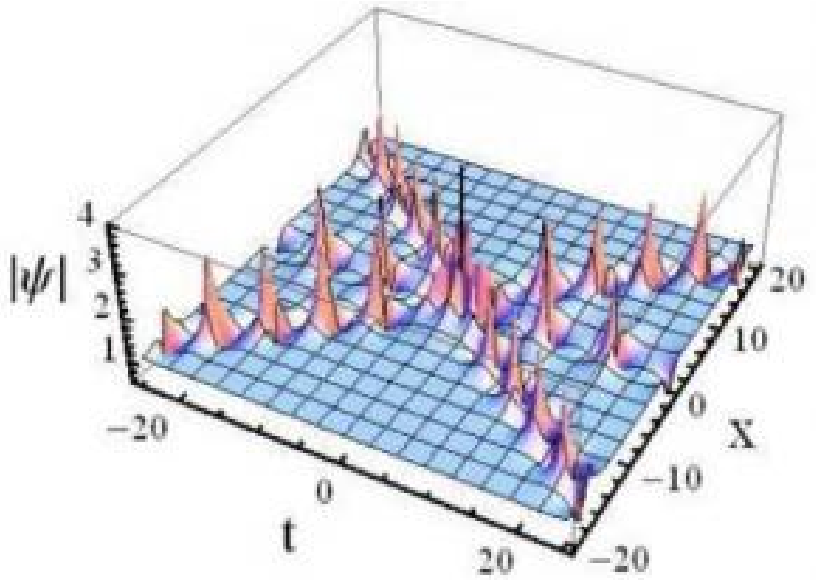
Journal reference:

1. Melanie W. Seybt; Sunny Khichi; David J. Terris. **Geriatric Thyroidectomy: Safety of Thyroid Surgery in an Aging Population**. *Archives of Otolaryngology - Head and Neck Surgery*, 2009; 135 (10): 1041 DOI: 10.1001/archoto.2009.138

Adapted from materials provided by Medical College of Georgia, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/10/091019172626.htm

Physicists Are Discovering Ways To Build Rogue Waves Out Of Light



Under the right conditions, colliding waves can add to create a rogue wave that's larger than the sum of its parts. (Credit: N. Akhmediev, J. M. Soto-Crespo and A. Ankiewicz)

ScienceDaily (Oct. 27, 2009) — Rogue waves—giant waves that spring up suddenly and tower over the seas around them—have inspired physicists to look for an analogue in light. These high-intensity pulses can cross large distances without losing information. Now a team of physicists have identified one set of conditions that produces optical rogue waves. Their findings are reported in *Physical Review A* and highlighted with in the October 19 issue of *Physics*.

Rogue waves were thought to be a sailor's tall tale until an 85-foot wave broke over an oil platform in the North Sea in 1995. Since then, scientists have tried to understand how such outsized waves arise from the erratic interactions of smaller waves on a choppy sea, with an eye toward creating them on purpose in the form of light traveling in an optical fiber.

While versions of quantum mechanical equations describe how optical rogue waves evolve, it's still difficult to pinpoint the conditions necessary to get them started. Now Nail Akhmediev of the Australian National University and his team have identified one possibility using theory—breathers, or small peaks that appear suddenly in one spot and disappear almost immediately, could seed rogue waves. Akhmediev's team found that two or three breathers, if they collide in exactly the right place at the right time, form an optical rogue wave. The researchers say the effect could be seen in water waves in a long, narrow tank. Their findings increase scientists' understanding of how to cook up optical rogue waves for communications applications.

Adapted from materials provided by American Physical Society, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/10/091019122958.htm

Smoking Gun: Just One Cigarette Has Harmful Effect On Arteries Of Young Healthy Adults

New research shows that even one cigarette has serious adverse effects on young adults. (Credit: iStockphoto/Kutay Tanir)

ScienceDaily (Oct. 27, 2009) — Even one cigarette has serious adverse effects on young adults, according to research presented by Dr. Stella Daskalopoulou at the Canadian Cardiovascular Congress 2009, co-hosted by the Heart and Stroke Foundation and the Canadian Cardiovascular Society.

Her study found that smoking one cigarette increases the stiffness of the arteries in 18 to 30 year olds by a whopping 25 per cent.

Arteries that are stiff or rigid increase resistance in the blood vessels, making the heart work harder. The stiffer the artery, the greater the risk for heart disease or stroke.

"Young adults aged 20-24 years have the highest smoking rate of all age groups in Canada," says Dr. Daskalopoulou, an internal medicine and vascular medicine specialist at McGill University Health Centre. "Our results are significant because they suggest that smoking just a few cigarettes a day impacts the health of the arteries. This was revealed very clearly when these young people were placed under physical stress, such as exercise."

The study compared the arterial stiffness of young smokers (five to six cigarettes a day) to non-smokers. The median age was 21 years. Arterial measurements were taken in the radial artery (in the wrist), the carotid artery (in the neck), and in the femoral artery (in the groin), at rest and after exercise.

Arterial stiffness in both smokers and non-smokers was measured using a new but well established method called applanation tonometry. Dr. Daskalopoulou introduced the 'arterial stress test' which measures the arteries' response to the stress of exercise. The test is comparable to a cardiac stress test, which measures the heart's response to the stress of exercise.

"In effect we were measuring the elasticity of arteries under challenge from tobacco," explains Dr. Daskalopoulou.

An initial arterial stress test was carried out to establish a baseline measurement for both the non-smokers and the smokers, who were asked not to smoke for 12 hours prior to the test. After the first meeting, smokers returned and smoked one cigarette each and then repeated the stress test. During the final meeting, smokers were asked to chew a piece of nicotine gum prior to the stress test.

Dr. Daskalopoulou found that after exercise the arterial stiffness levels in non-smokers dropped by 3.6 per cent. Smokers, however, showed the reverse: after exercise their arterial stiffness increased by 2.2 per cent. After nicotine gum, it increased by 12.6 per cent. After one cigarette, it increased by 24.5 per cent.

Interestingly, there was no difference in the arterial stiffness measurements between smokers and non-smokers at rest.

"In effect, this means that even light smoking in otherwise young healthy people can damage the arteries, compromising the ability of their bodies to cope with physical stress, such as climbing a set of stairs or running to catch a bus," says Dr. Daskalopoulou. "It seems that this compromise to respond to physical stress occurs first, before the damage of the arteries becomes evident at rest."

"More than 47,000 Canadians will die prematurely each year due to tobacco use, which often starts in the teen years," warns Heart and Stroke Foundation spokesperson Dr. Beth Abramson. "We know that over 90 per cent of teenagers who smoke as few as three to four cigarettes a day may be trapped into a lifelong habit of regular smoking, which typically lasts 35 to 40 years."

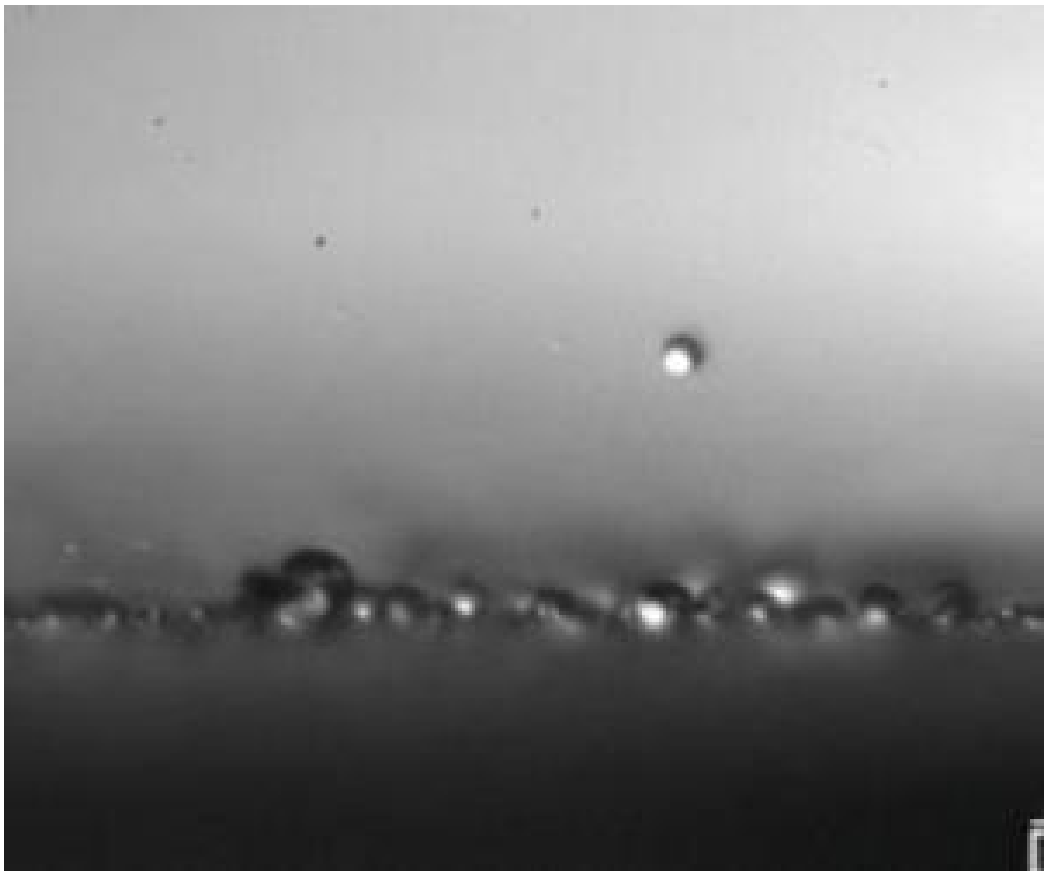
Smoking contributes to the build up of plaque in the arteries, increases the risk of blood clots, reduces the oxygen in the blood, increases blood pressure, and makes the heart work harder. Smoking also nearly doubles the risk of ischemic stroke.

Dr. Abramson says this study reinforces the importance of education, prevention programs, and legislation such as the recently passed Bill C-32, Cracking Down on Tobacco Marketing Aimed at Youth Act.

Adapted from materials provided by Heart and Stroke Foundation of Canada, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/10/091027085300.htm

Mushrooms, Water-repellents More Similar Than You Might Think



Jumping water droplet. What do spore-launching mushrooms have in common with highly water-repellent surfaces? According to Duke University engineers, the answer is "jumping" water droplets. (Credit: Image courtesy of Duke University)

ScienceDaily (Oct. 27, 2009) — What do spore-launching mushrooms have in common with highly water-repellent surfaces?

According to Duke University engineers, the answer is "jumping" water droplets. As it turns out, the same phenomenon that occurs when it's time for certain mushrooms to eject spores also occurs when dew droplets skitter across a surface that is highly water repellent, or superhydrophobic.

Using a specially designed high-speed camera and microscope set-up, the engineers for the first time captured the actions of tiny water droplets on a man-made superhydrophobic surface, and to their surprise found that the droplets literally jumped straight up and off the surface.

Simply put, when two tiny water droplets -- whether on a mushroom's spore or on a water-repellent surface -- meet to form a larger drop, enough energy is released in the formation of the new droplet to cause it to "jump" off the surface.

"This spontaneous jumping is powered by the surface energy released when droplets coalesce," said Jonathan Boreyko, a third-year graduate student at Duke's Pratt School of Engineering, who works in the laboratory of Assistant Professor Chuan-Hua Chen. "Because this process involves very tiny droplets at high speeds, no one had captured this phenomenon before."

The results of the team's experiments were published early online in the journal *Physics Review Letters*.

"A similar phenomenon occurs with the ejection of spores, known as ballistospores, from certain kinds of mushrooms," Boreyko said. "When a drop of water condensate at the base of the spore comes into contact with the wetted spore, it triggers the propulsion of the spore into the air."

Chen and Boreyko's research is the first known engineering reproduction of the ballistospore ejection process.

The work also has immediate applications in energy harvesting and thermal management, Chen said. For example, the spontaneous jumping motion offers an internal mechanism, independent of gravity, to remove condensate from the condensers in power plants.

The superhydrophobic surface used by the researchers is characterized by rows and rows of tiny bumps, covered with even tinier hairs projecting upward. When a water droplet lands on this type of surface, it only touches the ends of the tiny hairs. This creates pockets of air underneath the droplet that keeps it from touching the surface. This cushion of air keeping the droplet aloft is much like a puck in an air-hockey game. The same principle allows water striders to skim along the surface of ponds without falling into the water, Chen said.

"When two of these condensate drops coalesce into one, they jump at very high speeds," Boreyko said. "They move as fast as one meter per second. By taking a side view of the phenomenon, we can plainly see the droplets jump. You wouldn't see it looking down on the surface."

Interestingly, the researchers found that the mechanism used to eject ballistospores is almost identical. The critical size of the droplet on the spore for the jumping to occur is the same as that on the man-made superhydrophobic surface, and spores "jump" off the mushroom at about the same speed.

Chen said knowing how superhydrophobic surfaces are able to repel condensate drops could lead to improvements in many types of systems where heat needs to be removed through condensation.

