



Infoteca's E-Journal



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First oxygen-free animals found

By Patrick Jackson

BBC News

Scientists have found the first animals that can survive and reproduce entirely without oxygen, deep on the floor of the Mediterranean Sea.



The team, led by Roberto Danovaro from Marche Polytechnic University in Ancona, Italy, found three new species from the Loricifera group.

He told BBC World Service they were about a millimetre in size and looked like jellyfish in a protective shell.

"We plan to go back and see if there are new surprises for us," he added.

“ It is a real mystery how these creatures are able to live without oxygen because until now we thought only bacteria could do this ”

Professor Roberto Danovaro

One of the three new Loriciferans (so-called because of their protective layer, or lorica) has already been officially named *Spinoloricus Cinzia* , after the professor's wife.

The other two, currently designated *Rugiloricus* and *Pliciloricus* , have still to be formally described.

They were discovered in the course of three oceanographic expeditions conducted over a decade in order to search for living fauna in the sediment of the Mediterranean's L'Atalante basin.

The basin, 200km (124 miles) off the western coast of Crete, is about 3.5km (2.2 miles) deep and is almost entirely depleted of oxygen, or anoxic.

Eggs included

Bodies of multicellular animals have been found previously in sediment taken from an anoxic area - or "dead zone" - of the Black Sea, Professor Danovaro told BBC News. But these were believed at the time to be remains of organisms which had sunk there from adjacent oxygenated areas.

What the team found in the L'Atalante dead zone was three species of living animals, two of which contained eggs.

Although it was not possible to extract the animals alive in order to show that they could live without oxygen, the team was able to incubate the eggs in anoxic conditions aboard on the ship.

The eggs hatched successfully in a completely oxygen-free environment.

"It is a real mystery how these creatures are able to live without oxygen because until now we thought only bacteria could do this," said Professor Danovaro, who heads Italy's Association of Limnology (the study of inland waters).

"We did not think we could find any animal living there. We are talking about extreme conditions - full of salt, with no oxygen."

The discovery of the new Loriciferans represents, he said, a "tremendous adaptation for animals which evolved in oxygenated conditions".

Dead zones in the world's oceans, he added, were expanding all the time.

Commenting in the journal BMC Biology, Lisa Levin of the Scripps Institution of Oceanography said that before this discovery, "no one had found [animals] capable of living and reproducing entirely in the absence of oxygen".

"Loriciferans are rarely reported," she noted.

"Whether they were overlooked or are exceedingly rare and thus not sampled is unclear. Perhaps scientists have been looking for them in all the wrong places."

Considering the implications of creatures which can exist without oxygen, she said that greater study of animal-microbe interactions in the extreme environment of Earth's oceans could help answer questions about the possibility of life existing on other planets with different atmospheres.

Story from BBC NEWS:
<http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8609246.stm>

Published: 2010/04/08 16:48:37 GMT

Childhood deafness gene uncovered

A new genetic fault which may account for some cases of inherited deafness has been revealed by Dutch researchers.



It means that parents with the hereditary condition may be able to predict more accurately the chances of passing it on to their children.

The new find, documented in the American Journal of Human Genetics, could even one day contribute to treatments, say the scientists.

One child in 750 is born with severe hearing loss or profound deafness.

“ This research will help develop medicines that are desperately needed to prevent deafness and restore hearing ”

Dr Sohaila Rastan, RNID

The gene in question, labelled PTPRQ, appears to play a role in the development of the inner ear "hair cell" before the birth of the child.

A genetic fault here means that these cells will not form properly or in sufficient numbers, leading to profound deafness or extremely poor hearing.

This can lead to problems throughout childhood, including behavioural and developmental difficulties, and low academic achievement.

Inheritance

The latest gene was tracked down by scientists at Radboud University Nijmegen Medical Centre who looked closely at the DNA of families prone to the condition, looking for shared genetic traits.

There are now more than 60 known locations in our DNA which can contain faulty genes contributing to this form of deafness, although only half the genes in these locations which actually cause the problem are yet to be identified.



Dr Hannie Kremer, who led the research, said: "Our approach is identifying more genes for congenital deafness.

"This knowledge will help improve treatments for patients, genetic counselling, molecular diagnosis and the development of advanced therapeutic strategies."

Dr Sohaila Rastan, chief scientific officer for the deaf and hard of hearing charity RNID, said: "Knowledge of genes causing deafness tells us more about how our hearing works.

"This research will help develop medicines that are desperately needed to prevent deafness and restore hearing."

There are hopes that gene therapy will one day be able to correct genetic defects linked to this type of deafness.

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8610136.stm>

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Deepest volcanic vents discovered

By Alasdair Cross
Producer, Costing the Earth

What are believed to be the world's deepest undersea volcanic vents have been discovered in the Caribbean.



The vents, known as black smokers, were located 5,000m (3.1 miles) down in the Cayman Trough.

The volcanic chimneys, which spew out water hot enough to melt lead, were caught on film by a British-led team.

Marine biologist Dr Jon Copley said: "Seeing the world's deepest black-smoker vents looming out of the darkness was awe-inspiring."

