Infoteca's E-Journal

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Tiny Hydrophobic Water Ferns Could Help Ships Economize on Fuel

Materials based on water ferns could reduce the fuel consumption of ships in a big way. (Credit: iStockphoto/Rafael Ramirez Lee)

ScienceDaily (May 5, 2010) — The hairs on the surface of water ferns could allow ships to have a 10 percent decrease in fuel consumption. The plant has the rare ability to put on a gauzy skirt of air under water. Researchers at the University of Bonn, Rostock and Karlsruhe now show in the journal *Advanced Materials* how the fern does this. Their results can possibly be used for the construction of new kinds of hulls with reduced friction.

The water fern *salvinia molesta* is extremely hydrophobic. If it is submerged and subsequently pulled out the liquid immediately drips off it. After that it is completely dry again. Or to be more precise: it was never really wet. For the fern surrounds itself by a flimsy skirt of air. This layer prevents the plant from coming into contact with liquid. And that even with a dive lasting weeks.

Materials researchers call this behaviour 'superhydrophobic'. This property is of interest for many applications such as rapidly drying swimsuits or simply for fuel-efficient ships. Meanwhile, it is possible to construct superhydrophobic surfaces modelled on nature. However, these 'replicas' have a disadvantage: the layer that forms on them is too unstable. In moving water it disappears after several hours at the latest.

The researchers from Bonn, Rostock und Karlsruhe have now deciphered the trick the water fern uses to pin down its airy skirt. It has been known for some years now that on the surface of its leaves there are tiny whisk-like hairs. These are hydrophobic. They keep water in the surroundings at a distance.

Water is 'stapled in place'

But this is only one side of the coin: "We were able to show that the outermost tips of these whisks are hydrophilic, i.e. they love water," Professor Wilhelm Barthlott from the University of Bonn explains. "They plunge into the surrounding liquid and basically staple the water to the plant at regular intervals. The air layer situated beneath it can therefore not escape so easily."

Professor Barthlott is head of the Nees Institute of Biodiversity of Plants in Bonn. There the experiments began which are continued today in conjunction with the Chair of Fluid Dynamics at the University of Rostock and the Institute of Applied Physics at the University of Karlsruhe. "After the solving of the self-cleansing of the lotus leaf twenty years ago, the discovery of the *salvinia* effect is one of the most important new discoveries in bionics," Professor Thomas Schimmel from the University of Karlsruhe says.

Fuel saved world wide: one percent

And it is one with huge technical potential to boot. Up to now with container ships more than half of the propulsion energy is lost through friction of the water at the hull. With an air layer this loss could be reduced by ten percent according to the researchers' estimate. Since ships are huge fuel guzzlers, the total effect would be enormous. "Probably one percent of the fuel consumption worldwide could be saved this way," is Professor Barthlott's prognosis. "Surfaces modelled on the water fern could revolutionise shipbuilding," Professor Dr. Alfred Leder from the University of Rostock concurs.

Story Source:

Adapted from materials provided by University of Bonn.

Journal Reference:

1. Wilhelm Barthlott, Thomas Schimmel, Sabine Wiersch, Kerstin Koch, Martin Brede, Matthias Barczewski, Stefan Walheim, Aaron Weis, Anke Kaltenmaier, Alfred Leder, Holger F. Bohn. **The Salvinia Paradox: Superhydrophobic Surfaces with Hydrophilic Pins for Air Retention Under Water**. *Advanced Materials*, 2010; DOI: 10.1002/adma.200904411

http://www.sciencedaily.com/releases/2010/05/100504095104.htm

Melanoma Not Caused by Early Ultraviolet (UVA) Light Exposure, New Fish Experiments Show

New research shows that early life exposure to ultraviolet A light does not cause melanoma in a fish model that previously made that connection. (Credit: iStockphoto/Michiel De Boer)

ScienceDaily (May 5, 2010) — Early life exposure to ultraviolet A light does not cause melanoma in a fish model that previously made that connection, scientists from The University of Texas MD Anderson Cancer Center reported in the online Early Edition of the *Proceedings of the National Academy of Sciences*.

UVA exposure is unlikely to have contributed to the rise in the incidence of melanoma over the past 30 years, the researchers conclude, because the fish model had been the only animal model to indicate a connection between exposure to UVA at a young age and later development of melanoma.

"Our data refute the only direct evidence that UVA causes melanoma, which is not to say that UVA is harmless," said the study's lead author David Mitchell, Ph.D., professor in M. D. Anderson's Department of Carcinogenesis located at its Science Park -- Research Division in Smithville, Texas. "UVA is just not as dangerous as we thought because it doesn't cause melanoma."

UVA is a carcinogen responsible for squamous cell carcinomas that also causes premature aging of the skin and suppresses the immune system. It's also possible, the authors note, that long-term chronic exposure to UVA can hasten the progression to malignancy of melanocytes in the skin that are already on the path to becoming melanoma.

Mitchell and colleagues tested the effects of UVA and ultraviolet B (UVB) light exposure in melanoma-prone fish hybrids that develop the disease spontaneously 15-20 percent of the time without exposure to UV light.

The scientists exposed a hybrid form of the genus Xiphophorus, more commonly known as platyfishes and swordtails, to either UVA or UVB daily between their fifth and 10th day of life. The fish were then scored for melanoma 14 months after exposure.

"We found that UVB exposure induced melanoma in 43 percent of the 194 treated fish, a much higher rate than the 18.5 percent incidence in the control group that received no UV exposure," Mitchell said. This was expected because UVB exposure at an early age is a well-established cause of melanoma.

Only 12.4 percent of 282 fish exposed to UVA developed the disease, which is not statistically different from the control group.

An influential 1993 study using the same hybrid fish connected UVA exposure to melanoma. Until that study, Mitchell said, sunscreens protected only against UVB exposure, which was of immediate public health concern because UVA makes up 90 percent of the ultraviolet light spectrum of sunlight.

"The thought was that people who used sunscreen stayed out in the sun longer, absorbing a higher dose of UVA, causing a higher risk for melanoma" Mitchell said. Most sunscreens now protect against UVA. However, the increase in the incidence of melanoma has been thought to be partly attributable to childhood exposure to UVA back when sunscreens blocked only UVB. That's unlikely, given the new results, Mitchell said.

The 1993 experiment could not be replicated in mammalian models of melanoma, Mitchell said, and a statistical retrospective of the 1993 paper indicated problems with sample sizes that were too small to yield a definitive answer on UVA exposure.

So, Mitchell and colleagues conducted the experiment again, with much larger sample sizes that provided the statistical power to reach stronger conclusions.

They also stratified the melanomas found in each group by severity, with the control and UVB-exposed fish having a higher incidence of severe, stage IV disease, while those exposed to UVA had significantly more early stage melanomas.

UVB exposure damages DNA directly, while UVA is thought to inflict its damage indirectly by inducing melanin free radicals that react with DNA to form oxidative damage that leads to melanoma. Previous studies had shown a correlation between melanin radical formation and melanoma in the UVA range of the solar spectrum. Since Mitchell and colleagues found no connection between UVA and melanoma, they note that the role of melanin free radicals in this disease is brought into question.

This research was funded by grants from the National Cancer Institute and the National Institute of Environmental Health Sciences.

Co-authors with Mitchell are André Fernandez, Ph.D., Rodney Nairn, Ph.D., Rachel Garcia, Lakshmi Paniker, David Trono and Irma Gimenez-Conti, Ph.D., D.D.S., all of the Department of Carcinogenesis; and Howard Thames, Ph.D., of MD Anderson's Department of Biostatistics. Mitchell, Thames, Conti and Nairn are also on the faculty of the University of Texas Graduate School of Biomedical Sciences, a joint program of MD Anderson and The University of Texas Health Science Center at Houston.

Story Source:

Adapted from materials provided by University of Texas M. D. Anderson Cancer Center, via EurekAlert!, a service of AAAS.

Journal Reference:

1. D. L. Mitchell, A. A. Fernandez, R. S. Nairn, R. Garcia, L. Paniker, D. Trono, H. D. Thames, I. Gimenez-Conti. **Ultraviolet A does not induce melanomas in a Xiphophorus hybrid fish model**. *Proceedings of the National Academy of Sciences*, 2010; DOI: 10.1073/pnas.1000324107

http://www.sciencedaily.com/releases/2010/05/100504155419.htm

Tetrahedral Dice Pack Tighter Than Any Other Shape

Tetrahedral dice have four triangular faces. When the dice are randomly poured into a container, they pack themselves more tightly than any other shape studied so far. (Credit: Alexander Jaoshvili, Andria Esakia, Massimo Porrati, and Paul M. Chaikin)

ScienceDaily (May 5, 2010) — Tetrahedral dice, which have four triangular sides, pack more densely than any other shape yet tested, according to research performed by a collaboration of New York University and Virginia Tech physicists.

The revelation is the result of a series of experiments that involved pouring tetrahedral dice into containers, shaking them, and adding more dice until the containers were completely filled. After adding water to measure the open space between the dice, the researchers confirmed that the tetrahedrons fill roughly 76% of the available space in a large container. Similar experiments with spheres typically only fill containers to about 64% of the total volume.

The researchers were able to get an inside view of the packed tetrahedral dice by imaging the containers with an MRI machine. The images are vital in helping them check and refine their die packing models.

The experiment, which is reported in the May 3 issue of *Physical Review Letters*, confirms recent calculations predicting efficient packing. Such packing problems are related to understanding many other problems including liquids seeping through soils, the flow of granular materials like sand and gravel, dense storage of information in digital memory, and even determining the best shapes for packaging consumer products like medicine tablets and candies.

Daan Frankel of the University of Cambridge discusses the tetrahedral packing experiment and related research in a Viewpoint article appearing in the current edition of APS Physics.

Story Source:

Adapted from materials provided by American Physical Society, via EurekAlert!, a service of AAAS.

Journal References:

1. Alexander Jaoshvili, Andria Esakia, Massimo Porrati, Paul M. Chaikin. **Experiments on the Random Packing of Tetrahedral Dice**. *Physical Review Letters*, 2010; 104 (18): 185501 DOI: 10.1103/PhysRevLett.104.185501
2. Daan Frenkel. **The tetrahedral dice are cast %u2026 and pack densely**. *Physics*, 2010; 3: 37 DOI: 10.1103/Physics.3.37

http://www.sciencedaily.com/releases/2010/05/100504215932.htm

Salad Spinner Useful to Separate Blood Without Electricity in Developing Countries

Rice University students Lauren Theis, left, and Lila Kerr created the Sally Centrifuge as part of a class on global health, and will take it overseas this summer for testing in developing countries. (Credit: Jeff Fitlow/Rice University)

ScienceDaily (May 5, 2010) — A simple salad spinner will save lives this summer, if everything goes as planned by two Rice University undergraduates.

The spinner has been turned, so to speak, into a rudimentary centrifuge that medical clinics in developing countries can use to separate blood without electricity.

Rice sophomore Lila Kerr and freshman Lauren Theis will take their Sally Centrifuge abroad for nearly two months this summer as part of Beyond Traditional Borders (BTB), Rice's global health initiative that brings new ideas and technologies to underdeveloped countries. Kerr will take a spinner to Ecuador in late May, Theis will take one to Swaziland in early June and a third BTB team will take one to Malawi, also in June. Such field testing is important to Rice students as they develop a range of tools to enhance global health.

Kerr and Theis are minoring in global health technologies and took the Introduction to Bioengineering and World Health class taught by Rebecca Richards-Kortum, Rice's Stanley C. Moore Professor, chair of the Department of Bioengineering and director of Rice 360˚: Institute for Global Health Technologies.

"There was a whole range of projects to take on this year, and luckily we got one that wasn't terribly engineering-intensive," said Kerr, a sociology major from Dayton, Ohio.

"We were essentially told we need to find a way to diagnose anemia without power, without it being very costly and with a portable device," added Theis, a political science major and native of San Antonio, Texas.

They found that a salad spinner met those criteria. When tiny capillary tubes that contain about 15 microliters of blood are spun in the device for 10 minutes, the blood separates into heavier red blood cells and lighter plasma. The hematocrit, or ratio of red blood cells to the total volume, measured with a gauge held up to the tube, can tell clinicians if a patient is anemic. That detail is critical for diagnosing malnutrition, tuberculosis, HIV/AIDS and malaria.

"The students really did an amazing job of taking very simple, low-cost materials and creating a device their research shows correlates nicely with hematocrit levels in the blood," said Maria Oden, professor in the practice of engineering education and director of Rice's Oshman Engineering Design Kitchen (OEDK). She was the team's co-adviser with Richards-Kortum. "Many of the patients seen in developing

world clinics are anemic, and it's a severe health problem. Being able to diagnose it with no power, with a device that's extremely lightweight, is very valuable," she said.

Kerr said the device spins tubes at up to 950 rpm. Results with the push-pump spinner compare favorably to those obtained with the ZIPocrit, a miniature, battery-powered centrifuge used as part of Rice's Lab-in-a-Backpack project. The ZIPocrit spins up to 10,000 rpm and completes its task in four to five minutes.

But the manual Sally Centrifuge, named in honor of a landmark known as the Sallyport on the Rice campus, has other advantages.

First, it requires no electricity -- just a bit of muscle. "We've pumped it for 20 minutes with no problem," Theis said. "Ten minutes is a breeze."

Second, it can spin up to 30 tubes at a time versus the ZIPocrit's maximum of four.

Third, it has proven to be fairly robust. "It's all plastic and pretty durable," Kerr said. "We haven't brought it overseas yet, of course, but we've trekked it back and forth across campus in our backpacks and grocery bags and it's held up fine."

The centrifuge, assembled using plastic lids, cut-up combs, yogurt containers and a hot-glue gun, costs about $30 in parts, including the spinner. The students expect to continue work on the device after their summer treks.

Story Source:

Adapted from materials provided by Rice University.

http://www.sciencedaily.com/releases/2010/05/100503135713.htm

Aboriginal Hunting and Burning Increase Australia's Desert Biodiversity, Researchers Find

Martu hunter Burchell Taylor burns a clump of spinifex grass to reveal lizard burrows in Australia's Western Desert. (Credit: Rebecca Bird)

ScienceDaily (May 5, 2010) — In Australia, Martu hunter-gatherers light fires to expose the hiding places of their prey: monitor lizards called goanna that can grow up to 6 feet long. These generations-old hunting practices, part of the Martu day-to-day routine, have reshaped Australia's Western Desert habitats, according to Stanford University anthropologists Douglas and Rebecca Bird.

"Martu" refers to a group of about 800 indigenous Australians from eight dialect-groups that inhabit the Western Desert. For 10 years, the Birds have been investigating Martu hunting strategies and their lasting environmental impacts. With support from the Woods Institute for the Environment at Stanford, the researchers have begun to explore what makes aboriginal hunting grounds molded by fire more biologically diverse than lands untouched by humans.

"The results of our work will be used to assist conservation efforts and joint indigenous land management policy in the Western Desert," said Douglas Bird, an assistant professor (research) of anthropology and principal investigator on the Woods Institute Environmental Venture Projects grant.

In many cases, humans aren't the wrench in nature's gears but an important piece of the clockwork, he added. And because so much of Australia's Western Desert, from lizards to shrubs, revolves around Martu practices, conservation efforts will succeed only if they incorporate traditional goanna-hunting practices, he said.

"We're trying to demonstrate what would happen if you did pull people off the landscape," he said. "What happens when you break all of these co-evolutionary links between people who've lived on the landscape for thousands of years and the diversity of the faunal and floral community?"

Martu life

Martu life revolves around hunting and fire, Douglas Bird explained. Martu inherit ritual duties that correspond to certain tracts of desert called "estates." An important part of this inheritance is the knowledge of when and where to light smoldering brush fires. Martu never start blazes without knowing every nook and cranny of a territory and often forgo campfires when traveling through foreign estates, he said.

"You never burn unless you're with someone who has all of that knowledge about that estate," he added. "If your fire were to threaten one of those totemic spots where they keep all their religious paraphernalia associated with these rituals, it's technically punishable by death."

The middle-aged and elderly women who typically hunt for goanna can spot the animal's burrows and tracks better in burn scars than in thick spinifex grass, explained Rebecca Bird, an associate professor of anthropology. Burning desert in about 55-acre chunks, the hunters make their grounds a patchwork quilt of recently burnt earth and recovering vegetation. These scars are much smaller than those left by lightning wildfires, which char an average of 2,000 acres.

Burning back grasses and other fire-prone plants encourages the growth of a diverse range of annual vegetation, she said. The variable turf of Martu hunting grounds allows small mammals to find plenty of places to hide from predators, she added, while areas free of human burning lack this patchwork quality and are home to fewer plants and animals.

"The thing that anthropogenic fire does is rearrange the landscape variation into smaller and smaller bits," said project collaborator James Holland Jones, an assistant professor of anthropology and a Woods Institute center fellow. "It happens to be the scale that animals, plants and people work at."

While Martu families believe strongly in preserving their lands and know all the animals and plants that benefit from burning, their fires are, first and foremost, tools for nabbing goanna meat.

"Martu don't think of it as, 'We apply fire in order to promote the future long-term biodiversity,'" Douglas Bird said. "They can talk about all those effects, but that's not what maintains the system."

To determine the impact of Martu hunting practices over time, the research team is searching the geologic record for evidence of burning thousands of years into the past. The researchers also will recreate the diversity of historic plant communities using molecular clues hidden in animal remains.

Conserving Australia's deserts

Despite growing awareness of the role that fire plays in wild space, many Australians have been slow to accept Martu burning practices, Rebecca Bird said. "They see it as a destructive force. It's in line with the thinking of most ecologists who view humans as a disturbance of the natural equilibrium," she said. "The Martu perspective is much more that humans are part of it all."

Most Australian conservationists have only paid lip service to Martu hunters, Douglas Bird noted. But desert conservation programs won't work unless they include an understanding of Aboriginal fire, he said. And because hunting is so central their culture, Martu men and women will only accept land-management practices that are compatible with their day-to-day subsistence.

"When you're drafting a fire-management program for a national park, if it's not done with respect to the actual practice of folks and the tradeoffs people face on a daily basis, then those prescriptions are disregarded," he said.

To bring Aboriginal representatives into a true dialogue on land management, a delegation from the Western Desert will meet with researchers on the Stanford campus in 2011 or 2012. The Birds and Martu leaders also will host an international conference for anthropologists and ecologists in Australia in 2011

on the role of fire in hunter-gatherer communities and ecosystems. A goal of the conference is to communicate that "indigenous knowledge is not different from scientific knowledge," Rebecca Bird said.

"Through generations of hunting for goanna, Martu appreciate fire for what it can be: a tool for shaping human communities as well as the natural world," she said. "They see the burned areas as beautiful. They say, 'It's safe. There are no snakes, no nasty things living here now that we've cleaned it up.'"

Other Stanford collaborators on the Woods Institute Environmental Venture Projects grant are Page Chamberlain, professor of environmental Earth system science; Tadashi Fukami, assistant professor of biology; and Katherine Maher, assistant professor of geological and environmental sciences.

Story Source:

Adapted from materials provided by Stanford University. Original article written by Daniel Strain.

http://www.sciencedaily.com/releases/2010/05/100503174030.htm

The Elitzur-Vaidman bomb-tester

- 07 May 2010
- Magazine issue 2759.

Could a single photon of light trigger a bomb? (Image: Henning Buchholz / stock.xchng)

A BOMB triggered by a single photon of light is a scary thought. If such a thing existed in the classical world, you would never even be aware of it. Any photon entering your eye to tell you about it would already have set off the bomb, blowing you to kingdom come.

With quantum physics, you stand a better chance. According to a scheme proposed by the Israeli physicists Avshalom Elitzur and Lev Vaidman in 1993, you can use quantum trickery to detect a light-triggered bomb with light - and stay safe a guaranteed 25 per cent of the time (*Foundations of Physics*, vol 23, p 987).

The secret is a device called an interferometer. It exploits the quantumly weird fact that, given two paths to go down, a photon will take both at once. We know this because, at the far end of the device, where the two paths cross once again, a wave-like interference pattern is produced (see "Quantum wonders: Corpuscles and buckyballs").

To visualise what is going on, think of a photon entering the interferometer and taking one path while a ghostly copy of itself goes down the other. In Elitzur and Vaidman's thought experiment, half the time there is a photon-triggered bomb blocking one path (see diagram). Only the real photon can trigger the bomb, so if it is the ghostly copy that gets blocked by the bomb, there is no explosion - and nor is there an interference pattern at the other end. In other words, we have "seen" the bomb without triggering it.

The computer retains a semblance of classical decency: to deliver a sensible answer, it must be switched on

Barely a year after Elitzur and Vaidman proposed their bomb-testing paradox, physicists at the University of Vienna, Austria, had brought it to life - not by setting off bombs, but by bouncing photons off mirrors (*Physical Review Letters*, vol 74, p 4763).

In 2000, Shuichiro Inoue and Gunnar Bjork of the Royal Institute of Technology in Stockholm, Sweden, used a similar technique to show that you could get an image of a piece of an object without shining light on it - something that could revolutionise medical imaging. "It would be very useful for something like X-ray scanning, if there were no radiation damage to the tissue because no X-rays actually hit it," says physicist Richard Jozsa of the University of Cambridge.

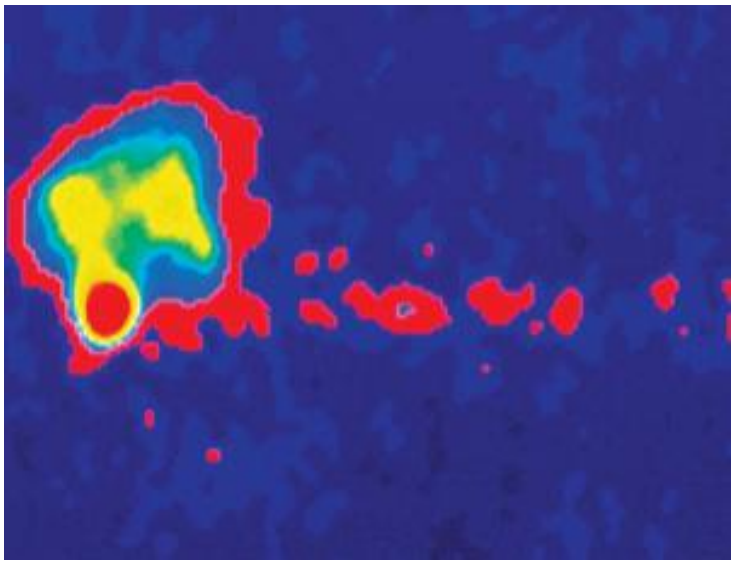
Josza is the brains behind perhaps the most eye-rubbing of such tricks: using a quantum computer to deliver the output of a program even when you don't run the program. As the team that implemented his idea in 2005 showed, quantum physics does at least retain some semblance of classical decency: to deliver a sensible answer, the computer does need to be switched on (*Nature*, vol 439, p 949).

http://www.newscientist.com/article/mg20627596.400-quantum-wonders-the-elitzurvaidman-bombtester.html

Baffling quasar alignment hints at cosmic strings

- 07 May 2010 by **Anil Ananthaswamy**

Magazine issue 2759.



Strung out in space (Image: NRAO/AUI/NSF/SPL)

SOMETHING has made neighbouring quasars in the distant universe point in a similar direction when their orientations ought to be random. Could this be the signature of cosmic strings - gigantic kinks in the fabric of space-time?

In 2005, Damien Hutsemekers at the University of Liège, Belgium, and colleagues reported an unusual effect in observations of 355 quasars. They found that light from these quasars tended to be polarised, with the electromagnetic oscillations confined to a particular plane that can be described by a polarisation vector. Though there is no obvious reason to think these vectors should be oriented in a special way from one quasar to the next, Hutsemekers's team found that the orientations were not random. If they took any two adjacent quasars, the polarisation vectors pointed in much the same direction.

If they looked at any two adjacent quasars, the light from each was polarised in much the same direction

What's more, as the team looked at ever more distant quasars, they saw this vector rotate by about 30 degrees with every 3.26 billion light years from Earth. The vector turned clockwise when they looked in the direction of the north galactic pole of the Milky Way and anticlockwise looking towards the south pole (arxiv.org/abs/astro-ph/0507274v1).

Last year, the team showed that the direction of the polarisation vector is correlated with the axis of rotation of the quasar itself. That means that adjacent quasars tend to have roughly the same orientation - again, not something anyone would have expected to see.

Now, Robert Poltis and Dejan Stojkovic of the State University of New York in Buffalo say they have an explanation. It's all down to events that occurred about 10^{-12} seconds after the big bang. At that time the universe went through a phase transition, causing the electroweak force to separate into the electromagnetic force and the weak nuclear force. The standard model of particle physics suggests that this would also have resulted in the formation of cosmic strings, which are topological defects in the fabric of space-time and can take the form of giant loops.

Cosmic strings can cause magnetic fields to form along their lengths, says Poltis. The strings are unstable and quickly decay, but the magnetic fields remain and would have become stretched to cosmological scales as the universe expanded.

Poltis and Stojkovic modelled how two giant loops of magnetic field lines could affect galaxies as they formed. A proto-galaxy contains charged particles - electrons and hydrogen ions - which acquire angular momentum from the magnetic field. The net effect is that the proto-galaxy acquires an overall angular momentum, aligning its axis in a certain direction. Two neighbouring proto-galaxies forming in the vicinity of the same magnetic field would end up with their axes pointing in the same direction.

The researchers also showed how the twisting of the magnetic field lines on cosmic scales could cause the axes of quasars to rotate the further out you look (arxiv.org/abs/1004.2704).

"This explanation can indeed reproduce our observations quite well, even the possible rotation of the polarisation angle," says Hutsemekers. "Moreover, the possibility that the imprint of strings can be detected through the study of galaxy or quasar orientations is exciting."

http://www.newscientist.com/article/mg20627593.900-baffling-quasar-alignment-hints-at-cosmic-strings.html

Quantum wonders: Something for nothing

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Come together (Image: Fiona Schweers/stock.xchng)

"NOTHING will come of nothing," King Lear admonishes Cordelia in the eponymous Shakespeare play. In the quantum world, it's different: there, something comes of nothing and moves the furniture around.

Specifically, if you place two uncharged metal plates side by side in a vacuum, they will move towards each other, seemingly without reason. They won't move a lot, mind. Two plates with an area of a square metre placed one-thousandth of a millimetre apart will feel a force equivalent to just over a tenth of a gram.

The Dutch physicist Hendrik Casimir first noted this minuscule movement in 1948. "The Casimir effect is a manifestation of the quantum weirdness of the microscopic world," says physicist Steve Lamoreaux of Yale University.

It has to do with the quantum quirk known as Heisenberg's uncertainty principle, which essentially says the more we know about some things in the quantum world, the less we know about others. You can't, for instance, deduce the exact position and momentum of a particle simultaneously. The more certain we are of where a particle is, the less certain we are of where it is heading.

A similar uncertainty relation exists between energy and time, with a dramatic consequence. If space were ever truly empty, it would contain exactly zero energy at a precisely defined moment in time - something the uncertainty principle forbids us from knowing.

It follows that there is no such thing as a vacuum. According to quantum field theory, empty space is actually fizzing with short-lived stuff that appears, looks around a bit, decides it doesn't like it and disappears again, all in the name of preventing the universe from violating the uncertainty principle. For the most part, this stuff is pairs of photons and their antiparticles that quickly annihilate in a puff of energy. The tiny electric fields caused by these pop-up particles, and their effect on free electrons in metal plates, might explain the Casimir effect.

Or they might not. Thanks to the uncertainty principle, the electric fields associated with the atoms in the metal plates also fluctuate. These variations create tiny attractions called van der Waals forces between the atoms. "You can't ascribe the Casimir force solely either to the zero point of the vacuum or to the zero point motion of the atoms that make up the plates," says Lamoreaux. "Either view is correct and arrives at the same physical result."

Whichever picture you adopt, the Casimir effect is big enough to be a problem. In nanoscale machines, for example, it could cause components in close proximity to stick together.

The way to avoid that might be simply to reverse the effect. In 1961, Russian physicists showed theoretically that combinations of materials with differing Casimir attractions can create scenarios where the overall effect is repulsion. Evidence for this strange "quantum buoyancy" was announced in January 2009 by physicists from Harvard University who had set up gold and silica plates separated by the liquid bromobenzene (*Nature*, vol 457, p 170).

http://www.newscientist.com/article/mg20627596.300-quantum-wonders-something-for-nothing.html

Quantum wonders: Corpuscles and buckyballs

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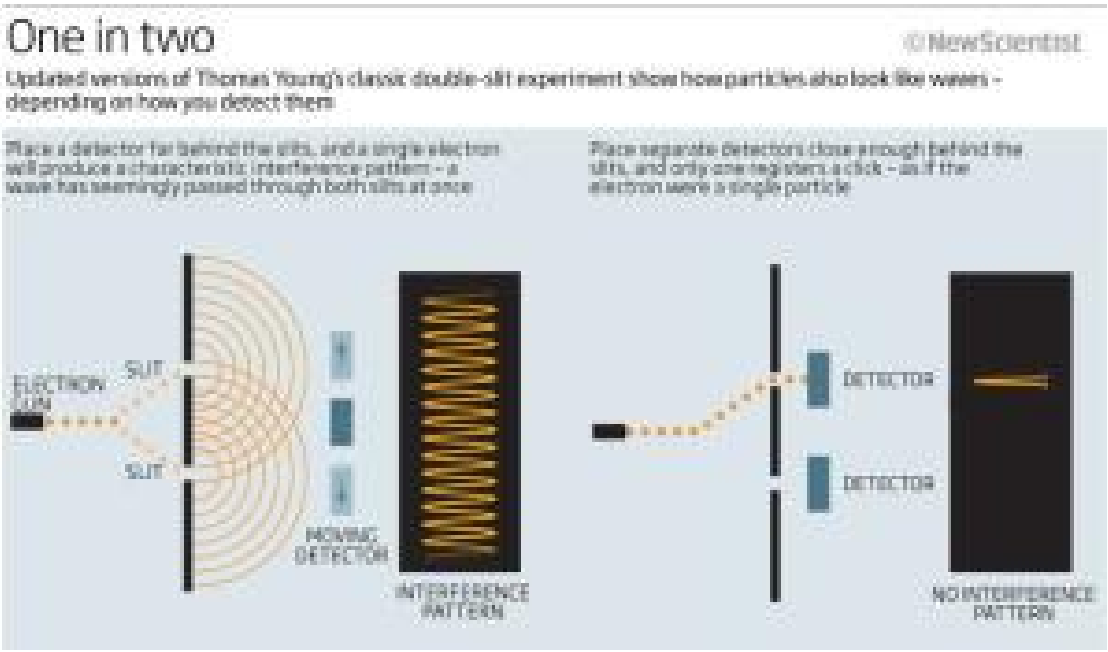

One in two

IT DOES not require any knowledge of quantum physics to recognise quantum weirdness. The oldest and grandest of the quantum mysteries relates to a question that has exercised great minds at least since the time of the ancient Greek philosopher Euclid: what is light made of?

History has flip-flopped on the issue. Isaac Newton thought light was tiny particles - "corpuscles" in the argot of the day. Not all his contemporaries were impressed, and in classic experiments in the early 1800s the polymath Thomas Young showed how a beam of light diffracted, or spread out, as it passed through two narrow slits placed close together, producing an interference pattern on a screen behind just as if it were a wave.

So which is it, particle or wave? Keen to establish its reputation for iconoclasm, quantum theory provided an answer soon after it bowled onto the scene in the early 20th century. Light is both a particle and a wave - and so, for that matter, is everything else. A single moving particle such as an electron can diffract and interfere with itself as if it were a wave, and believe it or not, an object as large as a car has a secondary wave character as it trundles along the road.

That revelation came in a barnstorming doctoral thesis submitted by the pioneering quantum physicist Louis de Broglie in 1924. He showed that by describing moving particles as waves, you could explain why they had discrete, quantised energy levels rather than the continuum predicted by classical physics.

De Broglie first assumed that this was just a mathematical abstraction, but wave-particle duality seems to be all too real. Young's classic wave interference experiment has been reproduced with electrons and all manner of other particles (see diagram).

Both waves and particles might be just constructs of our mind to facilitate everyday talking

We haven't yet done it with a macroscopic object such as a moving car, admittedly. Its de Broglie wavelength is something like 10^{-38} metres, and making it do wave-like things such as diffract would mean creating something with slits on a similar scale, a task way beyond our engineering capabilities. The experiment has been performed, though, with a buckyball - a soccer-ball-shaped lattice of 60 carbon atoms that, at about a nanometre in diameter, is large enough to be seen under a microscope (*Nature*, vol 401, p 680).

All that leaves a fundamental question: how can stuff be waves and particles at the same time? Perhaps because it is neither, says Markus Arndt of the University of Vienna, Austria, who did the buckyball experiments in 1999. What we call an electron or a buckyball might in the end have no more reality than a click in a detector, or our brain's reconstruction of photons hitting our retina. "Wave and particle are then just constructs of our mind to facilitate everyday talking," he says.

http://www.newscientist.com/article/mg20627596.100-quantum-wonders-corpuscles-and-buckyballs.html

The Hamlet effect

- 06 May 2010
- Magazine issue 2759.

Boiling, maybe (Image: OJO Images / Rex Features)

A WATCHED pot never boils." Armed with common sense and classical physics, you might dispute that statement. Quantum physics would slap you down. Quantum watched pots do refuse to boil - sometimes. At other times, they boil faster. At yet other times, observation pitches them into an existential dilemma whether to boil or not.

This madness is a logical consequence of the Schrödinger equation, the formula concocted by Austrian physicist Erwin Schrödinger in 1926 to describe how quantum objects evolve probabilistically over time.

Imagine, for example, conducting an experiment with an initially undecayed radioactive atom in a box. According to the Schrödinger equation, at any point after you start the experiment the atom exists in a mixture, or "superposition", of decayed and undecayed states.

Each state has a probability attached that is encapsulated in a mathematical description known as a wave function. Over time, as long as you don't look, the wave function evolves as the probability of the decayed state slowly increases. As soon as you do look, the atom chooses - in a manner in line with the wave function probabilities - which state it will reveal itself in, and the wave function "collapses" to a single determined state.

This is the picture that gave birth to Schrödinger's infamous cat. Suppose the radioactive decay of an atom triggers a vial of poison gas to break, and a cat is in the box with the atom and the vial. Is the cat both dead and alive as long as we don't know whether the decay has occurred?

We don't know. All we know is that tests with larger and larger objects - including, recently, a resonating metal strip big enough to be seen under a microscope - seem to show that they really can be induced to adopt two states at once (*Nature*, vol 464, p 697).

The weirdest thing about all this is the implication that just looking at stuff changes how it behaves. Take the decaying atom: observing it and finding it undecayed resets the system to a definitive state, and the Schrödinger-equation evolution towards "decayed" must start again from scratch.

The corollary is that if you keep measuring often enough, the system will never be able to decay. This possibility is dubbed the quantum Zeno effect, after the Greek philosopher Zeno of Elea, who devised a famous paradox that "proved" that if you divided time up into ever smaller instants you could make change or motion impossible.

And the quantum Zeno effect does happen. In 1990, researchers at the National Institute of Standards and Technology in Boulder, Colorado, showed they could hold a beryllium ion in an unstable energy configuration rather akin to balancing a pencil on its sharpened point, provided they kept re-measuring its energy (*Physical Review A*, vol 41, p 2295).

The converse "anti-Zeno" effect - making a quantum pot boil faster by just measuring it - also occurs. Where a quantum object has a complex arrangement of states to move into, a decay into a lower-energy state can be accelerated by measuring the system in the right way. In 2001, this too was observed in the lab (*Physical Review Letters*, vol 87, p 040402).

The third trick is the "quantum Hamlet effect", proposed last year by Vladan Pankovic of the University of Novi Sad, Serbia. A particularly intricate sequence of measurements, he found, can affect a system in such a way as to make the Schrödinger equation for its subsequent evolution intractable. As Pankovic puts it: to be decayed or not-decayed, "that is the analytically unsolvable question".

http://www.newscientist.com/article/mg20627596.200-quantum-wonders-the-hamlet-effect.html

Spooky action at a distance

- 08 May 2010
- Magazine issue 2759.

Entanglement poses a serious challenge to our view of the world (Image: Allan Baxter / The Image Bank / Getty)

ERWIN SCHRÖDINGER called it the "defining trait" of quantum theory. Einstein could not bring himself to believe in it at all, thinking it proof that quantum theory was seriously buggy. It is entanglement: the idea that particles can be linked in such a way that changing the quantum state of one instantaneously affects the other, even if they are light years apart.This "spooky action at a distance", in Einstein's words, is a serious blow to our conception of how the world works. In 1964, physicist John Bell of the European Organization for Nuclear Research (CERN) in Geneva, Switzerland, showed just how serious. He calculated a mathematical inequality that encapsulated the maximum correlation between the states of remote particles in experiments in which three "reasonable" conditions hold: that experimenters have free will in setting things up as they want; that the particle properties being measured are real and pre-existing, not just popping up at the time of measurement; and that no influence travels faster than the speed of light, the cosmic speed limit.

As many experiments since have shown, quantum mechanics regularly violates Bell's inequality, yielding levels of correlation way above those possible if his conditions hold. That pitches us into a philosophical dilemma. Do we not have free will, meaning something, somehow predetermines what measurements we take? That is not anyone's first choice. Are the properties of quantum particles not real - implying that nothing is real at all, but exists merely as a result of our perception? That's a more popular position, but it hardly leaves us any the wiser.

Or is there really an influence that travels faster than light? Cementing the Swiss reputation for precision timing, in 2008 physicist Nicolas Gisin and his colleagues at the University of Geneva showed that, if reality and free will hold, the speed of transfer of quantum states between entangled photons held in two villages 18 kilometres apart was somewhere above 10 million times the speed of light (*Nature*, vol 454, p 861).Whatever the true answer is, it will be weird. Welcome to quantum reality.

http://www.newscientist.com/article/mg20627596.500-quantum-wonders-spooky-action-at-a-distance.html

The field that isn't there

- 08 May 2010
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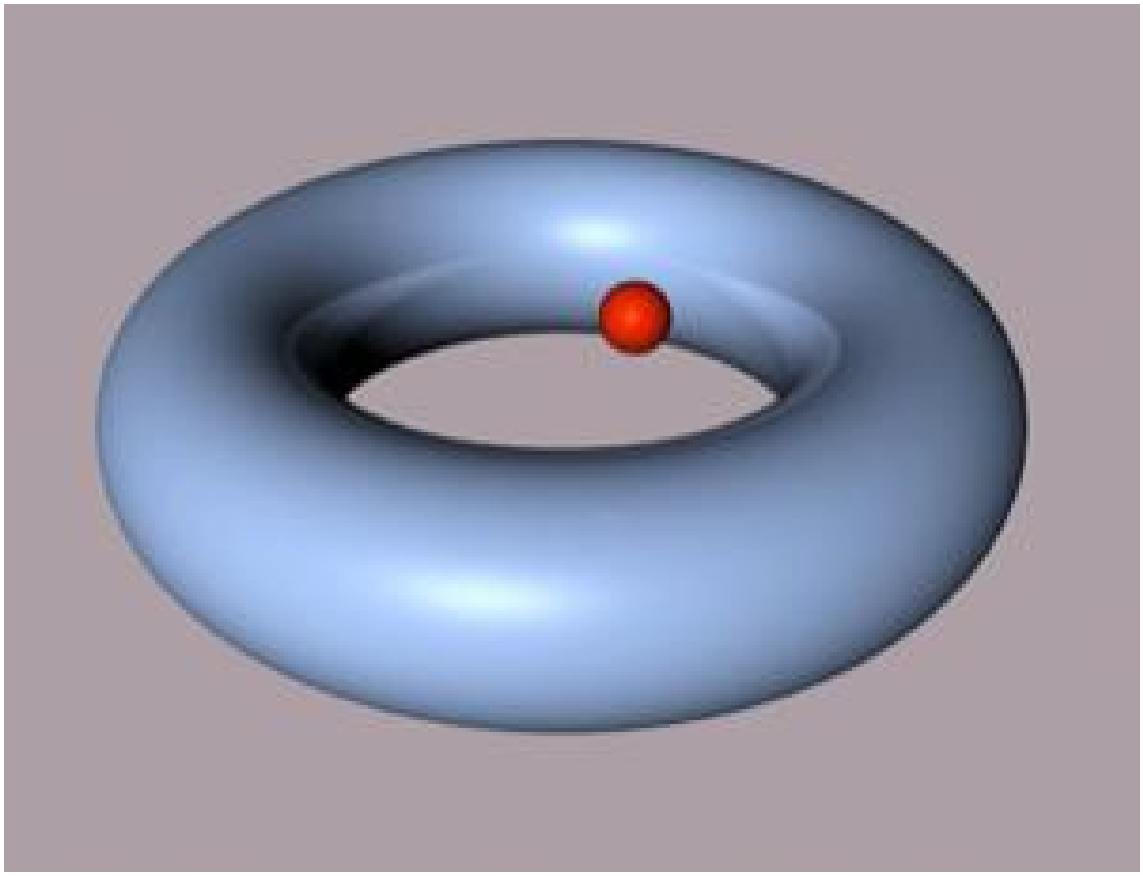


It starts with a doughnut-shaped magnet...

HERE'S a nice piece of quantum nonsense. Take a doughnut-shaped magnet and wrap a metal shield round its inside edge so that no magnetic field can leak into the hole. Then fire an electron through the hole.

There is no field in the hole, so the electron will act as if there is no field, right? Wrong. The wave associated with the electron's movement suffers a jolt as if there were something there.

Werner Ehrenberg and Raymond Siday were the first to note that this behaviour lurks in the Schrödinger equation (see "Quantum wonders: The Hamlet effect "). That was in 1949, but their result remained unnoticed. Ten years later Yakir Aharonov and David Bohm, working at the University of Bristol in the UK, rediscovered the effect and for some reason their names stuck.

So what is going on? The Aharonov-Bohm effect is proof that there is more to electric and magnetic fields than is generally supposed. You can't calculate the size of the effect on a particle by considering just the properties of the electric and magnetic fields where the particle is. You also have to take into account the properties where it isn't.

Casting about for an explanation, physicists decided to take a look at a property of the magnetic field known as the vector potential. For a long time, vector potentials were considered just handy mathematical tools - a shorthand for electrical and magnetic properties that didn't have any real-world significance. As it turns out, they describe something that is very real indeed.

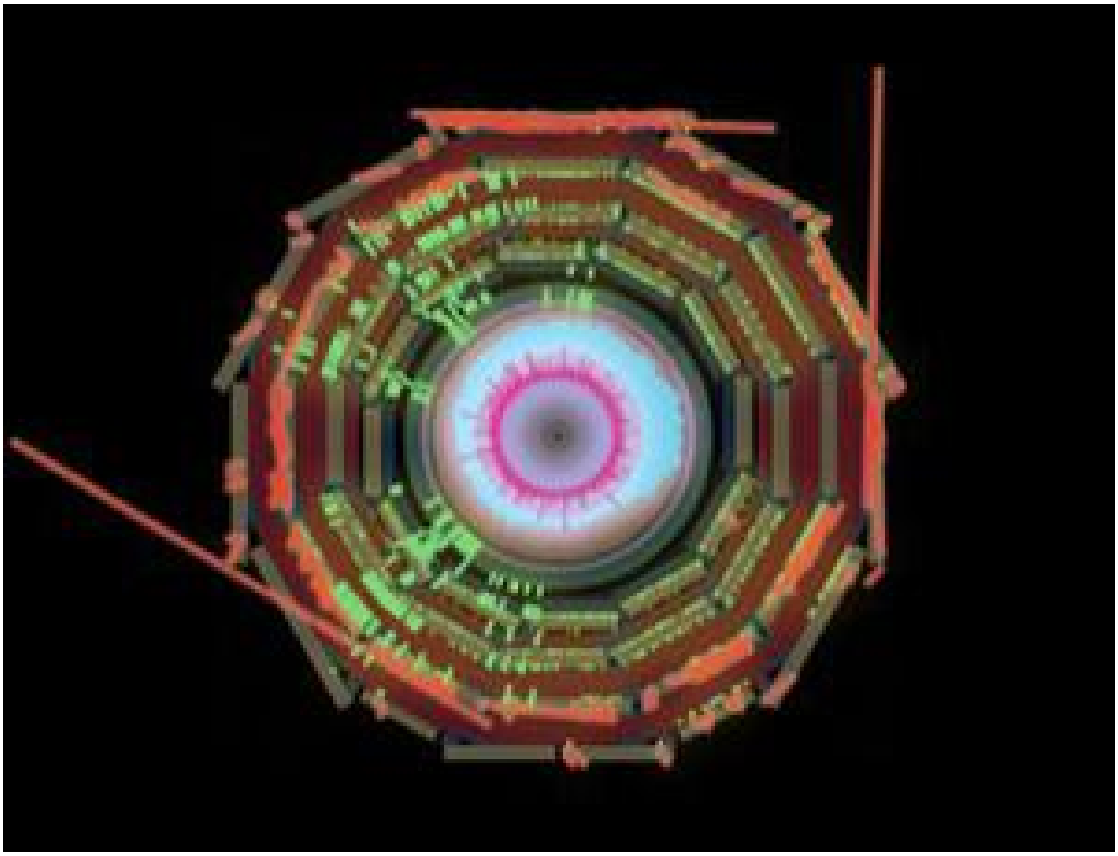
The Aharonov-Bohm effect showed that the vector potential makes an electromagnetic field more than the sum of its parts. Even when a field isn't there, the vector potential still exerts an influence. That influence was seen unambiguously for the first time in 1986 when Akira Tonomura and colleagues in Hitachi's laboratories in Tokyo, Japan, measured a ghostly electron jolt (*Physical Review Letters*, vol 48, p 1443).

Although it is far from an everyday phenomenon, the Aharonov-Bohm effect might prove to have uses in the real world - in magnetic sensors, for example, or field-sensitive capacitors and data storage buffers for computers that crunch light.

http://www.newscientist.com/article/mg20627596.600-quantum-wonders-the-field-that-isnt-there.html

Quantum wonders: Superfluids and supersolids

- 09 May 2010
- Magazine issue 2759.



Particle collisions at the LHC's CMS experiment (Image: CMS Collaboration/CERN)

FORGET radioactive spider bites, exposure to gamma rays, or any other accident favoured in Marvel comics: in the real world, it's quantum theory that gives you superpowers.

Take helium, for example. At room temperature, it is normal fun: you can fill floaty balloons with it, or inhale it and talk in a squeaky voice. At temperatures below around 2 kelvin, though, it is a liquid and its atoms become ruled by their quantum properties. There, it becomes super-fun: a superfluid.

At room temperature, helium is normal fun. Close to absolute zero, though, it becomes super-fun

Superfluid helium climbs up walls and flows uphill in defiance of gravity. It squeezes itself through impossibly small holes. It flips the bird at friction: put superfluid helium in a bowl, set the bowl spinning, and the helium sits unmoved as the bowl revolves beneath it. Set the liquid itself moving, though, and it will continue gyrating forever.

That's fun, but not particularly useful. The opposite might be said of superconductors. These solids conduct electricity with no resistance, making them valuable for transporting electrical energy, for creating enormously powerful magnetic fields - to steer protons around CERN's Large Hadron Collider, for instance - and for levitating superfast trains.

We don't yet know how all superconductors work, but it seems the uncertainty principle plays a part (see "Quantum wonders: Something for nothing"). At very low temperatures, the momentum of individual atoms or electrons in these materials is tiny and very precisely known, so the position of each atom is highly uncertain. In fact, they begin to overlap with each other to the point where you can't describe them individually. They start acting as one superatom or superelectron that moves without friction or resistance.

All this is nothing in the weirdness stakes, however, compared with a supersolid. The only known example is solid helium cooled to within a degree of absolute zero and at around 25 times normal atmospheric pressure.

Under these conditions, the bonds between helium atoms are weak, and some break off to leave a network of "vacancies" that behave almost exactly like real atoms. Under the right conditions, these vacancies form their own fluid-like Bose-Einstein condensate. This will, under certain circumstances, pass right through the normal helium lattice - meaning the solid flows, ghost-like, through itself.

So extraordinary is this superpower that Moses Chan and Eun-Seong Kim of Pennsylvania State University in University Park checked and re-checked their data on solid helium for four years before eventually publishing in 2004 (*Nature*, vol 427, p 225). "I had little confidence we would see the effect," says Chan. Nevertheless, researchers have seen hints that any crystalline material might be persuaded to perform such a feat at temperatures just a fraction above absolute zero. Not even Superman can do that.

http://www.newscientist.com/article/mg20627596.700-quantum-wonders-superfluids-and-supersolids.html

Quantum wonders: Nobody understands

- 09 May 2010
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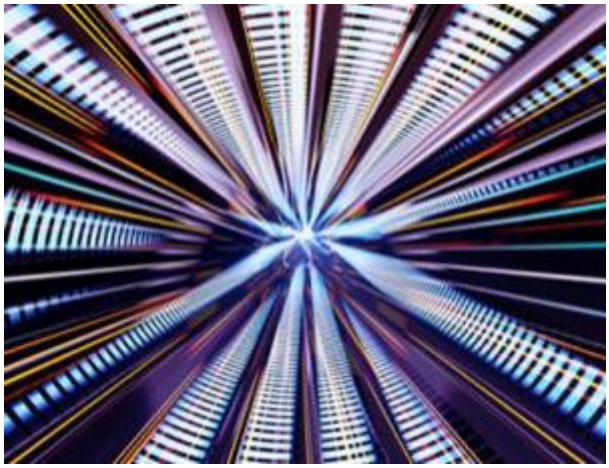


So what does it all tell us? (Image: Paul Cooklin/Brand X Pictures/Getty)

It is tempting, faced with the full-frontal assault of quantum weirdness, to trot out the notorious quote from Nobel prize-winning physicist Richard Feynman: "Nobody understands quantum mechanics."

It does have a ring of truth to it, though. The explanations attempted here use the most widely accepted framework for thinking about quantum weirdness, called the Copenhagen interpretation after the city in which Niels Bohr and Werner Heisenberg thrashed out its ground rules in the early 20th century.