"Smaller water droplets are much more efficient at transferring heat," Chen explained. "With the jumping mechanism, the average droplet size is about one hundred times smaller.

"In conventional cooling systems, as in big industrial plants, condensate must be removed using external forces for continuous operation," Chen said. "One of the main benefits of this superhydrophobic surface is that it needs no external energy -- the coalescing of the droplets provides all the energy needed to remove the condensate."

Chen's research is supported by the National Science Foundation. Jonathan Boreyko is supported by the Pratt-Gardner Fellowship.

Adapted from materials provided by Duke University.

http://www.sciencedaily.com/releases/2009/10/091026103844.htm

First Ever Method To Genetically Identify All Eight Tuna Species

Tunas are among the most economically valuable and yet the most endangered commercially exploited fish in the world. Identification of these species in traded forms, which are typically dressed, gilled and gutted, or loin and belly meat, and either fresh or frozen, is a highly complex process -- which may hamper conservation efforts on trade controls. (Credit: iStockphoto)

ScienceDaily (Oct. 27, 2009) — A new paper published October 27 in *PLoS One* unveils for the first time a method to accurately distinguish between all eight tuna species from any kind of processed tissue using genetic sequencing.

Tunas are among the most economically valuable and yet the most endangered commercially exploited fish in the world.

Identification of these species in traded forms, which are typically dressed, gilled and gutted, or loin and belly meat, and either fresh or frozen, is a highly complex process -- which may hamper conservation efforts on trade controls.

The paper, co-authored by Dr Jordi Viñas, a fish genetics specialist at Girona University in Spain and Dr Sergi Tudela, Head of Fisheries of WWF Mediterranean, proposes for the first time ever a genetic method for the precise identification of all eight recognized species of tuna.

The analysis of the DNA sequence variability of two unlinked genetic markers, one a hypervariable segment of the mitochondrial genome and the other a nuclear gene, enables full discrimination between all eight tuna species.

"This methodology will allow the identification of tuna species of any kind of tissue or type or presentation -- including sushi and sashimi," said Dr Jordi Viñas of Girona University. "The differentiation between different tunas, even those with highly similar genes, is now possible."

"Our findings are particularly relevant for the highly overfished, overtraded -- and hence endangered Atlantic bluefin tuna, for which there is a growing campaign to impose a temporary ban on international trade," added co-author Dr Sergi Tudela of WWF. "There will now be no trace of doubt when seeking to identify chilled or frozen tuna flesh at port or point of sale."

Funding: This work was done thanks to funding from OAK Foundation and Prince Albert II of Monaco Foundation. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Journal reference:

1. Viñas et al. **A Validated Methodology for Genetic Identification of Tuna Species (Genus Thunnus)**. *PLoS ONE*, 2009; 4 (10): e7606 DOI: 10.1371/journal.pone.0007606

Adapted from materials provided by Public Library of Science, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/10/091026220014.htm

Wolves Lose Their Predatory Edge In Mid-life, Study Shows

Wolf (Canis Lupus) near Yellowstone National Park. (Credit: iStockphoto/Jim Kruger)

ScienceDaily (Oct. 27, 2009) — Although most wolves in Yellowstone National Park live to be nearly six years old, their ability to kill prey peaks when they are two to three, according to a study led by Dan MacNulty and recently published online by *Ecology Letters*.

The study will appear in the journal's December print issue.

The finding challenges a long-held belief that wolves are successful predators for their entire adult lives. It now appears that like human athletes, they are only at the top of their game for about 25 percent of that time. It also shows that physiology can limit predation.

"Wolves are not perfect predators," says MacNulty, a postdoctoral researcher in the College of Biological Sciences' Department of Ecology, Evolution and Behavior. "They lack physical characteristics to kill prey swiftly, so they rely on athletic ability and endurance, which diminishes with age. They're like 100-meter sprinters. They need to be in top condition to perform."

By comparison, mountain lions, with their short snouts, powerful muscles and retractable claws, are designed to kill, MacNulty says. Not surprisingly, they live and hunt alone.

In Yellowstone, wolves, who hunt in packs, depend on elk for survival. The finding is timely because the park's elk population is shrinking and wolves are being blamed. Wolves were hunted out of the area in the 1930s and re-introduced in 1995. But the study shows there isn't a strong correlation between the number of wolves in the park and the number of elk killed.

MacNulty says that number fluctuates based on the age structure of the wolf population at any given time. The higher the proportion of wolves over age three, the lower the rate at which they kill elk. For every 10 percent rise in the proportion of wolves older than three, the kill rate declined 10 to 15 percent. He notes that the drop in the elk population is also attributable to drought and to Grizzly Bears.

"Wolves are not the sole factor limiting Yellowstone's elk population," MacNulty says.

When older wolves can no longer hunt successfully, younger wolves share their kill with them, in what MacNulty describes as a lupine version of Social Security. While a high ratio of old-to-young wolves may benefit elk, it could strain the wolf population because there aren't enough workers to support retirees.

Montana legalized hunting wolves after they were removed from the endangered species list in 2007. Although hunting is prohibited in the park, packs wander beyond it boundaries and radio-marked wolves have been killed. MacNulty says hunting won't put the species at risk, but it actually skews the population towards younger wolves, which could mean more deaths, not fewer, for the elk.

MacNulty became a field biologist at Yellowstone after graduating from the University of Colorado in 1995, the year wolves were reintroduced, and focused his doctoral studies on their predatory behavior. He has continued tracking Yellowstone's wolves as a University of Minnesota postdoctoral researcher for Craig Packer, the world's foremost authority on lions.

MacNulty's next step is to create mathematical models to study the long-term effects of fluctuations in the age structure of Yellowstone's wolf population on the elk population. His collaborators include Douglas Smith (Yellowstone Center for Resources); John Vucetich, Michigan Technological University) David Mech (US Geological Survey); Daniel Stahler (Yellowstone Center for Resources) and Craig Packer (University of Minnesota).

Adapted from materials provided by University of Minnesota.

http://www.sciencedaily.com/releases/2009/10/091026125539.htm

Alcohol Activates Cellular Changes That Make Tumor Cells Spread

Researchers have identified a cellular pathway that may explain the link between alcohol consumption and cancer. (Credit: iStockphoto)

ScienceDaily (Oct. 27, 2009) — Alcohol consumption has long been linked to cancer and its spread, but the underlying mechanism has never been clear. Now, researchers at Rush University Medical Center have identified a cellular pathway that may explain the link.

In a study published in a recent issue of *Alcoholism: Clinical and Experimental Research,* the researchers found that alcohol stimulates what is called the epithelial-to-mesenchymal transition, in which run-of-the-mill cancer cells morph into a more aggressive form and begin to spread throughout the body.

"Our data are the first to show that alcohol turns on certain signals inside a cell that are involved in this critical transition," said Christopher Forsyth, PhD, assistant professor of medicine and biochemistry at Rush University Medical Center and lead author of the study.

The epithelial-to-mesenchymal transition is a hot area of research right now, implicated in the process whereby cancer cells become metastatic. A large body of laboratory and clinical research suggests that it plays a key role in making cancer cells aggressive.

"Cancer cells become dangerous when they metastasize," Forsyth said. "Surgery can remove a tumor, but aggressive tumor cells invade tissues throughout the body and take over. If we can thwart this transition, we can limit cancer's toll."

The researchers treated colon and breast cancer cell lines with alcohol and then looked for the biochemical hallmarks of the epithelial-to-mesenchymal transition, including evidence of a transcription factor called Snail and of the receptor for epidermal growth factor. Snail controls the epithelial-to-mesenchymal transition; when overexpressed in mice, it induces the formation of multiple tumors.

Epidermal growth factor is required by many cancer cells. "They need lots of it," Forsyth said. "They are addicted to it."

Laboratory tests showed that alcohol activated both these and other biochemicals characteristic of the epithelial-to-mesenchymal transition. Tests also demonstrated that the alcohol-treated cells had lost their tight junctions with adjacent cells, a preparation for migrating, as metastatic cells do.

In addition, Forsyth and his colleagues found that the same roster of biomarkers was activated in normal intestinal cells treated with alcohol, suggesting that alcohol not only worsens the profile of existing cancer cells but also may initiate cancer by stimulating the epithelial-to-mesenchymal transition.

Journal reference:

1. Forsyth et al. **Alcohol Stimulates Activation of Snail, Epidermal Growth Factor Receptor Signaling, and Biomarkers of Epithelial-Mesenchymal Transition in Colon and Breast Cancer Cells**. *Alcoholism Clinical and Experimental Research*, 2009; DOI: 10.1111/j.1530-0277.2009.01061.x

Adapted from materials provided by Rush University Medical Center, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/10/091026172052.htm

Moderate Amounts Of Protein Per Meal Found Best For Building Muscle

For thousands of years, people have believed that eating large amounts of protein made it easier to build bigger, stronger muscles. New research shows that only about the first 30 grams (just over one ounce) of dietary protein consumed in a meal actually produce muscle. (Credit: iStockphoto/Don Bayley)

ScienceDaily (Oct. 27, 2009) — For thousands of years, people have believed that eating large amounts of protein made it easier to build bigger, stronger muscles. Take Milo of Croton, the winner of five consecutive Olympic wrestling championships in the sixth century BC: If ancient writers are to be believed, he built his crushing strength in part by consuming 20 pounds of meat every day.

No modern athlete would go to such extremes, but Milo's legacy survives in the high-protein diets of bodybuilders and the meat-heavy training tables of today's college football teams. A recent study by University of Texas Medical Branch at Galveston metabolism researchers, however, provides evidence that strongly contradicts this ancient tradition. It also suggests practical ways to both improve normal American eating patterns and reduce muscle loss in the elderly.

The study's results, obtained by measuring muscle synthesis rates in volunteers who consumed different amounts of lean beef, show that only about the first 30 grams (just over one ounce) of dietary protein consumed in a meal actually produce muscle.

"We knew from previous work that consuming 30 grams of protein -- or the equivalent of approximately 4 ounces of chicken, fish, dairy, soy, or, in this case, lean beef -- increased the rate of muscle protein synthesis by 50 percent in young and older adults," said associate professor Douglas Paddon-Jones, senior author of a paper on the study published in the September issue of the *Journal of the American Dietetic Association*. "We asked if 4 ounces of beef gives you a 50 percent increase, would 12 ounces, containing 90 grams of protein, give you a further increase?"

The UTMB researchers tested this possibility by feeding 17 young and 17 elderly volunteers identical 4- or 12-ounce portions of lean beef. Using blood samples and thigh muscle biopsies, they then determined the subjects' muscle protein synthesis rates following each of the meals.

"In young and old adults, we saw that 12 ounces gave exactly the same increase in muscle protein synthesis as 4 ounces," Paddon-Jones says. "This suggests that at around 30 grams of protein per meal, maybe a little less, muscle protein synthesis hits an upper ceiling. I think this has a lot of application for how we design meals and make menu recommendations for both young and older adults."

The results of the study, Paddon-Jones points out, seem to show that a more effective pattern of protein consumption is likely to differ dramatically from most Americans' daily eating habits.

"Usually, we eat very little protein at breakfast, eat a bit more at lunch and then consume a large amount at night. When was the last time you had just 4 ounces of anything during dinner at a restaurant?" Paddon-Jones said. "So we're not taking enough protein on board for efficient muscle-building during the day, and at night we're taking in more than we can use. Most of the excess is oxidized and could end up as glucose or fat."

A more efficient eating strategy for making muscle and controlling total caloric intake would be to shift some of extra protein consumed at dinner to lunch and breakfast.

"You don't have to eat massive amounts of protein to maximize muscle synthesis, you just have to be a little more clever with how you apportion it," Paddon-Jones said. "For breakfast consider including additional high quality proteins. Throw in an egg, a glass of milk, yogurt or add a handful of nuts to get to 30 grams of protein, do something similar to get to 30 for lunch, and then eat a smaller amount of protein for dinner. Do this, and over the course of the day you likely spend much more time synthesizing muscle protein."

Other authors of the paper include postdoctoral fellow T. Brock Symons, associate professor Melinda Sheffield Moore and University of Arkansas professor Robert R. Wolfe. The study was supported by funding from the National Cattlemen's Beef Association Checkoff Program and UTMB's National Institutes of Health Claude D. Pepper Older Americans Independence Center.

Journal reference:

1. Symons et al. **A Moderate Serving of High-Quality Protein Maximally Stimulates Skeletal Muscle Protein Synthesis in Young and Elderly Subjects**. *Journal of the American Dietetic Association*, 2009; 109 (9): 1582 DOI: 10.1016/j.jada.2009.06.369

Adapted from materials provided by University of Texas Medical Branch at Galveston, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/10/091026125543.htm

Tuna ban 'justified' by science

By Richard Black
Environment correspondent, BBC News website

Banning trade in Atlantic bluefin tuna is justified by the extent of their decline, an analysis by scientists advising fisheries regulators suggests.

The International Commission for the Conservation of Atlantic Tunas' (ICCAT) advisers said stocks are probably less than 15% of their original size.