He added: "Super-heated water was gushing out of their two-storey-high mineral spires, more than three miles beneath the waves."

Expedition leader Doug Connelly said: "We hope our discovery will yield new insights into biogeochemically important elements in one of the most extreme naturally occurring environments on our planet."

The team, led by the National Oceanography Centre (NOC) in Southampton, is sailing across the Caribbean and the Southern Ocean on the scientific research vessel the James Cook.

“ It was like wandering across the surface of another world ”

Bramley Murton, scientist

Previously, the deepest smokers were found in the Ashadze vent field in the mid-Atlantic Ridge at a depth of 4,040m.

The discovery was made with the help of two deep-sea vehicles.

Firstly, a robotic submarine called Autosub6000 enabled the team to map the seafloor of the Cayman Trough in fine detail. Then a vehicle called HyBIS equipped with hi-definition cameras, was lowered down and captured detailed images of the smokers.

"It was like wandering across the surface of another world," said geologist Bramley Murton, who piloted the HyBIS underwater vehicle around the world's deepest volcanic vents for the first time.

"The rainbow hues of the mineral spires and the fluorescent blues of the microbial mats covering them were like nothing I had ever seen before."

Deep sea mining

By studying life around the hydrothermal vent systems, which are dotted along the deep sea mountain range that girdles the planet, the team hopes to increase the understanding of the way marine communities interact. This, in turn, could aid efforts to better protect endangered marine species.

Senior researcher Dr Alex Rogers, from the Zoological Society of London, said: "The densities of animals and the biomass of life around these hydrothermal vents is just staggering."

However, scientists will not have these extraordinary environments to themselves for long.

Gold, silver, copper and zinc are all present in the mineral-rich emissions of the vent systems and recent advances in deep-sea oil exploration are giving miners the chance to exploit these areas for the first time.

Nautilus Minerals, a small Canadian company backed by the giant mining company Anglo-American, has just received an environmental permit from the government of Papua New Guinea to conduct the world's first deep-sea mining in the vent fields of the Bismarck Sea.

Giant undersea excavators will be built this year, and ore could be rising from depths of 1,600m by 2012.

Conservation biologist Professor Rick Steiner, formerly of the University of Alaska, was called in to examine the company's original environmental impact assessment study.

He is concerned about the dumping of thousands of tonnes of rock on the seabed and about the danger of spillages of toxic residue, but his real objection is more fundamental.

He explained: "The site that they mine, they're going to destroy all these vent chimneys where the sulphide fluids come out."

He added that it could cause the extinction of species that are not even known to science yet.

"I think that, from an ethical stand-point, is unacceptable," he said.

Steven Rogers, CEO of Nautilus, said that he accepted that the mined area would be damaged, but said he was convinced that it could recover.

He believes deep-sea mining will be less damaging to the environment than mining on land.

He said: "I think there's a much greater moral question... here we have an opportunity to provide those metals with a much, much lower impact on the environment."

The success of the Nautilus enterprise is dependent less on questions of morality than of profit.

Steven Rogers estimates that this first mining site could yield anything from tens of millions of dollars up to \$300m in value.

But Professor Steiner believes that success in the Bismarck Sea will provoke a "goldrush" at vent systems around the world, most of which have yet to be properly studied.

'Crucial crossroad'

Dr Jon Copley is well aware of the moral and political questions being thrown up by the team's ground-breaking work.

He believes that we are at a crucial crossroads in the use of the deep ocean.

He can see a future where nation states squabble over natural resources, but he is optimistic that the international co-operation demonstrated on his current voyage will lead to sensitive study and sustainable exploitation of the deep sea's riches.

"Hopefully there's a different path forward if we've got the courage and determination to take it," he said.

investigates the deep sea vents on Wednesday 14 April at 2100 BST on BBC Radio Four, or listen to the podcast

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8611771.stm>

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New light on near-death flashes

Near-death experiences during cardiac arrest - from flashing lights to life flashing before one's eyes - may be down to carbon dioxide, a study finds.



Examination of 52 patients found levels of the body's waste gas were higher in the 11 who reported such experiences, the journal *Critical Care* reports.

The Slovenian researchers hope to move on the debate over why so many cardiac arrest patients report the experiences.

Reasons previously suggested for the phenomenon include religion and drugs.

Those who have had near-death experiences report various encounters, including seeing a tunnel or bright light, a mystical entity, or looking down from the ceiling at the scene below in an "out of body" experience.

Others describe a simple but overwhelming feeling of peace and tranquillity.

It is thought between one in ten and nearly a quarter of cardiac arrest patients have experienced one of these sensations.

No religion

In this latest study, published in the journal *Critical Care*, a team looked at 52 cardiac arrest patients. Eleven of these reported a near-death experience.

“ Near death experiences make us address our understanding of human consciousness so the more we know the better ”

Zalika Klemenc-Ketis Lead author

There appeared to be no pattern in regards to sex, religious belief, fear of death, time to recover or drugs given during resuscitation.