With its uncertainty principles and measurement paradoxes, the Copenhagen interpretation amounts to an admission that, as classical beasts, we are ill-equipped to see underlying quantum reality. Any attempt we make to engage with it reduces it to a shallow classical projection of its full quantum richness.

Lev Vaidman of Tel Aviv University, Israel, like many other physicists, touts an alternative explanation. "I don't feel that I don't understand quantum mechanics," he says. But there is a high price to be paid for that understanding - admitting the existence of parallel universes.

In this picture, wave functions do not "collapse" to classical certainty every time you measure them; reality merely splits into as many parallel worlds as there are measurement possibilities. One of these carries you and the reality you live in away with it. "If you don't admit many-worlds, there is no way to have a coherent picture," says Vaidman.

Or, in the words of Feynman again, whether it is the Copenhagen interpretation or many-worlds you accept, "the 'paradox' is only a conflict between reality and your feeling of what reality ought to be".

http://www.newscientist.com/article/mg20627596.800-quantum-wonders-nobody-understands.html

Gene switch rejuvenates failing mouse brains

- 19:00 06 May 2010 by **Wendy Zukerman**
- For similar stories, visit the **The Human Brain** and **Genetics** Topic Guides

Step aside, Sudoku. A genetic switch that causes memory impairment in ageing mice when it goes into "off" mode has been flicked on, restoring failing brains to a more youthful state.

If a similar switch can be found in people, it might provide a new way to keep ageing human brains young.

Cognitive decline, particularly memory impairment, is a normal part of ageing in humans and animals. Yet why this happens, and how we can prevent it, is largely unknown, says David Sweatt at the University of Alabama, Birmingham, who was not involved in the new work.

André Fischer of the European Neuroscience Institute in Göttingen, Germany, and colleagues forced 3-month-old mice to find their way around a new environment and assessed them on their ability to associate an electric shock with a particular environment.

New neurons

The result was increased activity of a cluster of over 1500 genes which are known make proteins that are needed for the creation of new neurons – a process that is necessary for learning in humans and mice.

This boost in gene expression did not occur in 16-month-old mice given the same tasks: the activity of their genes changed only slightly. The mice also did worse than the young ones at spatial learning and memory tasks.

To uncover what prevents elderly mice getting this genetic boost, Fischer analysed the DNA found in neurons in the hippocampus of both old and young mice.

They found that when young mice are learning, a molecular fragment known as an acetyl group binds to a particular point on the histone protein that DNA wraps itself around – with the result that the cluster of learning and memory genes on the surrounding DNA ends up close to the acetyl group.

DNA 'on' switch

This acetyl "cap" was missing in the older mice that had been set the same tasks. From this, the team concludes that the cap acts as an "on" switch for the cluster of learning and memory genes: removing the cap switches off the genes.

Next, by injecting an enzyme known to encourage caps to bind to any kind of histone molecule, Fischer's team artificially flipped the switch to the on position in old mice. The acetyl group returned to the histone molecule and the mice's learning and memory performance became similar to that of 3-month-old mice.

Post-mortem brains

Fischer says that an as yet unpublished post-mortem analysis carried out by his team showed that the same area of the histone molecule is uncapped in the brains of people who had Alzheimer's disease. What's more, drugs that promote acetyl binding are currently being tested for their ability to treat cancer in people.

However, for these findings to be exploited to improve brain function in elderly people, new drugs would have to be created that make acetyl caps bind only to the specific area of the histone molecule required, so that other processes are not disrupted.

Even if this can be done, it is still not clear that such drugs would have the same benefits as the enzyme did for the mice in Fischer's experiment.

Sweatt also cautions that the newly discovered switch is probably not the only one needed to improve memory impairment. Similar "epigenetic" alterations to a large number of proteins surrounding DNA are likely to occur as a result of ageing in the human brain.

Molecular geneticist Ryszard Maleszka points out that it is still not clear why the switch flips off as we get older. One possibility is that it might help us cope with other cellular assaults that come with ageing, such as oxidative stress, he suggests, which would mean that switching it on might have damaging side effects.

"After all, an ageing animal approaching the limits of its lifespan doesn't need to burden its brain with lots of new memories," he says.

Journal reference: *Science* DOI: 10.1126/science.1186088

http://www.newscientist.com/article/dn18870-gene-switch-rejuvenates-failing-mouse-brains.html

First cancer vaccine approved for use in people

- 06 May 2010
- Magazine issue 2759.

THE latest weapon in the war on cancer is a patient's own cells. A prostate cancer vaccine that the US Food and Drug Administration rejected in 2007 has now won the regulator's approval, making it the first cancer vaccine to do so.

Provenge, made by Dendreon of Seattle, does not prevent or cure prostate cancer, which killed 27,000 men in the US last year and more than 10,000 in the UK in 2008. Rather, in its largest study yet, the therapy extended the lives of 512 people with aggressive prostate tumours by four months, compared with patients who did not receive it.

Administering Provenge involves harvesting a patient's immune cells and exposing them to a protein produced by prostate tumours. These "primed" cells are then re-injected into the patient, where they attack tumours.

Though modest, the latest result shows that harnessing the immune system is a viable way to fight cancer. Oncologist Philip Kantoff at the Dana-Farber Cancer Institute in Boston led the trial. He expects similar approaches to other cancers, such as melanoma, kidney cancer and lymphoma, to be approved in five to 10 years and that tweaks to Provenge will see it further extend people's lives.

http://www.newscientist.com/article/mg20627593.000-first-cancer-vaccine-approved-for-use-in-people.html?full=true&print=true

Trauma leaves its mark on immune system genes

- 15:18 06 May 2010 by **Jessica Hamzelou**

Can leave a traumatic imprint (Image: Joe Raedle/Getty)

Traumatic experiences can scar for life, both mentally and physically. Now it seems they even leave chemical marks on DNA – in areas responsible for immune functions and memory.

The result could help explain why people with post-traumatic stress disorder (PTSD), including some soldiers and victims of rape or earthquake, often have poorer physical health years later, as well as memory problems. It could also lead to a new method for diagnosing the disorder.

Sandro Galea and his team at Columbia University, New York, looked at blood samples from 23 people who had PTSD and 77 who didn't. Galea examined the samples to see if there were any notable differences in the levels of methyl groups that were attached to various genes.

Such "epigenetic" chemical changes don't change the genetic code, but can mean that a gene's function is increased or decreased, or switched on or off.

Weak immunity

The team identified a number of genes with altered methylation in people with PTSD – all of which were involved in immune function and brain cell development. This might explain why PTSD sufferers have weaker immune systems and poorer memories, says Galea.

What's more, the number of affected genes was linked to the number of traumatic events a person with PTSD had experienced. "We think that traumatic events induce methylation changes," says Galea.

The people with PTSD also had more antibodies to cytomegalovirus (CMV), a herpes virus that is present to some degree in most human populations. This indicates that their levels of CMV were higher, and greater CMV infection is associated with an ageing immune system.

"It is tempting to speculate that higher CMV antibodies observed in PTSD could be a hallmark of accelerated ageing features associated with psychological stress exposure," says Moisés Bauer at the Pontifical Catholic University of Rio Grande do Sul in Porto Alegre, Brazil.

Diagnosing trauma

Galea says he hopes his team's findings will help those with PTSD. For a start, changes in methylation might help diagnose the condition. "It's not implausible that epigenetic changes could provide a biomarker, a diagnostic tool for PTSD," he says.

"It will also help guide us on interventions," he says. Galea hopes to find a way of preventing the epigenetic changes in individuals who have recently experienced traumatic events. Bauer agrees: "Drugs targeting DNA methylation profiles will be of clinical interest for PTSD."

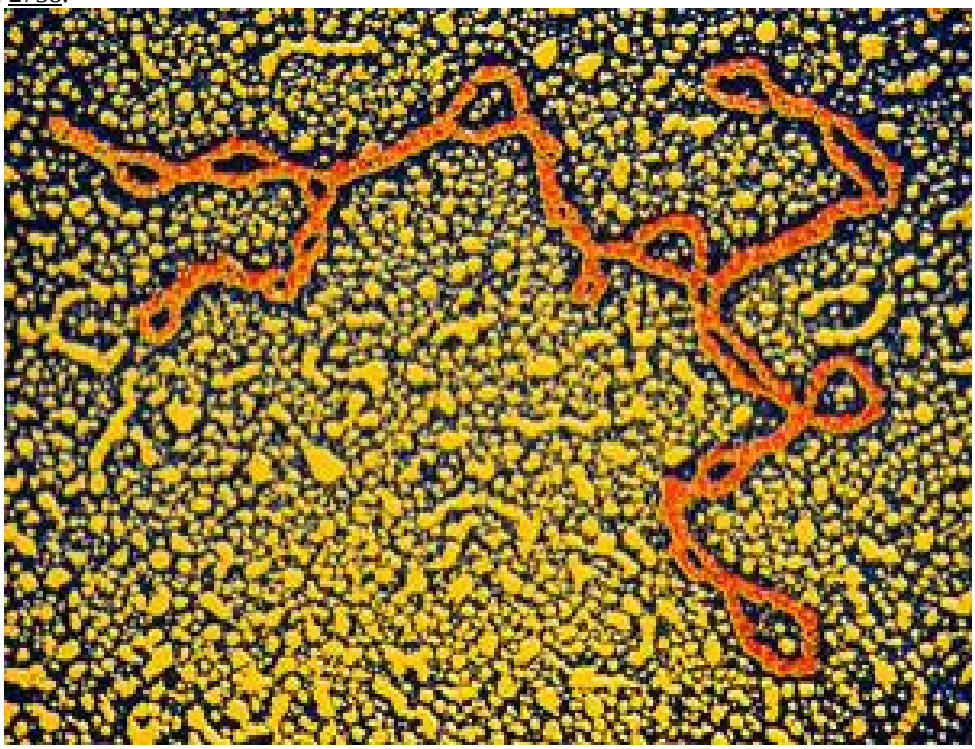
Journal reference: *Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.0910794107

http://www.newscientist.com/article/dn18865-trauma-leaves-its-mark-on-immune-system-genes.html

Cellular 'battery' is new source of stroke defence

- 05 May 2010 by **Linda Geddes**

Magazine issue 2758.



Circular DNA 5 to 6 micrometres long from a mitochondrion, the site of synthesis of chemical energy within the cell (Image: Alain Pol, ISM/Science Photo Library)

GENE hunters looking for the causes of strokes and other common diseases may have been looking in the wrong place. It seems that common mutations in the DNA of mitochondria, tiny structures that form the energy powerhouses of cells, may protect people against strokes, and play a role in Parkinson's and other complex diseases.

Until now mitochondrial DNA has only been associated with a few, rare disorders: catastrophic mutations can cause diseases such as MELAS, which results in muscle weakness and seizures. But recent studies have hinted that less problematic - but far more common - mitochondrial mutations might also be implicated in diseases with no obvious link to energy demand, including strokes.

Mitochondrial DNA varies from person to person, but humans can generally be divided into broad "haplogroups" on the basis of the combinations of mutations they possess. Patrick Chinnery at the University of Newcastle, UK, and his colleagues assigned haplogroups to 950 people who'd had strokes, 340 people with heart disease symptoms, and 2939 healthy volunteers, all of whom live in Oxfordshire, UK.

They found that among those people who'd had strokes, half as many belonged to haplogroup "K" as would be expected in the general population. The researchers conclude that K - which accounts for around 9 per cent of people of European ancestry - decreases the risk of stroke by 50 per cent compared with the other haplogroups. This makes it one of the best predictors of stroke risk identified so far - on a par with aggressively lowering blood pressure (*The Lancet Neurology*, DOI: 10.1016/S1474-4422(10)70083-1).

Belonging to the other haplogroups did not alter the risk of stroke and haplogroup K's protective effect didn't extend to heart disease.

The result could help explain why genome-wide association studies - which only look at nuclear DNA - have so far failed to identify new genes associated with stroke, says Chinnery. "Our findings indicate the importance of mitochondrial DNA as a genetic risk factor," he adds.

This could explain why genome-wide association studies have failed to identify new stroke genes

It is not clear how mitochondrial mutations offer stroke protection but Chinnery speculates that those found in haplogroup K might produce fewer reactive oxygen species, which are known to contribute to the blood vessel damage that leads to strokes.

The next step is to examine whether different groups within haplogroup K are better protected against strokes than others, and to work out what the protective mechanism is.

Other recent studies suggest a link between specific mitochondrial haplogroups and other complex disorders, including diabetes, Parkinson's and Alzheimer's, and the rate at which people with HIV develop AIDS. Some have even linked a haplogroup particularly prevalent among centenarians to longevity (*PLoS One*, DOI: 10.1371/journal.pone.0006423).

http://www.newscientist.com/article/mg20627584.500-cellular-battery-is-new-source-of-stroke-defence.html

Bugs will give us free power while cleaning our sewage

- 12:47 07 May 2010 by **Helen Knight**

Sustainable sewage (Image: Jonathan Hordle/Rex Features)

You might think a constant supply of fresh air would be essential for a sewage treatment plant, but some bacteria cannot stand the stuff. These bugs could be the key to cleaning waste water so efficiently that the process could generate power rather than consume it.

In conventional sewage plants, micro-organisms digest solid waste in "activated sludge". They convert the organic matter into methane but leave liquid waste containing ammonium and phosphates, which must be removed before the water can be poured into rivers.

Existing treatment plants use a lot of energy to get rid of the ammonium. The process uses bacteria that convert ammonium into nitrate, and the bugs that do this need oxygen, which must be constantly supplied to the treatment tanks by electric pumps. The nitrate is then converted into nitrogen gas by still more bugs, known as denitrifying bacteria. These require methanol, which must also be added to the mix.

This process consumes an average of 44 watt-hours per day for each person who adds waste to the sewage system. This can add up to megawatts in a big city.

Cut out the middle bug

But now Gijs Kuenen at Delft University of Technology in the Netherlands and colleagues are developing a technique that cuts out the energy-consuming processes. The key is a recently discovered type of bacteria that can munch ammonia without oxygen. So-called anammox bacteria short-cut the nitrogen cycle by converting ammonium directly into nitrogen gas.

One by-product of this process is methane, which Kuenen proposes to harvest and use as fuel. The team calculates that, far from consuming energy, the process could generate 24 watt-hours per person per day. "This is about trying to make waste water treatment plants completely sustainable, in the sense that they could even produce energy, which is not the case in present treatment facilities," says Kuenen.

This month the team will begin building a pilot plant to demonstrate the technology at the Dokhaven waste water treatment plant in Rotterdam, the Netherlands, working with from Radboud University Nijmegen and water purification firm Paques, based in the Dutch town of Balk.

Michael Wagner, a microbiologist at the University of Vienna in Austria, points out that anammox bacteria were discovered only 20 years ago and hold great promise for a new generation of sustainable waste water treatment plants. "The anammox story shows how fundamental discoveries by microbiologists can revolutionise waste water treatment," he says.

Journal reference: *Science*, DOI: 10.1126/science.1185941

http://www.newscientist.com/article/dn18872-bugs-will-give-us-free-power-while-cleaning-our-sewage.html

Designing leaves for a warmer, crowded world

- 05 May 2010 by **Linda Geddes**

Magazine issue 2759.

Time to tinker with nature (Image: Raul Touzon/National Geographic Stock)

FROM blades of grass to the cup-like fly-catcher of the pitcher plant, the diversity of leaf shapes, sizes and structures is stunning. It is also incredibly useful, allowing plants to live nearly everywhere on Earth, from the deserts of the western US to the lush shores of the Amazon. Now the precise molecular switches that control the process are being unpicked.

"We are at the stage of putting together a blueprint of the genetic program controlling leaf shape," says Andrew Fleming, a leaf researcher at the University of Sheffield, UK. "This opens the door to experiments whereby we can change leaf form in a targeted fashion." And it's not just about creating weird and wonderful leaf shapes at will. The findings could be the first step in the next green revolution, leading to a new generation of crops with dramatically increased yields. They could also be better adapted to surviving in a warmer world.

Because leaves are the main site of photosynthesis, they are ultimately the source of almost all food on the planet. By controlling the molecular basis of leaf shape, plant biologists may be able to enhance plants' ability to adapt to a changing environment without the protracted guesswork involved in selective breeding. "The question is: what does an optimal leaf look like and can we design one?" says Fleming.

Leaves are the main site of photosynthesis, and so are the source of almost all food on the planet

Over the past year, several landmark papers have been published that shed light on how different leaf patterns are generated. They reveal that the genes and molecules that guide leaf patterns are very similar across a wide variety of plants.

"More and more we're seeing that it's a combination of promoting and suppressing outgrowth," says Neelima Sinha at the University of California at Davis.

Sinha's group has discovered that a growth hormone called auxin - previously known to boost the growth of leaf veins - plays a key role in controlling leaf shape. They applied auxin to one edge of a tomato leaf and found that it lost its serrated pattern and grew indiscriminately. The auxin-free side of the leaf developed normally (*Development*, DOI: 10.1242/dev.033811).

Miltos Tsiantis of the University of Oxford and his colleagues have also shown that the shape of complex leaflets in *Cardamine hirsuta*, a relative of mustard, is dependent on the action of auxin at distinct points at the edges of developing leaves, and that inhibiting its action prevents leaflet formation (*Nature Genetics*, DOI: 10.1038/ng.189).

Meanwhile, Patrick Laufs at the French National Institute for Agricultural Research in Versailles has discovered "boundary" genes that are expressed in the small nook separating leaflets in pea, columbine, tomato and lamb's cress. The genes seem to inhibit the growth of leaf cells (*Science*, DOI: 10.1126/science.1166168). "If you remove them then the two outgrowths just flow into each other and become one," says Sinha. "By doing this kind of punctuated 'grow' 'don't grow' 'grow' signalling program, you can start to change its shape."

Other genes involved in different aspects of shape are also emerging. Fleming has identified one that seems to make flat leaves goblet-shaped by suppressing cell division in certain areas of the leaf. And Michael Lenhard of the University of Potsdam in Germany and his colleagues recently identified a key gene involved in controlling the size of leaves, petals and seeds (*Current Biology*, DOI: 10.1016/j.cub.2010.01.039). Overexpressing the gene in *Arabidopsis* creates larger leaves, flowers and seeds. Preliminary studies also suggest that it might increase grain size in oil seed rape.

This last point is key. Plants are adapted to the environments they grow in naturally, but these can be very different from farmed settings. Understanding how plants optimise light capture is important, says Sinha. Many of our crops are grown in dense conditions where shading can be an issue, for instance. The emerging research might lead to crops with bigger leaves, or help work out whether certain leaf shapes are better suited to capture light in shadier conditions.

Modifying shape and size can go a long way to increasing a plant's productivity, but it doesn't end there. Stomata are the small pores on leaves that regulate how much carbon dioxide and water moves in and out of leaves. Leaves convert CO_2 into sugars through photosynthesis (see "Tweak photosynthesis") and water is key to both the plant's temperature and ultimately its survival. Controlling whether stomata are open or shut and how many there are can therefore have a major impact on how well the leaf works.

Ikuko Hara-Nishimura at Kyoto University in Japan and her colleagues have found a gene called *stomagen* that increases the density of the pores. When they purified the protein it produces and applied it to *Arabidopsis* seedlings the leaves produced more stomata (*Nature*, DOI: 10.1038/nature08682).

As well as boosting yields by optimising the amount of CO_2 that plants can capture and therefore boosting the amount of sugars they produce, artificially manipulating stomata numbers may help create crops that are more resistent to drought or heat. Plants open their stomata to cool themselves down through transpiration, and close them to retain water. This suggests they may be able to adapt to climate change to some degree, but in extreme situations they may need a helping hand.

"One of the things people have been worrying about for some time now is if we take a global warming scenario, where CO_2 goes up and temperature goes up," says Dominique Bergmann of Stanford University in California. Plants naturally reduce stomata numbers in response to high CO_2 concentrations. But in doing so they might lose their ability to cool themselves, and overheat and die. "If stomata number is sensitive to a number of different environmental factors, they might not be able to uncouple those things in the time that they need to," says Bergmann.

Plant biologists believe that by artificially manipulating the number of stomata, it might be possible to boost plants' natural ability to adapt and create more resilient plants as a result.

Fleming points out that a modified wheat that had shorter stems was in many ways the basis of the green revolution of the 20th century. Shorter stems meant the plant put more resources into producing grain that

was easier to harvest. He thinks a similar revolution is overdue. "If we're going to support the growing global population, we need some sort of step change in the amount of food that we produce," he says.

Tweak photosynthesis to turbocharge rice

Rice is a staple food for much of the world, and will be an essential part of solving the looming global food crisis. One way of boosting yields may be to fundamentally change the way it photosynthesises - and that could involve tinkering with the cells that shuttle CO_2 around the leaves.

Photosynthesis comes in two flavours: C3, and the more efficient C4. Rice, like most plants, is a C3 plant so researchers are seeking to make it C4. Early attempts to do this have focused on modifying photosynthetic enzymes - particularly rubisco, which fixes CO_2 and makes it available to chloroplasts. "It now appears clear that you need to adapt aspects of leaf form and anatomy as well," says Andrew Fleming at the University of Sheffield, UK.

In C3 leaves the CO_2 diffuses into each leaf cell separately, where it is captured by rubisco to be turned into sugars. The catch is that rubisco occasionally binds to oxygen instead of CO_2. In C4 leaves, on the other hand, concentric rings of cells "pump" CO_2 into specialised, rubisco-containing cells. By increasing the concentration of CO_2 around the enzyme, this system reduces rubisco's error rate, says Julian Hibberd of the University of Cambridge and a member of an international C4 rice project, funded by the Bill and Melinda Gates Foundation.

Hibberd and his colleagues are screening thousands of different rice mutants for subtle changes in leaf structure that could help them identify the genes responsible for this cellular organisation. The hope is that once they can find the genetic switches that create the cellular CO_2 pump they will be able to implant it into C3 rice and turn them into C4 super-producers.

http://www.newscientist.com/article/mg20627593.400-designing-leaves-for-a-warmer-crowded-world.html

Rumbles hint that Mount Fuji is getting angry

- 05 May 2010
- Magazine issue 2759.

What's going on below? (Image: Japan Stock/Alamy)

SOMETHING is brewing under Japan's Mount Fuji. Using rocks ejected by previous eruptions, between 781 AD and 1707, geologists are figuring out what the volcano's internal plumbing looks like.

A team led by Takayuki Kaneko at the University of Tokyo's Volcano Research Center has found that over the centuries the magma's silica levels have gradually increased. High silica tends to indicate large explosions, suggesting eruptions have become more violent. Large amounts of basalt rich in aluminium oxide were also found, which can trigger an eruption when it collides with silica.

Based on the pressures required to form both materials, Kaneko believes the two mineral composites are housed in separate chambers under Fuji: one deep chamber 20 kilometres below the volcano, rich in basaltic magma, and a shallower chamber housing the silica 9 kilometres underground.

He says the deep rumble of low-frequency earthquakes beneath Fuji in 2000 and 2001 suggests movement inside the basaltic magma chamber, and adds he would not be surprised if Fuji erupts in the very near future.

Not everyone agrees. For an eruption, new basaltic magma from deeper underground must intrude into the existing basaltic chamber, pushing it towards the silica, says Phil Shane at the University of Auckland, New Zealand, and we simply don't know if that is happening.

http://www.newscientist.com/article/mg20627594.300-rumbles-hint-that-mount-fuji-is-getting-angry.html

Green machine: Generating more light than heat

- 17:40 04 May 2010 by **Helen Knight**
- For similar stories, visit the **Green machine** and **Energy and Fuels** Topic Guides

Lots of energy never gets this far (Image: Lars Sundstrom stock.xchng)

Green machine *is our new weekly column on the latest advances in environmental technologies*

Not only are fossil-fuel-fired power plants major polluters, they are also pretty inefficient. Most of the energy in the fuel they burn is lost as heat.

Salvaging some of this energy to reduce our consumption of coal and natural gas, not to mention lower our greenhouse gas emissions, is not a new idea. Combined heat and power stations already do this, using the heat produced in electricity generation to keep local homes warm.

Some countries, such as Denmark and Finland, generate significant proportions of their domestic heating requirements in this way. But most power plants are sited far from towns and cities, making it impossible to use the waste heat in this way.

So efforts are under way to convert the heat lost in power-plant exhaust flues into useable electricity. One option is to use a twist on the Rankine cycle – the thermodynamic cycle used in power stations whereby superheated steam is generated in a boiler, drives a turbine and is then fed back to the boiler.

Among others, GE Global Research – General Electric's European research arm, based in Munich, Germany – is developing "organic" Rankine cycle technologies for waste heat recovery. These systems use a refrigerant liquid with a lower boiling point than water, meaning less energy is required to transform it into a high-pressure vapour to drive a turbine.

However, such technologies are costly because they involve installing new generators to existing power plants. Alphabet Energy, a spin-out company from the Lawrence Berkeley National Laboratory, aims to

cut the cost of waste heat recovery using a thermoelectric device that can convert a temperature difference across its surface into a current.

The company claims that this could offset as much as 500 million tonnes of carbon per year worldwide. But it refuses to reveal how the company's device works or what materials it is using to produce them. However, in a study published in *Nature* in 2008, Alphabet co-founder Peidong Yang demonstrated that silicon nanowires could act as a thermoelectric device.

10 per cent extra free

Most existing thermoelectric devices are based on the Seebeck effect, whereby a voltage is generated when there is a temperature difference across two different metals or semiconductors.

Matthew Scullin, Alphabet's CEO, claims that Alphabet's device will be as efficient as existing thermoelectric technologies, but considerably cheaper.

"Waste heat recovery technologies tend to be fairly inefficient, at around 10 per cent efficiency, but when your waste heat source is free, and you're doing nothing with it otherwise, 10 per cent is actually very significant," he says.

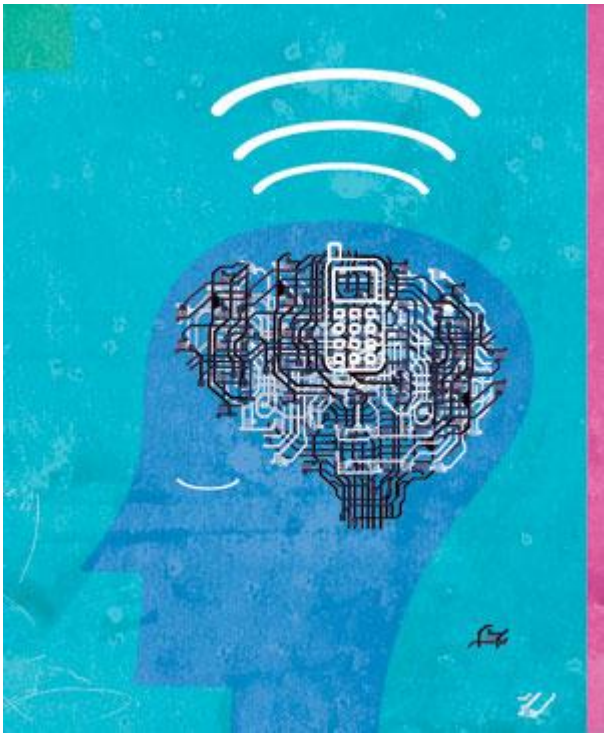
In principle, the technology could also be used to recover waste heat from car exhausts and aircraft engines.

http://www.newscientist.com/article/dn18856-green-machine-generating-more-light-than-heat.html

Army of smartphone chips could emulate the human brain

- 04 May 2010 by **Paul Marks**

Magazine issue 2758.



Chips on the brain (Image: Frazer Hudson)

IF YOU have a smartphone, you probably have a slice of Steve Furber's brain in your pocket. By the time you read this, his 1-billion-neuron silicon brain will be in production at a microchip plant in Taiwan.

Computer engineers have long wanted to copy the compact power of biological brains. But the best mimics so far have been impractical, being simulations running on supercomputers.

Furber, a computer scientist at the University of Manchester, UK, says that if we want to use computers with even a fraction of a brain's flexibility, we need to start with affordable, practical, low-power components.

"We're using bog-standard, off-the-shelf processors of fairly modest performance," he says.

Furber won't come close to copying every property of real neurons, says Henry Markram, head of Blue Brain. This is IBM's attempt to simulate a brain with unsurpassed accuracy on a Blue Gene supercomputer at the Swiss Institute for Technology, Lausanne. "It's a worthy aim, but brain-inspired chips can only produce brain-like functions," he says.

That's good enough for Furber, who wants to start teaching his brain-like computer about the world as soon as possible. His first goal is to teach it how to control a robotic arm, before working towards a design to control a humanoid. A robot controller with even a dash of brain-like properties should be much better at tasks like image recognition, navigation and decision-making, says Furber.

"Robots offer a natural, sensory environment for testing brain-like computers," says Furber. "You can instantly tell if it is being useful."

Called Spinnaker - for Spiking Neural Network Architecture - the brain is based on a processor created in 1987 by Furber and colleagues at Acorn Computers in Cambridge, UK, makers of the seminal BBC Microcomputer.

Although the chip was made for a follow-up computer that flopped, the ARM design at its heart lived on, becoming the most common "embedded" processor in devices like e-book readers and smartphones.

But coaxing any computer into behaving like a brain is tough. Both real neurons and computer circuits communicate using electrical signals, but in biology the "wires" carrying them do not have fixed roles as in electronics. The importance of a particular neural connection, or synapse, varies as the network learns

by balancing the influence of the different signals being received. This synaptic "weighting" must be dynamic in a silicon brain, too.

To coordinate its 'neurons' the chip mimics the way real neurons communicate using 'spikes' in voltage

The chips under construction in Taiwan contain 20 ARM processor cores, each modelling 1000 neurons. With 20,000 neurons per chip, 50,000 chips will be needed to reach the target of 1 billion neurons.

A memory chip next to each processor stores the changing synaptic weights as simple numbers that represent the importance of a given connection at any moment. Initially, those will be loaded from a PC, but as the system gets bigger and smarter, says Furber, "the only computer able to compute them will be the machine itself".

Another brain-like behaviour his chips need to master is to communicate coordinated "spikes" of voltage. A computer has no trouble matching the speed at which individual neurons spike - about 10 times per second - but neurons work in very much larger, parallel groups than silicon logic gates.

In a brain there is no top-down control to coordinate their actions because the basic nature of individual neurons means that they work together in an emergent, bottom-up way.

Spinnaker cannot mimic that property, so it relies on a miniature controller to direct spike traffic, similar to one of the routers in the internet's backbone. "We can route to more than 4 billion neurons," says Furber, "many more than we need."

While the Manchester team await the arrival of their chips, they have built a cut-down version with just 50 neurons and have put the prototype through its paces in the lab. They have created a virtual environment in which the silicon brain controls a Pac-Man-like program that learns to hunt for a virtual doughnut.

"It shows that our four years designing the system haven't been wasted," says Furber. He hopes to have a 10,000-processor version working later this year.

As they attempt to coax brain-like behaviour from phone chips, others are working with hardware which may have greater potential.

The Defense Advanced Research Projects Agency, the Pentagon's research arm, is funding a project called Synapse. Wei Lu of the University of Michigan at Ann Arbor, is working on a way of providing synaptic weights with memristors, first made in 2008 (*New Scientist*, 3 May 2008, p 26).

Handily, their most basic nature is brain-like: at any one moment a memristor's resistance depends on the last voltage placed across it. This rudimentary "memory" means that simple networks of memristors form weighted connections like those of neurons. This memory remains without drawing power, unlike the memory chips needed in Spinnaker. "Memristors are pretty neat," says Lu.

Their downside is that they are untested, though. "Synapse is an extremely ambitious project," says Furber. "But ambition is what drives this field. No one knows the right way to go."

http://www.newscientist.com/article/mg20627585.700-army-of-smartphone-chips-could-emulate-the-human-brain.html

Cuddly robots aim to make social networks child-safe

- 07 May 2010 by **Lakshmi Sandhana**

Magazine issue 2759.

We'll meet again online (Image: Mixed Reality Lab/National University of Singapore)

SMALL, cute and furry they may be, but mere toys they are not. The interactive "social robots" called Petimos have been designed to help protect children when they make friends on social networks.

Petimos, due to be launched later this year, are aimed at 7 to 10-year-olds. Children will only be able to accept new online "friends" if their Petimos are brought into physical contact first, to guard against cyberbullies and paedophiles masquerading as children. The devices work in conjunction with an online social network called Petimo-World in which they are represented by avatars. By squeezing their physical Petimos, or pressing buttons on them, children can send messages or "gifts" to their online friends.

Parents are notified each time a friend request is made and can block approaches that concern them, so children only see and interact online with the avatars of approved friends.

"Internet and text-based communication is only a small part of human communication that we have evolved with," says the device's inventor, Adrian David Cheok at the National University of Singapore. "I want to use new media to help develop more natural human forms of communication. Petimo is one step in this direction."

A study published in January by the California-based Kaiser Family Foundation found 18 per cent of 8 to 10-year-olds in the US use social networking sites. My Secret Circle, Yoursphere and FaceChipz are sites used by children in this age group. Other surveys suggest that as many as 3 in 10 children have been subjected to bullying while online.

In March, leading UK police officers called on social networking sites to place a standard "panic button" designed by the Child Exploitation and Online Protection Centre on all pages.

Parents who took part in tests of Petimo in Singapore this year said the need for children to physically meet those who they wished to interact with online helped ease their fears about the risks posed by strangers.

While the devices will initially only be used with Petimo-World, Cheok hopes that eventually they could be used to provide safer access to other social networks.

Jennifer Perry of E-Victims, a group in the UK that helps victims of online crime, says the system's appeal might be limited if children get bored with the restricted content of Petimo-World. "Children young enough to be content with a walled garden approach and its limitations will probably be too young to be seriously interested in the chat element," she says.

http://www.newscientist.com/article/mg20627595.600-cuddly-robots-aim-to-make-social-networks-childsafe.html

Is water the key to cheaper nanoelectronics?

- 11:55 06 May 2010 by **Colin Barras**

What high-tech industry looks like (Image: Thiago Felipe Festa/stock.xchng)

Water and electronics don't usually mix. But a splash of the wet stuff could help make nanoelectronic manufacturing both quicker and cheaper.

Today's electronic circuit boards already include nanoscale components, but they are tricky to make. To get complicated nanostructures on a silicon chip it is sometimes necessary to grow them in separate layers and then transfer these one by one onto the final chip (PDF) to build them into working components.

Often it takes strong chemicals to separate the layers from the surface on which they are grown, and high temperatures may be needed to activate the thermal adhesives that keep the components in place at their destination.

Grégory Schneider and Cees Dekker at the Kavli Institute of Nanoscience in Delft, the Netherlands, have found a way to use water to quickly and easily transfer layers from one surface to another. They exploit the fact that different materials have different hydrophilicity – the tendency to attract water through transient hydrogen bonds.

Wet and dry

The team took a relatively hydrophilic, or water-attracting, silicon wafer onto which a graphene structure had been deposited in the required pattern. Then they dipped it into a solution containing a hydrophobic – water-repellent – polymer that dried to form a strong, solid hydrophobic layer on top of the wafer.

Next, they submerged the silicon wafer in water. Because graphene is equally hydrophobic, the water molecules muscled both layers out of the way to wet the hydrophilic silicon beneath it, gradually "wedging" them off the silicon base. The polymer-graphene film then floated to the surface of the water.

Now the team placed a second silicon wafer beneath the floating film and used a needle to prod the film into position before draining away the water. Intermolecular forces between the graphene and silicon then provide a "surprisingly stable attachment", says Dekker, removing the need for glue.

They then dissolved away the hydrophobic polymer to leave the graphene attached to the new wafer. Repeating the technique several times would allow graphene layers to be built up into a complex electronic nanostructure.

"A 3D microelectrode can be designed, layer by layer, using our 'wedging' transfer technique," says Schneider. "And because it's simple it can reduce manufacturing costs."

Do try this at home

It's possible to demonstrate the technique by drawing a line with a whiteboard marker pen on a stainless steel spoon before dunking it in a glass of water. After a few seconds the inky line begins to lift away from the spoon and floats to the surface.

"It looks interesting and I like it," says John Rogers at the University of Illinois at Urbana-Champaign. However, he says that others experimented with "lift off, float on" approaches in the late 1990s, but the technique never became widely used. Rogers speculates that might be because the alignment process would be difficult to automate.

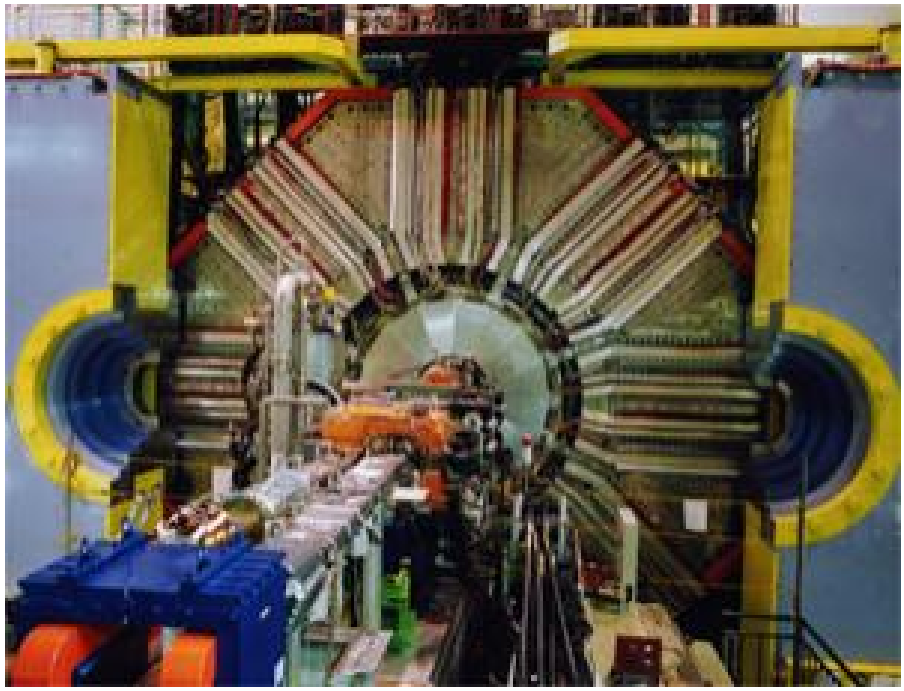
Dekker has an alternative explanation. "The earlier studies used extremely toxic hydrogen fluoride solutions where we use simply water," he says. "We are already receiving enthusiastic responses on our work from researchers that want to use our new technique," he says.

Journal reference: *Nano Letters*, DOI: 10.1021/nl1008037

http://www.newscientist.com/article/dn18862-is-water-the-key-to-cheaper-nanoelectronics.html

Elusive tetraquark spotted in a data forest

- 17:07 04 May 2010 by **MacGregor Campbell**



Results from the BELLE collaboration at the KEK particle accelerator in Japan hint at a tetraquark (Image: KEK)

The keepers at Particle Zoo should ready a new enclosure. Particle hunters are claiming a sighting of a beast of legend – the tetraquark. A jumbo particle made up of four quarks, it is a hitherto undiscovered form of matter.

Tetraquarks were first posited to exist over 30 years ago, as solutions to the equations of quantum chromodynamics. QCD is a theory developed to describe how quarks combine to make two-quark mesons, such as pions and kaons, and three-quark baryons like protons or neutrons.

Although QCD allows for particles made of higher numbers of quarks, such exotic variants have remained in the wild because the physicists hunting them lacked instruments with the power and sensitivity to detect them.

Popping up

In 2003, results from the BELLE collaboration at the KEK particle accelerator in Tsukuba, Japan, hinted at the existence of a pentaquark.

Subsequent analyses of data from other experiments seemed to confirm this, but other groups were unable to recreate Belle's results. As the pentaquark evidence dried up, a number of possible tetraquark sightings have been made by groups at KEK in Japan, the SLAC National Accelerator Laboratory in Stanford, California, and D-Zero at the Fermilab accelerator in Illinois.

Now Ahmed Ali of the German Electron Synchrotron (DESY) in Hamburg, Germany, and his colleagues have found another tetraquark candidate while looking to explain an anomaly reported in 2008. BELLE

researchers had collided beams of electrons and positrons in an attempt to create an energetic form of "bottomonium" – a meson made of a bottom quark and its antiparticle. Their product of their collisions, however, decayed much faster than predicted.

Twice as massive

Ali and colleagues found that if a tetraquark made of one bottom quark, one up quark, and each of their anti-particles was created instead of bottomonium, the faster decay could be explained. "This is the sought after tetraquark," says Ali.

The proposed particle is over twice as massive as previous specimens.

According to Ken Hicks of Ohio University in Athens, the team's result supports a growing body of evidence for the tetraquark's existence. "Everyone is dead sure that this particular state exists," he says. However, he adds that there is still debate over whether the team have seen a pure particle or a "meson molecule" – a pair of two-quark mesons orbiting each other.

Ali says he expects observations from the Large Hadron Collider will provide additional statistical support for the tetraquark's existence.

Journal reference: (*Physical Review Letters*, DOI: 10.1103/PhysRevLett.104.162001).

http://www.newscientist.com/article/dn18857-elusive-tetraquark-spotted-in-a-data-forest.html

Economic recovery needs psychological recovery

- 07 May 2010 by **Stephen Lea**
- Magazine issue 2759. **Subscribe and save**
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Mind over money (Image: Rex Features)

ECONOMICS used to concern itself with a species called *Homo economicus* - a purely rational being driven largely by self-interest. In this Panglossian world, everything worked out for the best if you just left it alone. Sadly, real economic life doesn't work like that.

Research into the psychology of economic behaviour has shown that, contrary to the assumptions of 20th-century theoretical economics, it is not completely described by rational choice models. The deviations from rationality are substantial and systematic. It follows that an economics, or an economic policy, that does not take psychology into account is radically incomplete.

So what can economic psychology say about the recession and the recovery? It is clear that the current situation was brought about by a crisis in the use of credit. Credit always requires a willing lender, and economists have documented how feckless bankers and complacent regulators lent and allowed lending where they should not.

There are plausible psychological explanations for that. However, I am concerned not with lenders but borrowers. No loan can take place without both, so at least half of the psychology of the credit crisis is the psychology of borrowers - and that means the psychology of you and me.

I think that three of the best-documented tenets of economic psychology can help explain why we collectively took on the loans that events have proved were so unwise.

The first is materialism. In general, the link between wealth and happiness is less strong than you might think, but there are some people who strongly believe that owning more things will enhance their happiness. Such people tend to be less happy than others - they are always on the hunt for more possessions. In countries like the UK, where house ownership is deemed especially desirable, these people will drive demand, and hence house prices, above any rational level.

Some people believe that owning more will make them happy. They tend to be less happy than others

The second is money. Often thought of as simply a convenient tool for facilitating transactions, it can be argued that, psychologically, money is like a drug, giving pleasure and being sought for its own sake as well as for what it can purchase. One aspect of its drug-like properties is the money illusion: people feel they are better off if the price of their house has doubled, even though, if all house prices have doubled, and they still need somewhere to live, their real wealth is unchanged at exactly one house.

Finally, we have the most spectacular deviation from rationality: the massive myopia with which we approach choices between good things that will arrive at different points in the future. Humans are quite hopeless at such "inter-temporal choice", consistently choosing to take small benefits sooner rather than large benefits later.

Put these responses together and we have at least a plausible explanation of why so many people were willing to take on the unwise loans that the bankers offered them. So can this interpretation of the past shine any light on the future? Has psychology anything to say about recovery from recession?

John Maynard Keynes pointed out the paradox of recession economics: in the long run, people need to save more and borrow less to prevent the crisis recurring. But in the short term, if we all do that, the recession will deepen into a depression.

A psychologically sophisticated recovery policy would focus attention on what George Katona, one of the founders of economic psychology, called the "better-better" group: people who feel they are better off than they were a year ago, and who believe they will be even better off in a year's time. Katona showed that their behaviour was the motor of economic recovery. It is the better-betters who are most likely to spend the economy back to stability.

Where are we going to find them in the present climate? The answer is that the great majority of people are not directly affected by the crisis. A recession makes us all less well off on average, but its impact is very unevenly distributed. Some people suffer major effects, losing their jobs or their businesses. But the majority of us suffer only marginal effects - a small increase in taxation, perhaps - and some are virtually immune, including many pensioners.

However, a much larger number of us are affected indirectly, either by the fear that we will be among those hit by the recession or through its effects on friends and family. We are all influenced by the "recession atmosphere" created by the media and policy-makers, with the result that people who are objectively unaffected nonetheless make cautious, conservative economic decisions. People whose circumstances place them in the better-better group nevertheless do not feel part of it.

What we need to do is build realistic confidence among those who can afford to act confidently. There is no economy without psychology, so there can be no economic recovery without psychological recovery. Economic policy needs to encourage people to recognise that they are in the better-better group.

It also needs to give a steer to the way they spend. Recovery will be faster if they spend money on products that have a high multiplier effect - in other words, they keep money in the economy where it will

be spent again. That means spending it on services rather than goods, and spending it disproportionately with those of lower income.

In a recession, economic psychology endorses Hilaire Belloc's dictum: "It is the business of the wealthy man to give employment to the artisan."

Stephen Lea is an economic psychologist at the University of Exeter, UK. This article is based on a seminar he gave at the House of Commons at the invitation of the Parliamentary Office of Science and Technology

http://www.newscientist.com/article/mg20627595.800-economic-recovery-needs-psychological-recovery.html

Ernst Fehr: How I found what's wrong with economics

- 04 May 2010 by **Mark Buchanan**

Magazine issue 2758.

From wrestler to economist (Image: Jos Schmid)

*Austrian economist **Ernst Fehr** tells **Mark Buchanan** why global economics could benefit from a touch of compassion and why a good wrestler never gives up*

FROM outside economist Ernst Fehr's office at the University of Zurich in Switzerland you would have no idea that he had been tipped to win a Nobel economics prize. For one thing, the name on the door looks as if it has been dashed off on the cheapest of departmental printers.

But Fehr himself seems to fit the bill. Smiling broadly, he extends a hand, eager to talk about his experiences, whether favourable, amusing or confounding. Ironically, he says, it was one of the latter that led to his current success. In reality, it all started with failure.

Twenty years ago, Fehr had a seemingly sensible idea - that a deep-seated human preference for fairness might play an important role in economics. He thought it might explain why companies - even in countries without a minimum wage - don't offer jobs paying wages far below the standard, despite research showing plenty of unemployed people would willingly take the work. It doesn't happen, he suggested, because companies know that workers hired at a lower wage feel they are being cheated, causing them to grow disgruntled and work less hard.

Fehr wrote a paper on the idea that fairness matters, which was promptly rejected by every prestigious economic journal he sent it to on the grounds that people only care about how much they get for themselves, not how that compares to what others might receive. "Most economists would be deeply

unhappy if paid less than what they consider to be fair, so I thought I had a convincing answer," Fehr says. "But I found out that in theoretical economics, fairness just doesn't count."

However, as a former Austrian national wrestling champion, Fehr doesn't give up easily. Over the past decade, he has pursued his ideas on human fairness far past their relevance to employment, and he is now experiencing something of a reversal of fortune. His work is overturning 50 years of economic wisdom about motivation, showing that most economists have overlooked one of the most important factors determining economic outcomes: our values about fairness. "We've moved past the doubt stage," he says. "There are now fewer serious critics."

At the University of Zurich, Fehr heads up the Institute for Empirical Research in Economics. The institute owes much of its reputation to the radical theme of Fehr's work, which aims to use lab experiments to provide an empirical basis for economic theories of behaviour. It is one part experimental psychology, one part economics, and one part searching tirelessly for ever more students to use as behavioural guinea pigs. "I don't think we'll ever run out of students," Fehr says, pondering the numbers. "But we do have to work hard to find them."

That wasn't a problem for economists of the past, who eschewed empirical work for the elegance of pure theory. Traditionally, economic theory assumes that people care only about themselves, pursuing their own self-interest. Even when people cooperate, the theory goes, this is really only pursuing their own interests by harnessing others' efforts. That may seem cynical, but it is a mainstay of economic thinking that has taken painstaking research by Fehr and his colleagues to refute.

Suppose, for example, you approach a stranger on the street and hand them $20. You tell them they can keep the money or give some to an unknown person. Whatever they choose to do, they will never meet that person, nor will anyone learn of their decision. Will the stranger keep it all or give some away? If you think like a "hard-headed" economist, you'll assume that everyone short of the late Mother Teresa would pocket the lot. But when Fehr and his colleagues did this a few years ago they found that a significant proportion of people gave away close to 50 per cent of the money.

These and a host of similar results represent "the most important work on the human sense of justice in many decades", according to evolutionary biologist Robert Trivers of Rutgers, the State University of New Jersey in New Brunswick. Fehr has won awards for it around the world. In February of this year, he gave the prestigious Clarendon lectures in economics at the University of Oxford.

None of this, apparently, has gone to his head, as he gently corrects my own slightly mangled interpretations of his work, and shares his bemusement over the emotional, sometimes almost hysterical reaction his work seems to provoke. "Our latest experience was just amazing," he says, referring to a paper he published in *Nature* in January (vol 463, p 356).

Hard-headed thinking played a fundamental role in the recent economic crisis... it's a biased way of perceiving the world

In that paper, he and his co-authors showed that testosterone, despite its reputation as a promoter of aggressive behaviour, actually made people more cooperative when playing economic games. They used female volunteers since previous studies have indicated that women are more likely than men to show behavioural changes if given very low doses of the hormone. "In the end we had six referees. Some had legitimate points, but one was really irrational and emotional," Fehr says. "The referee suggested that maybe we had done a more general study and then decided only to report the effects in women, basically accusing us of being dishonest."

Such responses, Fehr suspects, arise from a deep-seated resistance in many people to the idea that something as apparently complex and unique to humans as our social instincts could find a relatively simple basis in chemical changes in brain activity. In other work, he has shown that broken promises

show up as enhanced brain activity reflecting emotional conflict, and do so well before a person actually makes the final decision to break a promise.

Fehr's most recent work focuses on so-called neuroeconomics, which explores the roots of our social instincts and emotions. That our precious moral values may ultimately be biologically based upsets some people, Fehr admits, but science is science. "I'm quite happy with whatever I find," he says. "You have to accept what the data tell you."