The analysis has delighted conservation groups, which have warned that over-fishing risks the species' survival.

ICCAT meets to consider the report in 10 days' time.

The analysis was triggered by Monaco's recent proposal to ban international trade in the Atlantic bluefin under the Convention on International Trade in Endangered Species (CITES) - a proposal that has gathered support from several other European countries.

" **ICCAT's track record isn't too good, but they could surprise us** "
Dr Sue Lieberman Pew Environment Group "What's needed to save the stocks is a suspension of fishing activity and a suspension of international commercial trade," said Sergi Tudela, head of fisheries with the environmental group WWF for the Mediterranean region.

"We must stop mercilessly exploiting this fragile natural resource until stocks show clear signs of rebound and until sustainable management and control measures are firmly put in place."

The body charged with regulating catches of the southern bluefin, a closely related species, has just approved 20% quota cuts across the board.

Quota excesses

For a number of years, ICCAT has set quotas higher than scientists' recommendations.

The pressure this puts on stocks has been compounded by illegal fishing for this valuable species, which according to some estimates adds 30% to the official quota.

Last year, an independent report concluded that ICCAT's management of tuna was a "disgrace", blaming member countries for not accepting scientific advice and for turning a blind eye to their fleets' illegal activities.

The report recommended interim closure of the Mediterranean fishery, where most bluefin are caught - a measure that won backing from the US.

Frustrated by what it saw as ICCAT's inability to control the problem, Monaco's government - supported by conservation groups - submitted its CITES proposal.

The proposal will be heard at the CITES meeting in March. If enacted and enforced, it would severely hamper the trade. Atlantic bluefin tuna are mainly caught from countries around the Mediterranean Sea, but most of the meat is consumed in Asia, particularly Japan.

Japan has previously argued that commercial fish species should be controlled by bodies like ICCAT rather than CITES.

"The right thing would be to impose a zero quota," said Sue Lieberman, director of international policy for the Pew Environment Group.

"It wouldn't be forever - stocks will recover, but not at current rates of catch."

ICCAT's scientific committee considered different ways of analysing the decline - whether to start from estimates of how many bluefin there were before industrial fishing began, or from the largest stocks reliably recorded, and according to different rates of reproduction.

They concluded that whichever way the data is cut, it is 96% likely that numbers in the east Atlantic and Mediterranean are now less than 15% of their pre-industrial-fishing size.

CITES guidance suggests this would trigger a trade ban for a slow-reproducing fish species.

For the western Atlantic stock, subject to much smaller catches, the figure is 93% likely.

At its forthcoming meeting in Brazil, ICCAT delegates will decide whether to place new restrictions on catches.

"ICCAT's track record isn't too good," commented Dr Lieberman, "but they could surprise us."

Usually, ICCAT makes reports such as this one publically available.

But because of its "controversial and politically-charged nature", the commission asked members to "consider refraining from distributing this report" before the Brazil meeting, and it is not clear if and when it will be posted on the organisation's website.

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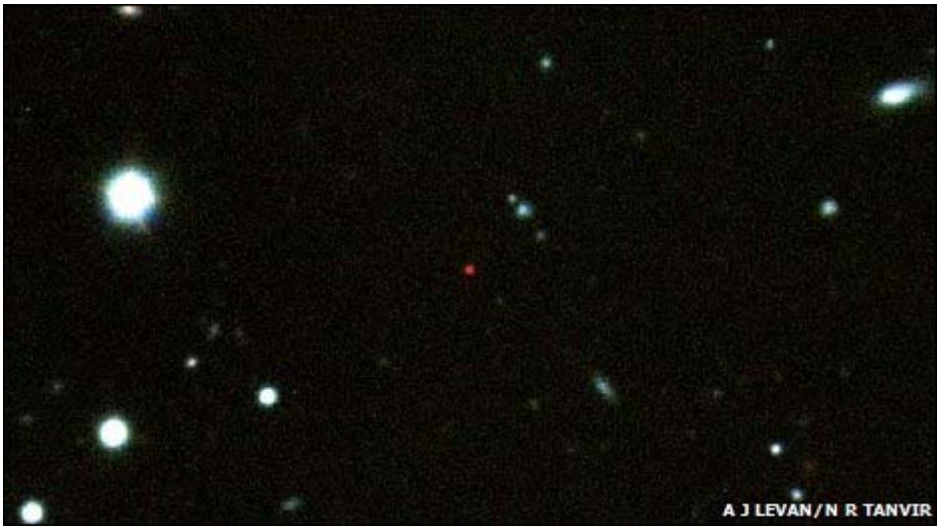
Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8331113.stm

Published: 2009/10/29 00:36:05 GMT

Stellar blast is record-breaker

By Victoria Gill
Science reporter, BBC News

Astronomers have confirmed that an exploding star spotted by Nasa's Swift satellite is the most distant cosmic object to be detected by telescopes.



In the journal Nature, two teams of astronomers report their observations of a gamma-ray burst from a star that died 13.1 billion light-years away.

The massive star died about 630 million years after the Big Bang.

UK astronomer Nial Tanvir described the observation as "a step back in cosmic time".

Professor Tanvir led an international team studying the afterglow of the explosion, using the United Kingdom Infrared Telescope (UKIRT) in Hawaii.

He told BBC News that his team was able to observe the afterglow for 10 days, while the gamma ray burst itself lasted around 12 seconds. The event, dubbed GRB 090423, is an example of one of the most violent explosions in the Universe.

It is thought to have been associated with the cataclysmic death of a massive star - triggered by the centre of the star collapsing to form a "stellar-sized" black hole. "Swift detects something like 100 gamma ray bursts per year," said Professor Tanvir. "And we follow up on lots of them in the hope that eventually we will get one like this one - something really very distant."

Another team, led by Italian astronomer Ruben Salvaterra studied the afterglow independently with the National Galileo Telescope in La Palma.

Little red dot

He told BBC News: "This kind of observation is quite difficult, so having two groups have the same result with two different instruments makes this much more robust."

"It is not surprising - we expected to see an event this distant eventually," said Professor Salvaterra.

"But to be there when it happens is quite amazing - definitely something to tell the grandchildren."

A GAMMA-RAY BURST RECIPE
- Models assume GRBs arise when giant stars burn out and collapse
- During collapse, super-fast jets of matter burst out from the stars
- Collisions occur with gas already shed by the dying behemoths
- The interaction generates the energetic signals detected by Swift
- Remnants of the huge stars end their days as black holes

The astronomers were able to calculate the vast distance using a phenomenon known as "red shift".

Most of the light from the explosion was absorbed by intergalactic hydrogen gas. As that light travelled towards Earth, the expansion of the Universe "stretches" its wavelength, causing it to become redder.

"The greater that amount of movement [or stretching], the greater the distance." he said.

The image of this gamma ray burst was produced by combining several infrared images. "So in this case, it's the redness of the dot that indicates that it is very distant," Professor Tanvir explained.

Before this record-breaking event, the furthest object observed from Earth was a gamma ray burst 12.9 billion light-years away.

"This is quite a big step back to the era when the first stars formed in the Universe," said Professor Tanvir.

"Not too long ago we had no idea where the first galaxies came from, so astronomers think this is a profound moment.

"This is... the last blank bit of the map of the Universe - the time between the Big Bang and the formation of these early galaxies."

And this is not the end of the story.

Bing Zhang, an astronomer from the University of Nevada, who was not involved in this study, wrote an article in Nature, explaining its significance.

The discovery, he said, opened up the exciting possibility of studying the "dark ages" of the Universe with gamma ray bursts.

And Professor Tanvir is already planning follow-up studies "looking for the galaxy this exploding star occurred in."

Next year, he and his team will be using the Hubble Space Telescope to try to locate that distant, very early galaxy.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8329865.stm

Published: 2009/10/28 18:47:05 GMT

Call to harmonise mobile airwaves

The EU has urged its members to use the same part of the airwaves for mobile broadband to help achieve its target of 100% broadband coverage by 2013.

The spectrum will become available as members switch from analogue to digital broadcasting, it said.

Using the same part of the spectrum would make it easier for devices to work "across borders" and allow consumers to use "roaming" services.

A similar plan allowed the emergence of GSM mobile phones in the 1990s.

The EU believes using the common frequency would be a particular boon for unconnected rural areas because it travels over long distances.

Up to 30% of the EU's rural population lacks high-speed internet access, it said.

Net harmony

The new proposal focuses on the 790-862 MHz sub-band of the radio spectrum, part of the so-called "digital dividend" freed up by the digital switchover.

The EU is keen to make sure that all of its its members agree common technical standards for its use.

It is worried that if this is not agreed, different member states may allocate different uses to the spectrum which may interfere with one another.

"Radio spectrum knows no borders," it said.

The 790-862 MHz sub-band is particularly attractive for mobile broadband because it can easily penetrate buildings.

It could be used for "3G and 4G mobile phone services that allow video streaming, full web browsing and fast downloads on a mobile handset," the commission said.

This would allow it to achieve its target of "high-speed broadband coverage of 100% of the EU population by the end of 2013".

To speed up the process, the European Union recommends that its member states should complete switchover by 2012, the current deadline in the UK.

British broadcasting watchdog Ofcom said it welcomed the recommendations and would study them with the government.

"The spectrum could deliver benefits such as mobile broadband or any other suitable services to EU citizens," said a spokesperson.

The UK intends to hold an open auction for many of the frequencies freed up by the switchover, although no date has been set for the sale.

Various groups are interested in the freed-up airwaves, including broadcasters who want to use parts of it for high-definition services.

'Common plan'

The EU's plans also detail other "strategic objectives" for how to take advantage of the digital divided.

These include adopting a common European position for negotiations between neighbouring countries on how to use parts of the spectrum and agreeing targets for technologies that can use the frequencies.

The EU forecasts that if members can agree common standards for the frequencies, the European economy could receive a boost of up to 50 billion euros (£45bn).

"The digital dividend is a once in a lifetime opportunity to make 'broadband for all' a reality all over Europe and boost some of the most innovative sectors of our economy," said Viviane Reding, EU commissioner for information society and media.

"Europe will only make the most of the digital dividend if we work together on a common plan."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/8329857.stm

Published: 2009/10/28 17:21:39 GMT

'Aura' migraines a stroke risk

Young women who have migraines with auras are twice as likely to have a stroke, researchers have confirmed.

Auras are notable sensory or visual disturbances that occur before the onset of a migraine headache.

Based on available evidence, the risk is greater if the woman is under 45, smokes and is on the contraceptive pill, say international experts.

But a migraine charity said most sufferers did not have auras and the absolute risk of a stroke was small.

Migraines affect between 10-20% of people and are four times as common in women compared to men.

" **Although the relative increased risk of stroke associated with migraine with aura is seemingly high, the actual risk is extremely low** "
Susan Haydon of The Migraine Trust

The researchers, writing in the British Medical Journal online, say they looked at nine of the most recent studies on the links between migraine and cardiovascular problems.

A previous large study in 2004 did find migraine sufferers had twice the risk of a stroke but the newer studies show that the risk is confined to people who suffer migraines with auras.

The investigators from the US, France and Germany did not find any link between migraines and heart attacks or death due to cardiovascular disease but there was a 30% increase in the risk of angina (heart pain).

Markus Schurks, of the Harvard Medical School and who led the research, said: "Clinicians may not agree but population studies show that up to a third of sufferers experience auras with their headaches.

"And when you consider that as many as 40% of young women suffer from migraines you can see that it really makes an impact on the health of the population."

Sex hormones

The authors recommend that young women who have migraine with aura should be strongly advised to stop smoking and methods of birth control other than oestrogen containing contraceptives should be considered.

They say recent animal studies have shown that high levels of oestrogen can produce auras in animals, so it could be the sex hormones affecting the vascular system, but more research is needed.

The British Heart Foundation recommended the women concerned reduce their risks as much possible - by switching to non-oestrogen based contraceptives, quitting smoking or contact their GP for further guidance.

Lee Tomkins, director of the charity Migraine Action, said: "I think this research will help women to understand that for the majority there is no additional risk, and for women with aura the best policy to help themselves is to have a migraine management plan in place that helps reduce the frequency of attacks, and try to minimise the aura part of the attack."

Susan Haydon of The Migraine Trust stressed: "Although the relative increased risk of stroke associated with migraine with aura is seemingly high, the actual risk is extremely low."

Dr Tony Rudd of The Stroke Association said: "Living a healthy lifestyle, taking regular exercise and having your blood pressure checked regularly are simple ways to reduce your risk of having a stroke."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8327869.stm

Published: 2009/10/28 00:01:59 GMT

Curry spice 'kills cancer cells'

An extract found in the bright yellow curry spice turmeric can kill off cancer cells, scientists have shown.

The chemical - curcumin - has long been thought to have healing powers and is already being tested as a treatment for arthritis and even dementia.

Now tests by a team at the Cork Cancer Research Centre show it can destroy gullet cancer cells in the lab.

Cancer experts said the findings in the British Journal of Cancer could help doctors find new treatments.

Dr Sharon McKenna and her team found that curcumin started to kill cancer cells within 24 hours.