And while anoxia - in which brain cells die through lack of oxygen - is one of the principal theories as to why near-death experiences may occur, this was not found to be statistically significant among this small group of patients.

Instead, the researchers from the University of Maribor found blood carbon dioxide levels were significantly higher in the near-death group than among those who had no experience.

Previous research has shown that inhalation of carbon dioxide can induce hallucinatory experiences similar to those reported in near-death experiences.

Whether the higher levels of carbon dioxide among this group of patients were down to the cardiac arrest itself or pre-existing is unclear.

"It is potentially another piece of the puzzle, although much more work is needed," said the report author, Zalika Klemenc-Ketis. "Near death experiences make us address our understanding of human consciousness so the more we know the better."

Cardiologist Dr Pim van Lommel, who has studied near death experiences extensively, described the findings as "interesting".

"But they have not found a cause - merely an association. I think this is something that will remain one of the great mysteries of mankind. The tools scientists have are simply not sufficient to explain it."

In the UK, a large study is ongoing into whether cardiac arrest patients genuinely do have out-of-body experiences. The research includes placing images on shelves that can only be seen from above. The brain activity of 1,500 patients will be analysed afterwards to see if they can recognise the images.

Dr Sam Parnia, who is leading the project at Southampton University, says he hopes to establish whether consciousness can in fact exist as a separate entity to the body.

Story from BBC NEWS:
<http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8607660.stm>

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Supervolcano: How humanity survived its darkest hour

- 14 April 2010 by **Kate Ravilious**
- Magazine issue 2756



The landscape after Pinatubo's eruption may give a glimpse of what early humans experienced (Image: Sipa Press/Rex Features)

THE first sign that something had gone terribly wrong was a deep rumbling roar. Hours later the choking ash arrived, falling like snow in a relentless storm that raged for over two weeks. Despite being more than 2000 kilometres from the eruption, hominins living as far away as eastern India would have felt Toba's fury.

Toba is a supervolcano on the Indonesian island of Sumatra. It has blown its top many times but this eruption, 74,000 years ago, was exceptional. Releasing 2500 cubic kilometres of magma - nearly twice the volume of mount Everest - the eruption was more than 5000 times as large as the 1980 eruption of mount St Helens in the US, making it the largest eruption on Earth in the last 2 million years (see "Blown away").

The disaster is particularly significant since it occurred at a crucial period in human prehistory - when Neanderthals and other hominins roamed much of Asia and Europe, and around the time our direct ancestors, *Homo sapiens*, were first leaving Africa to ultimately conquer the world. Yet with no recent eruptions for easy comparison, the full extent of its fallout and impact on early humans has been shrouded in mystery.

Now dramatic finds from archaeological digs in India, presented in February at a [conference](#) at the University of Oxford, are finally clarifying the picture of the eruption and its effects, and how it shaped human evolution and migration. Further results from the digs may even rewrite the timing and route that modern humans took out of Africa.

The new work portrays a somewhat different view of the eruption from the most popular current theory. Previous computer models of the eruption had suggested the event was truly cataclysmic - very nearly a doomsday for early humankind. With calculations based on the assumption that Toba belched out 100 times more aerosols than the 1991 eruption of mount Pinatubo in the Philippines, and scaling the environmental effects accordingly, the models suggested global temperatures dropped by about 10 °C following the blast. This supports the idea of a decade-long "volcanic winter" and widespread catastrophe ([Journal of Geophysical Research - Atmospheres](#), vol 114, p D10107).

To make matters worse, the aerosols would have blocked out life-giving sunlight and absorbed water vapour in the atmosphere, causing a dryer global climate for the next few years. This would have resulted in a rapid decline in tree cover and a concomitant expansion of grasslands, leading to the extinction of many mammals and nearly wiping our ancestors out ([Palaeogeography, Palaeoclimatology, Palaeoecology](#), vol 284, p 295). The few primitive humans that did survive the eruption would have had to act fast, quickly adapting their way of life to suit the new conditions, travelling further to find food and cooperating with neighbouring populations in the battle for survival.

Indeed, the event may have drastically altered the path of evolution for our own species, *Homo sapiens*. Modern humans, who were still thought to be living in Africa, would have been whittled down to just a few thousand breeding pairs scattered in dispersed refugia - creating a so-called "genetic bottleneck" in evolution. As the separate colonies developed independently of one another, they would have sown the seeds for the genetic differences between races once these separate groups eventually left Africa.

Yet this theory has drawn some criticism since it was first put forward 17 years ago, with scholars such as [Hans Graf](#), an atmospheric scientist at the University of Cambridge, believing that the climate change following the explosion has been wildly overestimated.

For Graf, the crux of the argument concerns the precise cooling effect of the sulphur dioxide released by the explosion. During smaller eruptions, like that of mount Pinatubo, most of the released sulphur dioxide reacts with hydroxide (OH) ions from water molecules in the atmosphere to form particles of sulphate - a highly reflective substance that bounces sunlight back into space before it can warm the Earth.

Previous estimates had placed Toba's sulphur dioxide production at 100 times that of mount Pinatubo's output. Graf thinks this figure is misguided: recent chemical analyses of Toba's fossilised magma suggests it should be roughly half that. "We think Toba was more of a giant in ash production, not sulphur," says Graf.