In the wake of the worst financial crisis in nearly a century, that may be good advice to economic science itself. At a conference on compassion in economics in Zurich last month, people from the fields of economics, psychology, philosophy and religion gathered to discuss the extent to which the crisis was enabled and even amplified by traditional thinking in economics. According to Fehr this is exactly what has steered us down the wrong path. "I think this kind of thinking played a fundamental role in the recent crisis," he says, "as this notion that people are strictly self-interested has been the dominant mindset for decades. Almost everyone in business, finance or government studies some economics along the way and this is what they think is the norm. It's a biased way of perceiving the world."

The paradox is that it's the economists' supposedly "hard-headed" thinking that has turned out to be profoundly naive. Getting that message out is now one of Fehr's most urgent aims.

Profile

Ernst Fehr is a professor in microeconomics and experimental economics and director of the Institute for Empirical Research in Economics at the University of Zurich, Switzerland. He has won many prizes for his work on neuroeconomics, including the "Swiss Nobel", the Marcel Benoist prize in 2008

http://www.newscientist.com/article/mg20627581.300-ernst-fehr-how-i-found-whats-wrong-with-economics.html

Neanderthal genome reveals interbreeding with humans

- 19:00 06 May 2010 by **Ewen Callaway**

Welcome to the family (Image: Javier Trueba/MSF/Science Photo Library)

How closely are Neanderthals related to us?

They are so closely related that some researchers group them and us as a single species. "I would see them as a form of humans that are bit more different than humans are today, but not much," says Svante Pääbo, a palaeogeneticist at the Max Planck Institute in Leipzig, Germany, whose team sequenced the Neanderthal genome.

The common ancestor of humans and Neanderthals lived in Africa around half a million years ago. After that, the ancestors of Neanderthals moved north and eventually made it to Europe and Asia. Our ancestors, meanwhile, stuck around Africa until about 100,000 years ago before eventually conquering the globe. Neanderthals died out around 28,000 years ago.

How did they sequence the Neanderthal genome?

Bone contains DNA that survives long after an animal dies. Over time, though, strands of DNA break up, and microbes with their own DNA invade the bone. Pääbo's team found ways around both problems with 38,000 and 44,000-year-old bones recovered in Croatia: they used a DNA sequencing machine that rapidly decodes short strands and came up with ways to get rid of the microbial contamination.

They ended up with short stretches of DNA code that computers stitched into a more complete sequence. This process isn't perfect: Pääbo's team decoded about 5.3 billion letters of Neanderthal DNA, but much of this is duplicates, because – assuming it's the same size as the human genome – the actual Neanderthal genome is only about 3 billion letters long. More than a third of the genome remains unsequenced. "It's pretty darn good for something that's 38,000 years old," says Edward Green, a team member now at the University of California, Santa Cruz.

What did they find?

Any human whose ancestral group developed outside Africa has a little Neanderthal in them – between 1 and 4 per cent of their genome, Pääbo's team estimates. In other words, humans and Neanderthals had sex and had hybrid offspring. A small amount of that genetic mingling survives in "non-Africans" today:

Neanderthals didn't live in Africa, which is why sub-Saharan African populations have no trace of Neanderthal DNA.

It's impossible to know how often humans invited Neanderthals back to their cave (and vice versa), but the genome data offers some intriguing details.

"It must have been at least 45,000 years ago," says David Reich, a geneticist at Harvard Medical School who was involved in the project. That's because all non-Africans – be they from France, China or Papua New Guinea – share the same amount of Neanderthal DNA, suggesting that interbreeding occurred before those populations split. The timing makes the Middle East the likeliest place where humans leaving Africa and resident Neanderthals did the deed.

Does this mean that Neanderthals didn't interbreed with Europeans more recently?

Not necessarily – it's just that earlier interbreeding is more likely to leave a mark on our genomes than more recent trysts, largely because of population expansion. With a more complete Neanderthal genome and DNA from other Neanderthals, it will be possible to find out if Europeans and Asians interbred with Neanderthals after those groups went their separate ways.

Archaeological evidence suggests that humans and Neanderthals overlapped for about 10,000 years in Europe and some fossils have even been interpreted as Neanderthal-human hybrids, though not all palaeoanthropologists agree on this.

Can we trace any human traits back to Neanderthals?

Probably not. Some researchers had hypothesised that some human genes, including one involved in brain development, originated from interbreeding with Neanderthals, but Pääbo's team found no evidence for this. In fact, no Neanderthal DNA sequences are consistently found in humans. "Each person has a different bit of Neanderthal in them," says Reich.

However, Sarah Tishkoff, a geneticist at the University of Pennsylvania in Philadelphia not involved in the project, says it is possible that interbreeding introduced traits into a few human populations. "It will be interesting to look at other ethnic groups and other Neanderthals," she says.

Does the Neanderthal genome explain what makes us different from them?

That is the hope, though this first scan emphasises the overwhelming similarity between humans and Neanderthals. Pääbo's team found just 78 amino acid peculiarities – differences that change the shape and potentially the function of a protein – which all humans have in their genes but Neanderthals didn't. To put that in context, the genome encodes about 10 million amino acids. They also identified more than 200 regions of the human genome that look like they have evolved since we split from Neanderthals.

These changes occurred in genes linked to cognition, skin and bone development, and reproduction, but they don't explain what makes us human, because they occurred after humans split from Neanderthals 500,000 years ago.

"There is no compelling story where you say, 'Ah, ah, this difference means this,'" Green says. "'It let us write poetry instead of making stone tools' – there's nothing that jumps out like that."

That means a lot of hard work for researchers, examining the genetic differences between humans and Neanderthals one by one, and in some cases genetically engineering bacteria, mice and other organisms with these genes. "This is really a gold mine for finding recent changes in human evolution," Green says.

Does this mean we could clone a Neanderthal?

No. "Resurrecting" a Neanderthal based on its genome sequence poses a number of scientific and technological problems, not to mention ethical dilemmas.

The most straightforward way to bring Neanderthals back to life would be to alter the DNA of a human cell to match that of Neanderthals and then transplant its nucleus into an unfertilised egg and implant it into a surrogate mother, a process called somatic cell nuclear transfer (SCNT). No one has accomplished this feat for humans, and it may not be possible.

Even if we could clone humans, another challenge would be introducing the millions of genetic differences that exist between humans and Neanderthals into a human cell. As it stands, the Neanderthal genome is incomplete and riddled with errors.

More problematic, though, is making many genetic mutations at once instead of one at a time, as is conventionally done. A technology exists to introduce dozens of mutations at a time into bacteria but this doesn't come close to the complexity required to make a Neanderthal.

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Did we evolve a special ability for catching cheats?

- 06 May 2010 by **Bob Holmes**

Magazine issue 2759.

Trust betrayed (Image: Glowimages/Getty)

PEOPLE are extraordinarily skilled at spotting cheats - much better than they are at detecting rule-breaking that does not involve cheating. A study showing just how good we are at this adds weight to the theory that our exceptional brainpower arose through evolutionary pressures to acquire specific cognitive skills.

The still-controversial idea that humans have specialised decision-making systems in addition to generalised reasoning ability has been around for decades. Its advocates point out that the ability to identify untrustworthy people should be favoured evolutionarily, since cheats risk undermining the social interactions in which people trade goods or services for mutual benefit.

To test whether we have a special ability to reason about cheating, Leda Cosmides, an evolutionary psychologist at the University of California, Santa Barbara, and her colleagues used a standard psychological test called the Wason selection task, which tests volunteers' ability to reason about "if/then" statements.

The researchers set up scenarios in which they asked undergraduate volunteers to imagine they were supervising workers sorting applications for admission to two schools: a good one in a district where school taxes are high, and a poor one in an equally wealthy, but lightly taxed district. The hypothetical workers were supposed to follow a rule that specified "if a student is admitted to the good school, they must live in the highly taxed district".

Half the time, the test subjects were told that the workers had children of their own applying to the schools, thus having a motive to cheat; the rest of the time they were told the workers were merely absent-minded and sometimes made innocent errors. Then the test subjects were asked how they would verify that the workers were not breaking the rule.

Cosmides found that when the "supervisors" thought they were checking for innocent errors, just 9 of 33, or 27 per cent, got the right answer - looking for a student admitted to the good school who did not live in the highly taxed district. In contrast, when the supervisors thought they were watching for cheats, they did much better, with 23 of 34, or 68 per cent, getting the right answer (*Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.0914623107).

This suggests that people are, indeed, more adept at spotting cheats than at detecting mere rule-breaking, Cosmides says. "Any cues that it's just an innocent mistake actually inactivate the detection mechanism."

People appear to be more adept at spotting cheats than at detecting mere rule-breaking

The result is what you would expect if natural selection had favoured this specific ability in early, pro-social humans - and is not at all what would happen under selection for generalised intelligence, Cosmides says. "My claim is not that there's nothing domain-general in the mind, just that that can't be the only thing going on in the mind."

Other psychologists remain sceptical of this conclusion. "If you want to conclude that therefore there's a module in the mind for detecting cheaters, I see zero evidence for that," says Steven Sloman, a cognitive scientist at Brown University in Providence, Rhode Island. "It's certainly possible that it's something we learned through experience. There's no evidence that it's anything innate."

http://www.newscientist.com/article/mg20627593.500-did-we-evolve-a-special-ability-for-catching-cheats.html

The imperfect universe: Goodbye, theory of everything

- 05 May 2010 by **Marcelo Gleiser**
- Magazine issue 2759. **Subscribe and save**
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FIFTEEN years ago, I was a physicist hard at work hunting for a theory of nature that would unify the very big and the very small. There was good reason to hope. The great and the good were committed. Even Einstein, who recognised that our understanding of reality is necessarily incomplete, had spent the last 20 years of his life searching for a unified field theory that would describe the two main forces we see acting around us - gravity and electromagnetism - as manifestations of a single force. For him, such a mathematical theory represented the purest and most elegant expression of nature and the highest achievement of the human intellect.

Fifty-five years after Einstein's death, the hunt for this elusive unified field theory continues. To physicist Stephen Hawking and many others, finding the "theory of everything" would be equivalent to knowing the "mind of God". The metaphor is not accidental.

Modern critics say that Einstein and other giants of 20th-century physics (including Wolfgang Pauli, Erwin Schrödinger and Werner Heisenberg) failed because their models didn't include all particles of matter and their fundamental interactions. Factor them in, they argue, and we stand a much better chance of success. Dreams of a final theory (as a book on the subject, by Nobel laureate Steven Weinberg, was titled) live on, stronger than ever.

But are we really getting any closer? Do we dare ask whether the search is fundamentally misguided? Could belief in a physical theory that unifies the secrets of the material world - a "hidden code" of nature - be the scientific equivalent of the religious belief in oneness held by the billions who go to churches, mosques and synagogues every day?

Even before what we now call physics existed, ancient Greek philosophers pondered whether the diversity of nature could radiate from a single source, a primal substance. Thales, regarded by Aristotle as the first philosopher in the Greek tradition, proposed that everything was made of water, a substance he believed represented nature's dynamic essence. Later, Pythagoras and his followers believed that nature was a mathematical puzzle, constructed through ratios and patterns that combine integers, and that geometry was the key to deciphering it.

The idea of mathematics as a fundamental gateway to nature's secrets re-emerged during the late Renaissance. Galileo Galilei, René Descartes, Johannes Kepler and Isaac Newton made it clear that the mathematical description of nature succeeds only through the painstaking application of the scientific method, where hypotheses are tested by experiments and observations and then accepted or rejected. Physics became the science of the "how", leaving the "why" for philosophy and religion. When Newton was asked why matter attracts matter with a strength that weakens with the square of the distance, he answered that he "feigned no hypotheses"; it was enough to provide a quantitative description of the phenomenon.

That, however, is only half the story. To Newton, God was the supreme mathematician and the mathematical laws of nature were Creation's blueprint. As science advanced, the notion that god interfered explicitly with natural phenomena faded away, but not the idea that nature's hidden code lay in an all-encompassing mathematical theory. Einstein's "God" was far removed from Newton's, as he famously said: "I believe in Spinoza's God who reveals himself in the orderly harmony of what exists." His search for a unified field theory was very much a search for the essence of this natural god.

Modern incarnations of unified field theories come in two flavours. The more traditional version, the so-called Grand Unified Theory (GUT), seeks to describe electromagnetism and the weak and strong nuclear

forces as a single force. The first of these theories was proposed in 1974 by Howard Georgi, of Harvard University, and Sheldon Glashow, now at Boston University. The more ambitious version seeks to include gravity in the unification framework. Superstring theory tries to do this by abandoning the age-old paradigm that matter is made of small, indivisible blocks, substituting them with vibrating strings that live in higher-dimensional spaces.

Like all good physical theories, GUTs make predictions. One is that the proton, the particle that inhabits all atomic nuclei, is unstable. For decades, experiments of increasing sensitivity have looked for decaying protons and failed to find them. As a consequence, the models have been tweaked so that protons decay so rarely as to be outside the current reach of detection. Another prediction fared no better: bundled-up interacting fields called magnetic monopoles have never been found.

For superstrings, the situation is even worse. In spite of its mathematical elegance, the theory is so detached from physical reality that it is exceedingly difficult to determine what a measurable string effect might be.

I now think that the very notion of a final theory is faulty. Even if we succeed in unifying the forces we know, we can only claim to have achieved partial unification. Our instruments have limits. Since knowledge of physical reality depends on what we can measure, we will never know all there is to know. Who is to say there are only four fundamental forces? Science is full of surprises. Much better to accept that our knowledge of physical reality is necessarily incomplete. This way, science is understood as a human enterprise and the "mind of God" is exorcised once and for all.

I now think that the very notion of a final theory is faulty

Ever since the discovery of parity violation in the weak interaction over 50 years ago, experiments in particle physics have shown us that our hopes for perfection are just that - hopes. Symmetries are violated left and right; in nature, unlike in John Keats's famous poem, beauty isn't always truth.

But there's more. I propose that fundamental asymmetries are a necessary part of our universe, that they determine our very existence. Consider the following. The universe had to have special properties to keep on expanding for 14 billion years. And particles of matter had to dominate those of antimatter soon after the big bang, or the universe would consist mostly of radiation.

Life itself is a product of imperfections, from the spatial asymmetry of amino acids to mutations during reproduction. Asymmetries forged the long, complex and erratic path from particles to atoms to cells, from simple prokaryotic cells without nuclei to more sophisticated eukaryotic cells, and then from unicellular to multicellular organisms.

The history of life is deeply enmeshed with the earth's environmental changes, from the increase of oxygen availability, to the advent of plate tectonics that help regulate carbon dioxide. Life (not to mention intelligence) in the extraordinarily complex forms we have come to know is probably quite rare, a product of asymmetries, imperfections and accidents.In the end, giving up on a final theory won't make doing physics - or science - less exciting. Nature has plenty of mysteries to keep us busy for a very long time.

Profile

Marcelo Gleiser is Appleton Professor of Natural Philosophy and professor of physics and astronomy at Dartmouth College, New Hampshire. He runs the 13.7 blog, hosted by US National Public Radio. This essay is based on his book *A Tear at the Edge of Creation: A radical new vision for life in an imperfect universe* (Free Press)

http://www.newscientist.com/article/mg20627591.200-the-imperfect-universe-goodbye-theory-of-everything.html?DCMP=NLC-nletter&nsref=mg20627591.200

The Jewish Question: British Anti-Semitism

By HAROLD BLOOM

TRIALS OF THE DIASPORA

A History of Anti-Semitism in England

By Anthony Julius

811 pp. Oxford University Press. $45

Anthony Julius has written a strong, somber book on an appalling subject: the long squalor of Jew-hatred in a supposedly enlightened, humane, liberal society. My first, personal, reflection is to give thanks that my own father, who migrated from Odessa, Russia, to London, had the sense, after sojourning there, to continue on to New York City.

With a training both literary and legal, Julius is well prepared for the immensity of his task. He is a truth-teller, and authentic enough to stand against the English literary and academic establishment, which essentially opposes the right of the state of Israel to exist, while indulging in the humbuggery that its anti-Zionism is not anti-Semitism. Endless boycotts of Israel are urged by this establishment, and might yet have produced a counterboycott of British universities by many American academics, whether Jewish or not. However, under British law the projected boycotts may be illegal. The fierce relevance of Julius's book is provoked by this currently prevalent anti-Semitism.

An earlier work by Julius, "T. S. Eliot: Anti-Semitism and Literary Form," impressed me as the only just and responsible treatment of Eliot's polite hatred of the Jewish people. Admiring Eliot's earlier poetry, Julius subtly demonstrated Eliot's evasion of some modes of anti-Semitism while extending others. Eliot was not Ezra Pound or Wyndham Lewis, but a great poet indulging a prejudice he himself regarded as a cultural and religious argument.

"Trials of the Diaspora" takes its title from its final epigraph, Philip Roth's pungent observation in his still undervalued novel "Operation Shylock":

"In the modern world, the Jew has perpetually been on trial; still today the Jew is on trial, in the person of the Israeli — and this modern trial of the Jew, this trial which never ends, begins with the trial of Shylock."

A remarkable solicitor, Julius casts this huge book as a series of trials, not of the Jews but of the English. His indictments tend to be fairly moderate, because only three or four European nations have been more honorable than Britain toward their own Jews, at least since state and popular violence against them ended with the medieval period, when it was dreadful indeed. After many massacres, the expulsion of 1290 effectually ended the Jewish presence in England until they were readmitted under Oliver Cromwell.

The best chapter in "Trials of the Diaspora" concerns the cavalcade of anti-Semitism in English literature, with its monuments in Chaucer's "Prioress's Tale," Shakespeare's "Merchant of Venice" and Dickens's "Oliver Twist." My only criticism of Julius is that he somewhat underplays the ultimate viciousness both of Shylock and of Shakespeare's gratuitous invention of the enforced conversion, which was no part of the pound-of-flesh tradition. As an old-fashioned bardolator, I am hurt when I contemplate the real harm Shakespeare has done to the Jews for some four centuries now. No representation of a Jew in literature ever will surpass Shylock in power, negative eloquence and persuasiveness. A "perplexed unhappiness" is the sensitive response of Julius, but I would urge him to go further. Shakespeare, still competing with the ghost of Christopher Marlowe, implicitly contrasts Shylock with Barabas, the Jew of Malta in Marlowe's tragic farce. I enjoy telling my students: let us contaminate the two plays with one another. Imagine Shylock declaiming: "Sometimes I go about and poison wells" while Barabas intones: "If you prick us, do we not bleed?" It is Shakespeare's continuing triumph over Marlowe that such an exchange will not work. Shylock is darker and deeper forever.

For Julius, "The Merchant of Venice" is both an anti-Semitic play and a representation of anti-Semitism. I dispute the latter: the humanizing of Shylock only increases his monstrosity. Who can doubt that he would have slaughtered Antonio if only he could? But I like a fine summary by Julius: "Shylock is an Englishman's Jew — wicked, malignant but ultimately conquerable."

Dickens created the second most memorable Jew in his superb Fagin. There is no third figure to compete with Shylock and Fagin, not even Joyce's Poldy Bloom, whose Jewishness is disputable anyway, marvelous as he is.

How does one estimate the lasting harm done by Shakespeare's and Dickens's egregious Jews? Himself a usurer, Shakespeare must have known how much he had invested in Shylock. Is that why he punishes the Jew with such ignoble humiliation? The zest of Dickens for his urban apocalypses burned through his own humane sense of fairness. Yet nothing mitigates the destructiveness of the portraits of Shylock and Fagin.

The greatness of Shakespeare and of Dickens renders their anti-Semitic masterpieces more troublesome than the litany of lesser but frequently estimable traducers: Thomas Nashe, Daniel Defoe, Rudyard Kipling, H. G. Wells, G. K. Chesterton, Hilaire Belloc, Wyndham Lewis, down to the contemporary poet Tom Paulin and the dramatist Caryl Churchill. Ezra Pound scarcely can be blamed upon the English, and T. S. Eliot, despite his conversion in citizenship and faith, remains an American phenomenon, a monument to a past illness, a literary malaise now largely vanished.

I am grateful to Julius for his calm balance, and I do not ask him to be Philip Roth rather than himself. There is an English passion for the grotesque, of which Shylock and Fagin are among the triumphs. American literary anti-Semitism is now sparse indeed. The new English (and Continental) anti-Semitism is hatred for Israel, which among all the nations is declared to be illegitimate. The United States remains almost free of this disease, and any current writer would not be tolerated for portraits like those of Hemingway's Robert Cohn in "The Sun Also Rises," Scott Fitzgerald's Wolfsheim in "The Great Gatsby" or the several Jewish males who are Willa Cather's villains. This is hardly to congratulate

ourselves, but to point out that the United States, despite bigots left and right, does not encourage the genteel anti-Semitism that is woven into the English academic and literary world.

Early in this book, Julius links anti-Semitism to sadism. He might have done even more with this, since sadomasochism is something of an English vice, and is so much a school-experience of the upper social class. And yet his chapter on “The Mentality of Modern English Anti-Semitism” shrewdly relates bullying to the puzzle of what appears to be an incessant prejudice, never to be dispelled.

At his frequent best, Julius refreshes by a mordant tonality, as when he catalogs the types of English anti-Semites. The height of his argument comes where his book will be most controversial: his comprehensive account of the newest English anti-Semitism.

To protest the policies of the Israeli government actually can be regarded as true philo-Semitism, but to disallow the existence of the Jewish state is another matter. Of the nearly 200 recognized nation-states in the world today, something like at least half are more reprehensible than even the worst aspects of Israel’s policy toward the Palestinians. A curious blindness informs the shifting standards of current English anti-Zionism.

I admire Julius for the level tone with which he discusses this sanctimonious intelligentsia, who really will not rest until Israel is destroyed.

I end by wondering at the extraordinary moral strength of Anthony Julius. He concludes by observing: “Anti-Semitism is a sewer.” As he has shown, the genteel and self-righteous “new anti-Semitism” of so many English academic and literary contemporaries emanates from that immemorial stench.

Harold Bloom’s forthcoming books are “The Anatomy of Influence” and “Till I End My Song: A Gathering of Last Poems.” He teaches at Yale.

http://www.nytimes.com/2010/05/09/books/review/Bloom-t.html?nl=books&emc=booksupdateema1

From a Prophet, a Call for Reform

By MICHIKO KAKUTANI

CRISIS ECONOMICS

A Crash Course in the Future of Finance

By Nouriel Roubini and Stephen Mihm

353 pages. The Penguin Press. $27.95.

He was known as “Dr. Doom” — a perennial pessimist in the often sunny world that is the dismal science of economics. And in 2008 his predictions of disaster — delivered two years earlier — came stunningly, frighteningly true, as the entire global financial system teetered on the brink of the abyss. Cassandra had belatedly become a much-celebrated prophet.

In a September 2006 talk before the International Monetary Fund, Nouriel Roubini presciently warned that a “U.S. housing bust” would spark a recession in America and a “global hard landing”: homeowners would default on mortgages, trillions of dollars of mortgage-backed securities would unravel, financial institutions would totter, and a fiscal tsunami would threaten the world.

Now, in his new book, “Crisis Economics” (written with the journalist and history professor Stephen Mihm, who has written for The New York Times Magazine), Mr. Roubini, a professor of economics at New York University’s Stern School of Business, uses his gifts as a teacher to give the lay reader a succinct, lucid and compelling account of the causes and consequences of the great meltdown of 2008.

Although his penchant for singing his own praises can be distracting (“Roubini’s prescience was as singular as it was remarkable: no other economist in the world foresaw the recent crisis with nearly the same level of clarity and specificity”), his analysis of the cataclysm and his deft placement of it within a historical context soon steamroller any doubts one might have. Readers may wish that Mr. Roubini elaborated more on certain points — like why he thinks the current recovery is likely to be “U-shaped” rather than a dangerous “W-shaped” double dip, as he’s suggested in the past. But “Crisis Economics” is nonetheless essential reading for anyone interested in getting a crisp, if opinionated, overview of how the

global financial system seized up in the fall of 2008 and what may happen in the months and years to come if serious reforms and new regulations are not embraced.

Instead of imposing a doctrinaire theory upon the facts, Mr. Roubini employs an eclectic, common-sense approach to history, picking à la carte from the thinking of such disparate economists as John Maynard Keynes and Joseph Schumpeter. "The insights of both schools can be synthesized and brought to bear on the problems we face now," he writes. "Indeed, the successful resolution of the recent crisis depends on a pragmatic approach that takes the best of both camps, recognizing that while stimulus spending, bailouts, lender-of-last-resort support, and monetary policy may help in the short term, a necessary reckoning must take place over the longer term in order to achieve a return to prosperity."

Taking the reader on a fast guided tour of several centuries of capitalism, Mr. Roubini points out how the patterns of boom and bust are predictable, from the rise of asset bubbles to the spread of collapse to other countries that share similar types of excess. "Lack of transparency," he writes, "underestimation of risk, and cluelessness about how new financial products might behave when subjected to significant stress are recurrent problems in many crises, past and present."

As Mr. Roubini observes, the calamities of 2008 were not caused by a bunch of bad subprime mortgages or by a simple housing bubble but by deeper, more tectonic pressures that had been building for years. Not only had the government failed to keep tabs on exotic new financial products like derivatives, but the sweeping away of banking regulations established in the wake of the Great Depression (along with Wall Street's ability to evade remaining rules) had resulted in the development of "a vast shadow banking system" outside regulatory oversight. Meanwhile the bonus system adopted by many financial firms spurred the pursuit of short-term profits and excessive risk taking, even as the low interest, easy money policies of the Fed under Alan Greenspan encouraged the growth of leverage and debt.

"By the spring of 2006," Mr. Roubini writes, "the financial system, with its extraordinary reliance on leverage — and its blind faith that asset prices would only continue to rise — was primed for a breakdown of monumental proportions." Whereas some Wall Street observers have argued that the collapse of Lehman Brothers in September 2008 — or the failure of the government to prevent its collapse — was the inflection point that led to the fall of global dominoes, Mr. Roubini sees that event as less of a cause of the crisis "than a symptom of its severity." Much of what happened in the succeeding days and weeks, he argues, "was probably inevitable" by that point.

To keep things from spiraling out of control, the United States government (along with other governments around the world) unleashed what Mr. Roubini calls an unprecedented "shock-and-awe campaign against the crisis." The Fed "embraced its historic role as a lender of last resort," he writes, "throwing lifelines of liquidity to one kind of financial institution after another," and eventually became an investor "of last resort" as well, "wading into government debt markets to inject still more liquidity into the system via quantitative easing." In addition the government "became a shareholder in a host of businesses, buying shares and injecting capital in exchange for an equity stake"; instituted "outright bailouts of individual banks, homeowners, and others"; and "even offered to subsidize the purchase of toxic assets, hoping this might restore faith."

All these monetary and fiscal measures fell into place — awkwardly and imperfectly — over the course of the next two years. "The response to the financial crisis had all the grace and beauty of a battlefield retreat," Mr. Roubini observes, "but in the end it seemed to work: capitalism did not collapse; the fate of particularly hard-hit Iceland was not the fate of the world at large."

That, of course, was the good news. The bad news, Mr. Roubini says, is that stability was purchased at an enormous price: "Thanks to all the bailouts, guarantees, stimulus plans, and other costs of managing the crisis, the public debt of the United States will effectively double as a share of the nation's gross domestic product, as deficits in the coming decade are expected to hit $9 trillion or more."

As Mr. Roubini sees it, America's soaring deficits (exacerbated by the recent bailouts and the tax cuts implemented by the administration of George W. Bush) and its borrowing of more and more money from abroad are dangerous and unsustainable, and could lead to decline of the dollar and the further erosion of American power on the international stage.

Much as the economist Joseph E. Stiglitz did in his recent book "Freefall," Mr. Roubini argues in these pages that the United States must use the recent crisis as an opportunity to make deep and meaningful reforms to its financial system.

He declares that Too Big to Fail firms like Citigroup and Goldman Sachs should be broken up; that the crazy quilt of overlapping regulatory agencies (which creates all sorts of gaps and inefficiencies that can be exploited by banks) should give way to a more consolidated and centralized system of oversight; and that a "beefed-up version" of the Glass-Steagall Act (which separated commercial banking and investment banking) should be adopted.

Wholesale reform, Mr. Roubini concludes, is necessary "to bring the financial system to heel." Merely tinkering with existing rules, he goes on, is absurd, given the serious illness of the patient. "As we've made clear throughout this book," he writes, "the crisis was less a function of subprime mortgages than of a subprime financial system. Thanks to everything from warped compensation structures to corrupt ratings agencies, the global financial system rotted from the inside out. The financial crisis merely ripped the sleek and shiny skin off what had become, over the years, a gangrenous mess."

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The Art of Style, and the Style of Art

By ROBERTA SMITH

Real women don't wear couture. Lacking the budgets or the bodies for it, they just watch. At best, they dress for short-term success, not posterity. That is, they don't buy or commission lavish and costly garments from reigning design geniuses that they plan to wear a few times during the evening hours, fastidiously maintain and finally bequeath to a museum.

Which brings us to the often delirious yet discomforting unreality of most museum exhibitions devoted to high fashion. These shows almost invariably chronicle the lifestyles and shifting, usually unattainable ideals of femininity of the leisure class. But they also reflect larger, historical trends in taste, mores and wealth, while encapsulating the technical innovations, artistic sensibilities and fantasies that perpetually trickle down to the less expensive, more utilitarian designs most women wear.

Now two outstanding examples of high-fashion exhibitions, mounted collaboratively, can be seen at major New York museums in different boroughs. "American Woman: Fashioning a National Identity" is the annual, widely anticipated extravaganza of the Costume Institute at the Metropolitan Museum of Art. Even if this year's version doesn't quite live up to its title, it is loaded with evening attire that ranges in date from the late Gilded Age to midcentury Hollywood. One of the best and most visually striking in the Costume Institute's history, the show is enhanced by seductive hand-painted murals designed by Nathan Crowley and the extravagant wigs of Julien d'Ys.

"American Woman," which has been organized by Andrew Bolton, curator of the Costume Institute, benefits from, and celebrates, the exponential expansion of the institute's holdings in one fell swoop in January 2009. That was when the Met took over the care and storage of a larger, older collection of fashion belonging to the Brooklyn Museum, which could not afford to maintain it.

On its side, the Brooklyn Museum has assembled "American High Style: Fashioning a National Collection" as a form of proud semi-farewell — semi because the transfer agreement allows the museum to borrow back works from its former collection. The show, composed entirely of pieces from the Brooklyn collection, is rife with what are justifiably being called "masterworks," which have not been exhibited for decades, if ever. The collection includes deep holdings (even drawings) of genuine geniuses like the French shoe designer Steven Arpad and especially the inimitable Charles James, whose

astounding “Diamond” evening dress is one of the show’s high points. But it is also rich in accessories, idiosyncrasies and objects steeped in history.

Here you’ll find the hat fashioned from green velvet drapes and heavy gold fringe by the impoverished post-war Scarlett O’Hara (Vivien Leigh) in “Gone With the Wind.” Another “Rarity” — as the labels designate such pieces — is the black silk twill gown that Queen Victoria wore in a famous 1896 family photograph, reproduced here. It shows her with her son, grandson and great-grandson, the future Kings Edward VII, George V and Edward (VIII) the Brief. Among the dresses once worn by sylphs like Ava Gardner, the art collector Dominique de Menil or the socialite and major Charles James patron Millicent Rogers, Victoria’s is a shock. The mannequin is so short, wide and top-heavy that you may first think that it is seated. Hers is the only imperfect body in either show.

Also relatively chunky are the credit lines on the ex-Brooklyn ensembles at the Met. They read “Brooklyn Museum Costume Collection at the Metropolitan Museum of Art, Gift of the Brooklyn Museum, 2009.” This is followed by the item’s original Brooklyn credit. For example, “Gift of the estate of Mrs. Arthur F. Schermerhorn, 1957” — this on a House of Worth ball gown from 1900 in the “Heiress” section, where the setting is based on an Astor ballroom in Newport, R.I. Or, in the sportif “Gibson Girl” section, where the wraparound outdoor setting ticks clockwise through the seasons, the label for a riding ensemble by an unknown American designer from around 1896: “Gift of the Princess Viggo in accordance with the wishes of the Misses Hewitt, 1931.” (The Misses Hewitt of the Cooper-Hewitt, to be precise.)

But enough reading. These shows play off each other well because they represent contrasting if not opposing curatorial approaches. The Brooklyn one, which I recommend seeing first, has a wonderful, multilevel clarity. Organized by Jan Glier Reeder, who is in charge of the Brooklyn costume collection at the Met, the show offers pleasures that are learning epiphanies. And its medley of masterworks, though less neatly organized than the Met show, may end up saying more about the “national identity” of the American woman. For one thing, it ventures closer to the present and includes relatively modest postwar designs by Americans like Claire McCardell and Bonnie Cashin. For another, many of the clothes, both early and late, belonged to interesting women.

Next to Victoria’s black gown, for instance, is the elaborate dress worn by Emily Warren Roebling — who oversaw the completion of the Brooklyn Bridge after her husband was incapacitated by the bends — for her presentation to the Queen in 1896. And behind that is Mrs. Roebling herself, wearing the dress in a full-length portrait painted by Émile Carolus-Duran, also in 1896.

Yet despite such historical references, the Brooklyn show also offers its garments — seen against white walls — as art objects. The best assert themselves as examples of an über-art that fuses aspects of painting, sculpture, architecture, body art and theater with exquisite craft.

An elaborately tucked and scalloped gown designed by Charles Frederick Worth in the late 1860s for the Empress Eugénie is made entirely of lavender silk taffeta. It looks like a very fancy maquette of itself, or some frothy harbinger of the modernist monochrome.Equally striking, in an almost painterly way, is a Balenciaga dress from 1945 whose bands of black lace and white organza are dotted with paillettes in four sizes.

The artistry of fashion is most alive in a row of nine floor-length ball gowns from the 1940s and ’50s by Charles James. Almost everything about them is dense with artistic thought, from their three-dimensional derring-do and play of matte and satiny fabrics, to their polymorphous eroticism and extremely refined and sometimes startling segmenting of garment and thus body.

Nowhere is this more evident than in the “Diamond” evening dress of 1957 (a gift from Mrs. de Menil). A black velvet line curves across the front of the dress at the waist, dividing an ivory bodice from a beige skirt, and then wraps around on either side to plunge steeply to the back of the knees in a V. Below, a short beige train flares toward the ground in an inverted V. Above, the back of the dress is a field of ivory

bisected by a beige panel, whose streamlined bowling-pin silhouette is an abstraction of the female form, designed to adorn one.

Then there is the sophisticated perverseness of the adjacent "Butterfly" dress of 1955 — weighing 18 pounds, mostly aubergine tulle — whose wedge-shaped train descends from a pair of silvery satin curves just below the waist. While plenty butterflylike, these also iterate the upper arcs of the wearer's backside. On the wall opposite these dresses, a dozen James sketches revert back to a more abstract turn of mind.

Compared with the Brooklyn Museum's presentation, the Met show is one long, atmospheric swoon. Its more than 80 gowns and ensembles are cosseted in circular galleries, where the murals evoke period settings. For the bohemians of the 1910s we get a fabulous re-creation of Louis Comfort Tiffany's studio; for the flappers in the '20s, a skyscraper nocturne based on the paintings of Tamara de Lempicka.

These scenes unfold almost entirely at night, with breaks for those athletic Gibson Girls, marching Suffragettes, World War I uniforms and a few other instances of daywear. But after taking in the theatrical ensembles and glamorous backgrounds, you begin to focus on the details. The mostly beaded and embroidered motifs on the cascading skirts of the evening gowns by Worth in the Astor ballroom are all derived or distilled from nature. The fabrics of the columnar chemise gowns by Poiret, Callot Soeurs and Liberty & Company, worn by the bohemian guests in Tiffany's studio, are incredibly but discreetly rich in color, texture and pattern; most of the dozen shoes strapped into a large, specially designed traveling trunk are embroidered. (The trunk in this setting is an odd but engrossing touch.)

In the "Flapper" room, the chemise persists, but hemlines rise precipitously. Thin silks and chiffons prevail, encrusted with beads and sequins, usually in geometric patterns that suggest architectural details. The patterns on a French dress from 1925 evoke the Chrysler Building, not yet built.

The gowns in the Hollywood section ("Screen Sirens: the 1930s") are by Madame Grès, Vionnet and Lanvin, as well as James. They are marvelous, but they get very distracting competition from the snippets of famous sirens on film — Katharine Hepburn, Lena Horne, Josephine Baker, Rita Hayworth and Garbo. Seeing well-dressed women in action tends to makes clothes on mannequins look a bit sad.

The final circular gallery is an animated mosaic of pictures of scores of American women, spanning most of the 20th century. It cuts through divisions of class and race the way the exhibition does not, and is so transfixing that it may cause serious traffic problems. But it has a caffeinating effect, and points the mind back toward reality and the city outside.

"American High Style: Fashioning a National Collection" runs through Aug. 1 at the Brooklyn Museum, 200 Eastern Parkway, at Prospect Park, (718) 638-5000, brooklynmuseum.org. "American Woman: Fashioning a National Identity" runs through Aug. 15 at the Metropolitan Museum of Art, (212) 535-7710, metmuseum.org.

http://www.nytimes.com/2010/05/07/arts/design/07fashioning.html?ref=design

The Garden That Grew Into a Muse

By HOLLAND COTTER

The Gagosian Museum of Fine Art in Chelsea? Not yet, but Gagosian Gallery has definitely shaped itself into a periodic and ambitious kunsthalle over the past few years. In 2009 it gave us an invaluable retrospective of the proto-conceptualist Piero Manzoni and a survey of career-end Picassos. Now, moving closer to old master turf, it delivers "Claude Monet: Late Work," a gorgeous "where on earth did this come from?" show of 27 Giverny paintings dating from 1904 to 1922.

And where, exactly, *did* these pictures come from? Among other places the Musée Marmottan Monet in Paris; the Fondation Beyeler in Basel, Switzerland; the Art Institute of Chicago; two Japanese museums; and several private collections. Loan shows on this order cost a mint, and they're calculated investments, usually promotional packages for a single work the gallery wants to flog. But in this case, Gagosian says, nothing's for sale. The show's there because it's there, so enjoy.

And, seriously, do. This is pretty celestial stuff.

By 1904 Monet had been living at Giverny, a village some 45 miles from Paris, for more than a decade. There, with a passel of gardeners, he designed and gradually installed an elaborate and exotic park of flowers and trees, with a waterlily pond.

He adored the place, shaped it like art, like a grand horticultural earthwork. And it was a never-ending project, with workers constantly weeding beds, planting willows, reshaping the pond, adding Japanese bridges to it, arranging lily pads just so. For Monet the garden was ultimately a muse, a moral theater and the equivalent of a studio model, of whom he made severe demands, but to whom he was devoted.

During his first years in Giverny, though, he paid it only sporadic attention. His domestic situation was complicated; his career required attention. And he was traveling a lot, to London, to the Mediterranean, and painting all kinds of things, from haystacks to Houses of Parliament.

And when he did paint his garden, he went about it a bit stiffly, depicting it in classic Impressionist style, with infinite tiny strokes packed into tight compositions. He was on good painterly behavior, as if the garden didn't really belong to him.

But it did belong to him. And somehow, at some point, he internalized that idea and psychologically settled in. His take on the garden grew more personal, which meant more experimental.

He loosened up, and it loosened up. A main point of the Gagosian show, organized by the art historian Paul Hayes Tucker, is to trace this process as reflected in his painting.

No doubt the settling-in was eased by his relatively newfound financial security. By the turn of the century Monet was one of the richest artists in France, and he used his wealth to customize his environment. In 1902 he expanded the waterlily pond to nearly three times its original size, transforming a sort of wading pool into an enveloping landscape. Soon afterward he painted the first of his extensive series of pictures titled "Nymphéas," or "Water Lilies."

Eight early examples, from 1904 to 1908, hang in the show's gray-painted, rotundalike first gallery. And if you know the pre-Giverny Monet even a little you'll instantly see the leap he made here. Anchoring structures are gone. So are most clues as to real time. Space is ambiguous. Where, as viewers, are we? On the pond's edge? In the water? Hovering above the water, or peering up from its depths with lily pads over our head?

The disorientations can be surprisingly effective.

In a 1907 painting we see a Niagara of livid yellow light gushing from some crevice in the cosmos. We think apocalypse, volcanoes, nascent abstraction, but what we're looking at is a Giverny sunset reflected in water. Whatever it is, dramatic effects like this are rare.

Mostly this early painting feels gentle, luminous and buoyant. The semiabstraction makes it look adventurous, but the venturing doesn't go far. In every picture the edges of the lily pond are clearly visible, a lifeline to the reality we know.

The several years after 1908 were bad ones for Monet. His wife died, then one of his two sons, and his second son became gravely ill. World War I commenced and stretched out agonizingly. He was haunted by professional anxieties, crises of confidence. He knew that, as an Impressionist, he was a dinosaur — Fauvism and Cubism had made that clear — and that he somehow needed to change course. At the same time his eyesight was deteriorating as a result of cataracts, leaving his vision so bad that he had to number his paint tubes to determine what colors he was using.

For some or all of these reasons, by 1917, where the show picks up again, the Giverny garden had become his world and the primary subject of his art. His paintings had grown large, even panoramic, to accommodate his increasingly broad brushwork. His surfaces, once so meticulously controlled, were now unpredictable, crusty here, paint-free there, as if intended for touch rather than sight.

Incidental elements in older pictures became main events in new ones. Willows, once secondary players, present in shadows or fringes of branches, are brought center stage. He wanted to examine them, really look, and he does, making their trunks fleshlike and sinewy, turning their branches into proscenium curtains of black crepe.

Once Monet's art was all about light; now it seems to be about darkness, or light escaping from darkness. It was about the garden at night. Whoever said a garden was necessarily a benign environment? It's a Darwinian battleground, rife with silent violence as plants compete for space, light, moisture, nutriment. It's a place of entanglements and strangulations, of poisonous, itch-inducing stabbing things. And of inexhaustible beauties.

The fact is that everything of essential importance that happens in the world happens in miniature in a garden in some form. To know this is to be absorbed into the botanical drama. Monet was absorbed, and he tried to simulate that drama in art.

In old age, when he was physically less adept at doing so, he painted large garden pictures in related sets, which were meant to wrap around the walls of circular or oval rooms, enfolding and enclosing the views, taking and keeping them in.

And a few years before he died, in 1926, he distilled this idea of absorption in nature and in art into a series of small paintings, "L'Allée de Rosiers," or "The Path Under the Rose Arches." Three of the pictures are in the show's last room, and they're incendiary. If some of the late "Nymphéas" are as dark as oil spills, here the oil is set alight in flames of daubed and splotched red, gold and violet paint. In each of the rose arches a passageway opens, like the entrance to a garden, to a grave, to the heart of a flower.

We're right on the lip of abstraction here; ignore the title, and we're there. A contemporary painter like Joan Mitchell, who loved this work and learned everything from it, saw that. Other artists have felt the Monet effect too. A second stated purpose of the exhibition is to keep such influence current and flowing, to emphasize, as Larry Gagosian writes in the show's catalog, "the revolutionary nature of these works in their time, as well as their continuing relevance to artists working today."

Obviously a worthy goal. And these days, when a handful of dealers are richer than many museums, commercial galleries may more and more be where the historical word can be spread. As to other artist-revolutionaries ripe for attention, I have my list, and I'm sure Mr. Gagosian has his. We'll see who gets the nod from him next. Meanwhile let's think of Monet.

"Claude Monet: Late Work" runs through June 26 at Gagosian Gallery, 522 West 21st Street, Chelsea; (212) 741-1717, gagosian.com.

http://www.nytimes.com/2010/05/07/arts/design/07monet.html?ref=design

Mulling Mortality, in the East and in the West

By KEN JOHNSON

No one lives forever. We may carry on as if we were immortal — life has its own mysterious agenda. But sooner or later, the Grim Reaper will come for each and every one of us. This undeniable truth has inspired mountains of great art over the millenniums. Some of it is in "Remember That You Will Die: Death Across Cultures," an exhibition at the Rubin Museum of Art that is equally entertaining aesthetically and philosophically.

As organized by the Rubin curators Martin Brauen and Karl Debreczeny, with Bonnie B. Lee, a curatorial consultant, the show's 84 works are evenly divided between traditional Tibetan objects and medieval and early Renaissance European pieces. (There is also one contemporary effort: an unusually affecting video by Bill Viola.) While loaded with arresting paintings, sculptures, prints and artifacts, the exhibition also highlights profound differences in what death means to the two cultures.

With the West on one side of the gallery, and the East on the other, it is apparent that the Europeans tend toward a more naturalistic, gloomy and macabre approach, while the Tibetan works tend to be more cartoonish, symbolically complicated and hopeful. Western works are morbidly preoccupied with the perishability of the body; Eastern works take a holistic, Buddhist view of death as a passage between states of being in nearly endless cycles of reincarnation.

An apt comparison, pointed out in the exhibition brochure, is between two pairs of doll-size skeletal figures. The European works, carved with amazing surgical skill from linden wood by an unidentified 17th-century German, are anatomically realistic representations of a man and a woman with the flesh falling off their bones and intestines spilling from their lower abdomens. A baleful memento mori, this twosome promises horror to vain and faithless sinners.

The Tibetan figures, cast in bronze in the early 19th century in a more simplified style, are happily dancing characters with their skins unfurling around them like long scarves. More joyful than punitive, they are not meant to symbolize corporeal decomposition; rather, they are protective deities for yogis who confront their fear of death by meditating in charnel grounds and other scary sites.

A harsh dualism prevails on the Western side. One of the exhibition's most remarkable objects is a golf-ball-size head carved from ivory by an unknown Bohemian craftsman sometime between 1750 and 1850. Mounted on a bejeweled metal stand, the head has one side portraying half of the handsome visage of a

certain General Wallenstein, who, the wall label tells us, was famously avaricious and power driven. The other half is all skull, as if the man's skin had been neatly peeled away, revealing a fate that even the richest and most powerful cannot evade.

The big, cosmic picture is represented in a 16th-century Italianate painting of the Last Judgment by a Flemish artist from the circle of Pieter Pourbus. To the left, dozens of saved, naked people rise up toward Jesus, who, having trampled a skeleton underfoot, looks down like a beneficent puppet master. To the right, the damned, vexed by demons, fall into darkness. Perhaps they will end up in a place like the insane underworld lovingly painted on a postcard-size panel by Herri met de Bles, an adept 16th-century follower of Hieronymus Bosch.

Such either-or starkness is foreign to the Eastern side. "The Wheel of Life," an 18th-century Tibetan painting, pictures a mandala divided into many sections held in the clawed paws of Yama, Lord of Death. Painted with miniaturist precision, the sections depict dozens of scenes involving humans, animals and supernatural beings.

In general, the wheel represents six possibilities of reincarnation, of which the Hell realm and the God realm are two. The others are the Animal, the Demigod, the Hungry Ghost and the Human. Interestingly, the only escape from the cycle of birth and death known as samsara is not through the God realm but through the Human. It seems that we get into trouble when we try to be more or less than merely human.

This may seem paradoxical, as there is little naturalism on the Eastern side. But the formal complexity of Buddhist paintings of a multilevel universe reflects a finely grained psychology. It systematically symbolizes many potential states of consciousness, from the calm of the meditating Buddha himself to the gesticulating fury of the bull-headed Yama, represented by a gleaming, pedestal-size 16th-century bronze.

If the Eastern side seems more attractive psychologically, the Western side — in this exhibition, anyway — boasts the more compelling objects, many of them tiny and weird. A skull-shaped silver pocket watch opens to reveal a watchface engraved with a skull and crossbones; a silver pendant in the form of a little coffin contains a full skeleton with a minuscule frog sitting on its abdomen. (These objects are of uncertain date.)

Among numerous prints, a small, densely engraved depiction of the Triumph of Death by Georg Pencz (from about 1539) pictures a lively, scythe-wielding skeleton steering his chariot over toppled bodies as the pope looks on helplessly, his hands joined in prayer. It is Dürer-like in its technical and imaginative intensity.

Knowing his penchant for heavy-handed allegory, you might think that putting a video by Mr. Viola in the exhibition would not be a good idea. This one, however, called "The Three Women," works. Presented on a flat screen at the juncture of East and West, it shows a middle-aged woman and two younger ones, who could be her daughters, turning away from the viewer in super-slow motion and moving through a sheer curtain of falling water.

As they do, they turn from crisp, colorful figures to blurry, gray ghosts that drift farther into the darkness beyond. Eventually, they return; as the video endlessly loops, it offers a haunting metaphor for the unknowable boundary between the quick and the dead.

"Remember That You Will Die: Death Across Cultures" continues through Aug. 9 at the Rubin Museum of Art, 150 West 17th Street, Chelsea; (212) 620-5000, rmanyc.org.

http://www.nytimes.com/2010/05/07/arts/design/07remember.html?ref=design

War Zone Traumas Restaged at Home

By JESSE McKINLEY

SAN FRANCISCO — During her yearlong tour of duty in Iraq Maj. Elizabeth A. Condon saw all manner of horror and heartbreak, from dead bodies in the street and memorials for fallen friends to "little babies with holes in their backs."

But it was a moment of tenderness, she said, that stuck with her most. It happened when she was helping to care for a young Iraqi woman, whose belly had been left ripped open and infected from an amateur cesarean.

"The eldest women in the room took my hand, and started kissing my cheek and then all the other adult women each came over and kissed my cheek too," said Major Condon, now 43 and living in Loudonville, N.Y. "It was a very warm, wonderful, wonderful feeling. I don't know if I saved the woman or whatever. But it was very, very emotional."

Major Condon's experience is one of 10 such moments — each drawn from an instance of high drama in a war zone — that have been given a surreal twist by the photographer Jennifer Karady for "In Country: Soldiers Stories From Iraq and Afghanistan," an exhibition opening on Thursday at SF Camerawork, a downtown gallery here.

"In Country" is the result of five years' work by Ms. Karady, who interviewed dozens of veterans and asked them to talk about their most traumatic war moments. She then overlaid those memories onto their present-day lives, in the suburbs, back at school and, in one case, on the streets.