'Natural' remedy

The cells also began to digest themselves, after the curcumin triggered lethal cell death signals.

Dr McKenna said: "Scientists have known for a long time that natural compounds have the potential to treat faulty cells that have become cancerous and we suspected that curcumin might have therapeutic value."

Dr Lesley Walker, director of cancer information at Cancer Research UK, said: "This is interesting research which opens up the possibility that natural chemicals found in turmeric could be developed into new treatments for oesophageal cancer.

"Rates of oesophageal cancer have gone up by more than a half since the 70s and this is thought to be linked to rising rates of obesity, alcohol intake and reflux disease so finding ways to prevent this disease is important too."

Each year around 7,800 people are diagnosed with oesophageal cancer in the UK. It is the sixth most common cause of cancer death and accounts for around five percent of all UK cancer deaths.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8328377.stm

Published: 2009/10/28 00:02:27 GMT

A Language of Smiles

Say "eeee." Say it again. Go on: "eeee."

Maybe I'm easy to please, but doing this a few times makes me giggle. "Eeee."

Actually, I suspect it's not just me. Saying "eeee" pulls up the corners of the mouth and makes you start to smile. That's why we say "cheese" to the camera, not "choose" or "chose." And, I think, it's why I don't get the giggles from "aaaa" or "oooo."

The mere act of smiling is often enough to lift your mood; conversely, the act of frowning can lower it; scowling can make you feel fed up. In other words, the gestures you make with your face can — at least to some extent — influence your emotional state.

(The notion that facial expressions affect mood isn't new. Edgar Allan Poe used it in his story "The Purloined Letter": one character reports that when he wishes to know someone's mind, he attempts to compose his face to mimic the expression of that someone — then waits to see which emotions arise. And the idea was developed, in different ways, by both Charles Darwin and William James. But telling stories and developing arguments is one thing. Showing, experimentally, that making a face can make a mood is harder; it's only in the past 30 years or so that data have started to accumulate.)

Exactly how frowns and smiles influence mood is a matter of debate. One possibility is classical conditioning. Just as Ivan Pavlov conditioned a dog to associate the sound of a bell with the expectation of food, the argument goes, so humans quickly come to associate smiling with feeling happy. Once the association has been established, smiling is, by itself, enough to generate happy feelings. Another possibility is that different facial gestures have intrinsic properties that make them more or less pleasant, perhaps by altering the way that blood flows to the brain.

But here's what interests me. As anyone who has tried to learn a foreign language will know, different languages make you move your face in different ways. For instance, some languages contain many sounds that are forward in the mouth; others take place more in the throat. What's more, the effects that different languages have on the movements of the face are substantial. Babies can tell the difference among languages based on the speaker's mouth movements alone. So can computers.

Which made me wonder: do some languages contain an intrinsic bias towards pulling happy faces? In other words, do some languages predispose — in a subtle way — their speakers to be merrier than the speakers of other languages?

As far as I can tell, no one has looked at this. (It doesn't mean no one has; it just means I haven't been able to find it.) But I did find a smidgen of evidence to suggest the idea's not crazy. A set of experiments investigating the effects of facial movements on mood used different vowel sounds as a stealthy way to get people to pull different faces. (The idea was to avoid people realizing they were being made to scowl or smile.) The results showed that if you read aloud a passage full of vowels that make you scowl — the German vowel sound *ü*, for example — you're likely to find yourself in a worse mood than if you read a story similar in content but without any instances of *ü*. Similarly, saying *ü* over and over again generates more feelings of ill will than repeating *a* or *o*.

Of course, facial gestures aren't the whole story of emotions; moreover, languages can potentially influence emotions in many other ways. Different languages have different music — sounds and rhythms — that could also have an emotional impact. The meanings of words may influence moods more than the gestures used to make them. And just as the words a language uses to describe colors affects how speakers of that language perceive those colors, different languages might allow speakers to process particular emotions differently; this, in turn, could feed into a culture, perhaps contributing to a general tendency towards gloom or laughter.

Separating these various factors will be difficult, and the overall impact on mood through the facial gestures of a language may well be small, if indeed it exists at all. Nevertheless, I'd love to know whether some languages, by the contortions they give the mouth, really do have an impact on their speakers'

happiness. If it turns out that there is a language of smiles, I'd like to learn it. In the meantime: have a giggle with "meeeeeee."

Notes:

For a fascinating overview of experiments on frowning, smiling and mood, see McIntosh, D. N. 1996. "Facial feedback hypotheses: evidence, implications, and directions." Motivation and Emotion 20: 121-147. This paper also discusses possible ways that facial expressions can influence emotions including both the conditioning idea and the blood flow idea. Further experimental results can be found in, for example, Kleinke, C. L., Peterson, T. R., and Rutledge, T. R. 1998, "Effects of self-generated facial expressions on mood," Journal of Personality and Social Psychology 74: 272-279; see also Schnall, S. and Laird, J. D., "Keep smiling: Enduring effects of facial expressions and postures on emotional experience and memory," Cognition and Emotion 17: 787-797; Flack, W. F. 2006, "Peripheral feedback effects of facial expressions, bodily postures, and vocal expressions on emotional feelings," Cognition and Emotion 20: 177-195; and Duclos, S. E. and Laird, J. D. 2001, "The deliberate control of emotional experience through control of expressions," Cognition and Emotion 15: 27-56.

Poe's purloined letter can be read here. Darwin's arguments about emotions can be found in his book, first published in 1872, "The Expression of Emotions in Man and Animals"; James's arguments are described in his book, first published in 1890, "The Principles of Psychology."

For evidence that facial movements can affect the way blood flows to the brain, see McIntosh, D. N. et al. 1997, "Facial movement, breathing, temperature, and affect: Implications of the vascular theory of emotional efference," Cognition and Emotion 11: 171-195.

For babies telling the difference among languages based on lip movements, see Weikum, W. M. et al. 2007, "Visual language discrimination in infancy," Science 316: 1159. For computers being able to do this, see Newman, J. L. and Cox. S. J. 2009. "Automatic visual-only language identification: a preliminary study," IEEE Proceedings of the International Conference on Acoustics, Speech, and Signal Processing vols 1-8: 4345-4348. A less technical account of the results are given here.

For my smidgen of evidence that the faces you pull when speaking a language can affect your mood, see Zajonc, R. B., Murphy, S. T. and Inglehart, M. 1989, "Feeling and facial efference: implications of the vascular theory of emotion," Psychological Review 96: 395-416. This paper describes what happens if you read stories full of the "ü" sound, or are made to repeat it over and over again.

The idea that the words in a language can affect the thought processes of the speakers is often attributed to Edward Sapir and Benjamin Lee Whorf; it has been controversial. However, some recent experimental evidence supports it, at least when it comes to processing colors. See, for example, Winawer, J. et al. 2007. "Russian blues reveal effects of language on color discrimination." Proceedings of the National Academy of Sciences 104: 7780-7785 and Regier, T. and Kay, P. 2009, "Language, thought, and color: Whorf was half right," Trends in Cognitive Sciences 13: 439-446. The idea that emotions might be similarly affected has been discussed by Perlovsky, L. 2009, "Language and emotions: Emotional Sapir-Whorf hypothesis," Neural Networks 22: 518-526.

This piece grew out of a conversation with Ismael Ludman about the different muscles used for speaking Spanish and German: many thanks. Many thanks also to Dan Haydon and Gideon Lichfield for insights, comments and suggestions.

http://judson.blogs.nytimes.com/2009/10/27/a-language-of-smiles/?ref=opinion

URS FISCHER
Exploration of Space

By ROBERTA SMITH

The sculptor Urs Fischer is hot, young and European. When it comes to installation art, he is prone to an efficient form of spectacle: he simply has very large holes cut or dug in the walls or floors of galleries, museums and the occasional art fair booth, usually to startlingly beautiful effect. Implicitly Duchampian yet marvelously experiential, these pieces have seemed to signal the end of installation art, like monochrome paintings sometimes seem to forewarn the end of painting. Add nothing, just use the space and the architecture, dummy. Boom.

The New Museum, seeking some heat of its own, has given Mr. Fischer the run of nearly all the exhibition space — three full floors — in its two-year-old building. It's a smart move, even if those hoping for a sizable new aperture in one of the museum's surfaces will be disappointed. The exhibition, titled "Urs Fischer: Marguerite de Ponty" (the subtitle referring to a character from the Symbolist poet Mallarmé), has been supervised by Massimiliano Gioni, a New Museum curator.
In the trifecta of sculpture surveys at major New York museums this fall — expect Roni Horn at the Whitney next week and Gabriel Orozco at the Museum of Modern Art in December — Mr. Fischer's show started in the lead, with the most anticipation. It felt premature, presumptuous and unpredictable, even though Mr. Fischer, who was born in Switzerland in 1973, descends from a line of German-speaking bad boys that includes Sigmar Polke and Martin Kippenberger and that has been one of the strongest strains of postwar art. Anything could happen, the thinking went, given Mr. Fischer's capricious, encompassing and, at best, fearless conception of sculpture.
Did it? Yes and no. The New Museum show is elegant and breathtakingly spare, even as it covers a lot of sculptural and installation-art ground. Mr. Fischer and Mr. Gioni wisely decided against a midcareer survey — which probably wouldn't fit into the museum — and instead concentrated exclusively on work from the last two years. But the results are quite a bit tamer and quieter than I expected.
Absence of holes is understandable; repetition is rarely good for a brand. But little in this show has quite the ability of the holes to shock and awe by assaulting a gallery's pure white cube while also providing an instructive, eye-opening beauty all their own. The show has only hints of this, but it does still communicate Mr. Fischer's particular brand of neo-Dada formalism, which combines nose-thumbing irreverence with a Minimalist interest in space, scale and perception for their own sakes. Abstraction is not a high priority since the detritus of popular culture and everyday life provide most of the motifs.
Mr. Fischer's fearlessness is most visible in the pictures in the exhibition's thick catalog, titled "Urs Fischer: Shovel in a Hole." These enumerate scores of sculptures and installations he has produced over the last dozen or so years, as well as his consuming interest in space. The images document several of the hole pieces, most notably his excavation of the floor of his New York gallery, Gavin Brown's Enterprise, to a depth of eight feet.

They also record works that go to the opposite extreme, with a very precise form of environmental trompe l'oeil that he evolved with Scipio Schneider, a graphic designer and friend since high school. It involves wallpapering a space with a life-size photographic image of itself down to the last architectural detail; the latest example of this method is one of the main surprises in the New Museum show.

The show feels like a stack of three commercial gallery exhibitions or museum project shows. Each level is a separate statement created by large and small pieces. Starting on the fourth floor and descending to the third and second is recommended. This saves the best for last and also creates a progression of thesis, antithesis and synthesis, or, more precisely, form, space and, finally, form and space, along with changing notions of size and scale.

The fourth floor is dominated by a small forest of five giant sculptural forms, amorphous boulders in gray metal that tower threateningly above the viewer. If the Wild Things took up abstract sculpture, it would look like this. The globular shapes conjure up the incessant molding and casting of traditional sculpture from the beginning of art to de Kooning and beyond but on a geological scale, while summoning fleeting associations and suggestions — a horse's raised head here, a pair of buttocks there. They're three-dimensional, asymmetrical Rorschach blots.

But soon you notice the concentric lines of giant fingerprints and the tip of a finger or two. You knew it was enlarged, but from something just an inch or two high? It is the artist's touch writ very, very large. "Frozen Pioneer," an old-fashioned street lamp, provides contrast. Cast in aluminum, bright pink and normal size, it bends and droops, as if drunk or made of rubber.

Other works are Duchampian exquisite corpses of unrelated objects, expressing a mannerism that is a bit too prevalent in sculpture these days. "The Lock" consists of facsimiles of a portion of a trolley car and a tote bag cantilevered from the wall. Thanks to electromagnets, a little pink cake floats in the gap between them. It's an anti-Gober. In "Violent Cappuccino" a life-size semihuman skeleton has one leg stuck through the top of a cardboard box that is stacked on another box. You don't know if it's going or coming, trapped or attacking.

The third floor is all space; emptiness rules, and everything is its actual size. The show's one hole is here, about three inches across, located on a long and otherwise empty wall, almost at eye level and titled "Noisette." When anyone approaches, a pink, implicitly lascivious prosthetic human tongue suddenly extends from the hole and just as quickly retracts, thanks to laser technology. It's an adolescent Surrealist joke, well done, and it can make you jump. Less engaging in its reliance on Surrealism is a life-size soft piano, like something out of a Dalí, that is also pink.

But the best work on this floor is "Last Call Lascaux," an exact, actual-size color image of the space printed as wallpaper. This too is pink, the result of photographing the entire white empty space — ceiling and skylight included — inch by inch without adding more lighting. The trompe l'oeil is clearest when you examine the public-safety signs. These could not, by law, be removed, so they're shadowed by images of themselves. In all, it is as if Mr. Fischer had discovered a space within a space and it were, literally, a twilight zone.