What's more, he says, the atmospheric effect of a super-eruption is incomparable to a smaller, typical eruption. Whereas most of the sulphur dioxide from mount Pinatubo would have been rapidly converted to sulphate particles, there simply would not have been enough OH ions in the atmosphere available to react with all the sulphur dioxide released by Toba, delaying the formation of these reflective particles. Even those particles that had formed would have probably clumped together and settled to the ground rather than stay in the atmosphere.

Taking all of this into account, Graf and his colleagues suggest a new estimate of global cooling of just 2.5 °C, which lasted for just a few years. According to this model, the effects were also highly

regional. In places like India the average temperatures may only have fallen by about 1 °C - not such a dramatic climate shift.

This new view is highly contentious. Alan Robock from Rutgers University in New Brunswick, New Jersey, who came up with the original simulations, stands by his original predictions. "Our model showed that extra water would be lofted into the stratosphere because of warming at the top of the troposphere [the lowest layer in the atmosphere], so water would not be a limiting factor," he says. "We simulate a decade or two of very cold, dry, dark conditions, which would have been difficult for humans to adapt to."

Yet recent archaeological and geological work in India seems to support Graf's claims, suggesting the environmental impact of the super-eruption was much less than previously imagined. Firstly, had there been a sudden deforestation event caused by the cooling and drying of the atmosphere, topsoil no longer anchored by trees would be expected to wash down into valleys, where it would quickly accumulate. "We don't find a rapid influx of soil arriving on top of the ash layers," says Peter Ditchfield of the University of Oxford.

To build further evidence, Ditchfield analysed the ratio of different carbon isotopes - which are each absorbed at different rates by different plants - in ancient plant remains in the Jwalapuram region of southern India and the Middle Son river valley in central northern India, both of which are around 2000 kilometres from Toba. He saw only a slight increase in the carbon-13 isotope after the Toba eruption, which suggests there was just a small increase in grassland environments at this time. "Woodlands weren't obliterated by Toba. We see a diverse range of habitats persisting after the eruption, which would have provided a diverse range of game and hunting opportunities," he says.

Nevertheless, hominin species living at the time of the eruption would undoubtedly have faced tough conditions. The blanket of ash, for example, would have been quickly washed into the freshwater supplies: Ditchfield found deposits up to 3 metres deep on the valley floors where rivers would once have flowed. And there is no doubt that in the years immediately following the eruption the early humans would have had to adjust to colder temperatures, probably having to economise significantly as food resources dwindled.

Early humans would have had to adjust to colder temperatures after the eruption, economising as resources dwindled

Flight to the refugia

"We are not saying that it wasn't difficult for humans after Toba," says Mike Petraglia at the University of Oxford, who has led the investigations. "We are just saying that we don't think it was a catastrophic change."

The remains of hominin species living at the time of the eruption would shed some light on life during this difficult period, but sadly no skeletons have been preserved in the sediments. "The moist tropical environment is not good for preserving bone," explains Petraglia.

Nevertheless, the tools that they left behind provide a window into their owners' lives. Petraglia and his team have investigated a number of sites at Jwalapuram. One has been particularly fruitful. Labelled Jwalapuram 22, it was probably a hunter-gatherer camp. It has yielded more than 1800 tools, including stone flakes, scrapers, points - the everyday tools for cutting and scraping - and the stone "cores" left over following tool manufacture. "The surface is just littered with stone tools, and then buried by the Toba ash," says Michael Haslam, also at the University of Oxford.

Surprisingly, hominin life appeared to continue in the same vein immediately after the eruption, with hundreds more stone tools in the layers immediately above the ash fall. The team uncovered a similar story 1000 kilometres further north of Jwalapuram, in the Middle Son river valley. "We see

very little change in tool technology across the Toba ash. They may have had to relocate for a short period of time, but within a generation or so they were back where they were before, making the same kinds of stone tools," says [Chris Clarkson](#), a stone-tool specialist from the University of Queensland in Brisbane, Australia, who worked at the digs in India.

Again, that's not to say the eruption was an easy ride for the hominins living in India. Jwalapuram and the Middle Son valley may have been special cases - refugia in which hominin populations sheltered when the times got tough. Jwalapuram, for example, is an ancient type of Indian geological formation known as a Purana basin, which contains highly fertile soil and abundant freshwater springs protected from contamination by the surface ash. Such circumstances could have buffered some of the effects of the eruption. "There are springs popping out everywhere in these basins, they contain plentiful rocks for making stone tools and their vegetation is generally resilient to environmental changes," explains [Ravi Korisettar](#) of Karnatak University in Dharwad, India. Still, the findings present a challenge to the traditional view of Toba as a devastating catastrophe for hominins alive at the time.