Ms. Karady, 43, described a process that she called equal parts journalism and psychotherapy. "This thing is replaying visually in the person's head, and we really have no idea what is going on," she said. "But the idea, conceptually, of taking that moment and recontextualizing and placing it in the civilian world, is based on a therapeutic model."

The portraits are striking. In one of the large-format color prints, which measure four feet square, a soldier ascends a dark flight of stairs, armed with nothing more than a pair of textbooks held like a rifle.

In another, a smiling ranger sits on the edge of a placid lake, camping, as two buddies — each wearing googly-eyed glasses and bloody fatigues — smile back. In a third, a sergeant sits bolt upright in a burned-out house with no other company other than a giant pink bunny.

Adding to the photos' emotional impact for the subjects is the fact that many of the models used to create the images — a little boy holding a gun, a young woman holding an IV, a mother holding a bouquet of lilies — are their friends or family members.

For Andy Davis, 29, a former Army staff sergeant who served two tours in Afghanistan and one in Iraq, that meant enlisting two other Iraq War veterans and his wife. The moment he chose involved a 13-day firefight, in which a fellow soldier was shot in the eye by a sniper.

Mr. Davis said it was his reaction to the shooting — laughter and gallows humor — that haunted him. "How quickly we were dealing with it with humor made me feel sick," said Mr. Davis, who now works as an outreach and training coordinator for the New York State Division of Veterans' Affairs. "It made me feel like we were laughing at a car accident."

Ms. Karady, who has done freelance photography for The New York Times, approached Mr. Davis last year when she was at Yaddo, the artist colony in Saratoga Springs, N.Y., and began general conversations about his experiences. Slowly, Mr. Davis recalled, those chats "started getting more specific." They talked, he said, "about things you still think about daily, very specifically: the smells, the sights, the thoughts and the feelings."

In the photograph, shot last fall at Saratoga Lake, Mr. Davis sits, bloodied with an awkward smile, while his buddies sit nearby, also washing off blood and wearing those novelty glasses with their eyes bulging out. In the distance, it seems, is Mr. Davis's more serene current reality, with his wife, Jodie, sitting next to a small pup tent.

Mr. Davis said the photograph — and the process leading to its creation — was remarkably therapeutic. "It helped me slow the whole scene down," he said. "And think about why things happened the way they did and why I'm still dealing with this."

Major Condon echoed that sentiment, saying her photograph — which includes her mother and 3-year-old daughter, seemingly praying — helped bridge a distance she felt from her family. When she hung a copy in her home, "something just clicked," she said. "I don't know how, but I really enjoy being with my daughter now. It was very painful, but very healing."

Dr. Jonathan Sherin, the chief of mental health for the West Los Angeles V.A. Medical Center and an informal advisor to Ms. Karady, likened the photos to "exposure therapy," in which veterans are asked to revisit painful experiences.

"Working with her, going through the staging, spending a lot of time reliving and remembering has been, for them, very helpful," Dr. Sherin said.

Ms. Karady's pictures have a heavy emphasis on symbolism. In a 2006 portrait of Steve Pyle, a former sergeant who was badly injured in a mortar attack, she put two of his children on a trampoline, to suggest the feeling of flying he felt when the mortar exploded. Likewise two other children are shown kicking a ball, a nod to a violent beating Mr. Pyle received after the attack.

A more recent picture — depicting Jason Lemieux, a former Marine — required her to buy dozens of bags of cheese puffs, which were relabeled with Arabic script to match a memory of Mr. Lemieux in which an unarmed civilian was killed coming out of a storeroom.

Ms. Karady says she is conscious about not pushing her subjects too far. She consults with them on what details they want to include. “I always ask: ‘Do you think you’re going to be O.K.?’ and ‘Is this going to bring anything up for you?’ ” she said.

She also emphasizes that many of her subjects are adjusting well to life after war, with or without the photos. One of those is Starlyn Lara, a 33-year-old Army veteran who now works at Swords to Plowshares, a nonprofit group in San Francisco that offers assistance to veterans. The group helped Ms. Karady get in touch with some of the veterans she photographed.

Ms. Starlyn’s photograph, taken on Treasure Island in San Francisco Bay in February, shows her sitting up in bed in a charred room, with a pink bunny gazing at her. The image comes from a recurring dream she began having after a bomb exploded under her Humvee in Iraq.

“I’m laughing in the dream, going, ‘I can’t believe this pink bunny!’ ” she says in an interview published in the exhibit catalog. “And I stop, and the pink bunny gets hit by my Humvee. I see myself in the vehicle, and I realize that the pink bunny is the bomb.”

In an interview Ms. Starlyn, whose bubbly demeanor belies her past life in the First Infantry, said she was initially skeptical of the process — “I thought it might come off as weird” — but actually found it cathartic.

“At first I thought, ‘Who wants to talk about this stuff?’ But this really was an opportunity for me to blossom,” she said. She now keeps a copy at her office.

“People ask, ‘What’s with the bunny?’ ” she said. “It really created a great reason for dialogue.”

http://www.nytimes.com/2010/05/06/arts/design/06veterans.html?ref=design

China's Energy Use Threatens Goals on Warming

By KEITH BRADSHER

HONG KONG — Even as China has set ambitious goals for itself in clean-energy production and reduction of global warming gases, the country's surging demand for power from oil and coal has led to the largest six-month increase in the tonnage of human generated greenhouse gases ever by a single country.

China's leaders are so concerned about rising energy use and declining energy efficiency that the cabinet held a special meeting this week to discuss the problem, according to a statement Thursday from the ministry of industry and information technology. Coal-fired electricity and oil sales each climbed 24 percent in the first quarter from a year earlier, on the heels of similar increases in the fourth quarter

Premier Wen Jiabao promised tougher policies to enforce energy conservation, including a ban on government approval of any new projects by companies that failed to eliminate inefficient capacity, the ministry said. Mr. Wen also said that China had to find a way to meet the target in its current five-year plan of a 20 percent improvement in energy efficiency.

"We can never break our pledge, stagger our resolution or weaken our efforts, no matter how difficult it is," Mr. Wen said. Western experts say it will be hard to meet the target, but that China's leaders seem determined.

"No country of this size has seen energy demand grow this fast before in absolute terms, and those who are most concerned about this are the Chinese themselves," said Jonathan Sinton, the China program manager at the International Energy Agency in Paris.

China has been the world's largest emitter of greenhouse gases each year since 2006, leading the United States by an ever-widening margin. A failure by China to meet its own energy efficiency targets would be a big setback for international efforts to limit such emissions.

Such a failure would also be a potential diplomatic embarrassment for the Chinese government, which promised the world just before the Copenhagen climate summit meeting in December that it would improve energy efficiency.

The issue has major economic implications for China and for global energy markets. The nation's ravenous appetite for fossil fuels is driven by China's shifting economic base — away from light export industries like garment and shoe production and toward energy-intensive heavy industries like steel and cement manufacturing for cars and construction for the domestic market.

Almost all urban households in China now have a washing machine, a refrigerator and an air-conditioner, according to government statistics. Rural ownership of appliances is now soaring as well because of new government subsidies for their purchase since late 2008.

Car ownership is rising rapidly in the cities, while bicycle ownership is actually falling in rural areas as more families buy motorcycles and light trucks.

General Motors announced on Thursday that its sales in China rose 41 percent in April from a year earlier, virtually all of the vehicles made in China because of high import taxes.

Zhou Xi'an, a National Energy Administration official, said in a statement last month that fossil fuel consumption was likely to increase further in the second quarter of this year because of rising car ownership, diesel use in the increasingly mechanized agricultural sector and extra jet fuel consumption for travelers to the Shanghai Expo.

The shift in the composition of China's economic output is overwhelming the effects of China's rapid expansion of renewable energy and its existing energy conservation program, energy experts said.

The increase in oil and coal-fired electricity consumption in the first quarter was twice as fast as economic growth of about 12 percent for that period, a sign that rising energy consumption is not just the result of a rebounding economy but also of changes in the mix of industrial activity. The shift in activity is partly because of China's economic stimulus program, which has resulted in a surge in public works construction that requires a lot of steel and cement.

Burning fossil fuels releases carbon dioxide, which many scientists describe as the biggest man-made contributor to global warming.

President Hu Jintao pledged in November that by 2020 the Chinese government would slow its growth in greenhouse gases by sharply improving energy efficiency. Mr. Wen went to the Copenhagen climate meeting three weeks later and opposed any international monitoring of China's energy efficiency effort or binding limits on China's overall energy consumption.

China's current five-year plan, from 2006 to 2010, already sets an efficiency target that the country may now be less likely to meet.

The plan calls for the energy needed for each unit of economic output to decline by 20 percent in 2010 compared to 2005.

For a while, China seemed to be on track toward that goal. According to the ministry of industry and information technology, energy efficiency actually improved by more than 14 percent from 2005 to 2009.

But it deteriorated by 3.2 percent in the first quarter, the ministry said on Thursday.

Mr. Wen said that this deterioration would make it "particularly difficult" for China to meet the 20 percent target.

Without big policy changes, like raising fuel taxes, “they can’t possibly make it,” said Julie Beatty, principal energy economist at Wood Mackenzie, a big energy consulting firm based in Edinburgh, Scotland.

Mr. Hu promised last November that China would improve the energy efficiency of its economy by 40 to 45 percent by 2020. The ministry statement on Thursday did not mention whether Mr. Hu’s promise might still be achievable.

Complicating energy efficiency calculations is the fact that China’s National Bureau of Statistics has begun a comprehensive revision of all of the country’s energy statistics for the last 10 years, restating them with more of the details commonly available in other countries’ data. Western experts also expect the revision to show that China has been using even more energy and releasing even more greenhouse gases than previously thought.

Revising the data now runs the risk that other countries will distrust the results and demand greater international monitoring of any future pledges by China. If the National Bureau of Statistics revises up the 2005 data more than recent data, for example, then China might appear to have met its target at the end of this year for a 20 percent improvement in energy efficiency.

China’s recent embrace of renewable energy has done little so far to slow the rise in emissions from the burning of fossil fuels.

Wind energy effectively doubled in this year’s first quarter compared with a year earlier, as China has emerged as the world’s largest manufacturer and installer of wind turbines. But wind still accounts for just 2 percent of China’s electricity capacity — and only 1 percent of actual output, because the wind does not blow all the time.

Meanwhile, fuel-intensive heavy industry output rose 22 percent in the first quarter in China from a year earlier, while light industry increased 14 percent.

Rajendra K. Pachauri, the chairman of the Intergovernmental Panel on Climate Change, a United Nations research unit, said in an e-mail message that he believed China was serious about addressing its emissions. “There is a growing realization within Chinese society that major reductions in greenhouse gas emissions would be of overall benefit to China,” he wrote after learning of the latest Chinese energy statistics. “This is important not only for global reasons, because China is now responsible for the highest emissions of greenhouse gases, but also because its per capita emissions are increasing at a rapid rate.”

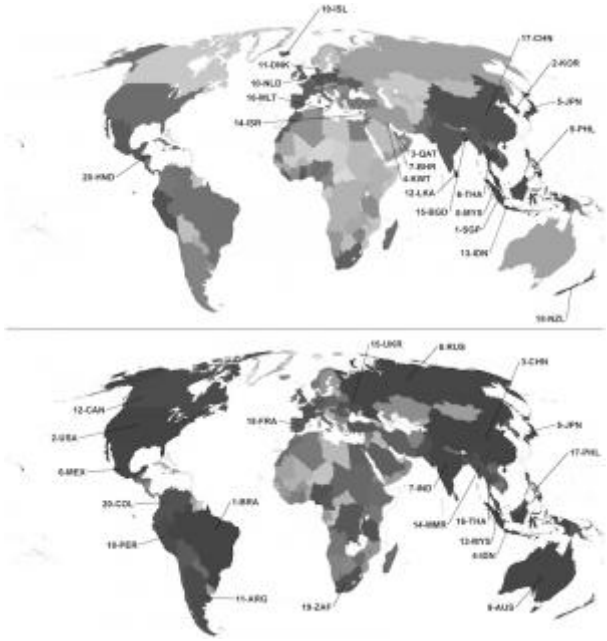
To some extent, China’s energy consumption now might actually help limit its global warming emissions in the future.

China, for example, used 200 million tons of cement in building rail lines last year, while the entire American economy only used 93 million tons, said David Fridley, a China energy specialist at the Lawrence Berkeley National Laboratory. Although production of that cement raised energy use and emissions of global warming gases, it also expanded a rail system that is among the most energy-efficient in the world. China currently moves only 55 percent of its coal by rail, for example, which is down from 80 percent a decade ago, as many coal users have been forced by inadequate rail capacity to haul coal in trucks instead. The trucks burn 10 or more times as much fuel per mile to haul a ton of coal, Mr. Fridley said.

But now, with new high-speed passenger lines leaving more room on older lines to haul coal and other freight, the percentages could begin shifting away from energy-inefficient trucking, he said.

http://www.nytimes.com/2010/05/07/business/energy-environment/07energy.html?ref=science

New Study Ranks Countries on Environmental Impact



Relative rank of countries by proportional and absolute environmental impact: Proportional environmental impact (179 countries; top panel) and absolute environmental impact rank (171 countries; bottom panel) (darker grey = higher impact) out of 228 countries considered are shown. Environmental impact ranks (proportional and absolute) combine ranks for natural forest lost, habitat conversion, marine captures, fertilizer use, water pollution, carbon emissions and proportion of threatened species (see text for details). The worst 20 countries for each ranking are shown.

ScienceDaily (May 4, 2010) — A new study led by the University of Adelaide's Environment Institute in Australia has ranked most of the world's countries for their environmental impact.

The research uses seven indicators of environmental degradation to form two rankings -- a proportional environmental impact index, where impact is measured against total resource availability, and an absolute environmental impact index measuring total environmental degradation at a global scale.

Led by the Environment Institute's Director of Ecological Modelling Professor Corey Bradshaw, the study has been published in the on-line, peer-reviewed science journal *PLoS ONE*.

The world's 10 worst environmental performers according to the proportional environmental impact index (relative to resource availability) are: Singapore, Korea, Qatar, Kuwait, Japan, Thailand, Bahrain, Malaysia, Philippines and Netherlands.

In absolute global terms, the 10 countries with the worst environmental impact are (in order, worst first): Brazil, USA, China, Indonesia, Japan, Mexico, India, Russia, Australia and Peru.

The indicators used were natural forest loss, habitat conversion, fisheries and other marine captures, fertiliser use, water pollution, carbon emissions from land use and species threat.

"The environmental crises currently gripping the planet are the corollary of excessive human consumption of natural resources," said Professor Bradshaw. "There is considerable and mounting evidence that elevated degradation and loss of habitats and species are compromising ecosystems that sustain the quality of life for billions of people worldwide."

Professor Bradshaw said these indices were robust and comprehensive and, unlike existing rankings, deliberately avoided including human health and economic data - measuring environmental impact only.

The study, in collaboration with the National University of Singapore and Princeton University, found that the total wealth of a country (measured by gross national income) was the most important driver of environmental impact.

"We correlated rankings against three socio-economic variables (human population size, gross national income and governance quality) and found that total wealth was the most important explanatory variable - the richer a country, the greater its average environmental impact," Professor Bradshaw said.

There was no evidence to support the popular idea that environmental degradation plateaus or declines past a certain threshold of per capital wealth (known as the Kuznets curve hypothesis).

"There is a theory that as wealth increases, nations have more access to clean technology and become more environmentally aware so that the environmental impact starts to decline. This wasn't supported," he said.

Story Source:

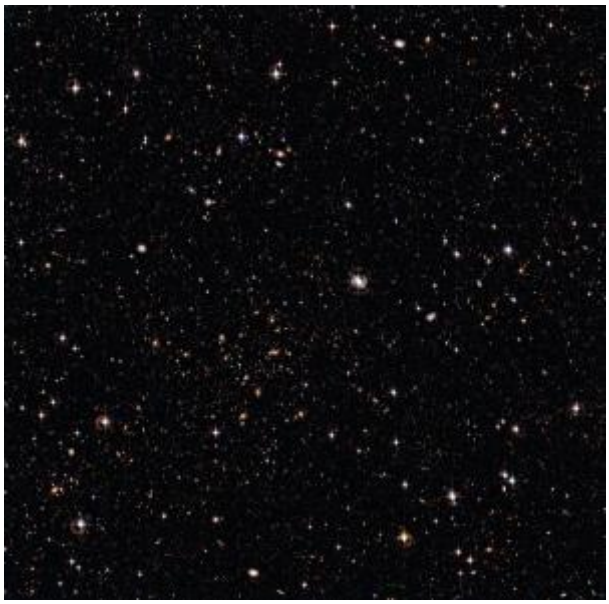
Adapted from materials provided by University of Adelaide.

Journal Reference:

1. Corey J. A. Bradshaw, Xingli Giam, Navjot S. Sodhi, Stephen Willis. **Evaluating the Relative Environmental Impact of Countries**. *PLoS ONE*, 2010; 5 (5): e10440 DOI: 10.1371/journal.pone.0010440

http://www.sciencedaily.com/releases/2010/05/100505092006.htm

A Cluster and a Sea of Galaxies



The Cluster of Galaxies Abell 315: This wide-field, deep image reveals thousands of galaxies crowding an area on the sky roughly as large as the full Moon. (Credit: ESO/J. Dietrich)

ScienceDaily (May 7, 2010) — A new wide-field image released by ESO displays many thousands of distant galaxies, and more particularly a large group belonging to the massive galaxy cluster known as Abell 315. As crowded as it may appear, this assembly of galaxies is only the proverbial "tip of the iceberg," as Abell 315 -- like most galaxy clusters -- is dominated by dark matter. The huge mass of this cluster deflects light from background galaxies, distorting their observed shapes slightly.

When looking at the sky with the unaided eye, we mostly only see stars within our Milky Way galaxy and some of its closest neighbours. More distant galaxies are just too faint to be perceived by the human eye, but if we could see them, they would literally cover the sky. This new image released by ESO is both a wide-field and long-exposure one, and reveals thousands of galaxies crowding an area on the sky roughly as large as the full Moon.

These galaxies span a vast range of distances from us. Some are relatively close, as it is possible to distinguish their spiral arms or elliptical halos, especially in the upper part of the image. The more distant appear just like the faintest of blobs -- their light has travelled through the Universe for eight billion years or more before reaching Earth.

Beginning in the centre of the image and extending below and to the left, a concentration of about a hundred yellowish galaxies identifies a massive galaxy cluster, designated with the number 315 in the catalogue compiled by the American astronomer George Abell in 1958 [1]. The cluster is located between the faint, red and blue galaxies and the Earth, about two billion light-years away from us. It lies in the constellation of Cetus (the Whale).

Galaxy clusters are some of the largest structures in the Universe held together by gravity. But there is more in these structures than the many galaxies we can see. Galaxies in these giants contribute to only ten percent of the mass, with hot gas in between galaxies accounting for another ten percent [2]. The remaining 80 percent is made of an invisible and unknown ingredient called dark matter that lies in between the galaxies.

The presence of dark matter is revealed through its gravitational effect: the enormous mass of a galaxy cluster acts on the light from galaxies behind the cluster like a cosmic magnifying glass, bending the

trajectory of the light and thus making the galaxies appear slightly distorted [3]. By observing and analysing the twisted shapes of these background galaxies, astronomers can infer the total mass of the cluster responsible for the distortion, even when this mass is mostly invisible. However, this effect is usually tiny, and it is necessary to measure it over a huge number of galaxies to obtain significant results: in the case of Abell 315, the shapes of almost 10 000 faint galaxies in this image were studied in order to estimate the total mass of the cluster, which amounts to over a hundred thousand billion times the mass of our Sun [4].

To complement the enormous range of cosmic distances and sizes surveyed by this image, a handful of objects much smaller than galaxies and galaxy clusters and much closer to Earth are scattered throughout the field: besides several stars belonging to our galaxy, many asteroids are also visible as blue, green or red trails [5]. These objects belong to the main asteroid belt, located between the orbits of Mars and Jupiter, and their dimensions vary from some tens of kilometres, for the brightest ones, to just a few kilometres in the case of the faintest ones.

This image has been taken with the Wide Field Imager on the MPG/ESO 2.2-metre telescope at ESO's La Silla Observatory in Chile. It is a composite of several exposures acquired using three different broadband filters, for a total of almost one hour in the B filter and about one and a half hours in the V and R filters. The field of view is 34 x 33 arcminutes.

Notes

[1] The Abell catalogue from 1958 comprised 2712 clusters of galaxies, and was integrated with an additional 1361 clusters in 1989. Abell put together this impressive collection by visual inspection of photographic plates of the sky, seeking those areas where more galaxies than average were found at approximately the same distance from us.

[2] Ten percent of a galaxy cluster's mass consists of a very hot mixture of protons and electrons (a plasma), with temperatures as high as ten million degrees or more, which makes it visible to X-ray telescopes.

[3] Astronomers refer to these slight distortions as weak gravitational lensing, as opposed to strong gravitational lensing, characterised by more spectacular phenomena such as giant arcs, rings and multiple images.

[4] A weak lensing study of the galaxy cluster Abell 315 has been published in a paper that appeared in *Astronomy & Astrophysics* in 2009 ("Weak lensing observations of potentially X-ray underluminous galaxy clusters," by J. Dietrich et al.).

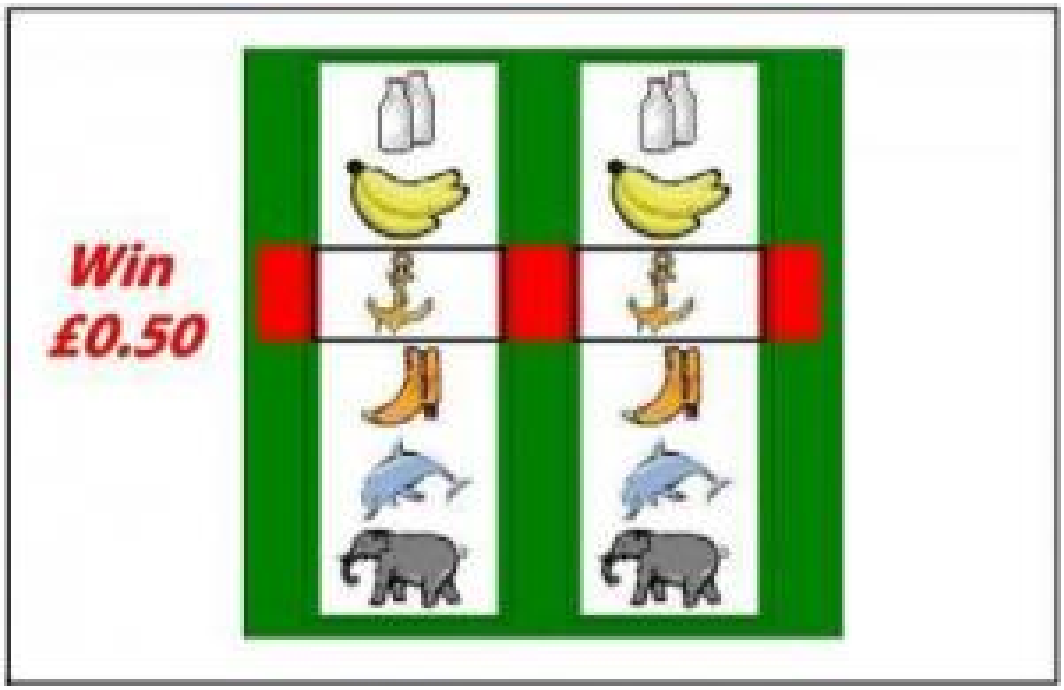
[5] The blue, green or red tracks indicate that each asteroid has been detected through one of the three filters, respectively. Each track is composed of several, smaller sub-tracks, reflecting the sequence of several exposures performed in each of the filters; from the length of these sub-tracks, the distance to the asteroid can be calculated.

Story Source:

Adapted from materials provided by European Southern Observatory - ESO.

http://www.sciencedaily.com/releases/2010/05/100505102559.htm

Problem Gamblers Provoked by 'Near Misses' to Gamble More



The slot machine task presents two wheels, each with six icons, and a horizontal line across the center of the screen. If the right wheel stopped on the selected icon (i.e., matching icons were aligned), the subject was awarded £0.50 (approximately 75 cents). All other outcomes won nothing. When the wheels stopped within one icon of a match, the outcome was considered a "near miss." (Credit: Courtesy, with permission: Chase and Clark. The Journal of Neuroscience 2010.)

ScienceDaily (May 7, 2010) — The brains of problem gamblers react more intensely to "near misses" than casual gamblers, possibly spurring them on to play more, according to new research in the May 5 issue of *The Journal of Neuroscience*. The researchers found the brain region that responds to rewards by delivering a dose of the chemical dopamine was especially active in these individuals.

Studies have shown that pathological gambling is an addiction, similar in many ways to drug addiction. Now, U.K. researchers Luke Clark, PhD, of the University of Cambridge, and Henry Chase, PhD, of the University of Nottingham find that the degree to which a person's brain responds to near misses may indicate the severity of addiction. In a given year, more than two million U.S. adults feel an uncontrollable urge to gamble despite negative consequences.

In this study, the researchers used functional magnetic resonance imaging (fMRI) to scan the brains of 20 gamblers. The participants' gambling habits ranged from buying the occasional lottery ticket to compulsive sports betting.

During the experiment, volunteers used an onscreen slot machine with two spinning wheels of icons. When the two icons matched, the volunteer won about 75 cents, and the brain's reward pathways became active. An icon mismatch was a loss. However, when the wheels stopped within one icon of a match, the outcome was considered a near miss. Clark and his team found that near misses activated the same brain pathways that wins did, even though no reward was given.

"These findings are exciting because they suggest that near-miss outcomes may elicit a dopamine response in the more severe gamblers, despite the fact that no actual reward is delivered," Clark said. "If these bursts of dopamine are driving addictive behavior, this may help to explain why problem gamblers find it so difficult to quit."

In particular, the authors detected strong responses in the midbrain, an area associated with addiction that is packed with dopamine-releasing brain cells. They also found the near misses were linked with increased activity in brain regions called the ventral striatum and the anterior insula, areas tied with reward and learning.

Studies have shown that people who play games of chance, such as slot machines or the lottery, often mistakenly believe some level of skill is required to win. This illusion of control often pushes players to continue. Matthew Roesch, PhD, an expert in reward and behavior at the University of Maryland College Park who was unaffiliated with the study, said the increased levels of dopamine during near misses may be critical in driving pathological gambling and supporting the misconception that games of chance involve any skill.

"Future work will be necessary to determine if this response is causal or if this abnormality is a preexisting trait of pathological gamblers -- and whether or not it is common across addictions," Roesch said.

The research was supported by the Responsibility in Gambling Trust (now the Responsible Gambling Fund), the Medical Research Council (United Kingdom), and the Wellcome Trust, and was completed within the University of Cambridge Behavioural and Clinical Neuroscience Institute.

Story Source:

Adapted from materials provided by Society for Neuroscience, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Henry W. Chase, Luke Clark. **Gambling Severity Predicts Midbrain Response to Near-Miss Outcomes**. *Journal of Neuroscience*, 2010; 30 (18): 6180 DOI: 10.1523/JNEUROSCI.5758-09.2010

http://www.sciencedaily.com/releases/2010/05/100504173817.htm

A New Way to Use Herbicides: To Sterilize, Not Kill Weeds

Sterilizing rather than killing exotic invasive grasses like Japanese brome (shown here) with herbicides might be a more economical and environmentally sound weed control strategy for rangeland, according to new ARS research. (Credit: Photo courtesy of Richard Old, XID Services, Inc., Bugwood.org)

ScienceDaily (May 7, 2010) — Using herbicides to sterilize rather than to kill weedy grasses might be a more economical and environmentally sound weed control strategy, according to a study by Agricultural Research Service (ARS) scientists and a cooperator.

Rangeland ecologist Matt Rinella at the ARS Fort Keogh Livestock and Range Research Laboratory in Miles City, Mont., conducted the study with colleagues at Miles City and Robert Masters with Dow AgroSciences LLC, in Indianapolis, Ind.

Exotic annual grasses such as Japanese brome, cheatgrass and medusahead are harming millions of acres of grassland in the western United States. Currently, the herbicides used to control these invasive grasses also sometimes damage desirable perennial grasses.

In contrast, when used properly, growth regulators typically do not greatly harm desirable perennial grasses. Growth regulator herbicides are used to control broadleaf weeds in wheat and other crop grasses, as well as on rangelands. Rinella and his colleagues knew that when dicamba and other growth regulator herbicides were applied to cereal crops late in their growth stage, just before seed formation, the plants produced far fewer seeds.

The scientists decided to see if these herbicides had the same harmful late-stage application effects on the invasive weed Japanese brome. In greenhouse experiments, they tested dicamba (Banvel/Clarity), 2,4-D, and picloram (Tordon) at typically used rates. They found that picloram reduced seed production nearly 100 percent when applied at the late growth stage of the weed. Dicamba was slightly less effective, but still nearly eliminated all seed production, while 2,4-D was much less effective.

Since annual grass seeds only survive in soil a year or two, it should only take one to three years of herbicide treatment at the right growth stage to greatly reduce the soil seed bank of annual weedy grasses without harming perennial grasses.

Rinella has recently finished field tests that support the greenhouse experiment results. He also tested the herbicide aminopyralid (Milestone) and found it was as effective as picloram. Next he will test much lower doses of the herbicides in an attempt to lower costs and reduce non-target damage to broadleaf plants.

The research was published in the journal *Invasive Plant Science and Management*.

Story Source:

Adapted from materials provided by USDA/Agricultural Research Service. Original article written by Don Comis.

Journal Reference:

1. Matthew J. Rinella, Marshall R. Haferkamp, Robert A. Masters, Jennifer M. Muscha, Susan E. Bellows, Lance T. Vermeire. **Growth Regulator Herbicides Prevent Invasive Annual Grass Seed Production**. *Invasive Plant Science and Management*, 2010; 3 (1): 12 DOI: 10.1614/IPSM-D-09-00007.1

http://www.sciencedaily.com/releases/2010/05/100505102603.htm

Toward Simplifying Treatment of a Serious Eye Infection

ScienceDaily (May 7, 2010) — Scientists are reporting development of a potential new way of enabling patients with bacterial keratitis to stick with the extraordinarily intensive treatment needed for this potentially blinding eye infection. The disease affects more than 500,000 people each year worldwide, including 30,000 people in the United States.

The study is in ACS' *Molecular Pharmaceutics*, a bi-monthly journal.

Howida Kamal Ibrahim and colleagues explain that bacterial keratitis is a rapidly-progressing infection of the cornea, the clear tissue covering the front of the eye. Treatment method requires that patients frequently use antibiotic eye medicine -- one drop every 5 minutes to start and then more drops every 15-30 minutes for up to 3 days -- and daily use of anti-inflammatory drugs. This intensive treatment regimen is difficult for patients to follow and often requires putting them into a hospital to assure they get adequate treatment.

The scientists describe the development of a new two-in-one formula that combines the antibiotic and anti-inflammatory drug into a single medication. The eye drops contain nano-sized particles -- each about 1/50,000th the width of a human hair -- of an antibiotic (gatifloxacin) and an anti-inflammatory drug (prednisolone) coated with a substance that keeps the medicine in the eye longer. In tests with lab animals, the drops delivered five times more medication to the eye and it remained there three times longer than existing medicine, the scientists say. For patients, the new drops could mean an easier course of treatment that can be done more often out-of-hospital.

Story Source:

Adapted from materials provided by American Chemical Society, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Howida Kamal Ibrahim, Iman Sadar El-Leithy, Amna Awad Makky. **Mucoadhesive Nanoparticles as Carrier Systems for Prolonged Ocular Delivery of Gatifloxacin/Prednisolone Bitherapy**. *Molecular Pharmaceutics*, 2010; 7 (2): 576 DOI: 10.1021/mp900279c

http://www.sciencedaily.com/releases/2010/05/100505113253.htm

Hidden Side of Star Birth Revealed

This image is taken looking towards a region of the Galaxy in the Eagle constellation, closer to the Galactic centre than our Sun. Here, we see the outstanding end-products of the stellar assembly line. At the centre and the left of the image, the two massive star-forming regions G29.9 and W43 are clearly visible. These mini-starbursts are forming, as we speak, hundreds and hundreds of stars of all sizes: from those similar to our Sun, to monsters several tens of times heavier than our Sun. These newborn large stars are catastrophically disrupting their original gas embryos by kicking away their surroundings and excavating giant cavities in the Galaxy. This is clearly visible in the 'fluffy chimney' below W43. (Credit: ESA/Hi-GAL Consortium)

ScienceDaily (May 6, 2010) — The first scientific results from ESA's Herschel infrared space observatory are revealing previously hidden details of star formation. New images show thousands of distant galaxies furiously building stars and beautiful star-forming clouds draped across the Milky Way. One picture even catches an 'impossible' star in the act of formation.

Presented May 6 during a scientific symposium held at the European Space Agency (ESA), the results challenge old ideas of star birth, and open new roads for future research.

Herschel's observation of the star-forming cloud RCW 120 has revealed an embryonic star which looks set to turn into one of the biggest and brightest stars in our Galaxy within the next few hundred thousand years. It already contains eight to ten times the mass of the Sun and is still surrounded by an additional 2000 solar masses of gas and dust from which it can feed further.

"This star can only grow bigger," says Annie Zavagno, Laboratoire d'Astrophysique de Marseille. Massive stars are rare and short-lived. To catch one during formation presents a golden opportunity to solve a long-standing paradox in astronomy. "According to our current understanding, you should not be able to form stars larger than eight solar masses," says Dr Zavagno.

This is because the fierce light emitted by such large stars should blast away their birth clouds before any more mass can accumulate. But somehow they do form. Many of these 'impossible' stars are already known, some containing up to 150 solar masses, but now that Herschel has seen one near the beginning of its life, astronomers can use the data to investigate how it is defying their theories.

Herschel is the largest astronomical telescope ever to be placed into space. The diameter of its main mirror is four times larger than any previous infrared space telescope and one and a half times larger than Hubble. As stars begin to form, the surrounding dust and gas is warmed up to a few tens of degrees above absolute zero and starts to emit at far-infrared wavelengths. The Earth's atmosphere completely blocks the majority of these wavelengths and thus observations from space are necessary.

Using its unprecedented resolution and sensitivity, Herschel is conducting a census of star-forming regions in our Galaxy. "Before Herschel, it was not clear how the material in the Milky Way came together in high enough densities and at sufficiently low temperatures to form stars," says Sergio Molinari, Istituto di Fisica dello Spazio Interplanetario, Roma.

A new Herschel image covering a number of stellar nurseries in the Milky Way shows how it happens. Stellar embryos first appear inside filaments of glowing dust and gas draped across the Galaxy. These form chains of stellar nurseries, tens of light-years long, wrapping the Galaxy in a web of star birth.

Herschel has also been surveying deep space beyond our Galaxy, and has measured the infrared light from thousands of other galaxies, spread across billions of light-years of the Universe. Each galaxy appears as just a pinprick but its brightness allows astronomers to determine the rate of star birth within it. Roughly speaking, the brighter the galaxy the more stars it is forming.

Here, too, Herschel has challenged our previous understanding by showing that galaxies have been evolving over cosmic time much faster than previously thought. Astronomers believed that galaxies have been forming stars at about the same rate for the last three billion years. Herschel shows this is not true.

In the past, there were many more so-called 'starburst' galaxies forming stars at 10-15 times the rate we see in the Milky Way today. But what triggered this frantic activity is not completely understood. "Herschel will now let us investigate the reasons for this behaviour," says Steve Eales, Cardiff University, UK.

Herschel is also a prime instrument for detecting the smallest forms of matter: molecules. It has made the first discovery in space of a new 'phase' of water. It is electrically charged and unlike the more familiar phases, namely solid ice, liquid water and gaseous steam, it does not occur naturally on Earth. In the birth clouds surrounding young stars, however, where ultraviolet light is pumping through the gas, this irradiation can knock an electron out of the water molecule, leaving it with an electrical change.

"This detection of ionised water vapour came as a surprise," says Arnold Benz, ETH Zurich, Switzerland. "It tells us that there are violent processes taking place during the early birth stages which lead to widespread energetic radiation throughout the cloud." From the biggest galaxies to the smallest molecules, these and many other Herschel results are being presented to the scientific community at the Herschel First Results Symposium, ESLAB 2010, taking place this week at ESA's ESTEC space research and technology centre, in Noordwijk in the Netherlands.

"These are still early days for Herschel and this is just the beginning of all the science that we will get from this mission in the years to come," says Göran Pilbratt, ESA Herschel Project Scientist.

Story Source:

Adapted from materials provided by European Space Agency.

http://www.sciencedaily.com/releases/2010/05/100506112607.htm

Stream Water Study Detects Thawing Permafrost

Arctic permafrost, Canada. (Credit: iStockphoto/Dawn Nichols)

ScienceDaily (May 5, 2010) — Among the worrisome environmental effects of global warming is the thawing of Arctic permafrost -- soil that normally remains at or below the freezing point for at least a two-year period and often much longer. Monitoring changes in permafrost is difficult with current methods, but a study by University of Michigan researchers offers a new approach to assessing the extent of the problem.

The new study approach, which relies on chemical tracers in stream water, is described in the journal *Chemical Geology*.

Overlying permafrost is a thin "active layer" that thaws every summer, and increases in the thickness of this layer over the years indicate thawing of permafrost. Both physical measurements and modeling suggest that active layer thickness has increased in some areas over the 20th century and that if present warming trends continue, increases of up to 40 percent could occur by the end of the 21st century.

Although the full effects of thawing are yet to be determined, coastal erosion and damage to the roads, buildings and pipelines that have been built on permafrost are likely outcomes. In addition, thawing permafrost may release the greenhouse gases carbon dioxide and methane into the atmosphere, triggering further warming and more permafrost thawing.

Currently, the main method for determining thaw depth is with a graduated steel probe. "You stick it in the ground and see when it hits frozen material," said geochemist Joel Blum, who with ecologist George Kling and former graduate student Katy Keller undertook the new study.

"We were studying the chemistry of soils in the area around Toolik Field Station in northern Alaska, and we found that once we got below the thickness that typically would thaw during summer, the soil chemistry changed dramatically," said Blum, who is the John D. MacArthur Professor of Geological Sciences. "Material that has not thawed since it was deposited by glaciers 10,000 to 20,000 years ago is now beginning to thaw, and when it does, it reacts strongly with water, which it's encountering for the

first time. This soil is much more reactive than soils higher up that interact with soil water every summer."

In particular, the amount of calcium, relative to sodium and barium, is higher in the newly-thawed permafrost, and the ratio of the strontium isotope 87Sr to its counterpart 86Sr is lower. The researchers wondered if these chemical signatures of increasing thaw depth could be seen in local stream water.

Kling, who is the Robert G. Wetzel Collegiate Professor of Ecology and Evolutionary Biology, has conducted research at Toolik Lake for many years and obtained stream water samples that had been collected over an 11-year period.

When the samples were analyzed, "we saw really significant changes from year to year that were consistent with what you would predict from increasing thaw depth," Kling said.

Although the method can't reveal precisely how much permafrost thawing is occurring in particular localities, it still can be a useful adjunct to current methods, Blum said. "We'd love to be able to say that we see an increase in thickness of, say, 1 centimeter over the entire watershed, but we simply can't say where in the watershed thawing is occurring. Nevertheless, we think it's important to monitor streams in Arctic regions to keep track of these kinds of changes and follow the rate of change."

The research was funded by the National Science Foundation and the Geological Society of America.

Story Source:

Adapted from materials provided by University of Michigan.

Journal Reference:

1. Katy Keller, Joel D. Blum, George W. Kling. **Stream geochemistry as an indicator of increasing permafrost thaw depth in an arctic watershed**. *Chemical Geology*, 2010; 273 (1-2): 76 DOI: 10.1016/j.chemgeo.2010.02.013

http://www.sciencedaily.com/releases/2010/05/100505163232.htm

Roots Meshed in Waste Materials Could Clean Dirty Water

Penn State horticulturist Robert Cameron stands in front of a biofilter that uses plants roots, waste materials and bacterial colonies to clean wastewater as it trickles down the pipes. (Credit: Amitabh Avasthi)

ScienceDaily (May 5, 2010) — Plant roots enmeshed in layers of discarded materials inside upright pipes can purify dirty water from a washing machine, making it fit for growing vegetables and flushing toilets, according to Penn State horticulturists.

"Our global fresh water supplies are fast depleting," said Robert D. Cameron, doctoral student in horticulture. "So it is critical that we begin to look at alternatives on how we can take wastewater and turn it into a resource."

Cameron and Robert D. Berghage, associate professor of horticulture, use discarded materials and a combination of plant and bacterial communities to treat water from a washing machine and other wastewater.

According to Cameron, this design is superior to previous living treatment systems in that it requires much less space and is much more efficient at removing contaminants.

"We have shown that with this system we can take wastewater from a washing machine and remove more than 90 percent of the pollutants within three days," said Cameron. "The treated water had very low levels of suspended solids and no detectable levels of e.coli."

Cameron presented the work at a meeting on organic and sustainable agriculture in Havana.

The water treatment system consists of two seven-foot long plastic corrugated pipes a foot in diameter. The researchers placed these pipes upright three feet apart in a basin containing a foot of potting soil and crushed limestone.

"We planted the three feet by five feet basin at the foot of the pipes with papyrus and horsetail reed," said Cameron. "Just like in a wetland, the roots of these plants and associated bacteria clean the water as it flows under the basin surface and through the two columns."

Both culvert pipes are filled with alternating layers of porous rocks, composted cow manure, peat moss, tire crumbs, potting soil and crushed limestone.

Researchers planted vegetables and ornamental plants -- tomatoes, peppers, rosemary, basil and orchids -- in holes drilled along the length of the pipes. They then pumped about 45 gallons of wastewater from a washing machine to the top of the two pipes.

"As the dirty water trickles down the pipes, the tight mesh created by the soil, gravel and roots filters out pollutants," explained Cameron. "Additionally, bacterial colonies among the roots eat away the dissolved organic matter while layers of iron scraps or clay can be added to trap phosphorous."

By periodically replacing the plants, pollutants not metabolized but trapped, can be removed from the system, he added.

Chemical analyses of the treated water show a reduction of nitrites from 24 parts per million to just 1.9 parts per million, a reduction of more than 90 percent.

The system is also effective in filtering out boron. While boron is a necessary micronutrient for plants, it is toxic at high levels and can accumulate in the ground.

"Our gray water sample had boron levels of about 702 parts per million," said Cameron. "But after about three days of treatment, water collected from the foot of the pipes had only about 58 parts per million -- a reduction of about 92 percent. Dozens of other pollutants were similarly reduced in two to three days."

Cameron indicates that the next phase of research will focus on the beneficial reuses of the treated wastewater such as reducing a building's need for air conditioning.

Story Source:

Adapted from materials provided by Penn State.

http://www.sciencedaily.com/releases/2010/05/100505091958.htm

Milk and Risk of Renal Cell Cancer: Genetic Research Sheds New Light

ScienceDaily (May 6, 2010) — While previous research had suggested that drinking milk was related to factors that may increase the risk of renal cell cancer, results of a recent study exploiting the genetic contribution to variation in milk consumption suggest that this may not be the case.

"The data in this study provide no concrete evidence of a need to alter milk drinking in any way," said lead researcher Nicholas Timpson, Ph.D., lecturer in genetic epidemiology at the MRC CAiTE Center in the department of social medicine at the University of Bristol, United Kingdom. "If anything, the failure of genetic findings to replicate the association between milk and renal cell cancer suggests that fears that milk consumption might elevate cancer risk are likely to be unfounded."

These study results are published in the May issue of *Cancer Epidemiology, Biomarkers & Prevention*, a journal of the American Association for Cancer Research.

Previously reported studies suggested a connection between milk intake and renal cell carcinoma risk, and whether this represents a causal association or is the result of bias is currently unclear. Timpson and colleagues used a genetic marker to try to help untangle this observation.

From 1999 through 2003 the researchers conducted a large, hospital-based, case-control study from four central and eastern European countries.

Using observational, genetic and phenotypic data, they determined whether the genetic variant at the gene MCM6 -- known to be associated with lactose tolerance -- may be used as a non-confounded and unbiased marker for milk consumption's link to cancer risk.

For adult milk drinkers vs. non-milk drinkers in this study, the difference in the odds of renal cell carcinoma was approximately 35 percent. However, when assessing the relationship in a more direct way by using genetic data there was no association between the two.

"We found evidence for the often-questioned relationship between milk consumption and cancer, yet when we used genotypes to verify this relationship, there was no corroboratory evidence," Timpson said. "This does suggest that the basic findings may be subject to the kinds of biases and inaccuracies that often upset epidemiological research, but that this study would need to be undertaken on a much larger scale in order to verify these initial findings."

Johanna Lampe, Ph.D., an editorial board member of *Cancer Epidemiology, Biomarkers & Prevention* who is not associated with this study, said this study demonstrates the complexities of evaluating dietary exposures and cancer risk.

"These results are a reminder to proceed with caution when interpreting data that suggest an association between intake of specific foods and risk of a particular cancer. Human diet is complex and typically involves adherence to certain dietary patterns that are also tied to other lifestyle behaviors," said Lampe, full member and nutrition scientist in the division of public health sciences at Fred Hutchinson Cancer Research Center, Seattle, Wash.

Story Source:

Adapted from materials provided by American Association for Cancer Research, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Nicholas J. Timpson, Paul Brennan, Valérie Gaborieau, Lee Moore, David Zaridze, Vsevolod Matveev, Neonilia Szeszenia-Dabrowska, Jolanta Lissowska, Dana Mates, Vladimir Bencko, Lenka Foretova, Vladimir Janout, Wong-Ho Chow, Nathaniel Rothman, Paolo Boffetta, Roger M. Harbord, George Davey Smith. **Can Lactase Persistence Genotype Be Used to Reassess the Relationship between Renal Cell Carcinoma and Milk Drinking? Potentials and Problems in the Application of Mendelian Randomization**. *Cancer Epidemiology, Biomarkers & Prevention*, 2010; 19: 1341-1348 DOI: 10.1158/1055-9965.EPI-09-1019

http://www.sciencedaily.com/releases/2010/05/100506083451.htm

Sunlight With Cooling Factor

Although it sounds like a contradiction in terms, using the power of the sun for refrigeration is proving to be an original energy concept. In Tunisia and Morocco, Fraunhofer research scientists are using solar energy to keep perishable foodstuffs such as milk, wine and fruit fresh. (Credit: Image courtesy of Fraunhofer-Gesellschaft)

ScienceDaily (May 6, 2010) — Although it sounds like a contradiction in terms, using the power of the sun for refrigeration is proving to be an original energy concept. In Tunisia and Morocco, Fraunhofer research scientists are using solar energy to keep perishable foodstuffs such as milk, wine and fruit fresh.

"Refrigerated by sunlight" -- we could well see an ecostatement like this printed on food packaging in the years ahead. Solar energy is already being used to power air-conditioning systems in buildings, but now researchers also want to refrigerate fruit and other perishable foodstuffs using energy from the sun. Scientists from the Fraunhofer Institute for Solar Energy Systems ISE in Freiburg are demonstrating that this is feasible in the Mediterranean region using the examples of a winery in Tunisia and a dairy in Morocco.

In the MEDISCO project (short for MEDiterranean food and agro Industry applications of Solar COoling technologies) solar plants for refrigerating milk and wine have been installed in cooperation with universities, energy agencies and European companies. The project funded by the European Commission is run by the Polytechnic University of Milan.

"Our method is ideal for countries which have many days of sunshine and in remote areas where there are no conventional means of refrigeration owing to a lack of water and non-existent or unreliable energy sources. It is environmentally friendly and reduces the use of expensive electricity for conventional refrigerators to a minimum," states Dr. Tomas Núñez, scientist at the ISE, listing the system's advantages.

"Refrigeration is always available when the sun shines, which means that it is produced at the times when demand is at its highest."

The scientists have installed concentrating collectors which direct the sunlight onto an absorber by means of a reflector. This makes it possible to convert the solar radiation into hot water with a temperature of 200 degrees.

"This extreme water temperature is necessary in order to drive the absorption refrigeration machine for the high external temperatures that prevail there. We do not use electricity to provide the refrigeration, we use heat. The result is the same in both cases: refrigeration in the form of cold water or -- in our case -- a water-glycol mixture," explains Núñez.

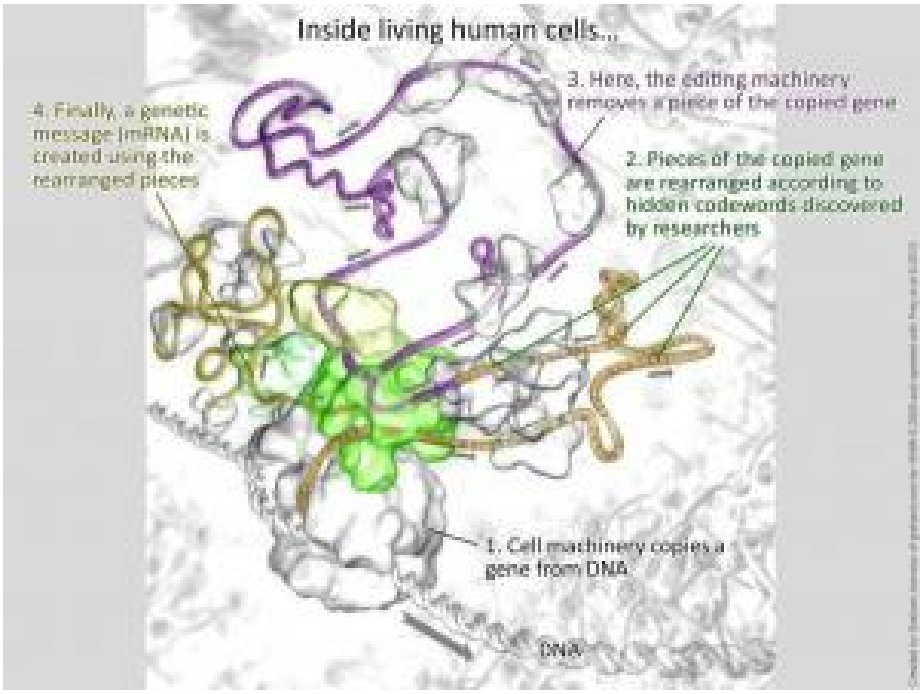
As the absorption refrigeration machine produces temperatures of zero degrees, the experts use the mixture to prevent the water from freezing. The water-glycol solution is collected in cold accumulators and then pumped through a heat exchanger, which cools the milk. "We use a slightly different system for wine, with the refrigerant flowing through coiled pipes in the wine tanks," says Núñez.