The show culminates on the second floor, where form and space come together in a large, attention-holding environmental piece. It consists of 51 polished-stainless-steel boxes in different sizes; the five exposed planes of each are printed with highly detailed color images of five views (front, back, two sides and top) of different everyday objects, most of them enlarged to many times their normal size. They include food, children's and dog's toys, bric-a-brac, books, a ladder, a sheet music stand and cigarette lighters. There are lots of visible cross references. A blue-and-white porcelain obelisk is here, near a rendition of the white foam casing in which it was shipped. Half of a freshly cut pear appears once and then a second time, rotten. Especially impressive: a sticky mass of colorful Froot Loops and a scrap of two-by-four, both expanded to the size of large doors.

The piece is titled "Service à la Française," a dining term for a meal presented all at once rather than in courses. And indeed, it combines Pop and Minimalism, matter and hollowness into a hall of mirrors, full of infinite layers and intersections of sight and meaning that are discovered, and in a sense created, by walking through the piece. It is, with the gallery in perpetual twilight one flight up, the best thing here.

"Urs Fischer: Marguerite de Ponty" is on display through Feb. 7 at the New Museum, 235 Bowery, at Prince Street, Lower East Side; (212) 219-1222, newmuseum.org.

http://www.nytimes.com/2009/10/30/arts/design/30urs.html?_r=1&ref=arts

'1969'
The Year of Tumult
By HOLLAND COTTER

In the fall of 1969, the country was having a nervous breakdown, and I was in my last year in college. I'd spent half the summer working in the emergency room of a New England factory town hospital, the rest traveling across Canada in a ruin of a car to visit friends in San Francisco.

Being in Canada, away from the political tumult at home, was a huge relief, though news kept breaking in throughout the ride: war, the moon walk, Charles Manson, Woodstock. Back in school in the fall there was more news: of Altamont, of Black Panthers killed in Chicago, of a panic-inducing draft lottery.
By many accounts, this was the year that finally snuffed out the flower-power high, turned the era sour. Whatever the reality, the cultural atmosphere was unforgettably manic and clamorous, though almost no sense of this comes through in the exhibition "1969" at P.S. 1 Contemporary Art Center in Queens.
True, the show was conceived with certain restrictive parameters. Almost everything in it is from the permanent collection of the Museum of Modern Art, P.S. 1 being a MoMA affiliate. Maybe this explains why the selection adheres so closely to the late-1960s art establishment demographics, with a negligible presence of black, Asian, Latin American and female artists.
In addition, almost every piece dates from the year of the title, a year that fell squarely within the early, intensively dematerializing phase of Conceptualism, an art movement that privileged ideas and words over object and left relatively little to look at — a printed phrase, a list of instructions, a documentary snapshot — after the visual glut of Abstract Expressionism, Pop and Minimalism.
Radical discretion, though, is what made this art look revolutionary, as is evident in the first gallery. On one side you see a kooky Pop drawing of a scowling face by John Wesley, a gleaming brass Donald Judd box and a big Helen Frankenthaler painting that suggests a patch of aquamarine mold spreading elegantly across the wall.
Opposite the Frankenthaler is something quite small, a sheet of framed writing paper with a single typed phrase: "Something which can never be anything specific." It's by the Conceptual artist Robert Barry, who had earlier gained notice for a solo show consisting entirely of radio waves.
Farther down the wall is another framed sheet of paper, this one carrying a handwritten and heavily annotated proposal by the artist Lee Lozano for setting up one-on-one conversations between herself and invited guests. Ms. Lozano was a painter who also developed idiosyncratic forms of social art, which were and weren't performances.
For one piece, she withdrew from the New York art establishment in an extended boycott. For another, she resolved to stop talking to women. Needless to say, this decision seriously complicated her already complicated relationship to feminism, which — though you would not know this from the show — was already a significant political force by 1969.
Whether Ms. Lozano was, strictly speaking, a Conceptualist is a question, one that might also be asked about the German artist Joseph Beuys, who appears, matinee-idol pretty and unblinkingly staring, in a video by Lutz Mommartz. Beuys referred to himself, his thinking and everything he did and made as "social sculpture," thereby politicizing every aspect of daily life.
This was a sexy idea, particularly in the 1960s, and had enormous influence on young artists in Europe, though we learn little directly about Beuys's politics here, or about any other kind of politics in a burningly polemical, liberationist era. There's a flash of women's liberation in Ms. Lozano's sardonic word pieces and of gay liberation via Andy Warhol's hilariously wearisome talk-and-tease "Blue Movie." A single poster by Emory Douglas, the official revolutionary artist for the Black Panther Party, is one of the few references to black power.
What does receive some detailed scrutiny is MoMA's own fraught history. A collection of letters, news releases and clippings is a reminder of ideological tussles between the museum and the Art Workers' Coalition, which formed in 1969 to demand rights for artists to control their work within the institution.

In a separate display is a text-and-photo spread on the Guerrilla Action Art Group, whose bloodbath performance in MoMA's lobby to protest the war was conceived and executed with an activist vehemence apparently now extinct.

It is absent, at least, from much of the rest of the show, which tends to define radicality in aesthetic terms of less-is-more. A page from a John Cage score points to other examples of reductive playfulness: tiny items, like party favors with surprises inside, by members of Fluxus; an exhibition catalog published by the art dealer Seth Siegelaub, which doubled as the exhibition itself; 1969 issues of Artforum in which Stephen Kaltenbach ran advertisements consisting of nothing but cryptic commands: "Start a rumor," "Perpetuate a hoax," "Become a legend."

The show doesn't lack for conventional objects. Chunky wall pieces by five California artists have been installed in a gallery-within-a-gallery as a reminder of what art at MoMA in 1969 actually looked like. And there are solid-gold stars. Bruce Nauman is ubiquitous; for him 1969 was a very good year, as it seems to have been for Richard Serra and Robert Smithson, both skeptics of the dematerializing trend. And sure enough, the trend didn't last. Galleries need retail; artists need to provide it; critics like to write about what they know. So it wasn't long before big, solid and bankable were back. They're going strong still, and in a nice touch, the show's organizers — Neville Wakefield, P.S. 1 senior curatorial adviser; Michelle Elligott, a MoMA archivist; and Eva Respini, associate curator of photography at MoMA — have acknowledged the present by inviting some young artists to add a final word to the show.

Hank Willis Thomas brings black popular culture into the picture with doctored clips from 1969 issues of Ebony and Jet magazines. The very-on-the-ball collective called the Bruce High Quality Foundation runs art historical pedagogy through visual shredders in its "portable museums."

And, in the spirit of early Conceptualism's rejection of the preciousness of objects, the San Francisco artist Stephanie Syjuco has created her own version of a multipart Beuys ensemble that is owned by MoMA but couldn't, for reasons of fragility, be brought to P.S. 1. The original, which consists of a sled, a flashlight, a roll of felt and a hunk of wax, was inspired by a formative, possibly fictional episode in Beuys's life when, after being shot down in a plane in World War II, he was rescued by nomadic Tartars, who rubbed him with fat, wrapped him in felt for warmth and transported him by sled to safety.

Ms. Syjuco specializes in making inexpensive, recyclable reproductions of famous art. Her solution in this case was to recreate the Beuys installation from elements contributed by friends she contacted by e-mail, thus creating a literal "social sculpture."

The piece was meant as a homage to Beuys, which is nice. But it's a funny thing: a work that was created as an emblem of a personal emergency, and that became a symbol of the artist-hero traveling with his survival kit of ideas and ideals through the world, looks, in reproduction, like a toy, intriguing but slight. A lot of what's in "1969" looks that way: clever, hermetic, tame, even timid, an impression reinforced by the fact that early Conceptualism's one overarching political gesture — to make itself market-resistant, uncollectible — was a bust, as the very existence of "1969" demonstrates.

At the opening I watched an audience of mostly young people, no doubt many of them artists, drifting through the galleries. And I wondered three things. First, what could anyone who wasn't around in 1969 make of this stuff, given that someone who was around then was having such trouble connecting it to any lived experience of that time?

Second, did the old notion that art reflects, in some profound way, the era that produced it become invalid as work grew increasingly self-referential and inaccessible? Such a question should be placed in the hands of imaginative art historians, and it's too bad some weren't invited to shape and contextualize this show, which is ridiculously withholding of factual information.

And third, should young artists fret about any of this? To some extent, yes. Whether they are making history or not, history is making them all the time as news pours in, constant and inescapable. They should pay attention to that news, sort through it, find their place in it, be as alert to the past as to the present. Then, overwhelmed, they should get behind the wheel, step on the gas and go till the tank's running dry.

"1969" is at P. S. 1 Contemporary Art Center, 22-25 Jackson Avenue, at 46th Avenue, Long Island City, Queens, through April 5.

http://www.nytimes.com/2009/10/30/arts/design/30ps1.html?ref=design

'WHO SHOT ROCK & ROLL'
Every Picture Tells a Story, Don't It?
By KEN JOHNSON

Rock 'n' roll and photography need each other — or, at least, rock musicians need photographers. You can't be a star if you don't have an image. But what makes a good rock photograph is something to ponder, and "Who Shot Rock & Roll: A Photographic History, 1955 to the Present" at the Brooklyn Museum offers an excellent opportunity to do so.

Organized by the photography historian Gail Buckland, the exhibition presents more than 175 images by 105 photographers, and includes album cover art, candid snapshots, publicity portraits and pictures of live performances.

Leaving aside aesthetic issues, it is hard to say what makes a high-quality rock photograph. So much depends on what you bring to it. For many viewers Richard Avedon's pellucid black-and-white portraits of the Beatles in 1967 will resonate differently from David LaChappelle's garishly colorful 1999 picture of the white hip-hop star Eminem sitting naked but holding a strategically placed stick of dynamite with a sparkling fuse.

It is not gratuitous to mention that Eminem is white, by the way, because most of the performers depicted are too. There are some pictures of black performers, but all have achieved crossover recognition, from Chuck Berry and Aretha Franklin to Tina Turner, Grace Jones and L L Cool J. This is an exhibition about what the white middle class has been listening to over the last 60 years: classic rock, as they call it on the radio. It could have been culled from past issues of People, and its impact is lessened because so many of these performers are already overexposed.

In the coffee table book that accompanies the show, Ms. Buckland argues that rock photography should be viewed like fashion photography, which has received considerable respect in recent decades. But fashion photography is more immediately visual; you don't have to know who the model is or who designed the clothes to be interested. With rock photographs it matters who the subject is. Knowing that the bearded young man smiling genially at the camera in a 1972 photograph by Lynn Goldsmith is Bruce Springsteen greatly enhances the experience of an otherwise nondescript picture, for fans of the Boss, anyway.

One way to make rock photographs more interesting would be to analyze them as sociological or anthropological documents. Examining them according to some quasi-scientific system could bring to light meanings and metaphors that we have come to take for granted in the cult of rock. Hero worship, sexual aggression, gender role-playing, youthful rebellion and the triumph of neo-primitivism in a consumerist age of unprecedented scientific, technological and industrial progress: these are topics worth examining.

A chapter could be devoted to the motif of the rock star who destroys his guitar during a performance, as in Ed Caraeff's sequence of four pictures of Jimi Hendrix setting his guitar on fire at the Monterey Pop Festival in 1967 or Pennie Smith's grainy image of Paul Simonon of the Clash swinging his bass by the neck in a blur of Dionysian catharsis. What do such sacrificial actions mean beyond the obvious theatrical expression of pent-up fury? Focused mainly on the fame, charisma and notoriety of its subjects, this exhibition offers few illuminating perspectives.

That said, it is an entertaining and sometimes absorbing show. Particularly for baby boomers, the demographic whose taste it most clearly represents, it is powerfully nostalgic. Perceptions of youth and age have a lot to do with it. To study images of Elvis Presley, Madonna and others when they were starting out is to marvel at the youth of those who created the huge global industry of today's pop music. For viewers who lived through the British Invasion of the early 1960s, going from Philip Townsend's 1963 portrait of the smooth-faced Rolling Stones before they ever recorded an album to Mark Seliger's 2005 image of a craggy, sinewy sexagenarian Mick Jagger leaning against a brick wall is truly affecting. However distant the lives of rock stars may be from ours, somehow we grow up with them and sooner or later find ourselves old like them.

Of course, some did not get old. Buddy Holly, Jimi Hendrix, Janis Joplin, Jim Morrison and Tupac Shakur will remain forever young, and pictures of them evoke thoughts of what might have been. Especially poignant is Judy Linn's black-and-white photograph of a young Patti Smith relaxing on a sofa bed in the messy apartment she shared with the photographer Robert Mapplethorpe in the early 1970s, before either became famous. It is breathtaking to think of how much has transpired since then. Ms. Smith became the godmother of punk; Mr. Mapplethorpe's fearlessly homoerotic photography made him a lightning rod for the family-values set in the 1980s. A big segment of a creative generation, including Mr. Mapplethorpe, was lost to AIDS.