[Stanley Ambrose](#) at the University of Illinois at Urbana-Champaign is a leading proponent of the catastrophe theory. He says he has observed strong evidence for technological change in south and east Africa following the eruption, which may have resulted from a need to adapt to pressured conditions, and reckons India should be no different. He says that flood erosion may have released some of the tools from the older sediment at the Indian sites, re-depositing them in younger sediments and creating the illusion of continuity. Not so, says Haslam. While he admits the artefacts do show some signs of abrasion, he reckons they shifted only a short distance through the layers of sediment - not enough to skew the dating significantly.

Answering such queries is of the utmost importance, since the new, less-devastating picture of the Toba eruption painted by recent research could have wide ramifications for theories of human evolution and migration. Just how wide depends on which species of human produced the tools found in India. According to the traditional view, modern humans did not arrive in this part of Asia until 60,000 years ago or later, at least 14,000 years after the Toba eruption. Before this time, modern humans are thought to have been confined to Africa, barring one failed dispersal to the Levant - the eastern part of the Mediterranean - about 125,000 years ago.

If you follow this line of reasoning, the tools must therefore be the product of a more primitive species, perhaps the descendants of *Homo erectus*, which first occupied India 700,000 years ago or more. The new evidence would still be significant should that be the case, since the survival of these species would suggest the eruption may not have had a drastic impact on the *Homo sapiens* populations in Africa either, throwing the "genetic bottleneck" theory of human evolution into doubt.

Petraglia and his colleagues have much grander claims, however. They report evidence that the tools in India were indeed made by *Homo sapiens* - a finding that, if true, would rewrite the textbooks on human migration from Africa (see "Routes out of Africa").

If the Indian tools were made by *Homo sapiens*, the findings could rewrite the textbooks on human migration from Africa

Previous evidence would just about allow an earlier migration. Fossil evidence from this period of human prehistory is pretty thin in the ground, so scientists have turned to genetics to retrace our ancestors' footsteps. By analysing the differences in mitochondrial DNA between modern aboriginal populations from different parts of the world, and considering how long it would have taken for these variations to emerge, [Martin Richards](#) at the University of Leeds, UK, [Stephen Oppenheimer](#) at the University of Oxford and colleagues have calculated that the earliest date for a migration out of Africa would have been 71,000 years ago. That is some 3000 years after Toba blew ([The American Journal of Human Genetics](#), vol 84, p 740). Many others go even further, believing the

likely date of exit to have been just 60,000 years ago. However, the large uncertainties associated with these techniques give a small probability that a pre-Toba migration may have been possible.

Indian invasion

In fact, there are other reasons to challenge the established theory of a late dispersal. Some Australian artefacts suggest modern humans made it to that part of the world 60,000 to 50,000 years ago, thousands of years earlier than current theory would allow (*Nature*, vol 345, p 153). And at Kota Tampan, in the Lenggong valley in Malaysia, archaeologists have uncovered a stone-tool culture spanning from 74,000 years to 4000 years ago. Since the tools don't change at all during this period, it would seem they were all produced by the same species of human. A 10,000-year-old *Homo sapiens* skeleton found at Kota Tampan suggests that this species was the modern human.

The tools discovered in India would seem to provide further tentative evidence for a pre-Toba migration. Firstly, Clarkson has spotted a subtle change in the way the tools in India were manufactured about 80,000 years ago (6000 years before the eruption) that may be evidence of a *Homo sapiens* invasion at this time. "They start to make better use of the stone and strike multiple flakes off in a more radial pattern, often from only one side of the core," he explains.

Comparing the patterning he sees on the Indian cores with more than 800 stone cores belonging to both modern humans and other hominins at sites all over the world, Clarkson finds that the Indian cores most resemble the cores made by modern humans in south Africa, south-east Asia and Australia. Meanwhile, the older Indian cores, with a flatter and more circular shape and often worked on both sides, have more in common with cores made by Neanderthals and other non-modern humans. "Tool-making is a skill and it takes a close apprenticeship to learn these methods. This was a cultural behaviour that was taught and passed down the generations," he says.

Further evidence for modern humans ousting non-modern hominins in India at this time comes from the tools themselves, with heavy hand-axes being abandoned for more lightweight tools. Petraglia and his colleagues have also uncovered three possible projectile points from beneath the ash at Jwalapuram 22, two of which are shaped carefully at the blunt end, apparently to enable them to be hafted onto a spear - a tool generally associated with *Homo sapiens*.

Ambrose is dismissive of the suggestion of modern humans arriving so early in India. "It is completely conceivable that Neanderthals could have made these hafted projectile weapons," he says. But others are more supportive of the idea. Chris Stringer from the Natural History Museum in London thinks it is possible that these tools are evidence of modern human activity, although he doesn't feel the evidence is conclusive. Robin Dennell, an archaeologist at the University of Sheffield, UK, is thoroughly impressed by the research. "Clarkson's work is excellent. I'm prepared to argue that *Homo sapiens* was in India pre-Toba," he says.

If modern humans really did live in India at this time, what route did they take from Africa to Asia? There is some good evidence that modern humans first attempted to leave Africa across treacherous desert regions into the Levant 125,000 years ago. Archaeologists had previously assumed the venture ultimately failed due to the adverse conditions, and that it was only much later, when humans tried coastal routes, that they succeeded. Petraglia, however, thinks that the wide range of new evidence in India challenges this view. "We're suggesting that perhaps this wasn't a failed dispersal," says Petraglia. "Maybe these people got out across Arabia and over to India after all."