Story Source:

Adapted from materials provided by Fraunhofer-Gesellschaft.

http://www.sciencedaily.com/releases/2010/05/100503111531.htm

Researchers Crack 'Splicing Code,' Solve a Mystery Underlying Biological Complexity



Researchers at the University of Toronto have discovered a fundamentally new view of how living cells use a limited number of genes to generate enormously complex organs such as the brain. (Credit: Created by Graham Johnson of grahamj.com for HHMI Copyright 2005 and updated with Frey et al copyright 2010.)

ScienceDaily (May 6, 2010) — Researchers at the University of Toronto have discovered a fundamentally new view of how living cells use a limited number of genes to generate enormously complex organs such as the brain.

In a paper published on May 6 in the journal *Nature* entitled "Deciphering the Splicing Code," a research team led by Professors Brendan Frey and Benjamin Blencowe of the University of Toronto describes how a hidden code within DNA explains one of the central mysteries of genetic research -- namely how a limited number of human genes can produce a vastly greater number of genetic messages. The discovery bridges a decade-old gap between our understanding of the genome and the activity of complex processes within cells, and could one day help predict or prevent diseases such as cancers and neurodegenerative disorders.

When the human genome was fully sequenced in 2004, approximately 20,000 genes were found. However, it was discovered that living cells use those genes to generate a much richer and more dynamic source of instructions, consisting of hundreds of thousands of genetic messages that direct most cellular activities. Frey, who has appointments in Engineering and Medicine, likens this discovery to "hearing a full orchestra playing behind a locked door, and then when you pry the door open, you discover only three or four musicians generating all that music."

To figure out how living cells generate vast diversity in their genetic information, Frey and postdoctoral fellow Yoseph Barash developed a new computer-assisted biological analysis method that finds 'codewords' hidden within the genome that constitute what is referred to as a 'splicing code'. This code contains the biological rules that are used to govern how separate parts of a genetic message copied from a gene can be spliced together in different ways to produce different genetic messages (messenger RNAs). "For example, three neurexin genes can generate over 3,000 genetic messages that help control the wiring of the brain," says Frey.

"Previously, researchers couldn't predict how the genetic messages would be rearranged, or spliced, within a living cell," Frey said. "The splicing code that we discovered has been successfully used to predict how thousands of genetic messages are rearranged differently in many different tissues." Blencowe's group, including graduate student John Calarco, generated experimental data used to derive and test predictions from the code. "That the splicing code can make accurate predictions on such a large scale is a major step forward for the field," says Blencowe.

Frey and Blencowe attribute the success of their project to the close collaboration between their team of talented computational and experimental biologists. "Understanding a complex biological system is like understanding a complex electronic circuit. Our team 'reverse-engineered' the splicing code using large-scale experimental data generated by the group," Frey said.

Prof. Frey has appointments to the Canadian Institute for Advanced Research and the U of T's Department of Electrical and Computer Engineering, the Banting & Best Department of Medical Research (BBDMR) and the Department of Computer Science. Prof. Blencowe works in the University's Donnelly Centre for Cellular & Biomolecular Research and has appointments in the BBDMR and Department of Molecular Genetics

The research was supported by the Government of Canada through Genome Canada and the Ontario Genomics Institute, the Canadian Institutes of Health Research, National Cancer Institute of Canada, and Microsoft Research. Frey is an NSERC EWR Steacie Fellow and said that the fellowship was critical in freeing up resources so he could complete the project. The authors of the study are: Yoseph Barash, John A. Calarco, Weijun Gao, Qun Pan, Xinchen Wang Ofer Shai, Benjamin J. Blencowe & Brendan J. Frey.

Story Source:

Adapted from materials provided by University of Toronto. Original article written by Paul Cantin.

http://www.sciencedaily.com/releases/2010/05/100505133252.htm

'Bypass' May Lead to Vision Gains for Central Retinal Vein Occlusion Patients

ScienceDaily (May 6, 2010) — Central retinal vein occlusion (CRVO) affects one to four percent of Americans older than 40 and very often causes severe vision loss, including "legal blindness" (20/200 vision). While current treatments reduce CRVO symptoms such as macular edema-swelling of the center of the eye's light-sensitive retina-none address the underlying problem, the blocked retinal vein. Ian L. McAllister, MD, Lions Eye Institute, Australia, and his research team took direct aim at the problem, using lasers to create a "bypass" around the constricted retinal vein with the aim of restoring near-normal blood flow to the retina.

In three-quarters of the eyes treated the "bypass" was successful, and patients achieved significant vision gains by the 18 month follow-up. This study was also the first prospective, randomized trial to compare the bypass approach, called laser-induced chorioretinal venous anastomosis (L-CRA), with conventional treatment.

L-CRAs were successfully created in 76.4 percent of the 58 patients in whom the procedure was attempted. Overall, bypass-treated patients achieved significantly better visual acuity and were more likely to gain 20/40 vision (the legal standard for drivers in many countries) than were control group patients. Bypass patients were significantly less likely to have moderate or severe vision loss. While about 18 percent of L-CRA-treated patients developed a significant complication-abnormal blood vessel growth at the surgery site-the researchers report that due to close monitoring and effective management, negative consequences from this and other complications were minimal.

"The risk of complications from L-CRA should be weighed against the substantial vision loss faced by CRVO patients with standard treatments," Dr. McAllister said. "In future studies of L-CRA, optical coherence tomography (not widely available when our study began) would be another useful outcome measure for L-CRA effectiveness," he added.

The research appears in the May issue of *Ophthalmology*, the journal of the American Academy of Ophthalmology.

Story Source:

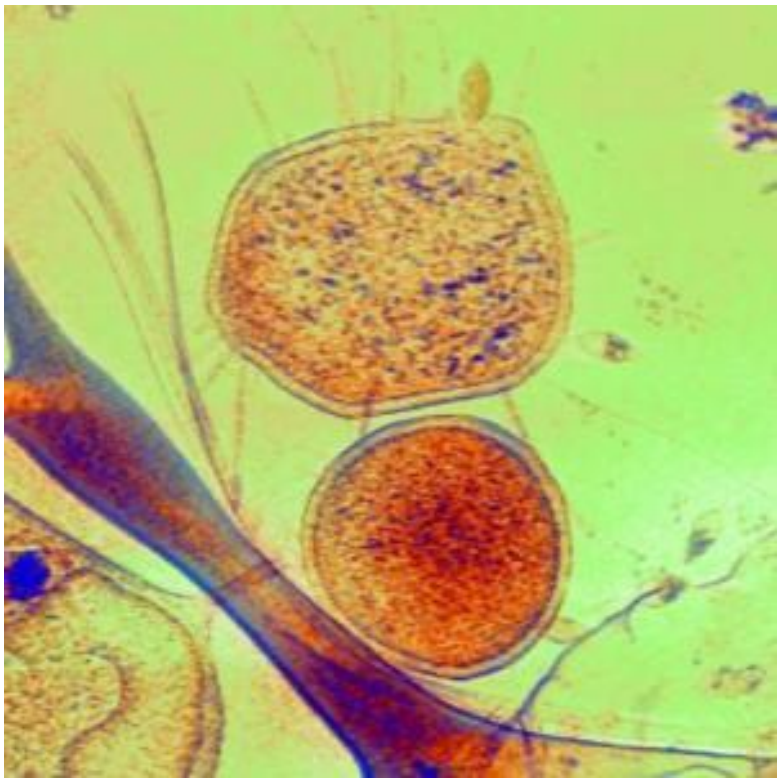
Adapted from materials provided by American Academy of Ophthalmology, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Ian L. McAllister, Mark E. Gillies, Lynne A. Smithies, Elena Rochtchina, Colin A. Harper, Mark D. Daniell, Ian J. Constable, Paul Mitchell. **The Central Retinal Vein Bypass Study: A Trial of Laser-induced Chorioretinal Venous Anastomosis for Central Retinal Vein Occlusion**. *Ophthalmology*, 2010; 117 (5): 954 DOI: 10.1016/j.ophtha.2009.10.026

http://www.sciencedaily.com/releases/2010/05/100504205801.htm

Weird, Ultra-Small Microbes Turn Up in Acidic Mine Drainage



An ARMAN cell (center, orange) is penetrated by a needle-like protrusion from Thermoplasma (lower left), an Archaea that lives in the same acidic pools as ARMAN. The much smaller, yellow lozenges are viruses that also infect ARMAN cells. A probably dying ARMAN cell (top) has grown to a diameter of about 1,000 nanometers -- less than one hundredth the width of a human hair. (Credit: Luis R. Comolli/LBNL)

ScienceDaily (May 6, 2010) — In the depths of a former copper mine in Northern California dwell what may be the smallest, most stripped-down forms of life ever discovered.

The microbes -- members of the domain of one-celled creatures called *Archaea* -- are smaller than other known microorganisms, rivaled in size only by a microbe that can survive solely as a parasite attached to the outside of other cells. Their genomes, reconstructed by a group at the University of California, Berkeley, are among the smallest ever reported.

The researchers also discovered another mine-dwelling microbe that occasionally produces weird protuberances unlike any structures seen before in *Archaea* and uses them to penetrate the ultra-small microbes.

"Other cells in the mine have what looks like a needle that sometimes pokes right into the cells," said Brett J. Baker, a researcher in UC Berkeley's Department of Earth and Planetary Science and first author of a new paper describing the findings. "It is really remarkable and suggests an interaction that has never been described before in nature."

These cellular extensions are only present when this interaction between the microbes is seen, noted co-author Luis R. Comolli, a microscopist at Lawrence Berkeley National Laboratory (LBNL).

Baker, Comolli and a team led by Jillian Banfield, UC Berkeley professor of earth and planetary science and of environmental science, policy and management and staff scientist at LBNL, published their findings in the online early edition of the journal *Proceedings of the National Academy of Sciences.*

Under a light microscope, the ultra-small microbes look like specks of dust. But Comolli used a state-of-the-art cryoelectron microscope, or cryoEM, to obtain high-resolution, 3-D images and even measure an individual microbe's internal volume -- between one-tenth and one-hundredth the volume of an *E. coli* bacterium. Each of the microbes, dubbed ARMAN, for archaeal Richmond Mine acidophilic nanoorganisms, is ellipsoidal and only 200-400 nanometers in diameter, one-third the diameter of the rod-shaped *E. coli*.

The team reconstructed the genomes of three distinct lineages of ARMAN and found them to be tiny -- a mere 1 million base pairs, in contrast to hundreds of billions in humans. In the smallest of the three, the average gene length is only 774 base pairs, in contrast to the average gene length in humans of 10,000 to 15,000 base pairs. Base pairs, the smallest chemical units of the gene, are nucleic acids that come in four forms. The base pairs are chained together to make DNA, and a gene is a sequence of base-pairs coding for a unique protein.

The genomes are so small that the researchers initially suspected that the ARMAN microbes are parasites upon other microbes, since parasites can afford to lose genes that their host already has.

But of the 70 individual specimens so far imaged in 3-D, 90 percent seem to be free-living. The other 10 percent are impaled on the mysterious needle-like spines of Thermoplasmatales, the other *Archaea* living alongside ARMAN in the mine. The researchers suspect that the penetrating spines may mean that the microbes live off other microbes at least part of the time, unlike symbiotic organisms or parasites, which must always associate with other organisms to live.

"ARMAN are among the smallest microbes we know of that, if not free-living, are at least not permanently obliged to be a parasite or symbiont," Comolli said.

The cells are about as large as the largest viruses, which can replicate only in living organisms and are not considered to be "living."

"The genome is very compact," Baker added." A microbial genome 10 percent larger has the same number of genes as ARMAN."

The organism has a much higher percentage -- 45 percent -- of unknown genes than any other organism sequenced, he said.

"ARMAN share a lot of genes with *Euryarchaeota* and *Crenarchaeaota*, but they also have a lot of genes not seen before in these branches of *Archaea*," he said, suggesting that ARMAN may have been around since these two branches split billions of years ago.

Three-dimensional cryoEM tomographic reconstructions show the unique architecture of ARMAN, Comolli said. It has very few ribosomes -- the machines that build proteins per unit volume, for example; in the same volume, E coli would have 100 times more. The ribosomes also are distributed close to the cell wall. ARMAN cells also have an enigmatic internal tube. Like other *Archaea*, however, they have no nucleus or other internal organelles.

Banfield's group first described the ARMAN microbes four years ago, after identifying the organisms in acidic pools in the Richmond Mine, which is owned by Ted Arman, in Iron Mountain, Calif. The team's continued analysis has revealed amazing organization within the mine drainage biofilm communities that grow on solutions with the acidity of battery acid. The new data will help the researchers explore even

further the community of organisms in the mine and determine how the organisms are able to live in such harsh environs and convert iron sulfides to sulfuric acid.

"Having these microbes described at the genomic level allows us to develop molecular identification methods and combine these methods with a 3-D view of the microbes to study the distribution of these organisms within this little ecological system, this little society, in the mine," Comolli said.

The work was supported by the Department of Energy and the National Aeronautics and Space Administration Astrobiology Institute. Sequencing was provided by the Community Sequencing Program at the Department of Energy Joint Genome Institute.

Story Source:

Adapted from materials provided by University of California - Berkeley. Original article written by Robert Sanders, Media Relations.

Journal Reference:

1. B. J. Baker, L. R. Comolli, G. J. Dick, L. J. Hauser, D. Hyatt, B. D. Dill, M. L. Land, N. C. VerBerkmoes, R. L. Hettich, J. F. Banfield. **Enigmatic, ultrasmall, uncultivated Archaea**. *Proceedings of the National Academy of Sciences*, 2010; DOI: 10.1073/pnas.0914470107

http://www.sciencedaily.com/releases/2010/05/100504095218.htm

Low-Maintenance Strawberry May Be Good Crop to Grow in Space

Purdue's Gioia Massa, from left, Cary Mitchell and Judith Santini found that a particular type of strawberry seems to meet NASA guidelines for foods that could be grown in space. (Credit: Purdue Agricultural Communication photo/Tom Campbell)

ScienceDaily (May 6, 2010) — Astronauts could one day tend their own crops on long space missions, and Purdue University researchers have found a healthy candidate to help satisfy a sweet tooth -- a strawberry that requires little maintenance and energy.

Cary Mitchell, professor of horticulture, and Gioia Massa, a horticulture research scientist, tested several cultivars of strawberries and found one variety, named Seascape, which seems to meet the requirements for becoming a space crop.

"What we're trying to do is grow our plants and minimize all of our inputs," Massa said. "We can grow these strawberries under shorter photoperiods than we thought and still get pretty much the same amount of yield."

Seascape strawberries are day-neutral, meaning they aren't sensitive to the length of available daylight to flower. Seascape was tested with as much as 20 hours of daylight and as little as 10 hours. While there were fewer strawberries with less light, each berry was larger and the volume of the yields was statistically the same.

"I was astounded that even with a day-neutral cultivar we were able to get basically the same amount of fruit with half the light," Mitchell said.

The findings, which were reported online early in the journal Advances in Space Research, showed that the Seascape strawberry cultivar is a good candidate for a space crop because it meets several guidelines set by NASA. Strawberry plants are relatively small, meeting mass and volume restrictions. Since Seascape provides fewer, but larger, berries under short days, there is less labor required of crew members who would have to pollinate and harvest the plants by hand. Needing less light cuts down energy requirements not only for lamps, but also for systems that would have to remove heat created by those lights.

"We're trying to think of the whole system -- growing food, preparing it and getting rid of the waste," Massa said. "Strawberries are easy to prepare and there's little waste."

Seascape also had less cycling, meaning it steadily supplied fruit throughout the test period. Massa said the plants kept producing fruit for about six months after starting to flower.

Mitchell said the earliest space crops will likely be part of a "salad machine," a small growth unit that will provide fresh produce that can supplement traditional space meals. Crops being considered include lettuces, radishes and tomatoes. Strawberries may be the only sweet fruit being considered, he said.

"The idea is to supplement the human diet with something people can look forward to," Mitchell said. "Fresh berries can certainly do that."

Judith Santini, a research statistical analyst in Purdue's Department of Agronomy, was responsible for data analysis from the tests.

Mitchell and Massa said they next plan to test Seascape strawberries using LED lighting, hydroponics and different temperature ranges. NASA funded their work.

Story Source:

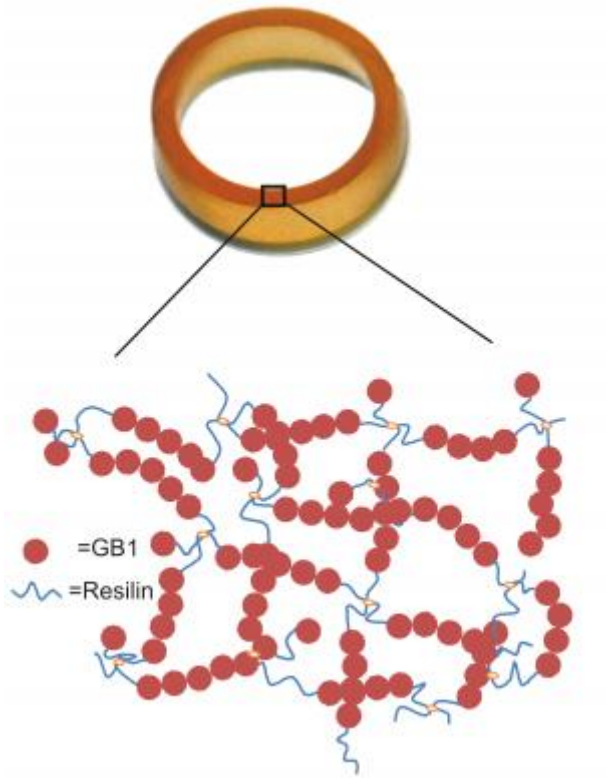
Adapted from materials provided by Purdue University. Original article written by Brian Wallheimer.

Journal Reference:

1. Massa et al. **Minimizing energy utilization for growing strawberries during long-duration space habitation**. *Advances in Space Research*, 2010; DOI: 10.1016/j.asr.2010.02.025

http://www.sciencedaily.com/releases/2010/05/100503135942.htm

Researchers Design New Biomaterial That Mimics Muscle Elasticity



Designed artificial elastomeric protein-based hydrogels mimic the passive elastic properties of muscles. (Credit: Yi Cao and Hongbin Li, University of British Columbia)

ScienceDaily (May 6, 2010) — University of British Columbia researchers have cast artificial proteins into a new solid biomaterial that very closely mimics the elasticity of muscle.

The approach, detailed in the current issue of the journal *Nature*, opens new avenues to creating solid biomaterials from smaller engineered proteins, and has potential applications in material sciences and tissue engineering.

"There are obvious long-term implications for tissue engineers," says Hongbin Li, associate professor in the Dept. of Chemistry. "But at a fundamental level, we've learned that the mechanical properties we engineer into the individual proteins that make up this biomaterial can be translated into useful mechanical properties at the larger scale."

Li, Canada Research Chair in Molecular Nanoscience and Protein Engineering, and UBC colleague John Gosline, professor in the Dept. of Zoology, engineered the artificial proteins to mimic the molecular structure of titin.

Titin -- also known as connectin -- is a giant protein that plays a vital role in the passive elasticity of muscle. The engineered version-which resembles a chain of beads-is roughly 100 times smaller that titin.

The resulting rubber-like biomaterial showed high resilience at low strain and was tough at high strain -- features that make up the elastic properties of muscles.

"A hallmark of titin-like proteins is that they unfold under a stretching force to dissipate energy and prevent damage to tissues by over-stretching," says Gosline. "We've been able to replicate one of the more unique characteristics exhibited by muscle tissues, but not all of them."

The mechanical properties of these biomaterials can be fine-tuned, providing the opportunity to develop biomaterials that exhibit a wide range of useful properties -- including mimicking different types of muscles. The material is also fully hydrated and biodegradable.

UBC researchers Shanshan Lv, Daniel Dudek, Yi Cao and MM Balamurali also contributed to the study.

This research is supported by the Canadian Institutes of Health Research, the Canada Research Chairs program, the Canada Foundation for Innovation, the Michael Smith Foundation for Health Research, and the Natural Sciences and Engineering Research Council of Canada.

Story Source:

Adapted from materials provided by University of British Columbia.

Journal Reference:

1. Shanshan Lv, Daniel M. Dudek, Yi Cao, M. M. Balamurali, John Gosline, Hongbin Li. **Designed biomaterials to mimic the mechanical properties of muscles**. *Nature*, 2010; 465 (7294): 69 DOI: 10.1038/nature09024

http://www.sciencedaily.com/releases/2010/05/100505133302.htm

First Detailed Underwater Survey of Huge Volcanic Flank Collapse Deposits

This is an aerial view of the Soufriere Hills volcano on the island of Montserrat in the Lesser Antilles. The photograph was shows one of the volcanic domes that grew and then collapsed into the sea since the volcano became active in 1995. However, there have been far bigger collapse events in the distant past that involve the entire volcanic edifice. (Credit: NOC)

ScienceDaily (May 6, 2010) — A scientific team led by Dr Peter Talling of the UK's National Oceanography Centre (NOC) is currently aboard the Royal Research Ship James Cook to map extremely large landslide deposits offshore from an active volcano on Montserrat in the Lesser Antilles.

The volcano has been erupting episodically since 1995, with the last major eruption and volcanic dome collapse occurring in February 2010. Previous eruptions on the island have included the largest volcanic dome collapses ever documented. These eruptions were monitored on land, and marine surveys showed what happens when the hot volcanic flows enter the ocean.

Thousands of years ago, far larger collapses of the entire volcanic edifice occurred sending huge landslides into the ocean to the east and south of the island. Some of these landslides involved over five cubic kilometres of material and travelled underwater for tens of kilometres. They were much larger than even the largest of the volcanic dome collapses since 1995 and probably generated tsunamis, whose magnitude is uncertain.

"We plan to produce the first detailed survey of this type of volcanic flank collapse deposit," said Dr Talling: "For the first time, we will image flank collapse deposits by collecting three-dimensional seismic reflection data, which will show how huge avalanches were emplaced."

The researchers wish to learn if landslides from the volcano that are violently emplaced on the seafloor can trigger even larger-scale failure of the underlying seafloor sediment. They have already successfully collected sonar images that show huge blocks of material scattered across the seafloor, forming a halo around the base of the island. Some of these blocks are over 40 metres high and 400 metres long. Sonar images also show streaks of material deposited underwater during the February 2010 eruption.

In the next two weeks, the team will finish mapping the flank collapse deposits using seismic reflection data. This seafloor mapping will provide survey data for an ambitious International Ocean Drilling Program (IODP) proposal to drill into and recover landslide material. This will help date the landslides and show whether they are associated with particular eruptions or other changes in volcano behaviour.

The people of Montserrat live in the north of the island, the southern part of the island containing the active volcano having been evacuated, including the old capital city of Plymouth, which is now mainly buried and destroyed.

The scientists are in close contact with Montserrat Volcano Observatory and hope that their work will help to understand the longer-term history of the volcano and help predict future hazards. They especially wish to understand the frequency and triggers of these huge landslides and the size and frequency of tsunamis that they could potentially generate.

"The way in which huge volcanic edifices collapse into the sea should become clearer during the next few days," said Talling: "These collapse events represent some of the most fascinating and potentially hazardous events around island volcanoes."

Ironically, the recent eruption of Eyjafjallajökull in Iceland threatened the study of the Montserrat volcano by nearly stopping the researchers from flying out to the Caribbean in time to join the vessel.

The research represents a collaborative project between the National Oceanography Centre (NOC), the University of Southampton's School of Ocean and Earth Sciences, IFM Geomar in Kiel and the Institute de Physique du Globe de Paris (IPGP).

In addition to Dr Talling, the project includes Veit Hühnerbach, Jessica Trofimovs and Doug Masson of the NOC, Mark Vardy, Sebastian Watt, Morelia Urlaub, Sudipta Sarkar, Michele Paulatto, Tim Minshull and Tim Henstock of the University of Southampton's School of Ocean and Earth Science based at the National Oceanography Centre, Southampton, Christian Berndt Gareth Crutchley, Jens Karstens and Martin Wollatz-Vogt of IFM Geomar in Kiel. Anne LeFriant from the IPGP is onboard and leads the IODP Drilling Proposal, and collaboration with the IPGP also involves Elodie LeBas, Natalie Feullet, Georges Boudon, Christine Deplus, and J-C Komorowski. Fukashi Maeno from the University of Tokyo aims to model these volcanic flows in conjunction with Steve Sparks from the University of Bristol. Adam Stinton and Paul Cole are assisting from the Montserrat Volcano Observatory.

Story Source:

Adapted from materials provided by National Oceanography Centre, Southampton (UK), via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2010/05/100505102607.htm

Gold Nanoparticles Promise to Enrich Everyday Products

Dr. Adrian Fuchs. (Credit: Image courtesy of Queensland University of Technology)

ScienceDaily (May 6, 2010) — Durable paint, water purification, faster computers, tougher shoe soles, and lighter and cheaper televisions are all possibilities now that a Queensland University of Technology (QUT) scientist has discovered a way to disperse gold nanoparticles evenly through plastic.

Adrian Fuchs, from QUT's School of Physical and Chemical Sciences, said the technique he had developed was a model for dispersing metals in nanoparticle form throughout polymers or plastic materials.

"The properties of metals change when they are in nano form and so combining the unique property of nanoparticles with plastic leads to a whole new range of composite materials that could be used for novel catalysts, drug delivery, and coatings," Dr Fuchs said.

"Paint is essentially a plastic so when gold nanoparticles are added it makes colours more intense across the whole visible spectrum. The paint would also be more durable when exposed to a harsh environment."

Dr Fuchs said gold had good conductivity and became a useful catalyst when mixed with different metals.

"If you put gold nanoparticles with titanium dioxide using a plastic mould, you can make a very efficient catalyst to purify water; the titania absorbs the light and converts it into electricity which is then passed into the conductive gold," he said.

Dr Fuchs said his method for dispersing nanoparticles through plastic could also be applied to encapsulating drugs into plastic casings so that they could be ingested and used for cancer detection and destruction.

Story Source:

Adapted from materials provided by Queensland University of Technology.

http://www.sciencedaily.com/releases/2010/05/100505092004.htm

Study Finds Racial Pay Disparities Among Nurses

Researchers use statistical regression analysis to spot discrimination in an unexpected profession.

By David Rosenfeld

Using statistical regression analysis, researchers spotted racial pay discrimination in nursing, but note that more study is needed.

When Sandra McGinnis and Jean Moore at the Center for Health Workforce Studies at the State University of New York at Albany looked at the results of a 2007 survey of close to 3,000 New York City hospital nurses, they didn't expect to see such wide differences in pay.

Conventional wisdom suggests in a world of inequality, nursing is less unequal, McGinnis said.

"It's pretty well known there are salary disparities by race and ethnicity in the wider work force, but because nursing has been a field that has these cyclical shortages, a lot of people have regarded it as some place where minorities can expect a more level playing field because they are so badly needed."

The data suggested otherwise. "We found that years of experience weren't worth as much for minority nurses than whites," McGinnis said.

Their findings suggest that even in a city as racially diverse as New York, in a profession largely regarded as equal, there still could be inequality. If the study's findings are correct, it should send a wake-up call to health care industry leaders nationwide.

Exactly how much less those years of experience were worth for African Americans, Asians or Pacific Islanders and Hispanics can be determined through statistical regression analysis, which uses linear progression to make assumptions about a larger population.

Their results showed that minority nurses in New York City earned on average $6,000 less than white counterparts with the same level of education and experience. African-American nurses received $3,000 less because their qualifications weren't valued as much and another $3,000 less for what researchers call human capital and their structural position in the labor market.

Put another way, minority nurses may choose to work within their own communities, which generally earn less as whole. Minority nurses, in this scenario, are working in community health centers and public hospitals rather than private institutions, but that only accounts for half the difference.

Asians and Hispanics also received around $6,000 less, on average, compared to whites, with slightly different proportions attributed to each cause.

After publishing their initial results in 2008, the researchers set out to further dissect their data and explain the difference. Their latest results were published online in January in *Policy, Politics, and Nursing Practice*.

McGinnis and Moore both caution against taking their findings to the bank — or a lawyer. They warn their results do not take into account overtime pay, and while the study involved 3,000 nurses, participation was voluntary.

They do say they found differences in pay based on race within the public hospital system and even among unionized nurses. But they weren't able to identify differences within a particular hospital. Plans for a future study are in progress.

Marie Ankner, chief of nursing for the New York City Health and Hospitals Corporation, which operates 11 acute care hospitals within the five boroughs of New York City, said any presumption that wage differences based on race occur at her company is simply incorrect. For one thing, the nurses are unionized, which makes such differences almost impossible.

"There is no truth to discrimination or that salaries are based on their race. Certainly not in our facilities," Ankner said. "That's why it raises the question of additional research."

After the work force study came out, the issue of racial pay disparities has not come up during contract negotiations, Ankner said. Both the New York State Nurses Association and Service Employees International Union local 1199 in part funded the study.

Deborah Elliot, NYSNA deputy executive officer, said the union has not addressed the issues raised in the study with hospital administrators because of limitations in the data. "We found the study interesting but understood it had certain limitations," Elliot said.

Without hospital-specific data, it's difficult to make a case of racial discrimination. That's something Moore and McGinnis want to take up in future surveys. And they may look specifically at certain hospitals to pinpoint whether some nurses have simply fallen through the cracks.

http://www.miller-mccune.com/health/study-finds-racial-pay-disparities-among-nurses-15735/?utm_source=Newsletter108&utm_medium=email&utm_content=0511&utm_campaign=newsletters

Compassion: The New Wonder Drug

New research suggests compassion helps buffer women against the physical consequences of emotional stress.

By Tom Jacobs

Maybe the Dalai Lama is on to something. Compassion helps buffer women against the physical consequences of emotional stress, research suggests. (istockphoto.com)

Compassion for others is a pathway to health and happiness. While that basic tenet of Buddhism may seem paradoxical to self-involved Westerners, newly published research suggests it has an actual physiological basis.

A study published in the *Journal of Experimental Social Psychology* found compassionate women are acutely receptive to emotional support offered by others, and this buffers the health-damaging effects of psychological stress.

A research team led by University of Maine psychologist Brandon Cosley conducted a study of 59 San Francisco residents, all white women in good health. Each filled out a survey in which they rated their level of agreement with a series of compassion-related statements, such as "it is important to take care of people."

One week or more later, the women participated in a laboratory session in which they were asked to perform a stressful task: Giving a five-minute long extemporaneous speech to two evaluators. Before, during and after, monitors measured three physical indicators of their bodies' stress response: their arterial blood pressure, cortisol level and high-frequency heart rate variability.

Half the women were assigned to the support condition: Evaluators nodded and smiled throughout their performance, and interrupted after 30 seconds to tell them they were doing well. The other half

experienced the neutral condition, in which the evaluators provided no feedback except to re-state the instructions.

For those who were provided social support (i.e. the nods and smiles), "the higher their compassion (as measured on the earlier test), the lower their systolic and diastolic blood pressure, the lower their cortisol, and the higher their high-frequency heart rate variability during the speech task," the researchers report.

In contrast, for those who did not receive social support, there was no relationship between compassion and reduced levels of physical stress reactions. The stress-buffering effect seems to occur only when a person both feels and receives compassion — a virtuous loop the body responds to in positive ways.

One obvious limitation of the study is it only looked at women. "Females may respond to stressors differently than men," the researchers concede. In addition, they note that "giving support to others may be negatively associated with health over time if that support is not, or cannot, be reciprocated" — say, in the case of caring for an infirm relative.

"Nevertheless," they conclude, "our data lend credence to the Dalai Lama's belief that compassion for others may ultimately serve to benefit the self, particularly when compassion is reciprocated by others in stressful situations." It points to a potentially powerful prescription for stress-related maladies: Feel genuine concern for the well-being of two people and call me in the morning.

http://www.miller-mccune.com/health/compassion-the-new-wonder-drug-15368/

Strengthening the Link Between Pollution, Cancer

Presidential advisory group moves to broaden focus of cancer research to precaution, prevention.

By Valerie Brown

A move is afoot in Washington to broaden the definition of cancer research to include precaution, prevention. (Firebrand Photography / istockphoto.com)

A new report from a presidential advisory group represents a major advance in the struggle to protect people from exposure to carcinogenic chemicals.

"Reducing Environmental Cancer Risk: What We Can Do Now," issued today by the President's Cancer Panel, announces a shift in emphasis from merely treating cancer to preventing it, and from seeking the roots of cancer in individual DNA to recognizing environmental contaminants as important causes.

Two distinguished cancer doctors appointed by President George W. Bush, LaSalle D. Leffall, Jr., professor of surgery at Howard University College of Medicine in Washington, D.C., and Margaret Kripke, professor emerita at the M.D. Anderson Cancer Center in Houston, sit on the panel. A third seat, usually filled by a celebrity like Lance Armstrong, is vacant. The panel itself was established in 1971 under the National Cancer Act.

In a telephone press conference, several environmental health researchers and activists who testified before the panel in the last two years praised it for taking a paradigm-shifting position regarding how cancer research and treatment should be conducted — and how environmental and health policies should reflect current science.

The panel writes that there's quite a lot we can do as individuals and through focused political will. Its cover letter to the president takes a stark and unambiguous position:

"The Panel was particularly concerned to find that the true burden of environmentally induced cancer has been grossly underestimated. …

"All levels of government, from federal to local, must work to protect every American from needless disease through rigorous regulation of environmental pollutants."

To accomplish this, the report calls explicitly for adopting the precautionary principle, long championed by environmental health advocacy groups. The idea is captured nicely by adages like "first, do no harm" and "look before you leap."

Precaution, says the report, "should be the cornerstone of a new national cancer prevention strategy."

Cancer research has long focused on genetic causes, believed to account for only about 5 percent of cases. The report acknowledges this focus as too narrow and recognizes that environmental contaminants can alter gene activity "without changing the underlying DNA sequences" — in other words, as Miller-McCune has reported previously, epigenetics may have as much or more to do with cancer initiation and progression as genes.

According to Jeanne Rizzo, president of the Breast Cancer Fund, the panel started its investigation thinking the connection between cancer and environmental exposures might have been exaggerated by public fears and activist pressure. But Leffall and Kripke developed a "voracious appetite" and reviewed 450 research reports and other documents linking environmental exposures with cancer, Rizzo said.

"When you delve into the science literature, it quickly becomes persuasive," added Julia Brody, director of the Silent Spring Institute, which itself focuses on the link between the environment and breast cancer.

The PCP report also expresses considerable concern about radiation exposure's role in cancer, including ionizing radiation from bomb test fallout, nuclear weapons production, medical testing and depleted uranium, as well as microwave and electromagnetic radiation from cell phones and other products. This position may strengthen support for pending legislation expanding compensation to victims of fallout and weapons production radiation exposures.

The delight with the report expressed by environmental health scientists and advocates may reverberate in reverse through the chemical industry, which has long fought tighter restriction of the 80,000-plus industrial chemicals, pesticides and other substances in use in the United States for which very little toxicity testing has been done. For example, the American Council on Science and Health, which is funded by the food and chemical industry, was critical of the report's "homage" to the precautionary principle.

"This so-called Presidential Cancer Panel, which consists of two physicians, has obviously been politically pressured by the activists running the EPA," the group's medical/executive director, Dr. Gilbert Ross, is quoted on its website. "When they mention babies being 'pre-polluted' and the alleged dangers of all of these chemicals, they not only sign their name to activist screeds, they neglect to mention that the dose makes the poison, and that finding traces of chemicals at levels of parts-per-billion does not imply a health hazard. And of course they do not address the potential health hazards of banning important chemicals from consumer products."

However, the PCP report endorses the expanding green chemistry movement as a way to keep the industry viable, as well as changes in the training of chemists so that precaution can be built into chemical processes and products from the beginning.

Sandra Steingraber, author of *Living Downstream: An Ecologist's Personal Investigation of Cancer* and the Environment, praised the report for three important findings: reducing the perceived role of genes as the culprit in cancer; that exposures in early life have effects "disproportionate to dose"; and that people are exposed to mixtures of chemicals rather than one at a time, while our testing protocols only capture individual chemicals.

The panel's report "invites us to decide that toxic pollution is archaic and primitive," she added.

The next battle to align policy with science in the war on cancer — and other diseases — will be fought over revision of the 1976 Toxic Substances Control Act via the Safe Chemicals Act introduced April 19 by Sen. Frank Lautenberg, D-N.J.

http://www.miller-mccune.com/health/strengthening-the-link-between-pollution-cancer-15667/

Bicycles and the 'Immigrant Effect'

Finally, some research that may have positive public health implications for minorities! (Or at least recent immigrants.)

By Elisabeth Best

New immigrants are much more likely to travel by bicycle than are native-born Americans, new research suggests. (Katrin Sommer / stockxchange.com

Immigrants tend to be healthier than native-born Americans when they arrive in the United States, but within a generation that advantage is lost. A new study by UCLA doctoral candidate Michael Smart suggests one reason why. In the May issue of *Transportation Policy* he describes findings that new immigrants — legal or not — are twice as likely to travel by bicycle than native-born Americans.

The group most likely to bike? Low-income immigrants living in dense urban areas.

Using the U.S.-based 2001 National Household Travel Survey, Smart analyzed the ridership rates for the small portion of trips Americans make by bike.

Although in the National Household Travel Survey more foreign-born immigrants over the age of 26 had graduate or professional degrees than native-born Americans, there were also many more immigrants without a high school degree or equivalent than native-born respondents. (It is important to note that the survey did not distinguish between legal and illegal immigrants.) Smart recognizes the need to be careful when studying "immigrants," as they are clearly a diverse group.

Previous research found that, although Latino immigrants in California have similar travel needs to the native-born, they are more likely to use alternative modes of transportation — primarily ride giving and receiving — because many have limited access to a car.

Other factors promoting pedaling among immigrants might include living in compact neighborhoods or being comfortable as a two-wheel commuter in their homeland. Plus, illegal immigrants may choose a bicycle to avoid the contact with law enforcement officials that cars may bring. But even when Smart accounted for these variables, he found a significant "immigrant effect" on bicycle use for all immigrant groups.

Smart argues that a better understanding of the benign factors responsible for immigrants' bicycle use, like cultural affinity for cycling, environmentalism, health concerns, thrift or fashion, could help identify ways to encourage cycling in the population at large. Any factors that don't "force" individuals to cycle

could be exploited to increase the number of bikes on the road, which could improve public health as well as the safety of cyclists.

“Increased physical activity among any group is surely a good thing for public health, though bicycling itself is a somewhat risky mode of transportation, and collisions with automobiles frequently result in serious injuries and fatalities,” he says. “However, there’s a large new scholarly literature that shows that there’s a nonlinear positive relationship between the number of cyclists on the road and the safety of cycling — this is the ’safety in numbers’ hypothesis.”

In other words, getting more cyclists on the road could decrease the number of cycling fatalities, which in turn would see more people’s health improving from the exercise.

Smart believes that transportation planning agencies should include immigrant communities when planning bicycle networks and facilities. Pointing to the example of the Los Angeles Bicycle Master Plan Update, he argues that this is not currently a priority. Although L.A. County has the largest concentration of immigrants in the U.S., immigrant community outreach has not been incorporated into city planning. In fact, an Internet survey was the most significant element of the public participation process for the bike plan revision.

“While the survey did not ask respondents questions related to immigration, the public participation process on the whole does not appear to include input from low-income individuals such as low-income immigrants,” Smart writes. “In fact, the opposite appears to be the case, with nearly 85 percent of all respondents to the survey having had a college degree — and nearly half of those respondents had post-graduate degrees.”

He believes that typical public participation processes grab the attention of special-interest groups but fail to garner input from unorganized individuals, even those most affected by the issue. Ultimately, he concludes that transportation planning agencies should reach out to immigrant cyclists for their input on bike-related issues, since they are most likely to be, as he puts it, “two-wheeled in Autopia.”

http://www.miller-mccune.com/health/bicycles-and-the-immigrant-effect-14744/

Vineyards in the Desert

In the north of Baja California where grape vines are tended along the Ruta de Vino, population pressure is making water even more valuable.

By Kristian Beadle

In the Valle de Guadalupe wine grapes grow in the rocky desert of Baja California.

Related Stories

I see that vintners are making the desert bloom with wine grapes, but where is their water coming from?

Location: in a desert canyon on the Rio Guadalupe, near a waterfall and natural hot springs, where a nice old man lets people camp.

Conditions: starry night and calm, save for a Mexican family sitting around a bonfire laughing in the distance.

Discussion: Instead of going directly to Ensenada along the coast, we veered inland and went upriver, to the main wine and olive growing region in Baja: the Valle de Guadalupe. The valley has the rocky appearance of a desert, which makes the vineyards sprouting along the *Ruta de Vino* (the Wine Route) seem like a string of oasis. I wondered, where does the water come from?

“Rain. When it rains, we have water. It seems simple, but there’s a problem,” explained David Dalgoff, owner of Bibayoff Winery. “There are too many people. Ensenada is piping our water for their city.”

Mr. Dalgoff, seen at right, is part of a Russian colony of 100 families that migrated to Baja in 1906 to find a place to live in peace. He is also the president of the local COTAS (for Comité Técnico de Aguas

Subterráneas, or Technical Commission for Underground Water), a group of community members that provide input to the federal-run water bureau.

"With COTAS, we are installing sensors to monitor water level in a number of new wells," Mr. Dalgoff continued. "We want evidence that more water needs to stay in the valley." As the Bibayoff Winery grew, and water levels in the valley dropped, they adopted new techniques – harvesting water in a rain reservoir, and dry cropping a few grape varieties, like the zinfandel. Dry cropping means that vines receive water only from rain; there is no irrigation.

We left the winery and drove into town, where we stumbled upon a building made from creative materials: irrigation tubing was wired together to make fences; scrap wood was nailed together as a shed; and wine bottles in neat rows lined entire walls. It turned out to be the wine and olive processing plant. I thought, "What a resourceful way to re-use 'waste products.'"

Our destination was the COTAS office – I wanted to learn about the well sensors that we had heard of. Julian Garcia, the head at the office (that's him and his daughter at left), showed us data from 1977 to present of wells throughout the valley, noting the overall pattern of decline despite occasional spikes caused by rainy years.

"People often don't cooperate with our recommendations – they draw more water than their permit allows, or they don't even have a permit," Mr. Garcia said. "The next step is to install water meters to record how much is actually being used."

Although every community is supposed to have a local COTAS, my understanding is that not every community has one, since it takes time, initiative, and collaboration. It is refreshing to see the wine industry taking on measures for conservation – dry cropping, participating in community groups like COTAS, and using recycled materials in the processing plant. These were encouraging signs, but as we were to discover later, not everyone in the wine industry is looked upon fondly.

As Mr. Dalgoff said, the water situation 'seems simple' but people are a problem. If climate also becomes a problem – and rain becomes more sporadic and fickle – the industry may take a tumble. If laborers lose their jobs, where do they go? Overcrowded Mexico City or Tijuana? Or into the United States? The connection between environmental degradation (water scarcity, soil erosion) and illegal immigration seemed like a stretch, particularly when I was stocking my shopping cart at Trader Joe's before this trip. But when I'm walking through a dusty agricultural town and talking to the local water manager, it becomes more plausible.

http://www.miller-mccune.com/science-environment/vineyards-in-the-desert-15759/

Oil Cleanup Cure May Be Worse Than Disease

Despite the agony of watching oil-sodden waters lap at pristine shores, our ham-fisted cleanups can do more harm than good, experts say.

By Melinda Burns

As oil from the massive BP spill in the Gulf of Mexico creeps toward land, experts say cleanup efforts can do more harm than good. (Wikipedia.org)

Irving Mendelssohn, a Louisiana wetland ecologist, knows what won't work if and when the oil slick in the Gulf reaches his marshy coastline.

Unfortunately, he's not sure what will.

"The most important thing is that you don't send hundreds of people walking into the wetlands, pushing that oil into the soil," he said. "You can't have people stomping around in their boots. And you don't want machines like tractors pushing the oil into the soil. That would definitely kill the vegetation."

All other "remediations" are problematic, too, Mendelssohn said. As a professor at Louisiana State University who specializes in the effects of oil on wetlands, he's been advising the National Oceanic and Atmospheric Administration on cleanup of the massive slick edging toward the mainland. The oil has now reached the sandy beaches of Louisiana's barrier islands, even as crews struggle to contain more than 200,000 gallons of oil gushing every day from BP's exploded Deepwater Horizon rig in the Gulf of Mexico.

Bioremediation, or breaking down the oil with bacteria, wouldn't work well in Louisiana because the coastal wetlands are flooded with water, Mendelssohn said. Setting the marshes on fire or flushing them

with low-pressure hoses could be effective in plots of 20 or 30 acres, he said, but those methods aren't feasible in larger areas.

"Would you want to burn hundreds of thousands of acres?" Mendelssohn asked. "That's a tremendously hard call."

There are no good cleanup options for the orange-colored slick the size of Delaware, just as there were none for the Exxon Valdez tanker spill off Alaska in 1989, the Amoco Cadiz tanker spill off Brittany, France, in 1978, or the platform blowout in the Santa Barbara Channel in Santa Barbara, Calif., in 1969.

Robert Bea, a University of California, Berkeley, professor of civil environmental engineering who spent nearly 60 years in the oil business, was sent as a troubleshooter to all of those and several dozen more onshore and offshore spills.

In Santa Barbara, he recalled, people tried to mop up the black tide on the beaches with paper towels and bales of straw. "It's more sophisticated today, but it's the same damn thing. Unfortunately, we have not progressed very far since the miserable experiences of Santa Barbara and the Exxon Valdez."

In the sensitive marshes of the California's Bay-Delta 35 years later, Bea said, workers used buckets to scoop up the mess from a 60,000-gallon pipeline oil spill.

"We killed the marsh," he said.

Along the coast of Brittany, some of the salt marshes there are still recovering from being trampled after the Amoco Cadiz accident, in which the supertanker split in two, spilling 68 million gallons of oil. Other marshes were bulldozed and the topsoil was carted away, leaving areas below water unable to regenerate. Effectively, studies show, the excavated marshes will never come back, while untreated areas are doing fine.

The Exxon Valdez spill, totaling 11 million gallons of oil, is still the largest in the U.S. and arguably one of the worst anywhere in terms of the environmental damage it caused. It covered more than 1,300 miles of wild coastline along Alaska's Prince William Sound with black sticky goo.

John Robinson, a Santa Barbara resident who was NOAA's scientific adviser on the Exxon Valdez spill, recalled this week how he advised the U.S. Coast Guard to use high-pressure hoses to blast steaming hot water on the rocky shores of Alaska. It enabled the cleanup workers — 11,000 in all — to push the oil back into the ocean where it was corralled and skimmed off behind booms. But it "cooked" everything in sight.

Robinson said he feared that if the oil was not removed, it would swirl around and cause damage elsewhere.

"In the end, it was proven pretty clearly that we did the wrong thing," he said. "We were approaching sterilization of the coast with that kind of equipment. It turned out to be a mistake. This kind of aggressive cleanup does nothing but delay the eventual recovery that nature is going to do anyway."

It turns out that driving oily sand below the tide line, where many plants and animals had escaped the spill, the blasts of hot water only made matters worse, according to a report by NOAA in 1991.

"Sometimes, the best thing to do in an oil spill is nothing," the report concluded.

The public, however, wants a reason to hope. In a 1993 report, the state of Alaska said that benefits to fishing and tourism outweighed the disruptions of the Exxon Valdez cleanup. Officials were willing to accept some damage in return for removing as much oil from shore as fast as possible, the report said.

And in a 10-year study on the effects of the spill, Bowdoin College researchers concluded that 90 percent of the plants and animals in the Exxon Valdez spill zone had recovered by mid-1990, in part because of the cleanup and in part because of natural forces.

Even the heavily oiled and treated shorelines of Prince William Sound have proved to be quite resilient: They appear today much as they did before the spill. At the same time, according to NOAA, deposits of oil linger underground, mussels are still contaminated, and once-rich clam beds have not yet recovered.

Robinson said his own experience has made him a skeptic. When the Exxon Valdez cleanup was in full swing, he fought for nine areas — totaling less than a mile of coast — to be set aside and not cleaned. Within a few years, he said, "It was clear that the areas that had not been cleaned were faring a lot better in terms of their recovery. The areas that were cleaned were in much worse shape."

As the head of NOAA's Hazardous Materials Response Team, which he founded in 1976, Robinson oversaw about 100 oil spill cleanups. "I can't think of any good example where a cleanup has been anything other than useless. It causes more damage than not doing anything at all. Once the genie gets out of the bottle, there's no getting it back in. That seems to be proving itself once more in New Orleans."

Bea is more of an optimist, even as he notes that cleanups typically capture only 10 percent of spilled oil.

"If you don't do anything, you don't learn anything," he said.

Of course, it's best to keep the genie in the bottle, Bea said. In 2002, he wrote a study urging oil companies to adopt a system of organizational checks and balances to guard against accidents at deepwater rigs.

Right now in the Gulf, more than 8,000 workers are attempting to contain the spill and prevent it from reaching the mainland, and another 2,500 are on call. Nearly 300 boats are assisting in cleanup efforts. More than 30 miles of floating booms have been laid along the Gulf Coast, and 10 staging areas have been set up onshore. To date, nearly 2 million gallons of watery oil have been recovered.

Just how bad the spill will be onshore depends on how much oil moves in, how much it has weathered or degraded over time and how long it stays. Wetland plants can survive a light oiling. But if the plants get coated every time the tide comes in, Louisiana will likely lose large pieces of its coast to the spill, Mendelssohn said.

"What is really frightful and very scary is, when the plants die, the top 12 inches of soil where the roots are will start to die and collapse like a balloon," Mendelssohn said, adding that when the soil loses volume, it sinks, giving rise to excessive flooding. New seeds cannot re-establish, he said, and "before you know it, you have land loss."