A few of the show's photographers have more ambitious artistic aims. Andreas Gursky's huge 2001 photograph made by digitally piecing together views of several Madonna concerts surveys the spectacle of modern rock from an Olympian distance. Ryan McGinley's blurry, blue-toned image of a crowd watching a Morrissey concert from 2005 or 2006 tries to say something about the nature of mass fandom. In this context there is an over-intellectualized lifelessness to such efforts.

In the midst of so much motionless and silent imagery, it is exciting to encounter one of the handful of film and video clips in the exhibition. One showing Bjork singing and dancing with infectious abandon on the back of a truck borders on the transcendental. Photographs of deities can have totemic value, but nothing captures the spirit of rock 'n' roll like video.

"Who Shot Rock & Roll: A Photographic History, 1955 to the Present" continues through Jan. 31 at the Brooklyn Museum, 200 Eastern Parkway, at Prospect Park; (718) 638-5000, brooklynmuseum.org.

http://www.nytimes.com/2009/10/30/arts/design/30rock.html?ref=design

DAMIÁN ORTEGA
How Things Work (or Sometimes Don't)
By KAREN ROSENBERG

BOSTON — What's the difference between an artist and a mechanic? At first glance, Damián Ortega's dismantled Volkswagen Beetle, "Cosmic Thing" (2002), invites such jokes. (Insert your own punch line here.)

It also has a serious side that becomes apparent when considering the Beetle's status as the "people's car" and its history of production and consumption in Mexico. Following the diagrams in the repair handbook, Mr. Ortega disassembled the vehicle and suspended the components from the ceiling. The result is a kind of ritual sacrifice. (In the other works that make up his "Beetle Trilogy," Mr. Ortega dragged a car with a rope and buried one outside a Volkswagen factory.)

"Cosmic Thing" is the centerpiece of an Ortega survey, "Do It Yourself," which opened at the Institute of Contemporary Art here last month. (He also has an exhibition that runs through Saturday at the Gladstone Gallery in Chelsea.) The Boston show is full of conceptually driven sculpture and installation. The best of it is schematic yet unpredictable, a seductive combination.

Mr. Ortega, 42, is based in Berlin but was born in Mexico City. Both places figure prominently in his work. In a short video that accompanies the exhibition, Mr. Ortega cites Berlin's transitional urban landscape as a major influence. But his art materials — from tortillas to Beetles — are often staples of Mexican life.

He's also associated with a group of Mexico City artists that includes his former teacher Gabriel Orozco, the subject of a Museum of Modern Art retrospective that opens in December. A fellow student, Gabriel Kuri, has written a "User's Guide" to Mr. Ortega for the Boston exhibition catalog. All three artists show at the Mexico City gallery Kurimanzutto, and are similarly inclined toward playful absurdism. (It's tempting, for instance, to interpret "Cosmic Thing" as a homage to Mr. Orozco's 1993 sculpture "La D.S.," a Citroen surgically reduced to two-thirds of its original size.)

The humor in Mr. Ortega's art can also be traced to his first career, as a political cartoonist for Mexican magazines and newspapers. It's both a strength and a weakness: he has interesting and provocative things to say, but often an arch delivery.

Jessica Morgan, an adjunct curator at the institute and curator of contemporary art at Tate Modern, has installed almost all of Mr. Ortega's work in one large room. The pieces feed off one another, but the crowded, playgroundlike setup has the gallery guards on constant alert.

The works date from 1996 to the present and reflect a mastery of the post-Conceptual, biennial-friendly idiom of the Orozco circle. Even so, art festival culture is sometimes a target of Mr. Ortega's wry wit. An

invitation to participate in the 2000 exhibition "Puerto Rico 00," in San Juan, inspired the performance-sculpture "100 Dollars Diet." Mr. Ortega saved the small allowance given to him by the show's organizers and changed the money into 10,000 pennies. (He got by on canned food and hors d'oeuvres.) The coins, in their cardboard tubes, form a long intestine that winds along the gallery floor.

Frequent shifts in scale keep things interesting. One minute you're hypnotized by the revolving oil drums of "False Movement (Stability and Economic Growth)"; the next, you're scrutinizing the numbered corn kernels on "Classified Cob."

Also riveting is the way Mr. Ortega flouts assumptions about common objects while working with their material properties. For the sculpture "Tortillas Construction Module" (1998), he engineered an architectural tower of corn tortillas by baking them to a crisp and slotting them together. And for the installation "120 Days" (2002) he worked with a Tuscan glass workshop to produce 120 variations on the Coca-Cola bottle. Their fluted, flanged and otherwise modified forms imply different kinds of deviance, especially in light of the title's allusion to the Marquis de Sade novel.

In the three hanging sculptures titled "Skin" Mr. Ortega achieves a meaningful transformation by substituting soft materials for rigid ones. When laid flat, the tan leather cutouts correspond to the floor plans of austere modernist housing projects. Draped from hooks, as they are here, they become wonderfully pliable and forgiving. They also echo felt sculptures by Robert Morris and organic abstractions by artists of the Brazilian Neo-Concrete movement.

Another charged substance, brick, figures in several projects, some more successful than others. In the installation "Nine Types of Terrain," nine short films show bricks toppling, like dominoes, in formations derived from Sun Tzu's "Art of War." The sight is hypnotic, the sound softly percussive.

Almost as good is a series of photographs of brick piles outside homes in Brazil and Mexico. In an accompanying statement Mr. Ortega explains that these provisional-looking stashes are a form of aspiration. Homeowners keep the bricks in reserve because they plan to expand their houses — someday, when they have the time and money.

It's harder to relate to the polished-stainless-steel cubes that serve as building blocks for "Selection From Belo Horizonte Project," a set of Tetris-like sculptures. Their surfaces reflect the spectacular harbor view of the corridor outside the main gallery, but they don't feel like Mr. Ortega's work. They're uncharacteristically sleek, impassive and luxurious.

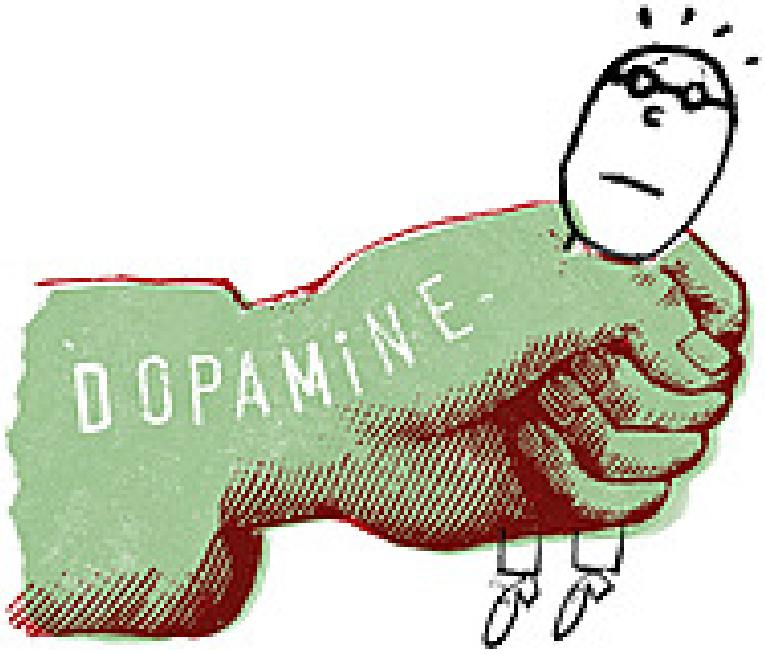
You could say the same about the large sculptures made from pressure-sanded brick and concrete in Mr. Ortega's show at Gladstone. They evoke pre-Columbian sculpture, geologic formations and utopian housing developments fallen into disrepair. Their rough edges, however, are smoothed by a display that emphasizes uniformity.

At his best, Mr. Ortega appeals to a fundamental curiosity about how things work: not just machines, but also larger social and economic systems. You can see it in the Volkswagen and in a strangely compelling video in which Mr. Ortega tunnels into the liquid center of a golf ball. They're feats of art making that can't be reduced to parts and labor.

"Damián Ortega: Do It Yourself" continues through Jan. 18 at the Institute of Contemporary Art, 100 Northern Avenue, Boston; (617) 478-3100, icaboston.org. "Damian Ortega: CAPITAL Less" continues through Saturday at Gladstone Gallery, 530 West 21st Street, Chelsea, (212) 206-9300, gladstonegallery.com.

http://www.nytimes.com/2009/10/30/arts/design/30ortega.html?ref=design

A Molecule of Motivation, Dopamine Excels at Its Task
By NATALIE ANGIER



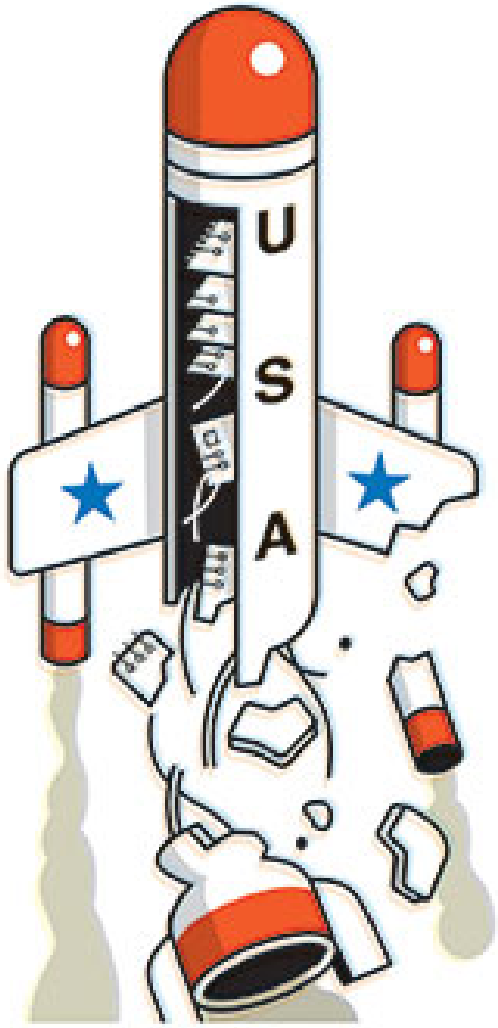
If you've ever had a problem with rodents and woken up to find that mice had chewed their way through the Cheerios, the Famous Amos, three packages of Ramen noodles, and even that carton of baker's yeast you had bought in a fit of "Ladies of the Canyon" wistfulness, you will appreciate just how freakish is the strain of laboratory mouse that lacks all motivation to eat.

The mouse is physically capable of eating. It still likes the taste of food. Put a kibble in its mouth, and it will chew and swallow, all the while wriggling its nose in apparent rodent satisfaction.
Yet left on its own, the mouse will not rouse itself for dinner. The mere thought of walking across the cage and lifting food pellets from the bowl fills it with overwhelming apathy. What is the point, really, of all this ingesting and excreting? Why bother? Days pass, the mouse doesn't eat, it hardly moves, and within a couple of weeks, it has starved itself to death.
Behind the rodent's fatal case of ennui is a severe deficit of dopamine, one of the essential signaling molecules in the brain. Dopamine has lately become quite fashionable, today's "it" neurotransmitter, just as serotonin was "it" in the Prozac-laced '90s.
People talk of getting their "dopamine rush" from chocolate, music, the stock market, the BlackBerry buzz on the thigh — anything that imparts a small, pleasurable thrill. Familiar agents of vice like cocaine, methamphetamine, alcohol and nicotine are known to stimulate the brain's dopamine circuits, as do increasingly popular stimulants like Adderall and Ritalin.
In the communal imagination, dopamine is about rewards, and feeling good, and wanting to feel good again, and if you don't watch out, you'll be hooked, a slave to the pleasure lines cruising through your brain. Hey, why do you think they call it dopamine?
Yet as new research on dopamine-deficient mice and other studies reveal, the image of dopamine as our little Bacchus in the brain is misleading, just as was the previous caricature of serotonin as a neural happy face.
In the emerging view, discussed in part at the Society for Neuroscience meeting last week in Chicago, dopamine is less about pleasure and reward than about drive and motivation, about figuring out what you have to do to survive and then doing it. "When you can't breathe, and you're gasping for air, would you call that pleasurable?" said Nora D. Volkow, a dopamine researcher and director of the National Institute on Drug Abuse. "Or when you're so hungry that you eat something disgusting, is that pleasurable?"