"There could easily have been a core population of *Homo sapiens* in southern Arabia by 100,000 years ago," agrees Dennell, "and that population could then have been the source of populations that subsequently dispersed eastwards across southern Asia."

Evidence in the Thar desert in Rajasthan, northern India, seems to support this idea, with remains suggesting that modern humans were adept at crossing desert regions, hopping from oasis to oasis. "In the Thar desert we find fossilised sand dunes. After cutting them open like cabbages, we have found stone tools inside," says [Hema Achyuthan](#), from Anna University in Chennai, India. Unfortunately, the tools are hard to date precisely, but they do show strong similarities to those found in Jwalapuram and the Middle Son valley.

But here's the killer question: if modern humans did migrate to Asia so early in prehistory, why isn't their journey reflected in modern mitochondrial DNA? [Sacha Jones](#), at the University of Cambridge, thinks she has a solution that may just reinstate Toba's importance in human evolution.

She suggests a double dispersal from Africa, with the first migrants arriving in India pre-Toba around 80,000 years ago and bringing the new tool technology Clarkson observed. Later, more than 10,000 years after the Toba eruption of 74,000 years ago, a second wave of migrants arrived that sounded the death knell for the early pioneers. "This explains the pre-Toba tools we find in India, but it also fits with the genetic data," says Jones. "If the older population were wiped out then no genetic signature would remain."

If this theory reflects the reality, the role of Toba's eruption in human evolution may have been highly significant after all, weakening the first wave of migrants and pushing them into luscious refugia. The later, competitive migrants would have then elbowed their distant cousins off their bountiful land, finishing them off in the process.

It's a tempting proposition that promises to tie up the loose ends of the other theories - though much more archaeological evidence is needed to shore it up. As the digs in India continue, all eyes will be searching for those elusive human remains, perhaps even a skeleton cocooned in the ash, that could settle the score once and for all.

Gallery: [*Hit parade: The biggest bangs in history*](#)

Today's supervolcanoes

The term "supervolcano" refers to any volcano capable of throwing out at least 300 cubic kilometres of magma during an eruption. At least one of these beasts explodes every 100,000 years or so, the geological record suggests. One of the most recent was the Toba eruption, 74,000 years ago. A medium-sized super-eruption, releasing 1000 cubic kilometres of magma, would wreak the same devastation as a 1-kilometre-wide asteroid smashing into the Earth. The bad news is that such a super-eruption is five to 10 times more likely than an asteroid strike, according to a [2005 report](#) by the Geological Society of London.

Previous super-eruptions have been linked to mass extinction events, such as the Permian mass extinction 250 million years ago, which wiped out more than 90 per cent of marine species and was associated with an eruption at the Siberian Traps. The eruption of the Deccan Traps in India, together with a meteorite impact, might even have finished off the dinosaurs.

There is no doubt that Earth will experience more super-eruptions. "It is not a question of 'if' - it is a question of 'when'," says [Bill McGuire](#), director of the Aon Benfield Hazard Research Centre at University College London.

Possible contenders for the next eruption include Yellowstone volcano in Wyoming, the Phlegrean fields volcano west of Naples, Italy, and Lake Taupo in New Zealand. However, there are many other areas where a supervolcano could one day pop up, including Indonesia, the Philippines, several Central American countries, Japan, the Kamchatka peninsula in eastern Russia, and even Europe (the area around Kos and Nisyros in the Aegean Sea might be a supervolcano).

As the recent research into the impact of the Toba eruption reveals, super-eruptions may not necessarily be as catastrophic as we fear. That said, a super-eruption would almost certainly devastate our civilisation. Unlike the humans living when Toba erupted, we depend on globalised trade and food production, with much reliance on air travel and space-borne communications, all of which would be severely knocked by a super-eruption.

Using similar considerations as they did for the Toba model, Hans Graf and his team at the University of Cambridge predict a Yellowstone super-eruption would cause the global temperature to drop by at least 1 °C. Several centimetres of ash would blanket all of North America. Oceans would become even more acidified and plant growth across the globe would be disrupted for several years.

The Geological Society of London's working group went one step further in 2005 when they described the impact of a generic super-eruption. "An area the size of North America or Europe could be devastated, and pronounced deterioration of global climate would be expected for a few years following the eruption. Such events could result in the ruin of world agriculture, severe disruption of food supplies, and mass starvation. The effects could be sufficiently severe to threaten the fabric of civilisation," they conclude. So fingers crossed, everybody.

Kate Ravilious is a writer based in York, UK

<http://www.newscientist.com/article/mg20627561.300-supervolcano-how-humanity-survived-its-darkest-hour.html?full=true&print=true>

Quiet sun puts Europe on ice

- 14 April 2010 by [Stuart Clark](#)
- Magazine issue [2756](#)



Harsh but fair in the UK (Image: Peter Henry/Flickr/Getty)

BRACE yourself for more winters like the last one, northern Europe. Freezing conditions could become more likely: winter temperatures may even plummet to depths last seen at the end of the 17th century, a time known as the Little Ice Age. That's the message from a new study that identifies a compelling link between solar activity and winter temperatures in northern Europe.