Louisiana has 40 percent of the remaining wetlands in the lower 48 states. Even before the spill, the state was losing wetlands to storms and erosion at the rate of 25 square miles per year.

"When the Louisiana wetlands are affected," Mendelssohn said, "it's both a regional and a national impact."

http://www.miller-mccune.com/science-environment/oil-cleanup-cure-may-be-worse-than-disease-15722/

Cliff-Top Living in Northern Baja

How might climate change affect homes and businesses built helter-skelter on a seaside cliff.

By Kristian Beadle

Climate change will have an impact on sea level, which, in turn, could affect homes and businesses built atop seaside cliffs like this one near Ensenada. (Kristian Beadle)

Along this part of the voyage, I am discovering how climate change might affect homes and businesses built helter-skelter on a seaside cliff.

Location: at an Internet café in the Valle de Guadalupe, 20 miles inland from the coast, with vineyards and olive groves lining the hills.

Conditions: Clear skies, 3 p.m. It is warmer inland in the valley, but the breeze keeps the temperature cool.

Discussion: After our brief encounter with "hyena-like" road criminals, we had a pleasant night at the cliff-top camping of K-58, one of the last spots before the old Mexico Highway 1 veers inland, north of Ensenada. It was interesting to discover where we were when we woke up in the morning and stumbled around: a mix of regal coastline and disheveled buildings.

Looking inland, the distant hills and canyons were empty, blooming with springtime wildflowers and green from this year's rains. But on the thin sliver of land adjacent to the ocean, it was a mish mash of

buildings and jumbled roads. Nearly the entire ribbon of coastal bluffs from Tijuana to Ensenada looks like an unsightly Legoland — an amusing mix of colors and shapes built by developers who seized on cheap Mexican construction costs and the relative proximity of the U.S. border.

When people say "they built right on the cliff," it is no joke. Like a concrete waterfall, hotels and houses lean over the cliff-top and splash down into the beach. Perhaps they are limiting erosion by fortifying the cliff with cement. Still, the buildings look dangerously close to the high-tide line, and I wonder how sea level rise could affect this area.

The camp manager who has been 11 years at K-58, Angeles, didn't think that storms were eroding the beach and cliffs. "Right now, there is almost no sand on the beach, because the winter storms washed it away with *El Niño*. I think the sand will come back during the summer, like it usually does."

The effect of sea level on coastlines is one of the most confusing aspects of climate change. People ask, "Will my house be OK? It is 20 feet up from the beach." Yearly variability of sand movement, like what Angeles observed at K-58, makes it hard to gauge changes over time. The interaction between the local sea, currents and terrain types — also known as coastal morphology — is a big variable. To make matters more complicated, sea level rise forecasts for this century range from 3 inches to 3 feet (or more). Doesn't seem like much — but king tides that bring an extra foot of water (especially when mixed with storms) can wreak havoc on coastlines.

Flooding and storm surge managers have been plagued with the task of protecting coastlines for centuries — sometimes with enormous costs. Places like the Netherlands, with the most experienced "coastal defense" managers in the world, are now reversing their policies to allow the sea to encroach back onto the land. In Baja, amateur developers have taken over the job. Fortunately, the anecdotal evidence suggests that there is no danger to the buildings — so far.

Walking along the beach away from the cliff-top buildings, we reached the river mouth. The seclusion of the riverbed was a relief from the overwhelming coastal development just out of sight. Alyssum and I walked along in a reverie of wildflowers and vibrant flora. Every corner revealed something new: white sage, crimson-spiked succulents, and orange nasturtiums, which Alyssum says make a spicy treat in a salad and can be steeped into a tea to counter infection.

There is plenty of water from this winter's rains, and nature is happily going about its business — even if a few assorted junk tires and plastic trash lay around without much use.

http://www.miller-mccune.com/science-environment/cliff-top-living-in-northern-baja-15707/

Perhaps We'll See Peak Bunker Oil, Too

Even low-grade oil used to fuel cargo ships is likely to become precious in the age of peak oil.

By Sam Kornell

The fuel used run cargo ships is likely to become a precious commodity in the age of peak oil. (Picasaweb)

The last few years haven't been kind to the shipping industry. First there was the chaos of summer 2008, when the cost of oil rose to nearly $150 per barrel. Prices eventually dropped, but only because of the onset of the worst economic crisis since the Great Depression.

Today, things are looking up. Shipping has increased by a third since last year, and the amount of cargo coming into the U.S. is predicted to grow by nearly 20 percent this year, which would bring imports close to where they were in 2008.

But the future of transoceanic shipping is cloudy. Cargo ships use diesel that's cheaper to produce than jet fuel. And shipping goods over water is energy efficient; indeed, it's cheaper than any other method of long-distance cargo transport. But in the era of peak oil the problems facing the airline industry will also bedevil shipping companies.

The difficulty and increasing cost of providing aviation fuel may ground many flights while winging us away from aerial democracy. Click here to see the main story.

Like planes, ships are too big to electrify — a pioneering solar-enhanced ship, for example, gets but 10 percent of its propulsion from electricity. Biofuels offer only a limited alternative to oil. Ships could move back to steam power, but burning coal is terrible for the environment and could soon be subject to international treaties (such as cap and trade) meant to limit carbon emissions.

Affordable air flight is an important spoke in the wheel of the global economy. But if oil depletion makes shipping steadily more expensive, the economic consequences are likely to be much more far-reaching than any contraction in the airline industry.

http://www.miller-mccune.com/science-environment/perhaps-well-see-peak-bunker-oil-too-15559/

Bald Eagles Will Eat Almost Anything

The top predator on California's northern Channel Islands might start dining on recovering foxes and seabirds, scientists warn.

By Melinda Burns

Scientists find that bald eagles on the northern Channel Islands historically adapted their diet to changing conditions and might do so again, with unknown consequences for rare foxes and seabirds making a comeback. (U.S. Fish and Wildlife)

Using the past to peer into the future, scientists warn that a growing population of bald eagles on California's northern Channel Islands might start preying on the rare foxes and seabirds making a comeback there.

The scientists looked at the diet of bald eagles over the millennia, analyzing 40,000-year-old fossil bones and an eagle nest well over 100 years old and filled with 10,000 bone fragments. They concluded that the eagles have historically switched diets to adapt to changing conditions on the islands and might do so again, with unknown consequences for other native species in recovery.

The study, published this month by the online Proceedings of the National Academy of Sciences, is among the first to reconstruct the diet of a bird of prey through prehistoric times, and it contained some surprises.

By looking at carbon and nitrogen isotopes, or chemical "signatures" of ancient bones, the scientists found that tens of thousands of years ago, bald eagles on the islands ate more seabirds than fish and rarely preyed on land or marine mammals. Yet between 1850 and 1950, when the islands were given over to sheep grazing, the eagles' diet abruptly changed. During the lambing season, the birds would gorge on the carcasses of lambs, forgetting seabirds and fish almost entirely.

The lambing season on the islands coincided with the eagles' nesting season, so it was convenient for eagles to pick up the carcass of a stillborn lamb, said Paul Collins, a co-author of the study and the curator of vertebrate zoology at the Santa Barbara Museum of Natural History.

"You have to put yourself in the frame of mind of a predator," he said. "You're not going to want to expend huge amounts of energy going after something that is hard to get."

Historically, sheep overran the islands, trampling them into virtual sand dunes and destroying some of the nesting and roosting grounds of native seabirds. But the carcass of an adult sheep is apparently a tall order even for a scavenging eagle. The study showed that every year, the eagles returned to a diet of seabirds and fish after their chicks fledged.

By the late 1960s, the eagles themselves had disappeared from the islands, victims of egg hunters, game hunters and DDT. They were reintroduced in 2002 by the National Park Service, and now between 30 and 35 eagles make their home there.

As their numbers grow, what will they choose to eat? The last remaining sheep were taken off the islands a decade ago. Fishing stocks near shore are in decline. The seabirds are in recovery mode, and so are the cat-sized island foxes, an endangered species battling back from the brink of extinction.

Satellite tracking data shows that many bald eagles frequent Anacapa Island during the breeding season of native pelicans and gulls. As for the foxes, the eagles have not been much interested, the study showed. In the historic eagle nest, scientists identified the bones of only two island foxes, more than likely scavenged, not killed, by the birds.

But, as previously reported by Miller-McCune, scientists suspect that the bald eagles on the islands today might very occasionally snack on foxes. The park has documented at least 14 fox "kills" by eagles since 2006. That's out of a population of more than 1,000 foxes now living on the islands.

Park officials believe the dead foxes were likely killed by golden eagles from the mainland. Bald eagle feathers have been found in two fox carcasses on Santa Rosa Island, but, again, the foxes could have been scavenged, not killed, by bald eagles.

Finally, there has been an unprecedented explosion in the island populations of California sea lions and elephant seals. These marine mammals are known to accumulate harmful concentrations of DDT, the same pesticide that hastened the decline of bald eagle populations in the first half of the 20th century. There's no evidence in the record that the eagles prey on sea lions, but, as the study notes, the sea lion pupping season coincides with the bald eagle nesting season.

The next step, Collins said, is to analyze the current eagle nests on the island to see exactly what the birds eating.

"You really have to pay careful attention to see which species are being hit by foraging," he said. "It's important to have an understanding of what the eagles are feeding on. It has ramifications across all these conservation efforts."

http://www.miller-mccune.com/science-environment/bald-eagles-will-eat-almost-anything-15629/

Peak Oil and the Return of the Jet Set

The difficulty and increasing cost of providing aviation fuel may ground many flights while winging us away from aerial democracy.

By Sam Kornell

Scientists have projected that oil production will peak in 2014, and no industry will suffer more than aviation. No biofuel or battery can meet the demand of a jet engine, and that may wing us away from aerial democracy. (Pavel Jedlicka / stockxchange.com)

Sitting atop the queue in my inbox is an e-mail from a travel company advertising a $736 roundtrip flight from Los Angeles to Auckland. Captain Cook discovered New Zealand in 1769; for the next 200 years the idea of visiting it, for an American, would have been alien to all but a few very wealthy individuals. Things change. As I write this, a ticket to travel 6,500 miles — one-quarter of the circumference of the Earth — is only a few clicks away.

But how permanent is that change? In the last decade, studies have consistently demonstrated that the world's storehouses of oil are drying up. Oil is now being consumed almost four times faster than it is being discovered, and in early March, Kuwaiti scientists projected that we will reach peak oil production in 2014.

Preparations to electrify much of the country's ground transportation are under way. But airlines have a problem: No battery is large enough to power a jet.

"Electricity holds great promise for substituting for a large fraction of the driving we do," says Joseph Romm, a physicist who writes the blog Climateprogress.org. "But it's not a perfect substitute for liquid fuel. You're not going to use electricity for air travel. We're going to need an alternative."

Developing a jet fuel alternative is vital not only to the commercial airline industry but also to the American military. The Department of Defense, the largest single oil consumer in the world, spends an enormous amount of money on jet fuel — more than $6 billion in 2006.

Unfortunately for both the DOD and the aviation industry, it will be difficult to duplicate the virtues of oil-derived jet kerosene. Jet fuel is compact and easily transportable, and it carries an immense amount of energy in a small volume.

In recent years airlines have begun experimenting with different kinds of biodiesel-jet fuel mixtures. But biodiesels and other biofuels, like biobutanol, are still prohibitively expensive, and their environmental benefits are in dispute.

They are also bedeviled by a geographic problem. Planes take off on one continent and land another; they must be able to use a chemically identical fuel in both places. Developing a single, inexpensive, high-energy biodiesel and then creating an infrastructure to ensure that it can be supplied to airports all over the world will be neither simple nor cheap.

A recent study by Swedish researchers found that it is "unrealistic" to imagine that biodiesels can rescue an aviation industry deprived of crude oil. "The possibility of biodiesel replacing conventional jet fuel is limited," the authors conclude.

"The airlines are starting to develop alternative fuels, but it's very preliminary at this stage," says Andrew Goetz, a geography professor at the University of Denver who specializes in the aviation industry. "In the short term —and maybe the long term — aviation is still very much dependent on fossil fuels."

Unfortunately, the cost and availability of alternative fuels isn't the only institutional problem facing the airline industry. Most climate scientists believe that stabilizing global carbon emissions and then reducing them by 60 to 80 percent by mid-century will avert the worst consequences of global warming. Without such reductions, they say, the world faces climate disaster.

Representatives of the airline industry have argued in the past that they could reduce their collective carbon footprint by making more efficient planes and designing better air traffic control. Since the 1960s, they pointed out, average fuel efficiency industrywide has increased by 70 percent; by the 2050s, they claimed, they could cut emissions by 40 to 50 percent.

Outside of the industry, however, few expert observers accept such claims.

The numbers are simply too daunting. "When you consider the projected increases in air travel and take into account that planes have long shelf lives, it's unclear that the industry can achieve the necessary emissions reductions through efficiency and air control," says Martin Staniland, a professor at the University of Pittsburgh's Graduate School of Public and International Affairs.

Staniland, who has written widely about commercial aviation, said that the industry has come to accept that an international agreement to limit carbon emissions is inevitable. Airlines are now lobbying in favor of a market-based cap-and-trade system, in which they would be given the opportunity to buy and sell carbon permits allotted to them by government institutions.

"The airlines have tended, at least recently, to conclude that cap and trade is the least bad of the approaches involving government regulation," Staniland said. But they are aware that even a cap-and-trade agreement will come with costs, which will increase over time. Those costs will eventually translate into higher fares.

Peak oil and global warming "cast a big shadow on the long-term viability of aviation as a means of mass transport," Alex Kuhlman, an aviation analyst based in France, told me. So serious is the threat, he said, that the airlines' best strategy may be to "consolidate and plan for a deliberate and profitable contraction."

Commercial aviation has always been a strange and volatile business. Warren Buffett once said that it would be better for investors if someone had shot down Orville Wright.

But up to this point the periodic crises through which the aviation industry has passed have been alleviated by government subsidies and bailouts, the primary beneficiaries of which have been consumers, who have been treated to decades of cheap fares.

But the glory age of the airline industry may be coming to an end. The institutional challenges the aviation industry faces are pervasive and intractable. “At this stage the airlines are just trying to survive quarter by quarter,” said Andrew Goetz. “It’s going be difficult for airlines to remain profitable. Price increases in jet fuel are going to have to be translated into higher fares.”

“It’s not a pretty picture,” he concluded.

In the 1950s, Igor Cassini, a widely read gossip columnist, devised the phrase “jet set” to describe a social milieu of wealthy Americans and Europeans who took advantage of the nascent commercial airline industry to visit each other in exotic places. They had the wealth to fly; hence Cassini’s instantly iconic moniker. In the various interviews for this article, one refrain was common: We may soon witness a return of the jet set — in actual, not metaphorical, form.

“At $150 dollars a barrel, the air industry is barely viable,” Romm said. “At $200 a barrel, it’s going to revert to the way it used to be, which is something that only rich people do.”

http://www.miller-mccune.com/science-environment/peak-oil-and-the-return-of-the-jet-set-15395/

The Primitive Science of Restoration

Biologists seek to "do no harm," improve island health, get rid of human-introduced predators and untangle complex relationships that developed on the fly.

By Melinda Burns

The Channel Islands Fox. The outcome of species removal, restoration on damaged islands can be hard to predict. (Adam Dale / Flickr)

In the northern Channel Islands off California, a cat-sized native fox is making a dramatic comeback, thanks to a 10-year, $22 million multifaceted program to save it from extinction.

The last of the resident golden eagles, a nonnative species that was snacking on foxes like kids in a candy store, was removed in 2006 and transported to the far-off northern Sierra Nevada. Also, fish-eating bald eagles, a territorial sort that was once native to the islands, were reintroduced to help chase off its red-meat-eating cousins.

It's just one piece of a Herculean effort by the National Park Service and The Nature Conservancy to turn back the clock, untangle scrambled ecosystems and restore some of the wildness that was lost when the islands — often called California's Galápagos — were settled by European ranchers in the mid-19th century. For the first time in 160 years, the rats, sheep, pigs, horses and cattle are gone, and the birds and plants are rebounding. The project is also another excellent example of just how hard it can be to re-establish some baseline condition from the past.

Today, there are nearly 1,000 foxes on Santa Cruz Island, more than 300 island foxes on San Miguel Island and 400 on Santa Rosa Island. That's way up from fewer than 90 foxes on all three islands in 1999, though not yet as high as the roughly 2,600 foxes there were 1993.

"The populations in the wild are doing great," said Tim Coonan, the park biologist. "They increased at a fantastic rate."

Yet, mysteriously, even with all the golden eagles gone, eagles still prey on a few island foxes. Since 2006, when the last golden eagle was removed, biologists have found 14 foxes killed by eagles — seven each on Santa Rosa and Santa Cruz, including at least one this year.

It's not enough mortality to threaten the now stable fox populations, but it's enough to make scientists scratch their heads. Are the culprits a few golden eagles on rare trips to the island, or are bald eagles now eating foxes? Bald eagle feathers have been found in two fox carcasses on Santa Rosa.

Unwanted Consequences

Mark Rauzon, a professor of geography at Laney College in Oakland, Calif., and a consultant with 30 years' experience in island restoration in the tropical Pacific Ocean, likens the field to surgery in its early, primitive years, when the science was crude at best.

"We're doing island surgery," Rauzon said. "It's 'do as little harm as you possibly can,' with the ultimate goal of adding more ecosystem health. It's impossible to know how it's going to go. We can't really restore to anything that was in the past. We're taking the responsibility of being practitioners for a new regime."

In 2004, Rauzon oversaw the eradication of nearly 300 wild cats on Wake Atoll, a U.S. possession and military base in the North Pacific where, by his estimate, the cats were killing or injuring 30,000 native seabirds per year. At the time, Rauzon said, the military did not have the funding for another eradication program, this one to get rid of the rats.

"People say, 'You shouldn't have started this then,' " Rauzon said. "But if we hadn't done it, nothing would have changed. You have to strike."

Since 2004, colonies of shearwaters, terns, tropicbirds, frigatebirds and boobies have returned to pre-World War II levels on the 6.5-square-kilometer atoll, Rauzon said. Without the cats, however, the rats have become a conspicuous nuisance, and the base is reviewing a plan to get rid of them.

"It's important to finish what you start," Rauzon said. "If you don't, everything would have died in vain."

On the now inappropriately named Rat Island in the Alaska Maritime National Wildlife Refuge, the U.S. Fish and Wildlife Service spent $3 million last fall to poison the rats and bring back the seabirds. Sure enough, some colonies of seabirds have started breeding on the island again. But officials can't explain why they found so many poisoned birds on survey this spring — 227 birds in all, including 41 bald eagles.

Brad Keitt, director of conservation for Island Conservation, a Santa Cruz, Calif.-based nonprofit organization that has carried out eradications on 40 islands, including Rat Island, said the long-term benefits always outweigh the short-term setbacks.

"Islands are at the epicenter of the extinction crisis," Keitt said. "If we don't do anything, a death will occur every time a bird flies to one of these islands. Either the adult gets eaten or the egg it's laying gets eaten. We can stop the chain of destruction."

On Macquarie Island, halfway between Australia and New Zealand, the Parks and Wildlife Service of Tasmania came under fire earlier this year for failing to eradicate the island's population of rabbits when it got rid of the cats in the 1990s. Researchers said that in the absence of cats, the rabbits bred out of control, stripping much of the vegetation that the seabirds used for cover.

In response, other researchers said the seabird populations on Macquerie had benefited from the cat eradication, and that anyway, the technology had not existed in the 1990s for large-scale rabbit removal.

Also, they said, the rabbit population is presently in decline, suggesting that other factors besides cat removal were affecting the numbers.

Next year, Tasmania will embark on a program to poison, fumigate and shoot 130,000 rabbits on Macquarie and kill off 36,000 rats and 103,000 mice.

Because of the experience at Macquarie, scientists expect there will be a strong push at the next world conference on island restoration, set for New Zealand in February, to learn more about how to conduct eradications of multiple nonnative species and predict the outcomes.

Eagles and Foxes, Redux

Bald eagles, once native to the Channel Islands, were wiped out by egg collectors, hunters and DDT by 1960. Today, between 30 and 35 of the birds make their home on the island and can be observed in their nests live on the Web.

During the debate over how to bring back the fox population, Paul Collins — curator of vertebrate zoology at the Santa Barbara Museum of Natural History and the co-author of a new study on the island fox recovery program — predicted that bald eagles, once reintroduced, might occasionally eat a fox. Now, he believes his prediction may have come true.

"There's a good chance that we're having predation from bald eagles," he said. "They may be feeding on dead carcasses they find. Or they may be chasing them down and catching them. It's not something we didn't expect."

Others say there's no way bald eagles, a species native to the islands and known to eat mostly fish, could be preying on foxes. It's much more likely, they say, that the guilty party is a transient golden eagle flying out from the mainland. Bald eagles are known scavengers, which could explain the presence of their feathers on fox carcasses.

"There's absolutely no evidence that bald eagles take island foxes," Coonan said. "We absolutely don't believe bald eagles are responsible for any of that."

Back in 1999, scientists had to sort out a much thornier problem in the northern Channel Islands. The success of the fox recovery hinged on deciding which invasive species to get rid of first. The fox population was crashing. Golden eagle predation and not disease was determined to be responsible. There were only 15 foxes each on Santa Rosa and San Miguel, and only 60 on Santa Cruz, and the park began trapping them as fast as possible to breed them in captivity.

The golden eagles had been attracted to the islands by thousands of wild pigs on Santa Cruz, another invasive species. But which should be removed first?

Some said the pigs should go first so that the eagles would leave and save the expense of capturing them live. Others reasoned that if the pigs went first, the eagles would simply eat more foxes — and this hypothesis prevailed.

There were calls to shoot the birds, but that would have been both a public relations disaster and physically difficult. Ultimately, it took six years to capture and relocate 32 increasingly savvy adult eagles. The last elusive birds had to be followed around by helicopters until they got tired and flopped on the ground, where they could be covered with nets.

At the same time, bald eagles were introduced to the islands in hopes that they would not allow golden eagles into their territory. Then, toward the end of the golden eagle removal, the park and the conservancy began killing 4,800 pigs.

Collins and his co-authors, Gary Roemer, an associate professor of wildlife and conservation ecology at New Mexico State University, and Brian Latta, executive director of The Bird Group, a nonprofit organization based in Santa Cruz, Calif., titled their recent study, "Does the Order of Invasive Species Removal Matter? The Case of the Eagle and the Pig."

Based on an examination of the contents of golden eagle nests, they found that the pair of eagles that had escaped capture the longest tripled its consumption of foxes after the pigs were gone. It was positive proof of the early hypothesis for removing the eagles first.

"It's been a jigsaw puzzle, but one that was workable," Collins said. "You could actually figure out how the pieces fit together."

As for the handful of foxes still being eaten by eagles, Peter Sharpe, a wildlife biologist with the Institute for Wildlife Studies, said golden eagles might be flying out to the islands during the annual deer and elk hunts on Santa Rosa. On Santa Catalina Island to the south, bald eagles have been coexisting with foxes for more than 25 years with no signs of predation, Sharpe said.

Lotus Vermeer, director of the Santa Cruz Island Preserve for The Nature Conservancy, said that bald eagles "harass the heck out of golden eagles" and were affording better protection to foxes. No golden eagles have established a nest on Santa Cruz since 2006, and none have been seen there for at least a year, Vermeer said.

"Bald eagles have been a very effective deterrent to golden eagles on the islands," she said.

But that doesn't mean that a bald eagle would never kill a fox, Collins said. The historical record shows that egg collectors found pieces of foxes in bald eagle nests on the islands at the turn of the century, he said. In addition, Collins said he found six fox bones — out of 10,000 bones — in a 60-year-old bald eagle nest on San Miguel. Mammals may comprise 14 percent of the bald eagle diet, he said. Video taken on Catalina shows them bringing live wild piglets and goat kids to feed their young in the nest.

Roemer said, "Reintroduction of bald eagles was a good idea, but maybe it would have been more efficacious to do it last. When you're faced with these complex issues and interactions between invasive and native species, you have to consider all the potential outcomes."

http://www.miller-mccune.com/science-environment/the-primitive-science-of-restoration-5145/

Better Weapons Don't Make for Shorter Wars

In spite of major advances in offensive military technology, researcher Marco Nilsson says the most cost-efficient weapon is a motivated soldier fighting a defensive war.

By Elisabeth Best

Researcher Marco Nilsson finds that offensive technology had no effect at all on war duration. (SSG Eddie L. Bradley)

As the British gobbled up much of Asia and Africa in the late 1800s, tiny forces of red-coated soldiers routinely thrashed huge groups of native troops, the odd Isandlwana aside, thanks to the Europeans' superior military technology. As historian Hillaire Belloc famously observed about a particular machine gun: "Whatever happens, we have got The Maxim gun, and they have not."

Superior military technology should make a war winnable. That suggests nations with the best offensive military technology — say Predator drones now or Maxim guns a century ago — are more likely to wage wars and win them quickly.

The U.S. involvement in Iraq, Afghanistan and, less recently, Vietnam, challenges this wisdom. If the enemy doesn't recognize your superiority, don't expect it to back down quickly.

That's the tone of Marco Nilsson's recently published dissertation, "War and Unreason: Bounded Learning Theory and War Duration." Nilsson, who recently completed his Ph.D. at the University of Gothenburg, statistically analyzed wars between nations from 1817 to 1992. He found that offensive technology had no effect at all on war duration.

He studied four wars in depth, two pitting Finland against Russia (The Winter War 1939 and The Continuation War 1941-1943) and two combatants in Southwest Asia (Iran-Iraq War of 1980-1988 and the Indo-Pakistani War in 1965) and found that when states sit down at the negotiation table, they don't always make their demands based on military capacity. In an e-mail interview with Miller-McCune, Nilsson discussed the implications of his research.

Miller-McCune: What prompted you to investigate the connection between military technology and war length?

Marco Nilsson: I got interested in the relationship between military technology and war length because of the assumption among several scholars — so-called 'offense-defense theorists' — that offense-dominant technology that makes attacking easier than defending also makes it more advantageous to start wars. This, however, depends on the assumption that military technology also has an impact on the probability of swiftly defeating the enemy. Nobody had yet tried to analyze whether this seemingly common-sense assumption holds.

M-M: How would you summarize your findings?

Nilsson: Wars are not shorter on average when military technology favors offensive operations. Instead, if we look at the interstate wars after the Napoleonic era, what matters more is the size of the armies. If one state has more troops, it will clearly shorten war duration.

The offensive potential of military technology such as tanks and attack aircraft (often believed to make swift victories more likely) are clearly limited by technological development, training of the troops, terrain, weather and norms of warfare.

Because the enemy can seldom be overrun by relying on military technology rather than overwhelming force, the duration of most wars will be decided at the negotiation table. A problem arises, however, if at least one of the belligerents does not adjust its war aims and demands based on its relative military performance. If there are beliefs that some force beyond the grasp of the enemy — for example God — will grant victory, the probability of being able to agree on the terms of peace will dramatically diminish. Similarly, if there are expectations that the offensive capacity will soon increase, the war aims will become too high for the belligerents to find a mutually acceptable negotiation solution to the war.

M-M: You state in your paper that the duration of a war is decided at the negotiation table. How could wars between an obviously militarily superior state and an obviously inferior state be resolved more quickly when the inferior state is unaware of its limitations?

Nilsson: There is no easy way. Usually, the offensive capacity is so limited that offensive action does not make it possible to defeat the enemy more swiftly. The U.S. willingness to use the nuclear bomb against Japan has been an exception.

The best way is, naturally, not to get involved in wars where the enemy cannot be expected to act rationally, e.g. lower its war aims when its battlefield performance is not encouraging. However, if the stronger enemy encounters a weaker enemy that is willing to bear the high costs of war and has unrealistic expectations of its ability to win the war, thus keeping up its high war aims, there is still a way out. The stronger state must then lower its war aims, even if it dominates the battlefield events. This is often somewhat counterintuitive for rational actors and politically unpopular.

Why would we make concessions to the seemingly irrational and weaker enemy? Some concessions can be made in secrecy, so that they do not stir up popular unrest. For example, during the Cuban missile crisis, Kennedy allegedly agreed to remove missiles from Turkey in return for the withdrawal of Soviet missiles from Cuba.

Sometimes, we hear people say 'we will bomb them to submission.' The problem is that the bombing does not always work against an enemy motivated by religion or some ideology. And if it succeeds in making the enemy lower its war aims, we often raise our own war aims beyond what is acceptable to the enemy as a result of the successful bombing. Either way, a negotiated solution to the war cannot be reached.

M-M: What policy implications do you believe your research has for the United States?

Nilsson: Despite recent technological developments, such as precision-guided munitions, the United States cannot rely too much on technology alone to subdue its enemies. While it is theoretically possible for the technological developments to reach such levels that they will shorten the length of wars, it is still unrealistic to be too optimistic about the foreseeable future. Advanced military technology is still very expensive. It calls for thorough training of the troops and still cannot guarantee quick victories. What matters the most is overwhelming force, inferior training of the enemy and a lack of local groups willing to continue waging a guerrilla war after the regular army has been defeated.

M-M: What implications does it have for Israel?

Nilsson: Even if Israel has access to and develops the most modern technologies of warfare, it cannot rely too much on technological developments alone for its security. In the conventional wars against its Arab neighbors, Israel has depended on the inferior quality of the enemy troops. Also, in its latest incursions against Hezbollah in Lebanon and Hamas in Gaza, it was clear that there is no offense-dominant military technology that would make it easy to swiftly defeat the irregular enemy.

Israel has recently been developing a network of antimissile defenses, but to be effective, such a network [would be] very expensive. However, developing defensive weapons systems is still the best option if offensive operations do not manage to eliminate the enemy.

M-M: How would you explain the long duration of U.S. engagement in Afghanistan and Iraq?

Nilsson: Mobile tank warfare characterized both the 1991 and 2003 campaigns against Saddam Hussein. The open-desert terrain allowed the well-trained U.S. troops to swiftly maneuver across Iraq and neutralize the inferior Iraqi troops. However, in 1991 the U.S. did not topple Hussein who, without hopes of increasing offensive capacity or help from God, accepted his defeat. Thus the war ended quickly.

In 2003, Saddam was removed from power. Despite "the end of major military operations," the U.S. soon found itself faced with several smaller actors posing a military threat to the U.S. troops. (These actors) did not acknowledge that the U.S. was militarily superior, and many of them believed that help from God would increase their fighting capacity.

The same story can be told about Afghanistan. As long as the Taliban and Hezb-e-Islami believe that God will help them to victory, they will have high war aims and a seemingly inexhaustible supply of soldiers ready to sacrifice their lives. Hezb-e-Islami has recently had negotiation contact with the Karzai government. However, the call for a hastier removal of foreign troops and a constitutional change may be too much for Karzai. Furthermore, there is no guarantee that the Taliban want to be included in any negotiated compromise.

Both the long wars in Iraq and Afghanistan reflect the U.S. overconfidence in what its military technology can do in offensive operations. When the enemy can hide in the mountains or among the civilian population, technology alone cannot shorten the length of wars. In the end, it is the foot soldiers that have to risk their lives. These lessons learned from the jungles of the Vietnam War were unfortunately forgotten after the success of the 1991 war against Saddam.

M-M: What would be an example of unrealistic offensive expectations prolonging war/negotiations?

Nilsson: The most flagrant case of religiously based offensive expectation is the Iranian refusal to negotiate with Iraq during the almost decade-long Iran-Iraq War during the 1980s. The war mostly went awry for the Iranians, but religious fervor was thought to substitute tactical skill planning.

M-M: What, in your opinion, are some of the limitations of military technology?

Nilsson: Even if precision-guided munitions can easily hit their targets, it is often difficult for them to find [their targets] in the first place. Night-vision technology works well in the desert, but is limited in its ability to locate the enemy in jungles or urban areas. In Vietnam, it was often difficult to find the enemy troop concentrations in time. In Afghanistan, the mountains provide a good cover for the enemy and make it difficult for U.S. foot soldiers to maneuver in large numbers.

The nuclear weapon would be the most efficient offensive weapon against a non-nuclear enemy. However, for normative reasons relating to the world opinion, the nuclear option has not been used since WWII.

M-M: In the case of the United States, do you believe that funding for offensive military technology should be redirected, and if so, where?

Nilsson: The irony of offensive military technology is that it can also be used for defensive operations. Therefore, it would be unrealistic to completely give up on developing, for example, tanks and stealth bombers. However, the efforts to find the ultimate offensive weapon should not be exaggerated because the costs will be immense and the expected results scant.

Militaries should always look for the most cost-efficient weapons. History teaches us that the most cost-efficient weapon is a well-motivated soldier fighting a defensive war. However, if the U.S. wants to keep the offensive option open, it will have to continue developing offensive military technology at the expense of, for example, missile defense systems. It is hard, even for the world's richest economy, to have it both ways…

The best option is still to not rely on offensive military technology too heavily and start wars too easily. If you cannot eliminate the enemy, you must be prepared to negotiate, but there is no guarantee that the enemy's demands will be acceptable to you.

http://www.miller-mccune.com/politics/better-weapons-don%E2%80%99t-make-for-shorter-wars-15589/

Some Bullies Just Want to Be Loved

As society gets more punitive in dealing with bullies, psychologists are trying to figure out what drives them to aggression.

By Joan Trossman Bien

Psychologists are trying to figure out what drives bullies to aggression (istockphoto.com).

Bullies have been an accepted, if unpleasant, part of childhood for generations. Although anti-bullying laws are increasingly common, and schools often have programs for dealing with bullies, this adolescent tyranny is traditionally left to resolve itself.

The resolution isn't always pretty, as in a recent Massachusetts case where nine students were charged with a teen's death in what has been called "bullycide." This week, Massachusetts became the 42nd state to sign anti-bullying legislation into law.

But why do some people feel compelled to act so aggressively in the first place? Two new studies find all bullies are not created equal.

A study from the Netherlands reported that some bullies are motivated by a need for affection and to gain status in the eyes of others.

The Dutch researchers also zeroed in on the bullies' targets and found that the weakest and least-liked classmates were easy victims for bullies. Researchers said the bullies saw those victims as a safe choice and would not offend the other students or diminish the bullies' personal status.

Meanwhile, a study in the journal *Current Directions in Psychological Science* focused on bullies who are afflicted with intense and painful shyness, a condition called "social anxiety disorder," or SAD. Instead of withdrawing and staying away from others, this subset of SAD sufferers was prone to aggression and high-risk behavior.

Study co-author Todd Kashdan, a George Mason University psychology professor, explained the characteristics of a bully with SAD. "If a bully fears being evaluated by other people, uncomfortable starting or maintaining conversations, lacks adequate skills for forming or retaining relationships and is anxious around other people for those reasons, these thoughts feelings and motives might explain why they are hostile, aggressive and defiant.

"If you think about it, a great strategy to avoid being rejected is to reject everyone else first. This allows for the illusion of being accepted, of being in control, of being the king lion or queen bee."

For treatment, Kashdan said the key is determining what motivates the bully.

"If they have antisocial tendencies, where they lack empathy and remorse, we would proceed very differently in attempting to help the perpetrator change their behavior than if they were socially anxious, where they lash out at other people to avoid being rejected themselves.

"Bullies are not a homogeneous group of people with the same goals. If we can help them satisfy their need to belong and feel connected, their need for bullying will decline."

There is a difference in the way boys and girls behave as bullies. Female bullies focus on social isolation and constant denigration of the victim's clothes or family or ethnicity. Gossip, rumor-spreading, and pressuring others to avoid the victim are commonly used to cause pain.

For boys, the characteristics are a need to feel powerful and in control, enjoyment at the suffering of others, absence of empathy and blaming the victim. Also noted were antisocial behaviors such as quickness to anger, a need to continue to be aggressive, presuming the actions of others to be hostile and a preoccupation with self-image.

Dealing effectively with bullies in the school setting can be a matter of understanding what benefit the bullies derive from their behavior. "Bullies are often looking for reactions," Kashdan said. "Make it the norm that bullying is 'uncool.' It helps to look at the situation from the bully's perspective. Bullies are no different than other people. They have a basic need to belong and fit in."

But there are definite limits to what can and should be tolerated by the adults.

"Sometimes victims are being tortured, psychologically or physically," Kashdan said. "There are no excuses for this behavior and victims need to remember that it is unacceptable for adults to ignore or discount these behaviors."

Sometimes, the adults make a bad situation much worse for the victim by failing to intervene. "I have seen parents laugh bullying off ('boys will be boys'), I have seen teachers tell me they don't have the resources to pay attention to what goes on between kids, and I have seen school administrators say that it builds character."

Watching a friend become the target of a bully is a disturbing experience. Children who see someone else being bullied can be traumatized too, sometimes more than the direct victim. Witnesses were more likely to report greater distress than the bully or the victim and were more likely to turn to substance abuse.

Kashdan said that witnesses should not be passive in the face of bullying. "This is a testing ground for character and virtue. Courage is about standing up to wrongdoing even if it makes you uncomfortable. Everyone has some degree of responsibility. By not doing something, you are letting violence take precedence over tolerance, compassion and kindness. Few people want to live in a world with these convoluted values."

http://www.miller-mccune.com/culture-society/some-bullies-just-want-to-be-loved-15639/

The Sociology of Avatar, The X Files and The Simpsons

Scouring "Avatar," "The X Files" and, yes, even "The Simpsons" for sociological subtext.

By Tom Jacobs

Do fictional TV series and films like "The Simpsons," "The X Files" and "Avatar" influence the sociopolitical zeitgeist?

After watching the premiere episode of *House*, I confidently predicted the Fox medical drama would be dead on arrival. I was certain the viewing public would not respond to a program based around such a cold, arrogant character. And the questions it posed — Is there a God? Does anyone ever tell the whole truth, even to himself? In the end, don't we always choose self-interest over altruism? — were not ones the *American Idol* crowd was especially interested in contemplating. I gave it six weeks, eight tops.

House is now in its sixth season and remains among the 10 most-watched programs in America. What's more, it has yet to succumb to sentimentality. The central character's bleak view of life — inspired in part by his chronic pain — is challenged by other characters, but never completely refuted. The possibility his misanthropy is justified always hangs in the air.

So what gives this cerebral, contrarian series its mass appeal? In the highly enjoyable new volume of essays, *Homer Simpson Marches on Washington*, Sara Jordan and Phillip Gray of the University of Hong Kong argue that Dr. Gregory House is sort of a fantasy figure: a professional who, due to his unique gifts, can get away with ignoring the rules.

For those forced to conform to the sometimes senseless regulations of a bureaucracy, watching Dr. House defy authority figures provides intense vicarious thrills. "Through his genius, his self-made autonomy and his sarcasm," they write, "House provides a cathartic release for all those trapped in the regulated life of mass man."

While that's not my personal point of entry into the show, Jordan and Gray are undoubtedly onto something, and their viewpoint is expressed in crisp, concise prose. The same can be said for all 15 essays in this lively volume, edited by University of Wisconsin political scientists Timothy Dale and Joseph Foy. A variety of pop-culture artifacts — primarily but not exclusively television series — are analyzed to discover the sociopolitical assumptions that underpin the storytelling. Ideologues looking for dastardly examples of liberal (or, for that matter, corporate) propaganda will be disappointed; the worldviews uncovered here don't fit neatly into such categories.

Take Paul Cantor's analysis of *The X Files* as a prescient look at the unsettled, evolving global power structure. Chris Carter's 1990s science fiction series about a pair of FBI agents "was one of the darkest and most unnerving shows in the history of television," the University of Virginia English professor writes, "especially in the way it dwelled on the nightmare aspects of globalization. … Again and again, *The X Files* suggested that in a globalized world, threats would take more shadowy, diffuse and mysterious forms, difficult to pin down and hence difficult to deal with." One decade's science fiction is another's unnerving reality.

Even programs that would seem to wear their politics on their sleeves are analyzed in provocative ways. Marshall University's Jamie Warner takes the long view of *The Daily Show with Jon Stewart* by noting that its central villain isn't one particular party or even the

shallowness of the news media, but the "permanent campaign" mentality that essentially prevents anyone in government or politics from addressing issues honestly. Stewart, she notes, "is a truth-teller in an environment where no truth goes unspun."

The volume has its missteps. An essay on Rosie O'Donnell's tumultuous stint on *The View* breaks no new ground, and it's questionable whether M. Night Shyamalan's horror film, *The Happening*, a critical and commercial failure, deserves the in-depth treatment it receives here. But most of the essays are revelatory, in that they analyze familiar works through unexpected lenses. Diane Relke notes how the *Star Trek* franchise values the humanities more highly than hard science. Matthew Henry surveys the spirituality of *The Simpsons*, which conveys a genuine appreciation of community and compassion even as it satirizes the wrathful-God emphasis of fundamentalism. In one episode, Bible literalist Ned Flanders implores his feuding fellow Christians: "Can't we all get together and concentrate on our real enemies: monogamous gays and stem cells?"

Wonderful line, but do jokes, however clever, change minds? Put it this way: If fictional television had no impact whatsoever on political opinion, I doubt conservative commentators would still be referencing 24 as they defend the use of harsh interrogation techniques. As *Time* magazine's Joe Klein noted in a recent comment on the environmentally conscious movie *Avatar*, "the zeitgeist is a subtle thing." Opinions are not exclusively shaped by political discourse.

With Americans increasingly turning to news sources that fit their ideologies, movies and television may become the last common meeting ground. This reality makes the astute analysis of *Homer Simpson Marches on Washington* all the more valuable. Murrow and Cronkite may be gone, but Bart and Homer endure. The startling thing about this volume is you close it thinking that tradeoff may not be so bad after all.

http://www.miller-mccune.com/media/the-sociology-of-avatar-the-x-files-and-the-simpsons-11433/

The Science of a Happy Marriage

By TARA PARKER-POPE

Stuart Bradford

Why do some men and women cheat on their partners while others resist the temptation?

To find the answer, a growing body of research is focusing on the science of commitment. Scientists are studying everything from the biological factors that seem to influence marital stability to a person's psychological response after flirting with a stranger.

Their findings suggest that while some people may be naturally more resistant to temptation, men and women can also train themselves to protect their relationships and raise their feelings of commitment.

Recent studies have raised questions about whether genetic factors may influence commitment and marital stability. Hasse Walum, a biologist at the Karolinska Institute in Sweden, studied 552 sets of twins to learn more about a gene related to the body's regulation of the brain chemical vasopressin, a bonding hormone.

Over all, men who carried a variation in the gene were less likely to be married, and those who had wed were more likely to have had serious marital problems and unhappy wives. Among men who carried two copies of the gene variant, about a third had experienced a serious relationship crisis in the past year, double the number seen in the men who did not carry the variant.

Although the trait is often called the "fidelity gene," Mr. Walum called that a misnomer: his research focused on marital stability, not faithfulness. "It's difficult to use this information to predict any future behavior in men," he told me. Now he and his colleagues are working to replicate the findings and conducting similar research in women.

While there may be genetic differences that influence commitment, other studies suggest that the brain can be trained to resist temptation.

A series of unusual studies led by John Lydon, a psychologist at McGill University in Montreal, have looked at how people in a committed relationship react in the face of temptation. In one study, highly committed married men and women were asked to rate the attractiveness of people of the opposite sex in a series of photos. Not surprisingly, they gave the highest ratings to people who would typically be viewed as attractive.

Later, they were shown similar pictures and told that the person was interested in meeting them. In that situation, participants consistently gave those pictures lower scores than they had the first time around.

When they were attracted to someone who might threaten the relationship, they seemed to instinctively tell themselves, “He’s not so great.” “The more committed you are,” Dr. Lydon said, “the less attractive you find other people who threaten your relationship.”

But some of the McGill research has shown gender differences in how we respond to a cheating threat. In a study of 300 heterosexual men and women, half the participants were primed for cheating by imagining a flirtatious conversation with someone they found attractive. The other half just imagined a routine encounter.

Afterward, the study subjects were asked to complete fill-in-the-blank puzzles like LO_AL and THR__T.

Unbeknownst to the participants, the word fragments were a psychological test to reveal subconscious feelings about commitment. (Similar word puzzles are used to study subconscious feelings about prejudice and stereotyping.)

No pattern emerged among the study participants who imagined a routine encounter. But there were differences among men and women who had entertained the flirtatious fantasy. In that group, the men were more likely to complete the puzzles with the neutral words LOCAL and THROAT. But the women who had imagined flirting were far more likely to choose LOYAL and THREAT, suggesting that the exercise had touched off subconscious concerns about commitment.

Of course, this does not necessarily predict behavior in the real world. But the pronounced difference in responses led the researchers to think women might have developed a kind of early warning system to alert them to relationship threats.

Other McGill studies confirmed differences in how men and women react to such threats. In one, attractive actors or actresses were brought in to flirt with study participants in a waiting room. Later, the participants were asked questions about their relationships, particularly how they would respond to a partner’s bad behavior, like being late and forgetting to call.

Men who had just been flirting were less forgiving of the hypothetical bad behavior, suggesting that the attractive actress had momentarily chipped away at their commitment. But women who had been flirting were more likely to be forgiving and to make excuses for the man, suggesting that their earlier flirting had triggered a protective response when discussing their relationship.

“We think the men in these studies may have had commitment, but the women had the contingency plan — the attractive alternative sets off the alarm bell,” Dr. Lydon said. “Women implicitly code that as a threat. Men don’t.”

The question is whether a person can be trained to resist temptation. In another study, the team prompted male students who were in committed dating relationships to imagine running into an attractive woman on a weekend when their girlfriends were away. Some of the men were then asked to develop a contingency plan by filling in the sentence “When she approaches me, I will _____ to protect my relationship.”

Because the researchers could not bring in a real woman to act as a temptation, they created a virtual-reality game in which two out of four rooms included subliminal images of an attractive woman. The men who had practiced resisting temptation gravitated toward those rooms 25 percent of the time; for the others, the figure was 62 percent.

But it may not be feelings of love or loyalty that keep couples together. Instead, scientists speculate that your level of commitment may depend on how much a partner enhances your life and broadens your horizons — a concept that Arthur Aron, a psychologist and relationship researcher at Stony Brook University, calls “self-expansion.”

To measure this quality, couples are asked a series of questions: How much does your partner provide a source of exciting experiences? How much has knowing your partner made you a better person? How much do you see your partner as a way to expand your own capabilities?

The Stony Brook researchers conducted experiments using activities that stimulated self-expansion. Some couples were given mundane tasks, while others took part in a silly exercise in which they were tied together and asked to crawl on mats, pushing a foam cylinder with their heads. The study was rigged so the couples failed the time limit on the first two tries, but just barely made it on the third, resulting in much celebration.

Couples were given relationship tests before and after the experiment. Those who had taken part in the challenging activity posted greater increases in love and relationship satisfaction than those who had not experienced victory together.

Now the researchers are embarking on a series of studies to measure how self-expansion influences a relationship. They theorize that couples who explore new places and try new things will tap into feelings of self-expansion, lifting their level of commitment.

“We enter relationships because the other person becomes part of ourselves, and that expands us,” Dr. Aron said. “That’s why people who fall in love stay up all night talking and it feels really exciting. We think couples can get some of that back by doing challenging and exciting things together.”

Tara Parker-Pope’s new book is “For Better: The Science of a Good Marriage.”

http://well.blogs.nytimes.com/2010/05/10/tracking-the-science-of-commitment/?nl=health&emc=healthupdateema1

Lighter Load for Nurses May Aid Patients

A state law in California requires hospitals to maintain certain minimal levels of nurses on duty. Now a study suggests that the requirement may be saving lives.

The study, published online last month by the journal Health Services Research, compares the outcomes of 1.1 million general surgery patients in 2005-6 in more than 800 hospitals in three states — California, where nurses in medical-surgical units are limited to five patients at a time; and New Jersey and Pennsylvania, where nurses' patient loads averaged more than six.

Researchers concluded that 225 hospital deaths in New Jersey, or 13.9 percent of all deaths in general surgery, and 200 deaths in Pennsylvania, or 10.6 percent, could have been averted with rules similar to California's.

The lead author, Linda H. Aiken, a registered nurse, acknowledged that the analysis did not prove that the California rules improved patients' outcomes. But she said it was the most likely explanation.

"Nurses are the surveillance system right at the bedside; they are the first to see something and mobilize a rescue," said Dr. Aiken, professor of nursing and director of the Center for Health Outcomes and Policy Research at University of Pennsylvania.

The researchers also surveyed more than 22,000 nurses and reported that those in California were less likely than nurses in the other states to say they were dissatisfied with their job or planned to leave the profession.

http://www.nytimes.com/2010/05/11/health/research/11patt.html?nl=health&emc=healthupdateema5

Rescuing Art From the Rubble of the Quake

By KATE TAYLOR

PORT-AU-PRINCE, Haiti — Susan Blakney, a paintings conservator from New York, scrambled up a mound of rubble left by the collapse of the Episcopal Holy Trinity Cathedral here, searching for small shards of the cathedral's murals.

The cathedral is a cherished part of this country's cultural heritage and most of its murals were destroyed in the earthquake that struck here in January. Two from the north transept, though, one depicting the Last Supper and the other the baptism of Christ, remain largely intact.

"It looks like there are some chunks underneath here," Ms. Blakney, 62, yelled to colleagues working with her last Thursday in an effort to save thousands of works of art damaged in the quake.

The rescue is being organized by the Smithsonian Institution, which is to open a center here in June where American conservators will work side-by-side with Haitian staff members to repair torn paintings, shattered sculptures and other works pulled from the rubble of museums and churches.

Haitian artists and cultural professionals have been conducting informal salvage operations for the past four months. But the Americans are bringing conservation expertise — there are few if any professionally trained art conservators in Haiti — and special equipment, much of it paid for by private money.

The initiative, in its swiftness, its close collaboration with a foreign government and its combination of private and government financing, represents a new model of American cultural diplomacy, one that organizers believe stands in stark contrast to the apathy Americans were accused of exhibiting during the looting of Iraqi artistic treasures in 2003.

"Mistakes have been made in the past, in times of great tragedy or upheaval, by not protecting and prioritizing a country's cultural heritage," said Rachel Goslins, the executive director of the President's Committee on the Arts and the Humanities, which has been involved in finding money for the project. "I think this is a huge opportunity for us to say, 'We get it.' "

The initial financing is coming from three federal agencies and the Broadway League, the trade group for theater owners and producers. Smithsonian officials say the project will cost $2 million to $3 million over the next year and a half, after which the center is expected to be turned over to the Haitian government.