In both responses, Dr. Volkow said, the gasping for oxygen and the wolfing down of something you would ordinarily spurn, the dopamine pathways of the brain are at full throttle. "The whole brain is of one mindset," she said. "The intense drive to get you out of a state of deprivation and keep you alive."
Dopamine is also part of the brain's salience filter, its get-a-load-of-this device. "You can't pay attention to everything, but you want to be adept as an organism at recognizing things that are novel," Dr. Volkow said. "You might not notice a fly in the room, but if that fly was fluorescent, your dopamine cells would fire."
In addition, our dopamine-driven salience detector will focus on familiar objects that we have imbued with high value, both positive and negative: objects we want and objects we fear. If we love chocolate, our dopamine neurons will most likely start to fire at the sight of a pert little chocolate bean lying on the counter. But if we fear cockroaches, those same neurons may fire even harder when we notice that the "bean" has six legs. The pleasurable taste of chocolate per se, however, or the anxiety of cockroach phobia, may well be the handiwork of other signaling molecules, like opiates or stress hormones. Dopamine simply makes a relevant object almost impossible to ignore.
Should the brain want to ignore what it might otherwise notice, dopamine must be muzzled. Reporting recently in Nature Neuroscience, Regina M. Sullivan of New York University Medical Center, Gordon A. Barr of Children's Hospital of Philadelphia and their colleagues found that, whereas rats older than 12 days would quickly develop an aversion to any odors that were paired with a mild electric shock, young rats would perversely show a preference for such odors if their mothers were nearby when the tutorial jolt was delivered. The researchers traced that infantile Candide spirit to a suppression of dopamine activity in the amygdala, where fear memories are born. Infant rats know their mother by smell, Dr. Sullivan explained, and they must not learn to avoid her, for even an abusive caretaker is better than none.
Large as its impact may be, dopamine is a compact molecule, built of 22 atoms, with the characteristic nitrogenous amine knob at one end. (Dopamine, by the way, takes its name from its chemical composition, and has nothing to do with the word dope — as in heroin or other recreational drugs — which is thought to derive from the Dutch term for stew.)
The dopamine production corps is tiny as well. Fewer than 1 percent of all neurons generate the neurotransmitter, most of them in midbrain structures like the substantia nigra, which helps control movement; it is the degradation of this population of dopamine cells that results in the tremors and other symptoms of Parkinson's disease.
There is also dopamine activity higher up, in the prefrontal cortex parked right behind the forehead, that great executive brain where storylines are written, impulses controlled and excuses contrived. An impoverishment of prefrontal dopamine is thought to contribute to schizophrenia.
Wherever their station, brain cells respond to the release of dopamine through one or more of five distinct dopamine receptors poking up from their surface, proteins designed to lock onto dopamine and respond accordingly. Another key player is the dopamine transporter, a kind of janitor that picks up used dopamine molecules and sweeps them back into the cells where they were born. Recreational drugs like cocaine tend to block that transporter, allowing dopamine to linger in the neuronal vestibule and keep punching its signal along.
People differ from one another at every juncture of the dopamine matrix, in the tonal background pace at which their dopamine neurons rhythmically fire, the avidity with which the cells spike in response to need or news, and the ease with which hyperstimulated cells revert to baseline.
Some researchers have looked at genetic variations in receptor types for clues to personality differences. According to Dan T. A. Eisenberg of Northwestern University, scientists have detected a modest connection between a relatively elongated version of dopamine receptor No. 4 and a tendency toward impulsivity and risk-taking behavior, particularly financial risk-taking.
One can't make too much of these preliminary correlations in behavioral genetics, but maybe before the next bailout, we should demand that bankers be tested for the presence of risky, long-form receptors. It's the economy, dopamine.

http://www.nytimes.com/2009/10/27/science/27angier.html?ref=science

CYBERWAR
Old Trick Threatens the Newest Weapons
By JOHN MARKOFF



Despite a six-year effort to build trusted computer chips for military systems, the Pentagon now manufactures in secure facilities run by American companies only about 2 percent of the more than $3.5 billion of integrated circuits bought annually for use in military gear.

That shortfall is viewed with concern by current and former United States military and intelligence agency executives who argue that the menace of so-called Trojan horses hidden in equipment circuitry is among the most severe threats the nation faces in the event of a war in which communications and weaponry rely on computer technology.

As advanced systems like aircraft, missiles and radars have become dependent on their computing capabilities, the specter of subversion causing weapons to fail in times of crisis, or secretly corrupting crucial data, has come to haunt military planners. The problem has grown more severe as most American semiconductor manufacturing plants have moved offshore. Only one-fifth of all computer chips are now made in the United States, and just one-quarter of the chips based on the most advanced technologies are built here, I.B.M. executives say. That has led the Pentagon and the National Security Agency to expand significantly the number of American plants authorized to manufacture chips for the Pentagon's Trusted Foundry program.

Despite the increases, semiconductor industry executives and Pentagon officials say, the United States lacks the ability to fulfill the capacity requirements needed to manufacture computer chips for classified systems.

"The department is aware that there are risks to using commercial technology in general and that there are greater risks to using globally sourced technology," said Robert Lentz, who before his retirement last month was in charge of the Trusted Foundry program as the deputy assistant defense secretary for cyber, identity and information assurance.
Counterfeit computer hardware, largely manufactured in Asian factories, is viewed as a significant problem by private corporations and military planners. A recent White House review noted that there had been several "unambiguous, deliberate subversions" of computer hardware.
"These are not hypothetical threats," the report's author, Melissa Hathaway, said in an e-mail message. "We have witnessed countless intrusions that have allowed criminals to steal hundreds of millions of dollars and allowed nation-states and others to steal intellectual property and sensitive military information."

Ms. Hathaway declined to offer specifics.

Cyberwarfare analysts argue that while most computer security efforts have until now been focused on software, tampering with hardware circuitry may ultimately be an equally dangerous threat. That is because modern computer chips routinely comprise hundreds of millions, or even billions, of transistors. The increasing complexity means that subtle modifications in manufacturing or in the design of chips will be virtually impossible to detect.
"Compromised hardware is, almost literally, a time bomb, because the corruption occurs well before the attack," Wesley K. Clark, a retired Army general, wrote in an article in Foreign Affairs magazine that warns of the risks the nation faces from insecure computer hardware.
"Maliciously tampered integrated circuits cannot be patched," General Clark wrote. "They are the ultimate sleeper cell."

Indeed, in cyberwarfare, the most ancient strategy is also the most modern.
Internet software programs known as Trojan horses have become a tool of choice for computer criminals who sneak malicious software into computers by putting it in seemingly innocuous programs. They then pilfer information and transform Internet-connected PCs into slave machines. With hardware, the strategy is an even more subtle form of sabotage, building a chip with a hidden flaw or a means for adversaries to make it crash when wanted.

Pentagon executives defend the manufacturing strategy, which is largely based on a 10-year contract with a secure I.B.M. chipmaking plant in Burlington, Vt., reported to be valued as high as $600 million, and a certification process that has been extended to 28 American chipmakers and related technology firms.
"The department has a comprehensive risk-management strategy that addresses a variety of risks in different ways," said Mitchell Komaroff, the director of a Pentagon program intended to develop a strategy to minimize national security risks in the face of the computer industry's globalization.
Mr. Komaroff pointed to advanced chip technologies that made it possible to buy standard hardware components that could be securely programmed after they were acquired.
But as military planners have come to view cyberspace as an impending battlefield, American intelligence agency experts said, all sides are arming themselves with the ability to create hardware Trojan horses and to hide them deep inside the circuitry of computer hardware and electronic devices to facilitate military attacks.

In the future, and possibly already hidden in existing weapons, clandestine additions to electronic circuitry could open secret back doors that would let the makers in when the users were depending on the technology to function. Hidden kill switches could be included to make it possible to disable computer-controlled military equipment from a distance. Such switches could be used by an adversary or as a safeguard if the technology fell into enemy hands.

A Trojan horse kill switch may already have been used. A 2007 Israeli Air Force attack on a suspected partly constructed Syrian nuclear reactor led to speculation about why the Syrian air defense system did not respond to the Israeli aircraft. Accounts of the event initially indicated that sophisticated jamming technology was used to blind the radars. Last December, however, a report in an American technical publication, IEEE Spectrum, cited a European industry source in raising the possibility that the Israelis might have used a built-in kill switch to shut down the radars.

Separately, an American semiconductor industry executive said in an interview that he had direct knowledge of the operation and that the technology for disabling the radars was supplied by Americans to the Israeli electronic intelligence agency, Unit 8200.

The disabling technology was given informally but with the knowledge of the American government, said the executive, who spoke on the condition of anonymity. His claim could not be independently verified, and American military, intelligence and contractors with classified clearance declined to discuss the attack.

The United States has used a variety of Trojan horses, according to various sources.
In 2004, Thomas C. Reed, an Air Force secretary in the Reagan administration, wrote that the United States had successfully inserted a software Trojan horse into computing equipment that the Soviet Union

had bought from Canadian suppliers. Used to control a Trans-Siberian gas pipeline, the doctored software failed, leading to a spectacular explosion in 1982.

Crypto AG, a Swiss maker of cryptographic equipment, was the subject of intense international speculation during the 1980s when, after the Reagan administration took diplomatic actions in Iran and Libya, it was widely reported in the European press that the National Security Agency had access to a hardware back door in the company's encryption machines that made it possible to read electronic messages transmitted by many governments.

According to a former federal prosecutor, who declined to be identified because of his involvement in the operation, during the early '80s the Justice Department, with the assistance of an American intelligence agency, also modified the hardware of a Digital Equipment Corporation computer to ensure that the machine — being shipped through Canada to Russia — would work erratically and could be disabled remotely.

The American government began making a concerted effort to protect against hardware tampering in 2003, when Deputy Defense Secretary Paul D. Wolfowitz circulated a memorandum calling on the military to ensure the economic viability of domestic chipmakers.
In 2005, the Defense Science Advisory Board issued a report warning of the risks of foreign-made computer chips and calling on the Defense Department to create a policy intended to stem the erosion of American semiconductor manufacturing capacity.

Former Pentagon officials said the United States had not yet adequately addressed the problem.
"The more we looked at this problem the more concerned we were," said Linton Wells II, formerly the principal deputy assistant defense secretary for networks and information integration. "Frankly, we have no systematic process for addressing these problems."

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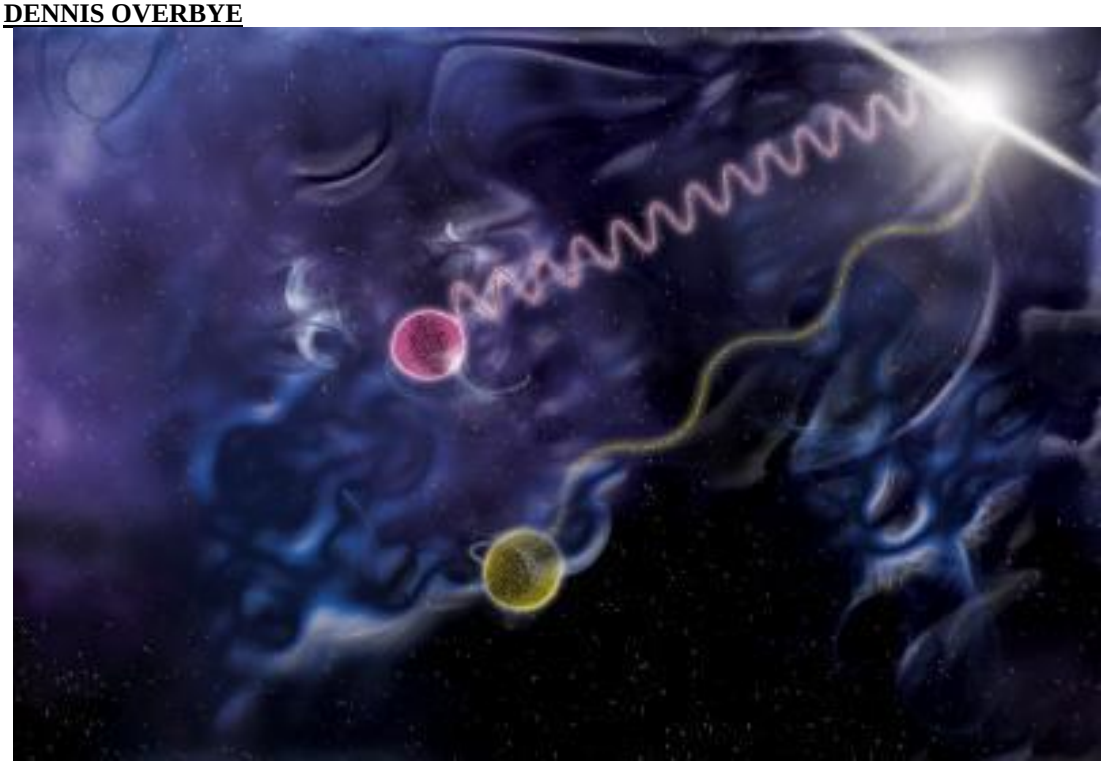
7.3 Billion Years Later, Einstein's Theory Prevails
By DENNIS OVERBYE



Astronomers said Wednesday that a race halfway across the universe had ended in a virtual tie. And so the champion is still Albert Einstein — for now.

The race was between gamma rays of differing energies and wavelengths spit in a burst from an exploding star when the universe was half its present age. After a journey of 7.3 billion light-years, they all arrived within nine-tenths of a second of one another in a detector on NASA's Fermi Gamma-Ray Space Telescope, at 8:22 p.m., Eastern time, on May 9.

Astronomers said the gamma-ray race was one of the most stringent tests yet of a bedrock principle of modern physics: Einstein's proclamation in his 1905 theory of relativity that the speed of light is constant and independent of its color, or energy; its direction; or how you yourself are moving.