The research finds that low solar activity promotes the formation of giant kinks in the jet stream. These kinks can block warm westerly winds from reaching Europe, while allowing in winds from Arctic Siberia. When this happens in winter, northern Europe freezes, even though other, comparable regions of the globe may be experiencing unusually mild conditions.

Northern Europe freezes, even though comparable regions experience unusually mild conditions
Mike Lockwood at the University of Reading in the UK began his investigation because these past two relatively cold British winters coincided with a lapse in the sun's activity more profound than anything seen for a century. For most of 2008-9, sunspots virtually disappeared from the sun's surface and the buffeting of Earth by the solar magnetic field dropped to record lows since measurements began, about 150 years ago.

Lockwood and his colleagues took average winter temperatures from the [Central England Temperature dataset](#), which extends back to 1659, and compared it with records of highs and lows in solar activity. They found that during years of low solar activity, winters in the UK were far more likely to be colder than average. "There is less than a 1 per cent probability that the result was obtained by chance," says Lockwood, in a paper to appear in *Environmental Research Letters*.

Judith Lean, a solar-terrestrial physicist at the US Naval Research Laboratory in Washington DC, says the analysis is statistically robust, and reckons it forms a piece in the larger puzzle of how solar activity influences weather. Often cited by climate-change sceptics as a cause of global warming (see "[What are you up to, sunshine?](#)"), the effects of solar cycles have largely evaded the grasp of climate modellers. Lockwood found that when he removed 20th-century warming due to industrial emissions from his models, the statistical link between solar lows and extreme winters was stronger, suggesting the phenomenon is unrelated to global warming. But the sun undeniably has a big influence on weather systems: it is, after all, the energy source that powers them.

"All the little pieces are adding up into something much bigger," says Lean. "People are beginning to realise that European weather is particularly susceptible to solar activity." A study she published in 2008 found that warmer-than-average temperatures were more likely in northern Europe when solar activity is high (*Geophysical Research Letters*, DOI: [10.1029/2008GL034864](https://doi.org/10.1029/2008GL034864)).

Lean says research like hers and Lockwood's is helping to overcome a long-standing reticence among climate scientists to tackle the influence of solar cycles on the climate and weather. A big clue to the nature of this influence may lie in work published in 2008 by David Barriopedro at the University of Lisbon, Portugal, and colleagues. They investigated so-called "blocking events" in the mid-latitude jet stream during the winters of 1955-99.

The jet stream brings winds from the west, over the Atlantic, and into northern Europe. Blocking occurs when the meanders in the jet stream become so large that they double back on themselves, halting the prevailing westerly winds and allowing cold north-easterlies to take control (see diagram). Barriopedro found that when solar activity is low, the blocking events move eastwards across the Atlantic towards Europe, effectively opening an atmospheric corridor to the frigid Siberian Arctic.

But how can solar variability influence the jet stream? One finger of suspicion is pointing at the stratosphere, the layer of the atmosphere that lies 20 to 50 kilometres above our heads. There, patterns of winds and temperature are known to be influenced by solar activity, says Lockwood. This is because peaks in ultraviolet radiation emitted by the sun boost ozone formation in the stratosphere, which in turn absorbs more ultraviolet and heats up. The heating is greatest in the region of the stratosphere nearest to the sun and so a temperature gradient appears across the stratosphere and winds are born.

How this affects the weather below is still debated. Very little is known about the physics that governs the stratosphere, but one pattern that is emerging is that stratospheric "weather" is linked to the troposphere below it - where our everyday weather and currents like the jet stream reside. Edwin Gerber of New York University studies these interactions. He and colleagues showed in 2009 that upward movements of air in the troposphere can change the patterns of stratospheric winds. These changes, in turn, can be reflected back down to the troposphere and influence weather at the surface of the Earth (*Geophysical Research Letters*, DOI: [10.1029/2009GL040913](https://doi.org/10.1029/2009GL040913)). "Changes in the stratospheric winds influence the path of winter storms across Europe," Gerber says.

If researchers can prove that the sun can similarly induce changes in the troposphere via the stratosphere, which Gerber thinks they will, this could solve one of the biggest puzzles of the Little Ice Age - namely, that it appeared to have been a peculiarly European phenomenon, with other parts of the globe largely spared. The effects of the sun on the stratosphere are not global, says Lockwood. "They change the way the atmospheric energy is distributed around the world rather than change the total amount of energy being put into it."

Future studies may show that the effects of changes in solar activity can be felt further afield, but for now it seems that Europe is particularly susceptible because it happens to sit under the northern jet stream at a longitude where its meanders can grow into kinks.

Although sunspot activity is gradually returning, astronomers are not expecting it to reach its previously high levels. So if Lockwood is correct, while the general temperature trend in the northern hemisphere will increase in line with global warming over the coming decades, northern Europe can look forward to some more harsh winters. It may be time to buy some decent gloves.