Ms. Blakney traveled here last week with two other conservators, a museum curator, and a group of engineers and planning experts from the Smithsonian. The conservators' task was to assess precisely what kinds of damage the art had sustained, not just from the earthquake but from subsequent exposure to rain and sun and from improper storage both before and after the quake. Based on that information, they will decide what specialized equipment that they, or whoever the Smithsonian ends up sending to work at the center, will need.

Restoring the most compromised art will not be a job for beginners. If the Episcopal Church decides to save the surviving murals from Holy Trinity, which were painted in the early 1950s by some of Haiti's most famous artists, they will probably need to be removed from the damaged building — a feat of engineering as much as conservation that would involve gluing a piece of fabric to the face of each mural and attaching the mural to a secondary support structure of plywood or steel before chiseling it away from the wall.

In her search through the rubble, Ms. Blakney found some small pieces of painted concrete that have now been brought to the Smithsonian for an analysis that will help to determine the right adhesive to use.

The American conservators will spend part of their time training Haitians in conservation, in preparation for turning the laboratory over to them.

The rescue operation came together largely because of the efforts of Corine Wegener, a curator at the Minneapolis Institute of Arts and a retired Army major who served in Iraq shortly after the looting of the Iraqi National Museum, and Richard Kurin, the under secretary for history, art and culture at the Smithsonian Institution. Three weeks after the earthquake, Ms. Wegener convened a meeting of art professionals and State Department officials in Washington about how to provide cultural assistance, and invited Mr. Kurin, who already had ties to Haiti from organizing programs on Haitian art and culture for the Smithsonian's Folklife Festival in 2004.

Ms. Wegener, who also made the trip last week, said she had been horrified by what had happened at the Iraqi National Museum, where she worked as a liaison between staff members and American officials during her deployment. "It was so disturbing for me as a museum professional to see the staff so completely in shock," she said. "How would I feel if I came to work one day and found 15,000 objects had been looted?" She was determined not to see history repeat itself in Haiti, she said, and believed that the sooner conservators arrived on the ground, the more artworks could be saved.

Mr. Kurin conveyed the need for help to Ms. Goslins of the President's Committee on the Arts and the Humanities, a group that includes the heads of the National Endowment for the Arts, the National Endowment for the Humanities and the Institute of Museum and Library Services, as well as well-connected art patrons like the Broadway producer Margo Lion. The three agencies ended up committing $30,000 each, while the Broadway League, of which Ms. Lion is a member, contributed $276,000.

As for the rest of the money that's needed, Ms. Goslins expressed confidence that it would materialize once the center was operating.

"We've been having conversations with both the federal and the private sector about further support," Ms. Goslins said, "and I'm optimistic that once we get through the initial urgent phase of getting this up and running, we'll be able to see the project through."

The conservators and Ms. Wegener spent four days here, visiting museums, churches and libraries, accompanied by Olsen Jean Julien, a former minister of culture and communication, who is acting as an intermediary between the Smithsonian and the Haitian government.

They visited the ruins of the Musée d'Art Nader, a private museum that before the earthquake housed 12,000 paintings and sculptures by 20th-century Haitian masters like Hector Hyppolite and Préfète Duffaut, thousands of which were either destroyed or badly damaged when the museum collapsed. They also saw what was left of the Centre d'Art, a workshop where many of those artists trained in the 1940s and 1950s, which also collapsed. In the weeks after the earthquake, volunteers pulled thousands of paintings from the wreckage, which were stashed inside two storage containers parked in the sun in front of the ruined building.

Some of the Haitian officials and cultural professionals with whom the group met were hearing about the conservation center for the first time, and responded with relief and many questions, like when it would be open and how much money was being set aside.

The American aid is "fundamental for us," said Patrick Vilaire, a sculptor, who took the lead in saving the collections of several damaged libraries after the earthquake.

A few, however, expressed frustration that aid had not come sooner and a worry that foreign experts were better at conducting visits and assessments than providing real, practical help.

At a meeting with Daniel Elie, the head of the government agency in charge of preserving Haiti's national heritage, the discussion in front of the plywood shack from which he and his staff have operated since January turned momentarily tense when his colleague and translator, Monique Rocourt, said she was fed up with hosting visiting advisers who came and did nothing.

"If I bring another team of experts to Jacmel," she said, referring to a city in southern Haiti that was seriously damaged in the quake, "we will look in front of the population like we're just bringing foreigners to look at disasters. It's cynical, but that's what people will think."

Ms. Wegener is sensitive to such concerns, she said on another occasion. She noted that this was her third trip to Haiti since the earthquake. "We're showing a constant presence," she said, "and now we're bringing people who are specialists."

At the same time, Ms. Wegener and her colleagues appeared anxious not to seem like cultural imperialists, frequently repeating that they wanted to know first what the Haitians wanted to do.

Occasionally, their efforts clearly seemed like overkill to some of the people they encountered. When Ms. Wegener suggested to two members of a foundation that supports voodoo art that they write a proposal outlining what the Americans could do to help, one of the two practically rolled her eyes.

"Everyone is coming here and asking us for a proposal," the woman, Rachel Beauvoir-Dominique, said. "You write us a proposal."

Ms. Wegener, anxious to explain, said that they did not want to create the impression "that we're telling you what you want."

"Don't worry about that," Ms. Beauvoir-Dominique's husband, Didier Dominique, interrupted, adding with a smile, "We know what we want."

http://www.nytimes.com/2010/05/11/arts/design/11restore.html?ref=design

Boldness Comes With Manifesto

By KAREN ROSENBERG

For proof that abstract painting can be as controversial as any other kind, look no further than Amy Sillman's latest show at Sikkema Jenkins. Art blogs and other online forums are filled with both praise and jeers for Ms. Sillman, and while admirers outnumber detractors, the collective intensity is worth noting.

Ms. Sillman has been showing in Chelsea for more than a decade, a period in which her art has evolved from small, meandering works on paper to large, square-shaped canvases. But the new paintings are bigger, bolder and more assertive than anything she has done before.

They also come with a manifesto, albeit a quirky one. In the latest issue of a zine she has been producing for the past year (available at the gallery for $1), Ms. Sillman muses about Conceptual art versus painting, ideas versus feelings, and fluorescent versus incandescent light bulbs. One passage reads: "Long live 'difficult' art, 'difficult' women, & art that's not just made to sell!"

The paintings in the show, "Transformer (or, how many lightbulbs does it take to change a painting?)" live up to this idea of "difficulty." Ms. Sillman's cheerleaders and hecklers agree on at least one thing: She borrows liberally from Guston, Gorky, Matta, De Kooning, Bacon and other robustly gestural painters. In some of her earlier canvases she knits those references together; here she unravels and recombines them, making them very much her own.

At the same time, she continues to develop her own formal lexicon: elephant trunks and other strange proboscises, tilted planes within planes, lines that abruptly swerve or boomerang. Some of these figures, or quasi figures, are articulated in a muscular series of charcoal drawings on backgrounds of pink, yellow and orange gouache.

The bigger scale works for Ms. Sillman. It allows her to engage her imagery on a more physical level, aligning her arm with the outstretched limbs in her paintings. At times, as in "Schmetterling," her way of

fighting for every line reminds you of Matisse. (Maybe that's because the painting has a bit of Matisse's sensuality and a palette that echoes his Moroccan period; it's hard to say.)

She also takes new liberties with color, notably in an orange fireball of a painting that's puckishly titled "Shade." It's positioned in one of the rear galleries, but its vibrations can be felt from the front. Meanwhile, "Blue Diagram," a net of electric blue thrown over a dusty teal ground, is as nuanced as "Shade" is impertinent.

Ms. Sillman does carry over some of the psychosexual tension of her earlier work, in paintings like "Nose," with a hand reaching into giant nostrils. And in a second series of drawings, a light bulb becomes a flashlight and, eventually, a prosthetic sex organ.

In the zine and other printed materials, Ms. Sillman's sense of humor can seem like a defense mechanism — a way of keeping people from talking about the paintings in purely formal or referential terms. (Would Guston have compiled a wisecracking crib sheet on famous philosophers, or asked, "How many lightbulbs does it take to change a painting?")

Yet you understand why she feels the need to do a soft-shoe around her canvases. In 2010 the art world doesn't quite know how to talk about gestural-abstract painting. Those who call Ms. Sillman a pastiche artist might want to apply the same litmus test to painters who use photographic sources — or painters who use other painters who use them, like Peter Doig, John Currin and Luc Tuymans.

In any case, her goofiness is refreshing — it's the opposite of the archness that has become standard around Chelsea and the Lower East Side. And in no way does it diminish the "difficulty" she's after.

"Transformer (or, how many lightbulbs does it take to change a painting?)" continues through Saturday at Sikkema Jenkins, 530 West 22nd Street, Chelsea; (212) 929-2262, sikkemajenkinsco.com.

http://www.nytimes.com/2010/05/11/arts/design/11sillman.html?ref=design

Exploring Mortality With Clothes and a Claw

By DOROTHY SPEARS

At first sight, the monumental artwork being installed at the Park Avenue Armory suggests nothing so much as a crane claw, the frustrating arcade game in which a player tries to pull a stuffed animal from a pile of many, and to hold on to it, with a grapple controlled by a joystick.

And even after spending time with its creator, the French artist Christian Boltanski, and hearing his take on the piece's emotional and psychic meanings, it's hard not to see it as a version of that childhood game, and as an embodiment of a similar, albeit more intense, kind of perplexity and heartbreak.

The work, "No Man's Land," which opens to the public on Friday and runs through June 13, is centered on a five-story crane and a 25-foot-high mound of salvaged clothing rising from the floor of the Armory's vast drill hall. Every few minutes, in an act meant to resonate with the arbitrariness of death and survival, the crane's giant claw will pluck a random assortment of shirts, pants and dresses from the mound then release them to flap back down haphazardly. Visitors can watch the action — set to a ceaseless, reverberating soundtrack of thousands of human heartbeats — from ground level, standing amid dozens of 15-by-23-foot plots of discarded jackets that extend in all directions from the mound and that may evoke refugee or death camps. Behind the visitors, a 66-foot-long, 12-foot-high wall made from 3,000 stacked cookie tins will cut off views of the exit.

A reprise of an installation called "Personnes" that was shown at the Grand Palais in Paris in January, "No Man's Land," which was commissioned by the Armory, aims to inspire questions like "Why did my mother die?" and "Why am I still here?" Its large-scale exercise in futility ultimately points to a single fact, Mr. Boltanski suggested during a recent tour of the drill hall. "You can hold onto the clothes, and even the heartbeats of many, many people," he said. "But you can't keep anybody."

Still, holding onto heartbeats is something, and "No Man's Land" also includes an ersatz doctor's office in a room off the hall, in which visitors will be able to record and register their own heartbeats, adding them to the roughly 40,000 already recorded in related Boltanski projects worldwide. There is even a permanent archive — "Les Archives du Coeur" — being built on an island in Japan by a museum foundation there.

Mr. Boltanski seems attracted to even the most ethereal traces of lives lived. “No Man’s Land” will differ from its predecessor in Paris in at least two regards, he noted. Given the season, the Armory will be much warmer than the unheated Grand Palais in January. “And with 30 tons of used clothes” trucked in from a textile recycling plant in New Jersey, he added approvingly, “you are going to have some smell.”

At 65, Mr. Boltanski has spent a career producing vivid reminders of life’s inevitable passing. His engagement with both death and survival has drawn glowing comparisons to the poetry of John Keats, and also been denounced — particularly when his fascination with the Holocaust is most evident — as pornographic and exploitive.

But during an interview over lunch at an uptown Manhattan bistro, he had a serenely unworldly air, somewhat reminiscent of the Peter Sellers character Chance the Gardener.

“What makes me very happy in my life is that I have enough money until I die,” he said, taking a healthy swig of red wine. Referring to the recent announcement that he would represent France in the 2011 Venice Biennale, he added: “I don’t need money, and I don’t need glory. And for this reason I’m really free.”

Asked what he intended to do with this freedom, Mr. Boltanski was quiet. “I want to try to understand,” he said finally.

The third son of a Catholic Corsican mother and a father descended from Ukrainian Jews, Mr. Boltanski has a lot in his background to make sense of. In 1943 his parents, living in occupied Paris, faked an argument and pretended that his father had abandoned the family. For more than a year after that, according to Mr. Boltanski, his father was kept hidden under floorboards in the family’s apartment. Mr. Boltanski was conceived during one of his father’s rare forays out of hiding. His mother went into labor in September 1944, just after the liberation of Paris. But with violence continuing in the streets, he said, his father remained under the floor, so his adolescent brother, Jean-Elie, delivered the baby at home. “He was the man of the house,” Mr. Boltanski said of his brother.

After the war, he said, his parents’ closest friends — all survivors of the camps — told stories that would forever loom large in his imagination. “At the beginning of the life of an artist,” he said, “there is often a trauma, and for me the trauma was hearing always that everything was very dangerous.”

His father, a doctor, would eventually return to the hospital where he had worked. Unable to go anywhere alone, however, his father required his wife and Christian to wait for him nearby in the family’s car until his shift ended.

Mr. Boltanski, too, was fearful of the outside world. He found school unbearable and refused to go, he said, spending his youth watching television, playing with toy soldiers and gazing out of the apartment window at the street below. “I was in love with a little girl,” he recalled. “I never spoke to her. But I saw her every day.”

Although he would not venture outside alone until he was 18, he insisted he never felt trapped. “I didn’t want to go out — I was very happy,” he said. When he was 13, Mr. Boltanski began making paintings based on images of massacres found in religious books he received as gifts for his first Communion. Later, as a young man, he made emotionally fraught installations with oversized dolls. His mature work, however, he traces to 1969, when he published a small book, “Research and Presentation of All That Remains of My Childhood: 1944-1950.”

In 1970, his displays of what he called “stupidly cruel instruments of torture”— razor blades, small knives, pins, improvised surgical tools — were exhibited at the Musée D’Art Moderne de la Ville de Paris. Ileana Sonnabend, the renowned New York and Paris art dealer, bought all his work in the show and began to represent him. Her endorsement, along with that of his subsequent dealer in both cities,

Marian Goodman, would ensure Mr. Boltanski's ongoing exposure in museums and galleries across Europe and the United States. His provocative sculptures and installations now sell for as much as $190,000.

Decades after he began his explorations of mortality, Mr. Boltanski now finds himself confronting his own more directly than ever before, and increasingly looking to his art not only for a way into it, but also for a way around. "The only way to fight dying is through legacy," he said with conviction.

David Walsh, an Australian art collector who is also a professional gambler, has provided him with a chance to create another kind of legacy. For a project called "The Life of C.B.," Mr. Walsh recently commissioned the artist to install a video camera in his studio near Paris, which is already recording Mr. Boltanski's working life and will eventually transmit a live 24-hour feed of it to a small waterfront enclosure at the Museum of Old and New Art in Tasmania, founded by Mr. Walsh and scheduled to open in 2011.

Under the terms of the agreement, Mr. Walsh will pay a monthly stipend of about $2,500 to Mr. Boltanski until the artist dies. "It's not as silly as it sounds," said Mr. Walsh, speaking by phone from his apartment in Sydney. "I get a work of art by an otherwise expensive artist I admire." And the longer Mr. Boltanski lives, he reasoned, the more artwork will be created.

Mr. Boltanski disagreed. Referring to Mr. Walsh as "the Devil," he accused his patron of gambling on his projected death. After all, the sooner he dies, the less the work will cost.

"He's calling it a bet," countered Mr. Walsh. "He likes to create a sense of immediacy about his death since he's so afraid of it."

"Of course," Mr. Walsh added, referring to the value of the work, "It would be absolutely great if he died in his studio. But I don't think it's ethical to organize it."

http://www.nytimes.com/2010/05/10/arts/design/10boltanski.html?ref=design

Who Draws the Borders of Culture?

By MICHAEL KIMMELMAN

London

IT was gridlock in the British Museum the other morning as South African teenagers, Japanese businessmen toting Harrods bags, and a busload of German tourists — the usual crane-necked, camera-flashing babel of visitors — formed scrums before the Rosetta Stone, which Egyptian authorities just lately have again demanded that Britain return to Egypt. From the Egyptian rooms the crowds shuffled past the Assyrian gates from Balawat (Iraq is another country pleading for lost antiquities) and past the Roman statue of the crouching Aphrodite (ditto Italy), then headed toward the galleries containing what are known in Britain as the Elgin marbles (but in Greece as the Parthenon marbles, or simply booty), where passers-by plucked pamphlets from a rack.

The British Museum is Europe's Western front in the global war over cultural patrimony, on account of the marbles. The pamphlets give the museum's version for why they should stay in Britain, as they have for two centuries — ever since Lord Elgin, the British ambassador to the Sublime Porte at Constantinople, and with the consent of the ruling Ottomans (not to mention a blithe disregard for whatever may have been the wishes of the Greek populace), spirited them from the Acropolis in Athens. The pamphlet stresses that the British Museum is free and attracts millions of visitors every year from around the world, making the sculptures available to, and putting them in the context of, a wide swath of human civilization.

For their part the Greeks, before their economy collapsed, finally opened the long-delayed New Acropolis Museum last year to much fanfare: it's an up-to-date facility, forbidding and frankly ugly outside, but airy and light-filled inside, a home-in-waiting for the marbles, whose absence is clearly advertised by bone-white plaster casts of what Elgin took, alongside yellowed originals that he left behind. The view through a broad picture window, eloquent but baleful under the circumstances, looks onto the ruined Parthenon, playing on visitors' heartstrings. Greeks deem the museum a slam-dunk argument for the marbles' return.

It's definitely compelling.

But the British still make the better case.

Siding with the imperialists drives good people bonkers, I know. It's akin to Yankees worship, with the Greeks playing the underdog role of the old Red Sox. That said, patrimony claims too often serve merely nationalist ends these days, no less often than they do decent ones, never mind that the archaeological and legal arguments by the Greeks, while elaborately reasoned and passionately felt, don't finally trump the British ones.

Mostly, though, the issue comes down to the fact that culture, while it can have deeply rooted, special meanings to specific people, doesn't belong to anyone in the grand scheme of things. It doesn't stand still. When Walter Benjamin wrote in the last century about the original or authentic work of art losing its aura, he was in part suggesting that the past is not something we can just return to whenever we like — it's not something fixed and always available. It's something forever beyond our grasp, which we must reinvent to make present.

Today's Acropolis is itself a kind of fiction. Over the centuries and through succeeding empires and regimes, it became Christian and Turkish, and briefly Venetian, after it had been Roman. The Parthenon was a pagan temple, a church, a mosque, an arms depot (disastrously, under the Turks) and even a place from which the Nazis hung a big swastika flag whose removal by Greek patriots helped spur a resistance movement. Modernity has mostly stripped the site of all those layers of history to recover a Periclean-era past that represents, because it has come to mean the most to us, its supposed true self — a process of archeological excavation, based on another modern kind of fiction about historical and scientific objectivity that inevitably adds its own layer of history.

One of the paradoxes of the marbles debate is that it was precisely their removal to London, and all the anguish and furor and archaeological interest and study this provoked, starting with Hellenophiles like Lord Byron heaping scorn on Elgin and fellow Britons, that helped galvanize the Greeks' own sense of national identity and their pride in the Parthenon sculptures. Now the Greek government has even chosen to name its consolidation plan to combat the economic collapse after an architect of the Parthenon, Kallikrates.

But the general question, looting and tourist dollars aside, is why should any objects necessarily reside in the modern nation-state controlling the plot of land where, at one time, perhaps thousands of years earlier, they came from? The question goes to the heart of how culture operates in a global age.

The Greek proposal that Britain fork over Elgin's treasures has never involved actually putting the sculptures back onto the Parthenon, which started crumbling long before he showed up. The marbles would go from one museum into another, albeit one much closer. The Greeks argue for proximity, not authenticity. Their case has always been more abstract, not strictly about restoration but about historical reparations, pride and justice. It is more nationalistic and symbolic.

Over the centuries, meanwhile, bits and pieces of the Parthenon have ended up in six different countries, in the way that countless altars and other works of art have been split up and dispersed among private collectors and museums here and there. To the Greeks the Parthenon marbles may be a singular cause, but they're like plenty of other works that have been broken up and disseminated. The effect of this vandalism on the education and enlightenment of people in all the various places where the dismembered works have landed has been in many ways democratizing.

That's not an excuse for looting. It's simply to recognize that art, differently presented, abridged, whatever, can speak in myriad contexts. It's resilient and spreads knowledge and sympathy across borders. Ripped from its origins, it loses one set of meanings, to gain others.

Laws today fortunately prevent pillaging sites like the Acropolis. But they stop short of demanding that every chopped-up altar by Rubens, Fra Angelico or whomever now be pieced together and returned to the

churches and families and institutions for which they were first intended. For better and worse, history moves on.

The Elgin marbles, from the cultural crossroads of imperial London, reshaped cultural history over the course of the last 200 years by giving rise to neo-Classicism around the globe. Or perhaps it is more precise to say that the Parthenon marbles, by virtue of their presence both in Athens and London, helped spread that movement along with sympathy for the Greeks' cause.

Americans, excepting Indians, may find this whole issue hard to grasp. We don't tend to think in terms of American cultural patrimony, save perhaps for the Liberty Bell or the Brooklyn Bridge, because we're an immigrant nation worshipful of the free market. Demanding the return of American art and artifacts to America sounds, well, un-American, not to mention bad for the bottom line. We are too diverse in our roots, too focused on the present, too historically amnesiac and individualistic (not to mention rich) to worry overly about a collective culture or who might own it.

And in the end patrimony is about ownership, often of objects that as in the marbles' case, come from bygone civilizations. What, in this context, does it really mean to own culture?

Italy recently celebrated the return of a national treasure after the Metropolitan Museum gave back a sixth-century B.C. Greek krater by the painter Euphronius that tomb robbers dug up outside Rome during the 1970s. Stolen property is stolen property. But how curious that an ancient Greek vase, which centuries after it was made came into the possession of an Etruscan collector (a kind of ancient Elgin) living on what is now the outskirts of Rome, and then ended up buried for thousands of years below what became modern Italy, is today Italian cultural patrimony. By that definition, Elgin's loot is arguably British patrimony.

It's not coincidental that conflicts over patrimony have accelerated in recent decades thanks to globalizing trends: the increasing circulation of information along with objects and money — consequences of the Web, jet travel and mass tourism — and the evolution of institutions like the British Museum from sleepy, scholarly repositories of artifacts into entertainment palaces and virtual town squares. Authorities in countries like Greece, having seen the escalating economic and symbolic value of works like the marbles, have naturally sought to take advantage.

It isn't to belittle a deep-seated connection to such works to point out that claimants to far-flung patrimony may have various motives. When Zahi Hawass, Egypt's chief archaeologist, who made the recent fuss about the Rosetta Stone, also demanded that Germany hand over Nerfertiti, the 3,500-year-old bust of Akhenaten's wife, he chose the moment when the Neues Museum in Berlin opened with the bust as its main attraction.

This was just after Farouk Hosny, Egypt's candidate to run Unesco, the United Nations cultural agency, was defeated in a vote that Egyptian leaders considered a diplomatic slap. Mr. Hawass used Egypt's only real weapon on the international stage, its cultural patrimony, to lash out by proxy at the perceived enemies of Mr. Hosny's candidacy and pander to the wounded egos of Egypt's ruling elite.

It was a public relations gambit. Practically speaking, Egypt had to know there was no immediate shot at getting Nerfertiti back. The sculpture served in a passing form of political theater common these days, with Egypt playing plucky David to the West's Goliath.

Patrimony debates often end up in this moral fog of shifting geopolitics. The world was outraged when the National Museum in Iraq was looted after the war there started. But almost nobody (outside Germany, anyway) cares today whether Russia returns storerooms of treasures it stole at the end of World War II. Nigeria holds the moral high ground in demanding the return of sculptures burgled from that country's beleaguered museums, even though insiders were often complicit in the crimes.

And after the Taliban destroyed a Buddhist temple and burned centuries-old illuminated manuscripts, hardly anybody outside the country blinked when Unesco refused to authorize shipments of artifacts from Afghanistan to Switzerland because the move violated international rules against the removal of "national patrimony" — and also because nobody was really paying much attention to that region yet.

Then Taliban inspectors pulverized priceless treasures before the eyes of helpless Afghan curators and blew up the Bamiyan Buddhas in obedience to Mullah Omar's edict against the existence of pre-Islamic art. Only then did people in the West wake up and Unesco reconsider its position. Too late.

In the Parthenon's case the Greek actress Melina Mercouri kicked off the modern repatriation push during the 1980s as part of the nationalist program of a Greek leader, Andreas Papandreou, whose slogan was "Greece for the Greeks." What started in conjunction with a political campaign then evolved into a genuine street movement. Dimitris Pandermalis, the New Acropolis Museum's director, told me before the museum opened last year that the Elgin marbles' return "unifies us," meaning the Greek people, although surveys show that few of them actually bother to visit the Acropolis after grade school, while antique sites rivaling the Parthenon in archaeological significance often go neglected across Greece. As I said, it's ultimately about nationalism and symbolism.

So be it. That's why Greek authorities always decline diplomatic solutions like sharing the marbles or asking for their loan. They assume any loan request would legitimize Britain's ownership. The principle is high minded. What results is, in effect, nothing, which doesn't diminish the Greeks' connection with the missing marbles.

But as the Princeton philosopher Kwame Anthony Appiah has cautioned about the whole patrimony question: "We should remind ourselves of other connections. One connection — the one neglected in talk of cultural patrimony — is the connection not through identity but despite difference."

What he means is that people make connections across cultures through objects like the marbles. These objects can become handmaidens for ideologues, instruments for social division and tools of the economy, or cicerones through history and oracles to a more perfect union of nations. Art is something made in a particular place by particular people, and may serve a particular function at one time but obtain different meanings at other times. It summons distinct feelings to those for whom it's local, but ultimately belongs to everyone and to no one.

We're all custodians of global culture for posterity.

Neither today's Greeks nor Britons own the Parthenon marbles, really.

http://www.nytimes.com/2010/05/09/arts/09abroad.html?ref=design

Melvin the Mummy's New Clothes

By TED LOOS

WHEN it comes to names for Egyptian mummies, there's no question that Anonymous Man lacks the royal heft of, say, King Tutankhamun. Even the Anonymous Man's nickname, Melvin, isn't quite a head turner.

Even so, as crowds swarm the mummy-less exhibition of treasures of the predictably famous King Tut at the Discovery Times Square Exposition, Melvin the Mummy has a good story to tell. The tale is noteworthy for his recent and innovative restoration — basically an extreme mummy makeover — and his harrowing and unlikely 1,700-year journey from ancient Egypt to a 21st-century exhibition vitrine in Brooklyn.

The Brooklyn Museum is currently displaying Melvin for the first time since he entered its collection in 1952. He has been cleaned up, rewrapped and is stretched out beneath his boldly painted cartonnage, or decorative covering — he looks a bit like a Byzantine Jesus graced with Groucho Marx eyebrows — as part of "The Mummy Chamber." The 170-work exhibition is dedicated to the artifacts of the afterlife and is scheduled to be on long-term view.

Melvin, however, almost didn't make it to his latest star turn. After being excised from 14 layers of linen wrappings in 1956, as part of a treasure hunt for amulets and jewelry, he was almost consigned to an incinerator.

But Melvin, given his nickname by the museum's staff in the 1950s, escaped the flames in a near miss so dramatic that it inspired an hourlong teleplay that was broadcast on CBS in 1958. Then he was shut in storage for decades. Only his cartonnage was deemed worthy of display and study.

But now he has been rewrapped, head to toe, in the original linen in which he was sent to the afterlife. It was an exacting process that, with study and research, took nearly a year.

Repairing a swatch of ancient linen, or rewrapping a mummy in new material, are both accepted restoration practices. However, as Mimi Leveque, an independent conservator of antiquities, said, "there is no normal mummy procedure," in part because mummification techniques varied over the centuries, and there just aren't that many mummies being actively studied.

But Melvin's reswaddling in 1,700-year-old fabric is something new, mummy experts say. "Brooklyn is pioneering in this," said Marie Svoboda, an associate conservator of antiquities at the J. Paul Getty Museum in Los Angeles. "That's the first I've heard of such a rewrapping."

The Brooklyn Museum has one of the country's best collections of Egyptian objects, and it includes nine mummies, which is considered a bounty of the dead and bandaged. Four of them are on display in "The Mummy Chamber," including Melvin.

"It was kind of nice, actually, putting his clothes back on — two little boat-neck tunics with cap sleeves," Lisa Bruno, the Brooklyn's Museum's chief conservator, said of dressing Melvin more than 50 years after his clothes were removed and flung aside. Even his plant-fiber necklace survived in storage and was draped around his cartonnage once again.

Putting his clothes back on was easy. Then came the linen, the traditional Egyptian mummification material since about 2400 B.C. When Ms. Bruno took on the project, she knew that she was lucky that Melvin had been entombed around A.D. 300, late in the mummification era, when Rome ruled Egypt.

"Resins were poured inside his body to preserve it, but not on top of the body with the wrapping," she said. "In earlier eras they also went on the linen, which became a brittle shell. If that had been done, there would be nothing left to rewrap him in."

Ms. Bruno compared Melvin's coverings at the start of the project to "a giant sleeping bag with a cut up the middle." The outer layer had been sliced and the other 13 peeled back. The mummy itself had become completely exposed in the intervening years. First, the conservators gently vacuumed the linens, because dust is rough and acidic. Then they studied the ancient creases to guide them in refolding the material over the body.

Once he was again snug in his traveling clothes for the afterlife, a delicate sewing job was needed. The original bindings that held the layers in place, also made of linen, were beyond repair, so the staff members distressed pieces of new cotton and used them to replace the old ones.

Conservators and curators from other institutions have taken note of the Brooklyn Museum's approach. "They have been shocked, and not in a bad way, that we could reuse the linens," Ms. Bruno said.

Edward Bleiberg, the museum's curator of Egyptian, classical and ancient Middle Eastern art, even went so far as to say that Ms. Bruno and the museum's textile conservator, Kathy Francis, "probably know more about wrapping a Roman mummy than anyone since the third century."

Attending to a mummified man, though, is not without its squirm-inducing moments, even for veterans of the mummy wars. "Basically he's turned into leather," Mr. Bleiberg said of Melvin's current state.

Ms. Bruno added: "He was the most smelly of the mummies we worked on. And that's probably because he had less resin. But he's really only decomposing on a microlevel."

Melvin's makeover is part of the effort to restore all nine of the Brooklyn Museum's mummies. The museum had an inquiry from the Getty in 2006 about another Roman-era man in the collection, and "it got us thinking about studying our mummies in depth," said Mr. Bleiberg, who organized "The Mummy Chamber."

Once museum staff members started giving the mummies a hard look, there was no lack of surprises. At one point four mummies were given CT scans. Before the scans they had always been classified as two women and two men. But it quickly became clear they were all men, including a mummy known as Hor (712-664 B.C.), who appears in the current exhibition. "The technician said, 'I thought you said this was a woman,' " Mr. Bleiberg recalled. "And then he pointed to the unmistakable evidence to the contrary."

In Hor's case the confusion arose because his pretty and hairless face led curators of the 1930s to assume he was a woman. The other newly reclassified male in the show, Thothirdes, had his name mistranslated from the hieroglyphics on his coffin, despite the beard present in his depiction there.

Another marquee object waiting in "The Mummy Chamber," a book of the dead that was interred with an Egyptian jeweler named Sobekmose, was a victim of less evolved museum practices of an earlier time. The 25-foot-long scroll, one of the oldest and longest such books ever dug up, was cut up into smaller sections so that it could be studied more easily.

An incident like that gives Mr. Bleiberg pause. He said he wonders what errors he and his staff members might be making today that would be mortifying 50 years from now. "I worry a lot," he said. "But you can't get frozen by that."

Those worries are why "reversibility" and "documentation" are crucial words among conservators of ancient objects today. Anything done to an object should be able to be undone easily, and museums chronicle each step of their work, as they did with Melvin.

And Melvin, strangely enough, a now-anonymous upper-middle-class man who was buried near Luxor, Egypt, in a simple wooden coffin, has ended up being one of the best-known mummies about town. (Though it must be said that he's still trumped by King Tut, who even had a song written about him by the comedian Steve Martin.)

Brooklyn Museum staff members tweeted about Melvin as he was rewrapped this past winter. And he had the title role in "The Complex Mummy Complex," which was broadcast on "Armstrong Circle Theater" in 1958. Inspired by a newspaper article, the show relates how the mummy was kept from the incinerator by Anthony Giambolvo, a devout museum technician who wanted to save Melvin's immortal soul.

Mr. Giambolvo and the museum's curator of Egyptian works then, John Cooney — the same man who had tried to cast Melvin aside — try and fail in several attempts to donate or bury the body.

The story is played for laughs, a kind of "Trouble With Harry" for Egyptologists. But at the end of the program, the real-life Mr. Cooney appears and humorlessly states that mummies "have no place in an art museum." Poor Melvin.

That attitude is in striking contrast to the one that is exemplified by the new "Mummy Chamber" and Melvin's restoration.

"When these mummies were altered and covered, they became artifacts," Mr. Bleiberg said, adding that the museum would never show them uncovered. "We display the mummies, and we respect them."

http://www.nytimes.com/2010/05/09/arts/design/09mummies.html?ref=design

Celebrating Artists Who Keep the Action in Abstraction

By SUSAN HODARA

WHEN Dara Meyers-Kingsley was invited to curate ArtsWestchester's annual exhibition of Westchester artists, she knew that the theme of the show was to be abstraction. By setting her focus on the last six letters of that word, she has assembled a collection of artwork that, she said, offers a new perspective on abstract art. Opening May 15 at the Arts Exchange in White Plains, the exhibition is titled "AbstrACTION," with action in various guises its highlight.

Ms. Meyers-Kingsley, an independent curator who has organized many exhibitions, including 20 international media shows at the Brooklyn Museum of Art, said she wanted to move the work "off the canvas, with all due respect to painting."

Of the 15 artists in the show, only three are painters; the others work in sculpture, drawing, photography, animation, video, installation and mixed media.

Action is prevalent in "AbstrACTION" on several levels. Some of the artwork actually moves, like Tom Sarver's three kinetic sculptures (one that's 18 feet tall), animations by Dannielle Tegeder and video projections by Kit Fitzgerald. Kirsten Nelson's "Corner with Dry Wall" appears to protrude from a wall.

In other cases, action is implicit in the processes involved in creating the work. For example, three pieces from Tricia Wright's "True Value" series are composed of patterns made by pricking hundreds of pinholes into paper. Henry Mandell is wrapping one of the gallery's movable walls in what he calls "artwork skin," created from digitally designed large-scale prints. "The Problem of One Thing Existing Simultaneously #4," by Tavares Strachan, displays the pieces of a shattered beer bottle laid out in a vitrine alongside handmade copies of each shard. Jason Repolle's intricate drawings can take a year to finish; Ms. Meyers-Kingsley described them as "obsessive." In Lori Nozick's "Window," fishing line is threaded through 42 holes in one of the gallery's large window shades, converging into a single point on the floor below.

"Of course, anything you make entails action," Ms. Meyers-Kingsley said, "but in these selections, that action is more apparent. By highlighting the processes that take place when creating the work, I'm hoping to help viewers to find a way in, to make sense of the piece." She said she also hoped that viewers would actively engage with the works, which will fill both floors of the Arts Exchange.

"I could have doubled the number of artists with the space we have," she said, "but I like leaving room around each piece. This is artwork that is experiential and interactive. It necessitates a more active form of participation than just looking."

Even some of the artists will become part of the action. A series of drawings by Steven Gwon, titled "six months," will grow to 18 panels from 8 as Mr. Gwon adds artwork he will create over the course of the exhibition. From June 2 through June 12, the painter Mike Childs will transform part of the Arts Exchange into a studio to paint a mural directly on one of the gallery walls. Donna Sharrett has built a sculpture of forsythia branches sown with indigenous plants and vines that will grow in the Arts Exchange's open-air interior courtyard. A live performance by Ms. Fitzgerald, her husband, Peter Gordon, and members of the Love of Life Orchestra is planned for June 25.

Ms. Meyers-Kingsley lives in Usonia, an enclave of houses designed by Frank Lloyd Wright and his disciples in Pleasantville, and all the artists featured in "AbstrACTION" live, work or were born in Westchester.

Some are represented by Chelsea galleries and have been shown in major museums. Mr. Strachan, of Pelham, currently has a solo exhibition at the MIT List Visual Arts Center in Cambridge, Mass. Work by Ms. Fitzgerald, an assistant professor of new media at Concordia College in Bronxville, has been shown at the Whitney Museum of American Art and is in the collection of the Museum of Modern Art. The painter Erik Hanson of Peekskill also has work in the Museum of Modern Art's collection, while the painter Creighton Michael of Mount Kisco has work in the collections of the Brooklyn Museum and the Neuberger Museum of Art. Mr. Repolle's drawings are on display in "IN.FLEC.TION," now at the Hudson Valley Center for Contemporary Art.

A preview of "AbstrACTION" is part of ArtsWestchester's Arts Bash Preview Party, held annually in conjunction with the Arts Exchange's spring exhibition of Westchester artists. The more than 400 guests expected to attend will partake of an array of food prepared by 10 local restaurants under the direction of Anthony Goncalves, the chef at nearby 42. Guests can also participate in Open Studios, visiting the work spaces of the 13 artists who rent space in the Arts Exchange.

"Once a year we open up our building for two reasons," said Janet Langsam, ArtsWestchester's executive director. "One is to showcase local artists; we try to present new talents whose work has not been shown here before. The other is to showcase the artists who have studios in our building. It's a focus on Westchester art — new work, new artists, new ideas."

"AbstrACTION," May 15 through Aug. 14; Tuesday through Saturday, 12 to 5 p.m.; admission is free. Arts Bash Preview Party takes place on Friday, 6:30 to 9 p.m.; tickets are $65. Open Studios: May 14, 6:30 to 9 p.m., for Arts Bash ticket-holders only; May 15, 12 to 5 p.m., free and open to the public. At the Arts Exchange, 31 Mamaroneck Avenue, White Plains. For Arts Bash tickets and more information: artswestchester.org or (914) 428-4220.

http://www.nytimes.com/2010/05/09/nyregion/09artwe.html?ref=design

Pounding the Pavement on a Bryant Park Pedestal

By RANDY KENNEDY

The warm-weather sidewalks around Bryant Park are usually as packed as the stateroom scene in the Marx Brothers' "Night at the Opera." But beginning on Monday, if pedestrians plowing through raise their weary heads, they will encounter a vision of truly stunning Midtown Manhattan density in the air above them.

Seven women in identical bright yellow dresses and ivory pumps will be walking across the top of an eight-foot-high yellow box — walking with purpose but with nowhere to go, really, except around the 100-square-foot surface, and into one another. Is it a psychology experiment? A catwalk gone horribly wrong? A reality show? An ad for organic bananas? Or is it art?

For 10 hours a day, 8:30 a.m. to 6:30 p.m., Monday through Friday of next week, you can come and decide for yourself. The project, "Walk the Walk," is the creation of the artist Kate Gilmore, who can currently be seen in a pretty red polka-dot dress and heels, walloping her way, Jake LaMotta style, out of a small sheetrock enclosure in a much-talked-about video at the Whitney Biennial.

Like that work, the new one, commissioned by the Public Art Fund, is the kind of primal-conflict-in-a-candy-wrapper that Ms. Gilmore, 34, has become known for in recent years, a sort of postfeminist take on the absurdity of contemporary life. It might not be quite the epic feat of public endurance taking place a few blocks north at the Museum of Modern Art, where Marina Abramovic has been sitting daily in the museum's atrium, unspeaking and mostly unmoving, since mid-March, and will continue to do so through May.

But Ms. Gilmore's work can be seen as a kind of crowd-friendly capstone to a serendipitous season of live public performance art in New York, one that began in late January with a show at the Guggenheim by Tino Sehgal, who enlisted dozens of performers to walk and talk with visitors along the museum's otherwise empty ramps.

The art fund selected Ms. Gilmore from among dozens of emerging artists who compete every year for only three commissions offered by this nonprofit organization, which finds the artists spaces — often

prominent ones — to display their work, provides them with up to $15,000 to make it and gives them each a $2,500 fee.

Getting the chance to present her first live-performance work in such a highly trafficked part of Manhattan, Ms. Gilmore — whose major themes are desire, uncertainty and defeat — is likely to find audiences that will understand what she is after, whether art lovers or not. As the writer Lyra Kilston observed in the magazine Modern Painters, in words that could just as well describe the life of many a New York office worker, the trials in Ms. Gilmore's work "thwart victorious resolution," and even if the hapless striver succeeds, "we see a vaguely confused expression that seems to question why she was engaged in the senseless action to begin with."

Nicholas Baume, the director of the Public Art Fund, said he was drawn to Ms. Gilmore's idea partly because it reflects urban life back at itself, riffing on personal space and "the individual versus the mass."

"One tends to forget how much energy and determination it takes just to walk down a busy city street," he said.

Given that she often uses an ax, a hammer or her own head to break things in her pieces, it probably shouldn't come as a surprise that when she started looking for women to perform in the project, Ms. Gilmore made one thing clear upfront: "I told them basically, 'I don't want to deal with any weaklings.' "

In person, Ms. Gilmore is funny and friendly, belying her drill sergeant routine, which she laughs trying to describe. Last week, when several of her performers (she calls them her "ladies") arrived at her studio in Dumbo, Brooklyn, for a fitting and a rehearsal of sorts, she had sun tea and almond cookies set out. But she is asking a lot of the women, because they will serve, in a sense, as stand-ins for Ms. Gilmore, who has always worked solo in the past and gives herself few breaks in her brand of hard-knocks aestheticism.

Seven women at a time will be crowded onto the structure, which will rise along the park's western edge on the Fountain Terrace. Those on the morning shift will climb up just before 8:30, and will be spelled by an afternoon shift at 1:30 — a version of the regimented office routines taking place in the buildings ringing the park.

The recruits will do only walking, no talking. "The only way I want you to communicate is with your bodies and with your feet," she told the nine who had arrived at her studio after they had all changed into their identical rayon-and-spandex cowl-neck dresses. Ms. Gilmore had bought these in bulk online from the "career dresses" section of Chadwick's, a budget clothier.

"I feel like we're all bridesmaids in some insane wedding," said Amanda Gale, 30, a graduate M.F.A. student at Purchase College, where Ms. Gilmore teaches and from which many of her art enlistees came.

Ms. Gilmore's goal for the piece was to create a kind of collective New York woman, she said, and the 14 performers she chose represent a range of ages (20 to 38), races (white, Asian, black) and dress sizes (2 to 12). "New York City is not all white girls who are size 4," she said.

Her biggest concern in casting them, she added, beyond diversity and their ability to go the distance, was to weed out actors and dancers: "You can tell an actor a mile away."

During the rehearsal, a 10-by-10-foot square was marked off on the studio floor with masking tape to give the women a sense of the severe ambulatory constrictions they were about to face eight feet above Manhattan. Seven women got into the square and started walking, in circles and zigzags, creating what looked at first like a children's-show dramatization of the properties of electrons.

A lively debate ensued: to stomp or not to stomp? The cube will be open on all four sides, allowing Bryant Park visitors to go inside and experience what it might sound like to be directly beneath the deafening drumhead of a New York City sidewalk.

“What about shuffling?” asked Mr. Baume, who had arrived to watch. “We promised shuffling in the press release.”

Reluctantly, Ms. Gilmore decided to cede a bit of control. “I think I’ll leave it up to you if you want to sort of diversify your foot experience,” she told the walking women, some of whom, 20 minutes in, had already begun to develop wan, “Stepford Wives” expressions.

The only concession to the performers’ peace of mind will be a 36-inch-high railing around the top of the box to prevent them from falling if they make a misstep, which would send them onto the concrete near the park’s fountain. (Perhaps appropriately, the fountain is believed to be the city’s first public memorial dedicated to a woman, Josephine Shaw Lowell, a social worker and reformer.)Rachel Wiecking, 38, another Purchase College M.F.A. student, said she was a little worried about what her feet would look like after a week, and whether people with pea shooters would show up.

“Will one of us go crazy?” she wondered. “Will we all hate each other by the end?”

But for any woman who has worked as a waitress, as most of the performers have, walking for five hours in public isn’t as daunting as it might sound, she said. And at $15 an hour, the pay wasn’t bad, either, at least for art work.

Nonetheless, Ms. Gilmore was making sure to prepare them mentally.

“I don’t want anyone to take a break,” she said. “I mean, of course, if you really need to, you can take a break.”

“But don’t take a break.”

Even if it rains? “Look,” she said, smiling self-consciously over her glasses, “I don’t want to torture these women. If it rains a lot, we’ll go out and get them some cute umbrellas.”

http://www.nytimes.com/2010/05/08/arts/design/08gilmore.html?ref=design

Mapping Ancient Civilization, in a Matter of Days

By JOHN NOBLE WILFORD

For a quarter of a century, two archaeologists and their team slogged through wild tropical vegetation to investigate and map the remains of one of the largest Maya cities, in Central America. Slow, sweaty hacking with machetes seemed to be the only way to discover the breadth of an ancient urban landscape now hidden beneath a dense forest canopy.

Even the new remote-sensing technologies, so effective in recent decades at surveying other archaeological sites, were no help. Imaging radar and multispectral surveys by air and from space could not "see" through the trees. Then, in the dry spring season a year ago, the husband-and-wife team of Arlen F. Chase and Diane Z. Chase tried a new approach using airborne laser signals that penetrate the jungle cover and are reflected from the ground below. They yielded 3-D images of the site of ancient Caracol, in Belize, one of the great cities of the Maya lowlands.

In only four days, a twin-engine aircraft equipped with an advanced version of lidar (light detection and ranging) flew back and forth over the jungle and collected data surpassing the results of two and a half decades of on-the-ground mapping, the archaeologists said. After three weeks of laboratory processing, the almost 10 hours of laser measurements showed topographic detail over an area of 80 square miles, notably settlement patterns of grand architecture and modest house mounds, roadways and agricultural terraces.

"We were blown away," Dr. Diane Chase said recently, recalling their first examination of the images. "We believe that lidar will help transform Maya archaeology much in the same way that radiocarbon dating did in the 1950s and interpretations of Maya hieroglyphs did in the 1980s and '90s." The Chases, who are professors of anthropology at the University of Central Florida in Orlando, had determined from earlier surveys that Caracol extended over a wide area in its heyday, between A.D. 550 and 900. From a ceremonial center of palaces and broad plazas, it stretched out to industrial zones and poor neighborhoods and beyond to suburbs of substantial houses, markets and terraced fields and reservoirs.

This picture of urban sprawl led the Chases to estimate the city's population at its peak at more than 115,000. But some archaeologists doubted the evidence warranted such expansive interpretations.

"Now we have a totality of data and see the entire landscape," Dr. Arlen Chase said of the laser findings. "We know the size of the site, its boundaries, and this confirms our population estimates, and we see all this terracing and begin to know how the people fed themselves."

The Caracol survey was the first application of the advanced laser technology on such a large archaeological site. Several journal articles describe the use of lidar in the vicinity of Stonehenge in England and elsewhere at an Iron Age fort and American plantation sites. Only last year, Sarah H. Parcak of the University of Alabama at Birmingham predicted, "Lidar imagery will have much to offer the archaeology of the rain forest regions."

The Chases said they had been unaware of Dr. Parcak's assessment, in her book "Satellite Remote Sensing for Archaeology" (Routledge, 2009), when they embarked on the Caracol survey. They acted on the recommendation of a Central Florida colleague, John F. Weishampel, a biologist who had for years used airborne laser sensors to study forests and other vegetation.

Dr. Weishampel arranged for the primary financing of the project from the little-known space archaeology program of the National Aeronautics and Space Administration. The flights were conducted by the National Science Foundation's National Center for Airborne Laser Mapping, operated by the University of Florida and the University of California, Berkeley.

Other archaeologists, who were not involved in the research but were familiar with the results, said the technology should be a boon to explorations, especially ones in the tropics, with its heavily overgrown vegetation, including pre-Columbian sites throughout Mexico and Central America. But they emphasized that it would not obviate the need to follow up with traditional mapping to establish "ground truth."

Jeremy A. Sabloff, a former director of the University of Pennsylvania Museum of Archaeology and Anthropology and now president of the Santa Fe Institute in New Mexico, said he wished he had had lidar when he was working in the Maya ruins at Sayil, in Mexico.

The new laser technology, Dr. Sabloff said, "would definitely have speeded up our mapping, given us more details and would have enabled us to refine our research questions and hypotheses much earlier in our field program than was possible in the 1980s."

At first, Payson D. Sheets, a University of Colorado archaeologist, was not impressed with lidar. A NASA aircraft tested the laser system over his research area in Costa Rica, he said, "but when I saw it recorded the water in a lake sloping at 14 degrees, I did not use it again."

Now, after examining the imagery from Caracol, Dr. Sheets said he planned to try lidar, with its improved technology, again. "I was stunned by the crisp precision and fine-grained resolution," he said.

"Finally, we have a nondestructive and rapid means of documenting the present ground surface through heavy vegetation cover," Dr. Sheets said, adding, "One can easily imagine, given the Caracol success, how important this would be in Southeast Asia, with the Khmer civilization at places like Angkor Wat."

In recent reports at meetings of Mayanists and in interviews, the Chases noted that previous remote-sensing techniques focused more on the discovery of archaeological sites than on the detailed imaging of on-ground remains. The sensors could not see through much of the forest to resolve just how big the ancient cities had been. As a consequence, archaeologists may have underestimated the scope of Mayan accomplishments.

For the Caracol survey, the aircraft flew less than a half-mile above the terrain at the end of the dry season, when foliage is less dense. The Airborne Laser Terrain Mapper, as the specific advanced system is named, issued steady light pulses along 62 north-south flight lines and 60 east-west lines. This reached

to what appeared to be the fringes of the city's outer suburbs and most agricultural terraces, showing that the urban expanse encompassed at least 70 square miles.