"I take it as a confirmation that Einstein is still right," Peter F. Michelson of Stanford, principal investigator for Fermi's Large Area Telescope and one of 206 authors of a paper published online Wednesday in the journal Nature, said in an interview.

There is no evidence so far that the energy or wavelength of light affects its speed through space. That is important because of what it could say about the structure of space-time. Some theorists have suggested that space on very small scales has a granular structure that would speed some light waves faster than others — in short, that relativity could break down on the smallest scales.

Dr. Michelson and others emphasize that while the new Fermi results do not yet eliminate the prospect, further observations with more gamma-ray bursts could eventually verify or refute the hypothesis. That would have a major effect on physicists' efforts to unify the Einsteinian gravity that governs outer space with the weird quantum laws that govern the inner space of the atom.

Mario Livio, an astronomer at the Space Telescope Science Institute in Baltimore, called the Fermi results an interesting effect but not revolutionary by any stretch. "The beauty of the experiment is not as much in what it achieves," Dr. Livio said, "as in the fact that you can use astronomical observations to place some interesting limits on very fundamental physics."

Quantum theory, as Einstein discovered to his chagrin, reduces life on subatomic scales to a game of chance in which elementary particles can be here or there but not in between. One consequence is that space-time itself should become discontinuous and chaotic when viewed at very close distances, the way an ocean that looks smooth from an airplane appears choppy and foamy up close.

This, the story goes, could have an effect on the propagation of light — or photons, as they are called in quantum-speak — slowing light with short wavelengths relative to light with longer wavelengths. The higher the energy of a photon, the shorter is its wavelength. One way to think about it is to envision the photons as boats on this choppy sea. The small ones, like tugboats, have to climb up and down the waves to get anywhere, while the bigger ones can slice through the waves and bumps like ocean liners, and thus go a little faster.

Until now such quantum gravity theories have been untestable. Ordinarily you would have to see details as small as 10^{-33} centimeters — the so-called Planck length, which is vastly smaller than an atom — to test these theories in order to discern the bumpiness of space. Getting that kind of information is far beyond the wildest imaginations of the builders of even the most modern particle accelerators, and that has left quantum gravity theorists with little empirical guidance.

"What's really lacking," Dr. Michelson explained, "is a laboratory experiment that tells us anything. So we have to use cosmology: we use the universe as the lab."

The photons from GRB 090510, detected on May 9, ranged from 10,000 electron volts — the energy unit of choice in physics — to 31 billion electron volts, a factor of more than a million, in seven brief bursts over about two seconds.

The spread in travel time of 0.9 second between the highest- and lowest-energy gamma rays, if attributed to quantum effects rather than the dynamics of the explosion itself, suggested that any quantum effects in which the slowing of light is proportional to its energy do not show up until you get down to sizes about eight-tenths of the Planck length, according to the Nature paper, whose lead author was Sylvain Guiriec of the University of Alabama.

But Dr. Livio emphasized that this was only one of many classes of models. "It would be amazing that in effect we don't need a quantum theory of gravity," he said. "This only tells us where there are the dead ends."

Indeed, other physicists said that even this model would not be ruled out until the size limit had been set much below the Planck size.

The good news, astronomers said, is that more data expected from Fermi could decide the question. As Lee Smolin, a quantum gravity theorist from the Perimeter Institute for Theoretical Physics in Waterloo, Ontario, said, "So a genuine experimental test of a hypothesized quantum gravity effect is in progress."

In the meantime, the last word belongs to Einstein, Robert P. Kirshner of the Harvard-Smithsonian Center for Astrophysics wrote in an e-mail message paraphrasing a 1919 headline in The New York Times about observations that confirmed Einstein's general relativity. "But the Nature story," Dr. Kirshner wrote, "is 'Einstein found right again. Heavens not askew! Savants not agog!' "

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At Ur, Ritual Deaths That Were Anything but Serene

By JOHN NOBLE WILFORD

A new examination of skulls from the royal cemetery at Ur, discovered in Iraq almost a century ago, appears to support a more grisly interpretation than before of human sacrifices associated with elite burials in ancient Mesopotamia, archaeologists say.

Palace attendants, as part of royal mortuary ritual, were not dosed with poison to meet a rather serene death. Instead, a sharp instrument, a pike perhaps, was driven into their heads.

Archaeologists at the University of Pennsylvania reached that conclusion after conducting the first CT scans of two skulls from the 4,500-year-old cemetery. The cemetery, with 16 tombs grand in construction and rich in gold and jewels, was discovered in the 1920s. A sensation in 20th century archaeology, it revealed the splendor at the height of the Mesopotamian civilization.
The recovery of about 2,000 burials attested to the practice of human sacrifice on a large scale. At or even before the demise of a king or queen, members of the court — handmaidens, warriors and others — were put to death. Their bodies were usually arranged neatly, the women in elaborate headdress, the warriors with weapons at their side.

C. Leonard Woolley, the English archaeologist who directed the excavations, a collaboration between Penn and the British Museum, eventually decided that the attendants had been marched down into burial chambers, where they drank poison and lay down to die. That became the conventional story.
Among the many human remains, only a few skulls were preserved, and those had been smashed into fragments — not in death but from the overburden of earth accumulating over the centuries to crush skulls flat as pancakes. That had frustrated earlier efforts to reconstruct the skulls.

In planning for a new exhibition of Ur artifacts, which opened Sunday at Penn's Museum of Archaeology and Anthropology, Richard L. Zettler, the co-curator and a specialist in Mesopotamian archaeology, said researchers had taken CT scans of skull bones of a woman and a man. From those they obtained three-dimensional images of each fragment and so determined where the pieces fit.

The researchers, led by Janet M. Monge, a physical anthropologist at Penn, applied forensic skills to arrive at the probable cause of death in both cases.

There were two round holes in the soldier's cranium and one in the woman's, each about an inch in diameter. But the most convincing evidence, Dr. Monge said in an interview, were cracks radiating from the holes. Only if the holes were made in a living person would they have produced such a pattern of

fractures along stress lines. The more brittle bones of a person long dead would shatter like glass, she explained.

Dr. Monge surmised that the holes were made by a sharp instrument and that death "by blunt-force trauma was almost immediate."

Ritual killing associated with a royal death was practiced by other ancient cultures, archaeologists say, and raises a question: Why would anyone, knowing their probable fate, choose a life as a court attendant? "It's almost like mass murder and hard for us to understand," Dr. Monge said. "But in the culture these were positions of great honor, and you lived well in the court, so it was a trade-off. Besides, the movement into the next world was not for them necessarily something to fear."

Dr. Zettler said the new research also turned up evidence that the bodies of some victims had been heated, baked not burned, and treated with a compound of mercury. It was a primitive mummification process, not as advanced as techniques in contemporary Egypt.

"This was just to keep the bodies from decomposing during extensive funerary ceremonies," he said.
On a brighter note, Dr. Zettler said the site of the ancient city-state Ur, near present-day Nasiriyah in Iraq, has been spared in the recent warfare that brought damage and looting to other ancient digs. Ur is protected within the perimeter of an air base, which was recently handed back to the Iraqis.

http://www.nytimes.com/2009/10/27/science/27ur.html?ref=science

Cancers Can Vanish Without Treatment, but How?

By GINA KOLATA

Call it the arrow of cancer. Like the arrow of time, it was supposed to point in one direction. Cancers grew and worsened.

But as a paper in The Journal of the American Medical Association noted last week, data from more than two decades of screening for breast and prostate cancer call that view into question. Besides finding tumors that would be lethal if left untreated, screening appears to be finding many small tumors that would not be a problem if they were left alone, undiscovered by screening. They were destined to stop growing on their own or shrink, or even, at least in the case of some breast cancers, disappear.

"The old view is that cancer is a linear process," said Dr. Barnett Kramer, associate director for disease prevention at the National Institutes of Health. "A cell acquired a mutation, and little by little it acquired more and more mutations. Mutations are not supposed to revert spontaneously."

So, Dr. Kramer said, the image was "an arrow that moved in one direction." But now, he added, it is becoming increasingly clear that cancers require more than mutations to progress. They need the cooperation of surrounding cells and even, he said, "the whole organism, the person," whose immune system or hormone levels, for example, can squelch or fuel a tumor.

Cancer, Dr. Kramer said, is a dynamic process.

It was a view that was hard for some cancer doctors and researchers to accept. But some of the skeptics have changed their minds and decided that, contrary as it seems to everything they had thought, cancers can disappear on their own.

"At the end of the day, I'm not sure how certain I am about this, but I do believe it," said Dr. Robert M. Kaplan, the chairman of the department of health services at the School of Public Health at the University of California, Los Angeles, adding, "The weight of the evidence suggests that there is reason to believe."

Disappearing tumors are well known in testicular cancer. Dr. Jonathan Epstein at Johns Hopkins says it does not happen often, but it happens.

A young man may have a lump in his testicle, but when doctors remove the organ all they find is a big scar. The tumor that was there is gone. Or, they see a large scar and a tiny tumor because more than 95 percent of the tumor had disappeared on its own by the time the testicle was removed.

Or a young man will show up with a big tumor near his kidney. Doctors realize that it started somewhere else, so they look for its origin. Then they discover a scar in the man's testicle, the only remnant of the original cancer because no tumor is left.

Testicular cancer is unusual; most others do not disappear. But there is growing evidence that cancers can go backward or stop, and researchers are being forced to reassess their notions of what cancer is and how it develops.

Of course, cancers do not routinely go away, and no one is suggesting that patients avoid treatment because of such occasional occurrences.

"Biologically, it is a rare phenomenon to have an advanced cancer go into remission," said Dr. Martin Gleave, a professor of urology at the University of British Columbia.
But knowing more about how tumors develop and sometimes reverse course might help doctors decide which tumors can be left alone and which need to be treated, something that is now not known in most cases.
Cancer cells and precancerous cells are so common that nearly everyone by middle age or old age is riddled with them, said Thea Tlsty, a professor of pathology at the University of California, San Francisco. That was discovered in autopsy studies of people who died of other causes, with no idea that they had cancer cells or precancerous cells. They did not have large tumors or symptoms of cancer. "The really interesting question," Dr. Tlsty said, "is not so much why do we get cancer as why don't we get cancer?"
The earlier a cell is in its path toward an aggressive cancer, researchers say, the more likely it is to reverse course. So, for example, cells that are early precursors of cervical cancer are likely to revert. One study found that 60 percent of precancerous cervical cells, found with Pap tests, revert to normal within a year; 90 percent revert within three years.
And the dynamic process of cancer development appears to be the reason that screening for breast cancer or prostate cancer finds huge numbers of early cancers without a corresponding decline in late stage cancers.
If every one of those early cancers were destined to turn into an advanced cancer, then the total number of cancers should be the same after screening is introduced, but the increase in early cancers should be balanced by a decrease in advanced cancers.
That has not happened with screening for breast and prostate cancer. So the hypothesis is that many early cancers go nowhere. And, with breast cancer, there is indirect evidence that some actually disappear.
It is harder to document disappearing prostate cancers; researchers say they doubt it happens. Instead, they say, it seems as if many cancers start to grow then stop or grow very slowly, as has been shown in studies like one now being done at Johns Hopkins. When men have small tumors with cells that do not look terribly deranged, doctors at Johns Hopkins offer them an option of "active surveillance." They can forgo having their prostates removed or destroyed and be followed with biopsies. If their cancer progresses, they can then have their prostates removed.
Almost no one agrees to such a plan. "Most men want it out," Dr. Epstein said. But, still, the researchers have found about 450 men in the past four or five years who chose active surveillance. By contrast, 1,000 a year have their prostates removed at Johns Hopkins. From following those men who chose not to be treated, the investigators discovered that only about 20 percent to 30 percent of those small tumors progressed. And many that did progress still did not look particularly dangerous, although once the cancers started to grow the men had their prostates removed.
In Canada, researchers are doing a similar study with small kidney cancers, among the few cancers that are reported to regress occasionally, even when far advanced.
That was documented in a study, led by Dr. Gleave that compared an experimental treatment with a placebo in people with kidney cancer that had spread throughout their bodies.
As many as 6 percent who received a placebo had tumors that shrank or remained stable. The same thing happened in those who received the therapy, leading the researchers to conclude that the treatment did not improve outcomes.
The big unknown is the natural history of many small kidney tumors, many of which are early kidney cancers. How often do small tumors progress? Do they ever disappear? Do they all need surgical excision? At what stage do most kidney cancers reach a point of no return?
These days, Dr. Gleave said, more patients are having ultrasound or CT scans for other reasons and learning that there is a small lump on one of their kidneys. In the United States, the accepted practice is to take those tumors out. But, he asks, "Is that always necessary?"
His university is participating in a countrywide study of people with small kidney tumors, asking what happens when those tumors are routinely examined, with scans, to see if they grow. About 80 percent do not change or actually regress over the next three years.
With early detection, he said, "our net has become so fine that we are pulling in small fish as well as big fish." Now, he said, "we have to identify which small fish we can let go."

http://www.nytimes.com/2009/10/27/health/27canc.html?ref=science