Not all the laser pulses transmitted from the aircraft made it to the surface. Some were reflected by the tops of trees. But enough reached the ground and were reflected back to the airborne instruments. These signals, measured and triangulated by GPS receivers and processed by computers, produced images of the surface contours. This revealed distinct patterns of building ruins, causeways and other human modifications of the landscape.

The years the Chases spent on traditional explorations at Caracol laid the foundation for confirming the effectiveness of the laser technology. Details in the new images clearly matched their maps of known structures and cultural features, the archaeologists said. When the teams returned to the field, they used the laser images to find several causeways, terraced fields and many ruins they had overlooked.

The Chases said the new research demonstrates how a large, sustainable agricultural society could thrive in a tropical environment and thus account for the robust Maya civilization in its classic period from A.D. 250 to 900.

"This will revolutionize the way we do settlement studies of the Maya," Dr. Arlen Chase said on returning from this spring's research at Caracol.

Lidar is not expected to have universal application. Dr. Sheets said that, for example, it would not be useful at his pre-Columbian site at Cerén, in El Salvador. The ancient village and what were its surrounding manioc fields are buried under many feet of volcanic ash, beyond laser detection.

Other modern technologies, including radar and satellite imaging, are already proving effective in the land beyond the temples at Angkor, in Cambodia, and in surveys of the Nile delta and ancient irrigation systems in Iraq.

Laser signals breaking through jungle cover are only the newest form of remote sensing in the pursuit of knowledge of past cultures, which began in earnest about a century ago with the advent of aerial photography. Charles Lindbergh drew attention to its application in archaeology with picture-taking flights over unexplored Pueblo cliff dwellings in the American Southwest.

NASA recently stepped up its promotion of technologies developed for broad surveys of Earth and other planets to be used in archaeological research. Starting with a few preliminary tests over the years, the agency has now established a formal program for financing archaeological remote-sensing projects by air and space.

"We're not looking for monoliths on the Moon," joked Craig Dobson, manager of the NASA space archaeology program.

Every two years, Dr. Dobson said, NASA issues several three-year grants for the use of remote sensing at ancient sites. In addition to the Caracol tests, the program is supporting two other Maya research efforts, surveys of settlement patterns in North Africa and Mexico and reconnaissance of ancient ruins in the Mekong River Valley and around Angkor Wat.

Nothing like a latter-day Apollo project, of course, but the archaeology program is growing, Dr. Dobson said, and will soon double in size, to an annual budget of $1 million.

http://www.nytimes.com/2010/05/11/science/11maya.html?ref=science

Finland's 100,000-Year Plan to Banish Its Nuclear Waste

By DENNIS OVERBYE

It is, in the words of the Danish filmmaker Michael Madsen, "a place we must remember to forget."

On a wooded island more than a hundred miles northwest of Helsinki, in the town of Eurajoki, Finnish engineers are digging a tunnel. When it is done 10 years from now, it will corkscrew three miles in and 1,600 feet down into crystalline gneiss bedrock that has been the foundation of Finland for 1.8 billion years.

And there, in a darkness that is still being created, the used fuel rods from Finland's nuclear reactors — full of radioactive elements from the periodic table as dreamed up by Lord Voldemort, spitting neutrons and gamma rays — are to be sealed away forever, or at least 100,000 years.

The place is called Onkalo (Finnish for "hidden") and it is the subject of "Into Eternity," a new documentary by Mr. Madsen.

Watching it during the recent Tribeca Film Festival brought me into a more visceral contact with the vicissitudes of geologic time than I might have really wanted. These days I find that I can barely envision the future more than about six months ahead — hardly enough time even to plan for a proper summer vacation. My images of the deep future have always been vaguely utopian, like "Star Trek," but "Star Trek" takes place only a few hundred years into the future, not 100,000 years.

Onkalo, on the other hand, is supposed to last 20 times as long as the pyramids have so far — so long that the builders of the site have to take into account the next ice age, when the weight of two miles of ice on top of Finland will be added to the stress on the buried waste containers, copper canisters two inches thick.

It might seem crazy, if not criminal, to obligate 3,000 future generations of humans to take care of our poisonous waste just so that we can continue running our electric toothbrushes. But it's already too late to wave off the nuclear age, and Mr. Madsen's film comes at a perfect time to join a worldwide conversation about what to do with its ashes. On June 3, administrative law judges from the Nuclear Regulatory Commission will begin hearing arguments about whether the Department of Energy can proceed with

shutting down development of the Yucca Mountain site in Nevada, where the United States had been planning since 1987 to store its own nuclear waste.

If the Obama administration prevails, the United States will be back to square one in figuring out how to get rid of its own 77,000 radioactive tons, including 53 million gallons left over from the dawn of the nuclear age sitting in leaky tanks in the Washington desert near the Columbia River. There are somewhere between 250,000 and 300,000 tons of high-level radioactive waste already in the world, much of it in pools on the sites of nuclear power plants where the rods have to cool for years before they can be put into containers.

Onkalo is being built to do its job without human intervention or maintenance. Once it is done and sealed back up a hundred years or so from now, the problem is less with keeping all the radioactivity in than keeping people out. Unfortunately, nothing in history suggests that humans will actually keep out. Indeed the builders themselves, according to their environmental impact statement, have not ruled out the possibility that future technological development will make it feasible to dig all this stuff back up and reprocess it to create more fuel or weapons material, in which case Onkalo will be like buried treasure

The pyramids, after all, are not an auspicious precedent. They have been looted and their inhabitants dispersed to the museums of the world by intrepid archaeologists and grave robbers not at all deterred by rumors of the Curse of the Mummy.

Mr. Madsen seems to agree. The film is framed as a message to the future, to those of us who might have blundered into this place We Were Never Meant to Go. Mr. Madsen himself appears in the darkness, illuminated by a burning match just long enough to drop rhetorical bombs, like the idea that we are encountering the last remnant of the fires that once warmed our civilization.

I found myself wondering just who, after another ice age, he might be talking to: Computers? Cockroaches? Ourselves, reduced to Stone Age lifestyles after the collapse of civilization under the weight of ice or nuclear or biological apocalypse? Citizens of the galaxy on a sentimental tour of the old home world? Does future history go up or down or sideways?

Robots won't mind the radioactivity; cockroaches might live on it. The rest of us, if history is any guide, will forget it. We'll be lucky, for that matter, if those future galactic citizens even remember the Earth in anything more than fairy tales. We're always reading about time capsules being buried, but we rarely hear about them being dug up and opened. One of the most famous archaeological discoveries of modern times, the terra-cotta army buried with the first Chinese emperor, Qin, outside the city of Xian, was made by a farmer digging a well.

As a species, we are good at forgetting. So maybe the best, ultimate, defense against people messing with Onkalo would be simply to forget that it is there. The best way to keep a secret is not to let on that there is a secret at all.

But what about the ethical duty to warn those future generations with some kind of marker that would survive the scouring of Finland by glaciers and evolution of language? If, in fact, the canisters are rediscovered a few hundred years or a few thousand years from now, we can imagine our descendants' reaction at having been left such a nasty surprise.

Of course, we ourselves could be surprised, like the peasant who found Qin's army. One joke that went around the Onkalo project for a while, according to Mr. Madsen's film, could have come straight from a novel by Arthur C. Clarke. What if, the team thought, the first thing it found when it started digging were canisters left by somebody else?

http://www.nytimes.com/2010/05/11/science/11nuclear.html?ref=science

Give It a Rest, Genius

What the new success books don't tell you about superachievement.

By Ann Hulbert
Posted Friday, May 7, 2010, at 10:04 AM ET

Success begets success. Sociologists call this phenomenon the Matthew Effect, after the parable in the Gospel of Matthew that concludes, "For to all those who have, more will be given, and they will have an abundance" (and the corollary, "from those who have nothing, even what they have will be taken away"). Nothing succeeds like a theory of success, too, it seems. Call it the Malcolm Effect: When Malcolm Gladwell challenges what he sees as the popular myth of inborn genius and champions the cultural contributions to extraordinary achievement instead, you can be sure that versions of the idea will soon be everywhere.

Gladwell's *Outliers: The Story of Success* was not, appropriately enough, a bolt of original genius when it appeared in November 2008. Geoffrey Colvin's *Talent Is Overrated: What Really Separates World-Class Performers From Everybody Else* had come out a month earlier. The following spring brought Daniel Coyle's *The Talent Code: Greatness Isn't Born. It's Grown. Here's How*. (*Outliers* rose straight to the top of the best-seller list and has stayed there; Colvin and Coyle's books both made it onto the extended list.) This spring David Shenk's *The Genius in All of Us: Why Everything You've Been Told About Genetics, Talent, and IQ Is Wrong* has gotten several raves. Hot on its heels arrives *Bounce: Mozart, Federer, Picasso, Beckham, and the Science of Success*, by Matthew Syed, a former Olympic ping-pong player turned journalist. A book that openly plunders from its predecessors, it plainly aims to enjoy some, well, bounce.

This highly successful wave of wisdom itself illustrates the "story of success" that the authors converge in telling. The outline goes like this: There is no such thing as solitary genius, springing forth out of nowhere from innate gifts and often against great odds. Check out the backstory of such wondrous legends, and you discover that social context and historical timing are crucial in enabling unusual achievements to flower. An awesome, and roughly contemporaneous, example of prowess in a given field can be an especially important impetus to similar accomplishment. Bobby Fischer, for example, spurred a chess renaissance in the United States. Gladwell, as publishers will tell you, has had a catalytic effect on journalists.

The formula fits the recent flurry of books about success: Start with two urgent social concerns—that America is falling behind in the global talent race and that inequality is rising at home. Add some nifty research from cutting-edge labs (about neurons, genes, and the acquisition of expertise). Factor in the Gladwellian model of publicizing such findings in mega-best-sellers that blend upstart argument, cool data, and irresistible anecdotes—and you have a boomlet. It would almost be a surprise if eager popularizers hadn't converged to ride a pendulum swing away from the view that talent is hereditary. And these authors, naturally, are hoping for a peak achievement themselves in the process.

If the times help explain the resurgence of genius-isn't-in-your-genes proselytizers (they have been around before), the writers in turn shed light on the times. In particular, they call attention to our conflicted views of a crucial ingredient of this current "talent code": hard work. In their calculus of success, these books endorse perspiration over inspiration as the key to extraordinary performance. The prevailing term is "deliberate practice," introduced by K. Anders Ericsson, a psychologist cited in every one of these books for research that has led to the "10,000-hour rule." That's how much intensely focused training it takes to reach the expert level, in any field. Coyle's more New Age coinage is "deep practice." And that adjective, so much less stodgy than *deliberate*, gives us a clue to a certain ambivalence these authors display about effort. This literature is torn about just how taxing the travails it urges really are.

Even as these books debunk the romantic and elitist belief in "giftedness," they don't always do realistic justice to the grunt work they champion. Gladwell tends to gloss over the sweaty specifics in favor of an emphasis on the larger cultural forces that enable the doggedness so key to extraordinary achievement. He reaches for the exacting Chinese tradition of rice cultivation, for example, to explain Chinese students' top showing on international math exams.

His epigones, aiming for the self-help shelves, do put those 10,000 hours of "effortful study" front and center. But in their zeal to tout this kind of practice as a tool for all, they can't resist glamorizing its intensity (Ted Williams, out tirelessly hitting balls from boyhood onward) and distracting us from how arduous, tedious, and dependent on adult pushiness it can be. (Talk to Andre Agassi!) They also skirt the question of whether producing the requisite 10,000-hour grinds may prove to be as inegalitarian and hypercompetitive as the emergence of geniuses ever was.

Colvin, a *Fortune* editor and the first out of the gate, is the hardest-headed about the rigors entailed by that word *deliberate*. Along with a dose of upbeat business rhetoric about how "to really turbocharge the benefits of deliberate practice," he devotes wonky prose to conveying the exhausting degree of focus. To practice effectively requires tackling a carefully mapped course of ever-rising challenges, assiduously responding to fine-tuned feedback, and sucking up failure again and again. It demands true obsessiveness. At the close, Colvin admits that the price of such super-intense perseverance is high. Dedication on this scale strains relationships and calls for relentless, far from immediately gratifying toil (which you better start when you're young and otherwise carefree—or you'll never catch up on all those hours).

Coyle, a sportswriter and Lance Armstrong chronicler with an effortless Gladwellian writing style, leavens *The Talent Code* with more excitement: He has lab secrets to spiff up the mundane labor involved. Channeling neuroscientists, he announces a mantra: myelin. That's the sheath of dense fat that insulates nerve fibers, allowing impulses to travel more speedily along them. Layers of it coil ever more thickly thanks to deep practice, a key to success that he often describes as rather like a miracle diet: Do it right (as in the "hotbeds" that produce great crops of particular talent, as Russia does tennis players), and mastery can require less time. Moscow's Spartak Tennis Club propels its students onward with a special method called *imitatsiya*, miming rallies in slow motion without a real ball. In whatever the field, almost "without your realizing it," ungainliness—physical, mental, artistic—is transformed into grace as a result of myelin-building deliberate practice. Coyle is in no way deterred by the fact, reported by the more cautious Colvin, that "research on myelin is still in its early stages." In a hurry to make his mark and get Americans myelinating with their "master coaches," he's not about to wait around while scientists amass more hours of painstaking experiments.

In *The Genius in All of Us*, Shenk supplies a talent secret too: the "new dynamic model of GxE (genes multiplied by environment)," which renders obsolete the old "catchy phrase 'nature/nurture' " with its crude dichotomizing. He tries for a catchy jingle of his own as he promotes a "new paradigm for talent, lifestyle, and well-being," which promises no short cuts but has a whistle-while-you-work tone: "Every day in every way you are helping to shape which genes become active." There is no inborn destiny, and DNA responds to disciplined effort. He calls it "dynamic development" and reaches for the imprimatur of a group of geneticists, neuroscientists, and others. These scientists, whom Shenk christens "the new interactionists," might be surprised at being pressed into popular, pep-rally service so soon. After all, they face plenty of hard work exploring the possible human applications of their view that genes are best understood not as blueprints but as "knobs and switches [that] can be turned up/down/on/off at any time—by another gene or by any minuscule environmental input."

Shenk acknowledges that the gene-environment interactions are all very complicated but skims over the darker implications of his message that we have more control than we think we do over how great we can become. If acquiring disciplined habits and learning to defer gratification end up influencing genes—if, as he rather wildly speculates, "a twelve-year-old kid could improve the intellectual nimbleness of his or her future children by studying harder now"—that would seem to multiply the Matthew Effect, for ill as well as good. That 12-year-old's tweaked genes would make him or her just the focused parent/mentor Shenk says children need to cultivate such concentration themselves. Doesn't that mean his or her progeny

would thus get a double chance at super-focus? Advantages quickly get compounded down the generations this way. Meanwhile, those who lag behind risk getting blamed for laziness and lack of discipline, not just bad genetic luck. And that's a legacy that lasts, too. It's an ethos in tension with Shenk's generous hope that the "genius in all of us is that we can all rise together."

Higher expectations can indeed work wonders for anyone, but truly relentless drive is a rarity. Amid all the recycled material in *Bounce,* Syed offers a sobering firsthand reminder from the sports front: The necessary fanatical commitment to mastery is most commonly inspired by competition, which has a way of winnowing ruthlessly. But in an era when plenty of American workers feel we're running in place and just barely keeping up, the mixed message of this genre is one we're understandably more eager to hear: Maybe we don't have to become magnitudes more frenetic than we already are—just a whole lot more focused—and we, too, stand a chance of zooming ahead.

http://www.slate.com/id/2251699/?from=rss

Harmonious minds: The hunt for universal music

- 10 May 2010 by **Philip Ball**

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Music from unfamiliar cultures can often sound disharmonious and odd (Image: Bengt Goran Caresson/Mira/Plainpicture)

WHEN Indian sitar virtuoso Ravi Shankar and his ensemble played at Madison Square Garden, New York, in 1971, the audience broke into rapturous applause at the first short pause. "Thank you," said Shankar. "If you appreciate the tuning so much, I hope you will enjoy the playing more."

When we listen to music from another culture, it's easy to get it badly wrong. Even if our misunderstanding isn't quite as embarrassing as the Shankar faux pas, we are likely to miss most of the nuances and allusions, think it all sounds the same or even dismiss it as a racket. Most 20th-century ethnomusicologists who compared the music of different cultures argued that this was because the way we make music and respond to it is learned, and therefore culture-specific.

Yet there does seem to be something universal about music. All cultures make music, though no one knows why; it's not obviously useful in the way cooking or language are. A number of musicians, including some notable composers, claim that music is a universal form of human communication which transcends barriers of culture and language. Now psychologists are putting this universality back on the agenda, and are investigating whether certain elements of music are hard-wired into the brain.

The issue of universality is significant, because it points to a deeper question. If there are universals in how we perceive music and respond to it, our musical sense might have some adaptive value - evidence for the widely held, but still unproven, belief that music is an evolutionary adaptation, rather than a mere parasite on other auditory processes. As Josh McDermott of the Center for Neural Science at New York University puts it: "Any universal features of music are potentially the result of adaptations enabling musical behaviour."

The ancient Greeks thought music must be universal because it seems rooted in mathematics. Pythagoras pointed out that two notes played simultaneously sound harmonious if the length of the strings that produce them - and hence, in our modern understanding of sound, their acoustic frequencies - are related in simple ratios. Notes an octave apart, for example, have frequencies in the ratio 1:2. Notes spaced by the harmonious interval called a perfect fifth - a C and the G above it, say - have a frequency ratio of 2:3 (see diagram). Most music theorists maintain that such combinations of notes with simple frequency ratios are in some sense natural and will sound harmonious to everyone, while combinations with a more complex frequency ratio sound jarring and dissonant.

There is a plausible biological explanation for some of this. All natural sounds are composed of many frequencies: a "fundamental", plus overtones that are generally simple multiples of that frequency. The lower overtones are typically the strongest. When you pluck a string, the pitches of the first and third overtones are respectively one and two octaves above the fundamental, while the second overtone is an octave plus a perfect fifth above the fundamental. An auditory system that blends these tones

harmoniously into a single note provides a more accurate representation of our sonic environment, and so is likely to be selected for by evolution.

There are also conceivable reasons why dissonant harmonies should sound grating. "Unlike the overtones of harmonic intervals, those of dissonant intervals do not overlap," says Sandra Trehub of the University of Toronto in Mississauga, Ontario, Canada. Interference between these frequencies produces rapid periodic changes in loudness, called acoustic roughness, which induces unpleasant sensations in many listeners. "You'll get the general idea if you imagine the sound of nails scratching on a blackboard," Trehub says.

These neat acoustical theories are all very well, but how do they relate to the music people play and listen to? Unfortunately, the answer is far from clear. Just about every culture bases its musical scales around the octave, and most also use the perfect fifth, but there is at least one that does not use octaves and some that omit fifths. In Indonesian gamelan music, for example, the only simple frequency ratio is the octave; one of its scales simply divides the octave into five equally spaced notes.

That's where music psychologists come in. They have devised all kinds of experiments to figure out if people really do have an innate preference for simple-ratio harmonies over complex ones.

To avoid the influence of learned preferences, psychologists have focused their tests on animals and babies. Animals such as monkeys can reveal their preferences simply by moving away if they don't like what they hear. In 2004, McDermott and Marc Hauser of Harvard University put tamarin monkeys in a V-shaped cage, offering them the choice of sitting in one branch with harmonious, or "consonant", musical chords playing, or the other, with dissonant chords. The monkeys were clearly aware of the sounds, showing a marked preference for low over high volume - but they didn't care whether they heard consonant or dissonant chords (*Cognition*, vol 94, p B11). This suggests that there is nothing innate in the human preference for consonance - but it could also just indicate differences between monkeys and humans.

So if monkeys cannot tell us very much, what about human infants? Though it's not easy to figure out what they prefer, you can at least find out what they notice by following their head movements. Babies show greater attentiveness to novel stimuli, a fact we can exploit to test what grabs their attention in music. For example, you can play them subtly different patterns of notes and see if they spot the changes.

Trehub and her colleague Glenn Schellenberg did just that, testing how well 6 and 9-month-old infants could detect small changes to consonant versus dissonant intervals. They reasoned that if the human brain evolved to prefer consonant intervals, then babies should be more alert to changes in these - and that is what they found. The more consonant the interval, the more reliably the babies could detect the change. They discerned changes to fifths (C plus G) best of all, fourths (C plus F) less well, and tritones (C plus F sharp) least well (*Psychological Science*, vol 7, p 272).

Musical babies

Even this, however, doesn't prove that we are innately disposed to like consonance. What we notice and what we prefer are not necessarily the same; besides, even 8-month-old babies may have learned a musical culture. Babies can hear in the womb during the third trimester and are astonishingly receptive to sensory information. They can recognise their mother's voice virtually from the moment of birth. This complicates all attempts to deduce innate preferences from infant studies. "It's very difficult to fully rule out learning effects," says McDermott.

In an effort to overcome this problem, Nobuo Masataka of Kyoto University in Japan tested a group of 2-day-old babies who were unlikely to have heard much music while in the womb - they were babies with normal hearing born to deaf parents. Masataka tested whether their eye movements showed greater attentiveness to a Mozart minuet or the same minuet modified to introduce dissonance (*Developmental*

Science, vol 9, p 46). He found the babies paid more attention to the original version, but the difference was so slight that it was not possible to say definitively that this reflects an innate preference.

Is there a way of answering the question once and for all? "One could conceivably rear infants in an abnormal musical environment to see whether that alters their preferences," says McDermott. "But how many parents would really want to do that to their kids?"

Despite the uncertainties, Trehub thinks that the evidence "is consistent with inherent processing biases and preferences for consonance". McDermott, however, is not persuaded. "I think the idea that there are universal preferences for particular harmonic or melodic intervals reflects a pervasive western-centric bias in the science of music," he says. "It's pretty clear that intervals that are considered dissonant by westerners are sometimes prevalent in other cultures."

While the universality of consonance and dissonance remains open to debate, what of another element of music that might be universally understood? For many people, music is all about emotion. Is our emotional response to music hard-wired, or merely a cultural convention?

In one of the first detailed studies to address this question, Laura-Lee Balkwill and William Forde Thompson, both then at York University in Toronto, found that Canadian listeners were pretty good at identifying whether pieces of Kyrgyzstani, Hindustani and Navajo music were meant to convey joy or sadness (*Music Perception*, vol 17, p 43).

Similarly, listeners from other musical cultures seem to be able to pick up the emotional intent of western classical music. A team led by Stefan Koelsch of the Max Planck Institute for Human Cognitive and Brain Sciences in Leipzig, Germany, played piano music to people from a remote region of Cameroon, some of whom had never heard western music before. The music had been specially composed to express happiness, sadness and fear in ways that were easily recognised by western listeners. The Cameroonians correctly identified the right emotion significantly more frequently than chance, although less reliably than westerners (*Current Biology*, vol 19, p 573).

What is it that conveys emotion in music? One possibility is the scale it is played in. To western listeners, the major scale seems so obviously happy and the minor scale sad that it is tempting to imagine everyone will hear them that way. Yet theories to account for these perceived qualities tend to be speculative and based on tenuous evidence.

Take the recent claim by neuroscientist Daniel Bowling at Duke University in Durham, North Carolina, that major and minor scales have intrinsic emotional associations because their sound spectra are akin to those of happy and sad speech (*Journal of the Acoustical Society of America*, vol 127, p 491). Bowling and his team showed that the spectrum of the major scale is indeed closer to that of happy speech than sad speech. But their claim isn't strong, as the same is true for the spectrum of the minor scale, albeit to a lesser extent.

Fast means happy

Tempo is another emotional signpost. Relatively fast, jaunty music tends to be interpreted as happy, while slower music is seen as sad or fearful.

Other musical parameters also furnish emotional cues. Balkwill and Thompson found that complex melodies with large, irregular or unusual changes in pitch tend to be associated with negative emotions, while tunes that seem happy, such as Beethoven's *Ode to Joy* or nursery rhymes, tend to just walk up and down the scales.

Complex melodies with large, irregular or unusual changes in pitch tend to be associated with negative emotions

Music psychologists agree that these associations probably do come from the way music mimics emotional speech and behaviour. Happy people the world over speak moderately loudly, with animated voices and gestures, while sad people speak and move in slower, softer ways. We can judge music's emotional state just as we can often tell when someone speaking an unfamiliar language is joyous, woeful or angry.

However, the emotional quality of music is more complex than just conveying a basic emotion such as happiness and sadness. Most music aims to represent not a single, uniform mood but one that is constantly changing. Many music psychologists believe that the key to picking up on this emotional flux rests on our ability to discern patterns in the notes and rhythms and use them to make predictions about what will come next. When our anticipations are violated, we experience tension; when the expectation is met we have a pleasurable sense of release.

If this model is correct, our emotional response depends on identifying patterns and regularities in the first place. So the question then arises: can we experience this moment-by-moment emotional landscape in the music of unfamiliar cultures?

Music psychologist David Huron of Ohio State University in Columbus and his collaborators have found that we are pretty good at deducing the underlying patterns in unfamiliar music. They played Balinese and American musicians a Balinese tune, and asked them to bet with poker chips on what the next note of the melody would be. Unsurprisingly, the Balinese subjects made better guesses, but the Americans did better than pure chance. It seems the American listeners were basing their predictions mostly on how often they'd heard the different notes already. This suggests we can quite quickly acquire the basic tools that enable the violation-of-expectation model of musical emotion to do its stuff.

So where does this leave the idea of the universality of music? McDermott thinks the only universal properties we are likely to find in the structure of music are those imposed by the limitations of our auditory perception. For instance, he says, "We can't hold too many pitches in mind at once, which constrains the number of notes that can be used in a scale. And intervals also need to be of a certain size in order to be easily heard."

But beyond the notes themselves, there may be something universal in the uses to which music is put. "Every culture that we know of has a genre of music geared towards infants, probably indicative of the importance of music in parent-children interactions," he says. "Music tends to always be used to signify important events within a culture, such as weddings or funerals, and always seems to accompany religious rituals."

Observations like this have led some evolutionary biologists to argue that musicality evolved as a kind of social glue. But to McDermott, music's role might primarily "reflect the deep connection between music and emotion". Just how our brains make that connection is something we are only just beginning to explore.

Philip Ball is a freelance writer based in London. His latest book is The Music Instinct (Bodley Head)

http://www.newscientist.com/article/mg20627591.300-harmonious-minds-the-hunt-for-universal-music.html?DCMP=OTC-rss&nsref=online-news

Witness brain scan won't reveal whether the face fits

- 18:25 11 May 2010 by **Wendy Zukerman**
- For similar stories, visit the **The Human Brain** Topic Guide

Having trouble picking out the guilty party? A brain scan won't help.

Jesse Rissman and his team at Stanford University in California have found that monitoring brain activity of witnesses reveals no more than what they say they remember.

The study comes amid controversy over whether to admit functional MRI scans as evidence in US courts.

Last week, an attorney in New York City attempted to use a brain scan to demonstrate the truthfulness of a witness in an employment case, but failed on a separate legal technicality. And this week, a judge in a federal case in Tennessee was due to decide whether to admit fMRI evidence in a fraud case; if successful, this would be the first time a court anywhere in the world accepted this type of scan.

The Stanford team asked 16 volunteers to view 200 mugshots.

An hour later, they were again shown pictures of faces, some of which they had seen before and others that were new. The researchers recorded fMRI scans of the volunteers' brains as they reported which faces they recognised.

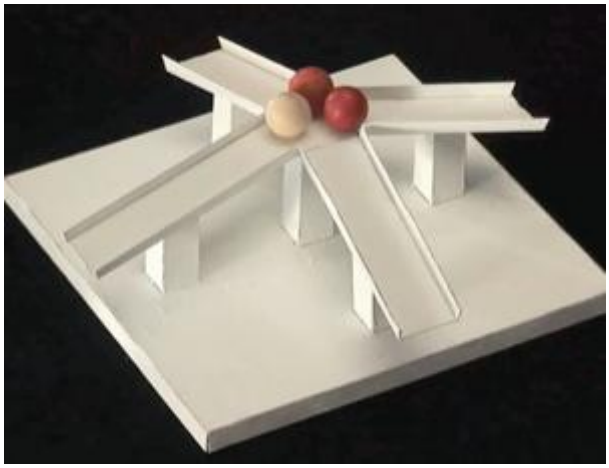
While the brain scans matched the volunteers' decisions on whether the faces were familiar, they could not predict if the recollection was accurate. The team also don't know how easily a witness could cheat the system: remembering a recent event or fabricating a lie may look the same to the scanner.

Journal reference: *Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.1001028107

http://www.newscientist.com/article/dn18888-witness-brain-scan-wont-reveal-whether-the-face-fits.html

'Impossible motion' trick wins Illusion Contest

- 17:48 11 May 2010 by **James Urquhart**
- For similar stories, visit the **The Human Brain** Topic Guide



Don't believe your eyes (Image: Kokichi Sugihara)

A gravity-defying illusion has won the 2010 Best Illusion of the Year Contest, held yesterday in Naples, Florida.

The visual trick involves a 3D construction of four slopes that appear to extend downwards away from a common centre (see video). When wooden balls are placed on the slopes, however, they bizarrely roll upwards as if a magnet is pulling them.

But the "Impossible Motion" illusion, created by Kokichi Sugihara of the Meiji Institute for Advanced Study of Mathematical Sciences in Kawasaki, Japan, is soon dispelled when it's viewed from a different perspective – each slope is actually sloping downwards towards a common centre.

We're fooled because we make the assumption that each supporting column of the object is vertical, and that the longest column in the centre is the highest. But in reality, the columns and slopes are angled to create the illusion.

http://www.newscientist.com/article/dn18886-impossible-motion-trick-wins-illusion-contest.html?full=true&print=true

Stray grey whale navigates the North-West Passage

- 11:26 11 May 2010 by **Fred Pearce**

Coast to the left, coast to the left… (Image: IMMRAC)

Conventional wisdom has it that grey whales have been extinct in the Atlantic Ocean for more than 200 years, and the species survives only in the north Pacific. That was the case until last weekend, when a 13-metre-long grey whale was spotted cruising off the coast of Israel.

"This is sensational," said Phillip Clapham of the US government's National Marine Mammal Laboratory in Seattle after hearing the news from marine biologists in Israel. "The most plausible explanation is that it came across an ice-free North-West Passage from the Pacific Ocean, and is now wondering where the hell it is."

The North-West Passage, which runs through the Canadian Arctic, has been open in summer in recent years, partly because of rising global temperatures.

Although they are known for their long migrations, grey whales do not normally stray from their regular routes. "Were I to speculate wildly, I'd say it found Europe and remembered its mother telling it to keep the coast to its left going south, then it hit the strait of Gibraltar and entered the Mediterranean," said Clapham.

The Arctic route makes most sense, agrees Giuseppe Notarbartolo di Sciara, an expert on Mediterranean cetaceans who advises several international conservation bodies. He points to reports that grey whales have been seen getting farther north than usual into the Arctic, probably helped by the low-ice conditions.

"Probably this one went so far east that when the time came to go south it had the Atlantic rather than the Pacific in front of its rostrum," says di Sciara. "Then, hugging the eastern side of the ocean as any good Pacific grey whale would do, it went into the first big warmish 'lagoon' it could find: the Mediterranean."

Incredible but inescapable

The finding was announced last Saturday by Aviad Scheinin, chairman of the Israel Marine Mammal Research and Assistance Center, who had followed the whale at sea for 2 hours. He at first thought it was a sperm whale, but checked the markings back on land and reached the "incredible but inescapable conclusion that it was a grey whale". Clapham told *New Scientist* that the identification had now been confirmed.

There are two distinct populations of grey whales in the northern Pacific Ocean, one on the Asian side and one on the American. A third population inhabited the Atlantic shores of North America and Europe until the 18th century, when it seems to have been hunted to extinction by American and European whalers. Archaeologists have found fossil remains in the Mediterranean, where the whales probably calved.

The discovery of a Pacific grey whale so far from home may revive calls to reintroduce the species to European waters. In 2005, Owen Nevin and Andrew Ramsey of the University of Central Lancashire in Preston, UK, proposed airlifting grey whales from the population in the eastern Pacific to the Irish Sea (PDF).

Conservationists at the time questioned whether the animals would survive in the Atlantic. That question, at least, seems to have been answered.

http://www.newscientist.com/article/dn18883-stray-grey-whale-navigates-the-northwest-passage.html

The deep roots of genetic disorders uncovered

- 11 May 2010 by **Michael Le Page**
- Magazine issue 2759. **Subscribe and save**
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LOOKING back at half a billion years of gene evolution could help uncover the genetic basis of many disorders, including Down's syndrome.

As vertebrates evolved, the entire genome was duplicated not once but twice. In theory, excess genes are superfluous and should soon be lost, but in fact many of the duplicated genes survive to this day - around a third of our genes can be traced back to these two ancient events.

So Aoife McLysaght of Trinity College Dublin, Ireland, set out to investigate why so many duplicated genes were retained. One idea concerns how duplication affects the activity of some genes. Take a process that requires balanced amounts of dozens of different proteins. If the amount of each protein produced depends on the number of copies of a gene, or gene "dosage", then duplicating an entire genome will double the amount of each protein, keeping the process balanced. If one of the genes gains or loses a copy, however, it would disrupt the process.

To test this idea, McLysaght and her colleague Takashi Makino set out to identify dosage-sensitive genes in the human genome by searching for genes that haven't gained or lost copies since the ancient duplication events. Because it's common to lose or gain genes - many of us have one or three copies of some genes - dosage-sensitive genes should stand out. Sure enough, they found that 4600 of the 7000 genes left over from the genome duplications appear to be dose-sensitive (*Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.0914697107).

"This is where it gets even more interesting," says McLysaght. The pair also found that chromosome 21 has the fewest dosage-sensitive genes, which makes sense as people can survive with an extra copy of this chromosome, though they will have Down's syndrome. A third copy of any other chromosome is lethal, as a person gets 1.5 times the dose of the genes on it, knocking the chemical balance out of kilter.

Of those genes on chromosome 21 that McLysaght has identified as being dosage-sensitive, many have already been linked to Down's syndrome. But the team identified other dosage-sensitive genes, which could also contribute to the disorder. While Down's syndrome cannot be reversed, identifying the genes involved could help treat the health problems associated with it.

Identifying the genes involved in Down's syndrome could help treat related health problems

The findings are not just relevant to Down's syndrome. Dosage-sensitive genes are more likely than other genes to be involved in human disease, because it only takes a small change in their activity to cause problems.

It's an interesting and thought-provoking study, says James Lupski of Baylor College of Medicine in Houston, Texas, who studies the effect of variations in the number of gene copies. Disorders like schizophrenia and autism have recently been linked to huge chunks of missing DNA, Lupski says, and this approach might help pin down the precise genes involved.

http://www.newscientist.com/article/mg20627593.800-the-deep-roots-of-genetic-disorders-uncovered.html

Soft tissue remnants discovered in *Archaeopteryx* fossil

- 20:00 10 May 2010 by **Jeff Hecht**

Chemistry in colour (Image: W. I. Sellers/Proceedings of the National Academy of Sciences)

It boasts more than just beautiful impressions of long-gone feathers. One of the world's most famous fossils – of the earliest known bird, *Archaeopteryx* – also contains remnants of the feathers' soft tissue.

"It's amazing that that chemistry is preserved after 150 million years," says Roy Wogelius, a geochemist at the University of Manchester, UK. Wogelius and colleagues scanned the "Thermopolis specimen" using a powerful X-ray beam from a synchrotron at the Stanford Synchrotron Radiation Lightsource in California.

The synchrotron excites atoms in target materials to emit X rays at characteristic wavelengths. The scan reveals the distribution of elements throughout the fossil. The green glow of the bones in this false-colour image shows that *Archaeopteryx*, like modern birds, concentrated zinc in its bones. The red of the rocks comes from calcium in the limestone that had encased the fossil since the animal died.

Copper and zinc are key nutrients for living birds, and their presence in the fossil bones shows the evolutionary link with dinosaurs. The study also revealed phosphorous along the main shaft of the feathers in the fossil: palaeontologists had long thought that only impressions remained.

"There is soft-tissue chemistry preserved in places that people didn't expect it," says Wogelius.

Journal reference: *Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.1001569107

http://www.newscientist.com/article/dn18882-soft-tissue-remnants-discovered-in-archaeopteryx-fossil.html?full=true&print=true

Bahamas islands were giant labs for lizard experiment

- 18:00 09 May 2010 by **Bob Holmes**

Think that'll save you? (Image: Danita Delimont/Alamy)

Wrapping entire islands in the Bahamas with netting, introducing snakes to two other islands and measuring the fitness of hundreds of lizards using treadmills: one of the most ambitious ecological field experiments ever conducted has resolved a long-standing question about the evolution of lizards.

Lizards of the genus *Anolis* are found throughout the American tropics, where they vary widely in size and shape depending on ecological conditions. It has long been thought that predation is the most important evolutionary force for continental lizard populations, whereas on islands competition between lizards themselves is more important. Until now, though, no one had tested this experimentally.

Ryan Calsbeek and Robert Cox of Dartmouth College in Hanover, New Hampshire, cut no corners in their experiment. They excluded predators from two small, uninhabited islands in the Bahamas by wrapping the islands – about 1000 square metres each – with netting to keep out predatory birds. Meanwhile, they enhanced predation on two other islands by introducing lizard-eating snakes.

To vary the amount of competition, they seeded one of each pair of islands with high densities of *Anolis sagrei* lizards, and the other with lower densities of the animals.

Lance Armstrong lizards

But first, they got to know the lizards. Before release, they marked and measured each one and tested its stamina by running it to exhaustion on a treadmill.

"Your Lance Armstrong lizards can run about 7 minutes. Your overweight field-biologist lizard runs for about 2 minutes," says Calsbeek. "We spent several hours a day just running the animals, and we did that day in and day out for several weeks."

Four months later, the researchers returned to the island and recaptured every remaining lizard, noting which had survived and which died. Larger, longer-legged and higher-stamina lizards had survived better than smaller, wimpier ones on higher-density islands where competition was more intense, they found. However, these traits did not affect the chance of survival in the face of predation. This supports the idea that competition, and not predation, is the primary selective force in these island lizards, says Calsbeek.

"To me, that's surprising," says David Reznick, an evolutionary biologist at the University of California, Riverside. "I would have thought that predation would matter."

Journal reference: *Nature*, DOI: 10.1038/nature09020

http://www.newscientist.com/article/dn18875-bahamas-islands-were-giant-labs-for-lizard-experiment.html

Even silent videos excite the listening brain

- 08 May 2010

Magazine issue 2759.

Sound of silence (Image: Viktor Drachev/AFP/Getty Images)

IS A sound only a sound if someone hears it? Apparently not. Silent videos that merely imply sound - such as of someone playing a musical instrument - still get processed by auditory regions of the brain.

Kaspar Meyer at the University of Southern California in Los Angeles and colleagues showed eight volunteers nine silent video clips that implied sound, including people playing violins, a dog howling and chainsaws cutting into trees. As they watched, their brains were scanned using functional MRI.

Each type of implied sound created a unique pattern of brain activity in the "early auditory cortices" - regions thought to be devoted to the initial processing of sounds. After noting these patterns in a several of the volunteers, the researchers were able to predict which type of video other volunteers had watched, just from the activity in the auditory cortices (*Nature Neuroscience*, DOI: 10.1038/nn.2533). The volunteers also reported imagining the sounds as they watched the videos.

The results broaden the role of regions previously thought only to be involved in initial sensory processing.

http://www.newscientist.com/article/mg20627595.000-even-silent-videos-excite-the-listening-brain.html

Why labs love gaming hardware

- 13:11 10 May 2010 by **MacGregor Campbell**

Not just fun and games (Image: Jonathan Alcorn/Bloomberg/Getty Images)

Innovation *is our regular column that highlights emerging technological ideas and where they may lead*

Blasting zombies may seem to have little to do with serious research, but video game hardware is helping scientists in a variety of ways including helping them to unravel the mysteries of the brain.

Specialist programmers have long been repurposing the graphics processing units (GPUs) that power action-packed scenes in games for non-graphics tasks. Now recent advances have opened up GPU-based supercomputing to non-specialists.

GPUs have greater raw computational power than conventional CPUs, but have a more limited repertoire of tasks. Combining hundreds of individual processors, they excel at applying simple repetitive calculations to large bodies of data.

Nicolas Pinto of the Massachusetts Institute of Technology is using them in his efforts to crack the brain's formula for recognising objects in images. "The interesting thing about a GPU is that they are made to produce a visual world," he says. "What we want to do is reverse that process.

Hidden rules

"When an object moves across your retina, it will obey certain rules, the physical rules of the world," Pinto says. "We are trying to learn these rules from scratch."

Last year, for less than $3000, he built a 16-GPU "monster" desktop supercomputer to generate and test over 7000 possible variations of an object-recognition algorithm on video clips.

To test each model, Pinto's makeshift supercomputer performed statistical analysis in both space and time on thousands of frames of video to find objects moving through the scene. Selecting for the models best able to decipher the action, he was able to match or better more traditional approaches.

He says this kind of work would previously have only been possible with a fully fledged supercomputer.

"If we weren't newcomers in this field and could apply for multi-million dollar grants, then yes, we could probably get one of these massive computers from IBM," he says. "But if money is an issue, or you are a newcomer, that is too expensive. It's very cheap to buy a GPU and explore."

Easy power

The latest graphics cards, from manufacturers ATI and Nvidia have 512 individual processors. By dividing the work among these processors, they can reach speeds of half a trillion calculations per second.

Previously it took specialist programming skills to set GPUs to work on serious, non-graphics science, but the process was difficult and time-consuming.

"The path from describing the problem to getting results was pretty treacherous," says Nvidia general manager Andy Keane.

"Things were in computer graphics shader languages and texture coordinates – none of the stuff we were used to in scientific computing," says Chris Johnson, director of the Scientific Computing and Imaging Institute at the University of Utah in Salt Lake City. "It was extraordinarily difficult to map your problem to a GPU."

Johnson says this changed around 2007 with the advent of new programming languages that make it easier for programmers without specialist graphics experience to program GPUs. Since then, researchers in both academia and industry have used them to, for example, analyse astronomical signals, simulate molecular interactions and rapidly check files for malware.

Exaflops beckons

While GPUs make desktop supercomputing accessible to a wide range of researchers, flagship computing centres such as Oak Ridge National Laboratory in Tennessee have also taken notice. Oak Ridge announced last October that its next supercomputer, predicted to be the world's fastest, would be built from GPUs.

"As we look at how to get the next 1000 times faster, to an exaflops, or 10^{18} calculations per second, we see a lot of big challenges," says Buddy Bland, a project director at Oak Ridge.

He says that the lab already uses clusters of GPUs for some number-crunching computing tasks such as climate modelling and simulations of supernovas. He says that increased precision and speed, along with reduced power consumption, make the cards an attractive option for the next generation of supercomputers. "We think this is one path to getting the higher-performance computing that we need."

http://www.newscientist.com/article/dn18879-innovation-why-labs-love-gaming-hardware.html?full=true&print=true

Exploring the network without guesswork

- 10 May 2010 by **Rebecca Thomson**
- Magazine issue 2759.

From tweets to the streets (Image: NYT/Redux/Eyevine)

A FEW hundred people travelled to Raleigh, North Carolina, last week for an international meeting intended to bring academic scrutiny to bear on a seemingly unstoppable force. For more than a decade it's been shaping our lives, transforming business and rewriting the rules of social interaction. That phenomenon is the World Wide Web.

The Raleigh meeting was only the second conference on the emerging discipline of web science. The web is clearly one of the most significant technologies of recent decades, but does it need to be treated as a field of study in its own right?

"The web is too important not to understand," says Nigel Shadbolt, professor of artificial intelligence at the University of Southampton, UK. "And you have to get some science done before you can understand something."

People from a diverse range of backgrounds will be needed to understand the technical, social, legal and political forces at work in cyberspace, says Shadbolt, just as in the 1970s the previously separate disciplines of physics, biology, geology and others contributed to the emergence of environmental science.

Interdisciplinary web science research groups and courses are springing up at universities around the world. Shadbolt and web inventor Tim Berners-Lee will co-direct a new Institute of Web Science at Southampton in collaboration with the University of Oxford, with £30 million of initial funding provided by the UK government.

At the Raleigh meeting, Devin Gaffney of the Rensselaer Polytechnic Institute (RPI) in Troy, New York, described how in mid-2009 he set up software to archive every message posted by Iranians using the social messaging service Twitter to coordinate dissident protests. Now that the buzz from bloggers and journalists declaring that this was a "Twitter revolution" has subsided, Gaffney is analysing the 766,263 tweets he has collected in order to assess how justified that description was.

At the time, Twitter boasted about its role in connecting the protestors, but Gaffney's initial results suggest that Twitter had a greater impact internationally. "Evidence so far suggests a demographic of non-Iranians generating awareness about the situation," he says.

Gaffney is now trying to find out if the Iranian government itself has been monitoring and reacting to online activity, and whether the authorities have used Twitter to keep track of the protests. "Twitter and Facebook give Iran's secret services superb platforms for gathering open-source intelligence," he says.

Twitter and Facebook give Iran's secret services a superb platform for gathering intelligence

Gaffney's work is one example of research that will help us make predictions about the likely impact of web interactions, says Jim Hendler, also at RPI, who recently began teaching the first undergraduate degree in web science in the US.

"I wouldn't expect to be able to say 'such and such a company will be successful' or 'this technology will succeed or fail', but to be able to more rapidly model the effects of new technologies," says Hendler. He likens the predictive use of web science to studying a flu outbreak. It is impossible to say exactly how many people will die, but it is possible to model when and how the outbreak becomes a pandemic.

Shadbolt says such insights will be of interest to business as well as academics and governments. For example, a web scientist would have been able to advise on the likely reception to Google's Buzz social network, he says. Launched in February, Buzz automatically assigned Gmail users to groups by looking at the people they emailed most frequently. The service had to be hastily modified after it became clear that people did not like their frequent contacts being displayed online.

Berners-Lee has said that new web services "are really social experiments", and Shadbolt thinks collecting the results of these experiments will help generate ideas for better web products, driven by considerations other than purely financial ones.

Shadbolt adds that web scientists are already leading the development of the semantic web, or web 3.0. This will see web services become able to process text and other online content at a deeper level, so that a search engine could "understand" the intent of a query and deliver results it thinks will answer the query, instead of crudely looking at documents where the search term appears most frequently, for example.

Marshall Kirkpatrick, co-editor of the influential blog ReadWriteWeb, is sceptical. He cautions that what appears ground-breaking to web scientists may fall flat with users. "Anything directly monetisable will be advanced, but the coolest innovations, the most democratic, will be grunted at by an uninspired market," he says.

Hendler acknowledges that most attempts to understand and exploit the web are driven by financial incentives. But that does not mean we should not study the web for its own sake, he says. "A more neutral, scientific view is needed if we are to understand this important force in our society and make sure it provides the services we need."

http://www.newscientist.com/article/mg20627595.400-web-science-exploring-the-network-without-guesswork.html

Rats top invasive mammals table

Page last updated at 16:40 GMT, Friday, 7 May 2010 17:40 UK

By Mark Kinver Science and environment reporter, BBC News

Brown rats opportunistic behaviour helped the species to spread quickly

Brown rats are among the most invasive mammals in Europe, according to a wide-ranging assessment.

Swiss researchers found that the creatures, along with sika deer and muskrats, were having the greatest ecological and economic impact.

The team considered a range of measurements, including the threats to native species and how widely the alien species had become established.

The findings have been published in the journal Conservation Biology.

The scientists said they had developed a scoring system that compared the impact of non-native species across the taxonomic group of mammals.

"This scoring can be used to identify the most harmful alien species, so that conservation measures to ameliorate their negative effects can be prioritised," they wrote.

"Alien invasive species are a large threat to biodiversity and the economic damage that they cause exceeds 5% of the global gross product."

Scoring impacts

To develop the "scorecard", the researchers looked at impact reports for all of the known invasive mammals found in Europe, before classifying the recorded impacts as either environmental or economic.

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A better understanding of the relationship between impact scores and species traits may provide a novel method with which to predict the potential impact of a new alien mammal species

Research team writing in Conservation Biology

Within the two classifications, there were a number of sub-divisions of impacts, including predation, hybridisation, transmission of diseases, and the species' impact on agriculture.

For each criterion, the researchers awarded "impact scores", which ranged from zero (no known impact) to five (maximum possible impact) to reach a "potential impact" score.

This was then multiplied by the percentage of area within Europe that was occupied by the invasive species to give the researchers an "actual impact" score.

The team applied the scoring system to 34 "true alien" mammal species, all of which had a native range outside of Europe. Brown rats, sika deer and muskrats had the highest overall scores.

The brown rat (Rattus norvegicus) is found across Europe in all habitats except high mountain ranges. It was believed to have been introduced in the 18th Century as maritime traffic increased.

Once introduced into an area, there is a recorded fall in other small rodent species, as well as marine and land bird species. The main economic impact is the result of damaged crops and food stores, and damage to people's homes.

According to the EU 's database of alien species, sika deer are described "a serious forest pest, causing significant damage to broadleaved and conifer plantations".

The deer "ring" trees, in which they strip bark around the base of trees, causing them to die. There have also been recorded cases of the animals carrying bovine and avian TB.

Muskrats are stocky aquatic rodents, weighing up to 1.8kg. Once imported for fur farming, they are found throughout continental Europe and cause extensive damage to aquatic vegetation habitats, crops, irrigation systems and dams.

The researchers said they decided to develop the scorecard because it had been proving difficult to get an overall view of what species were causing the most harm to native habitats.

"It is obviously challenging to compare the damage caused by different species, such as the carnivorous American mink and the herbivorous sika deer," they observed.

"To overcome these obstacles, a general system of impact categories was needed, which allowed scoring and comparison of all potentially relevant types of environmental and economic impacts caused by alien species.

"A better understanding of the relationship between impact scores and species traits may provide a novel method with which to predict the potential impact of a new alien mammal species."

The team added that the system could be applied to other taxonomic classes of species, such as birds or fish, and allow resources to be targeted towards the species that cause the most damage.

http://news.bbc.co.uk/2/hi/science_and_environment/10100907.stm