What are you up to, Sunshine?

How much influence solar activity wields over our climate has vexed scientists for centuries. Take the British astronomer William Herschel: in the late 18th century, he compared the price of wheat in England with the number of sunspots and suggested that years with more sunspots produced good harvests, keeping the price lower.

Since the discovery of the 11-year solar cycle in the mid-19th century, many have sought to make links between different elements of solar variability and changes in climate. Here's a snapshot of the arguments and the evidence.

Cosmic rays: One persistent claim is that cosmic rays could affect cloud formation, influencing climate - but most analyses have found little or no correlation. CERN in Switzerland is running an experiment that will provide data about how likely such particles are to cause cloud formation.

Sunspots: People have tried to link the number of sunspots during the 20th century with rising global temperatures. But average sunspot numbers have been dropping since the 1920s. Global mean temperatures, meanwhile, have risen over the same period.

Ultraviolet rays: Less easy to dismiss has been the idea that changes in ultraviolet radiation from the sun, a quantity closely linked to solar activity, could influence the climate. Direct measurements only began in 2003. However, average solar activity has fallen over the last two decades while temperatures have risen, making it unlikely that UV radiation is a dominant driver of global temperatures.

Irradiance: Measurements of the sun's brightness - an indicator of its energy output - only began in 1977. Irradiance rose between 1977 and 1985, but has been dropping since.

Since about 1985, all the solar factors that could have warmed the climate have been going in the wrong direction, says Lockwood. "If they were really a big factor we would have cooling by now."

<http://www.newscientist.com/article/mg20627564.800-quiet-sun-puts-europe-on-ice.html?full=true&print=true>

Entangle qubits for a true random number machine

- 14 April 2010 by [Kate McAlpine](#)
- Magazine issue [2756](#).

PURE randomness is surprisingly difficult to create, even if you draw on the inherent randomness of quantum mechanics. Now, though, a "true" random number generator is on the cards, which may help create the ultimate [cryptographic messages](#).

Existing [quantum random number generators](#) are only as reliable as their parts. For example, some devices send single photons through a [beam-splitter](#) and record the path taken, but a pattern could emerge over time if the beam-splitter comes to favour one direction or the materials degrade. A new number generator produces random strings of numbers without the worry of such flaws, because it relies on the inherently random behaviour of two quantum-entangled objects.

The new number generator relies on the inherently random behaviour of two entangled objects. Entangled objects violate the "[Bell inequalities](#)", which provides mathematical proof that their behaviour is [definitively random](#). It doesn't matter who made the objects or how, says team member [Antonio Acín](#) of the Institute for Photonic Sciences in Barcelona, Spain.

Two ytterbium ion quantum bits or [qubits](#) were trapped in separate vacuum chambers. When they each emitted a photon, the interactions between the photons entangled the two ions. The team fed numbers into the device, causing microwave oscillators to turn the qubits in one of two directions. The qubits were then exposed to light, and a random string of ones and zeros was recorded, depending on whether or not they shot photons to a detector. We know that the ions are entangled because they emit photons in the same way.

To remove any chance of human error during measurement, this string was fed into a mathematical formula that removed traces of pattern, but cannot generate randomness itself (*Nature*, [DOI: 10.1038/nature09008](#)).

"If the same task can be implemented over some distance, it can lead to device-independent cryptography," says cryptography pioneer [Artur Ekert](#) of the University of Oxford.

<http://www.newscientist.com/article/mg20627565.400-entangle-qubits-for-a-true-random-number-machine.html?full=true&print=true>

Rethinking internal combustion engines

- 16:44 13 April 2010 by **Helen Knight**



Engineering a makeover (Image: WestEnd61/Rex Features)

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

It may seem dirty and outdated compared with the batteries that power electric vehicles, but the internal combustion engine is set for a makeover that could halve its greenhouse gas emissions.

Today's engines are pretty inefficient, converting only around a quarter of the energy contained in fuel into motion; the remaining three-quarters is lost as heat. So efforts are under way to recover some of this lost energy in the hope of reducing fuel consumption and emissions.

Up to 40 per cent of an engine's potential output is lost in its exhaust, says Guy Morris, engineering director at Controlled Power Technologies based in Laindon, UK. The company plans to recover some of this energy by fitting a turbine inside the tailpipe: the fast-moving exhaust gases coming straight from the engine drive the turbine, generating electricity.

A prototype device fitted to a large family car harvests up to 6 kilowatts of energy in track tests, says Morris. This could be fed back into the car's battery to power its onboard electrical systems, reducing fuel consumption by up to 15 per cent, he claims.

Super fly

Elsewhere, designers are looking to capture the energy that most cars lose in braking. Putting that kinetic energy to work would reduce the load on the engine.

Hybrid cars that have both an electric motor and an internal combustion engine already have regenerative brakes that generate electricity when they are applied. But a team led by car maker Jaguar is cutting out the electric middleman with a system that simply stores unwanted kinetic energy for later.

They are developing a hybrid car equipped with a kinetic-energy-recovery system similar to those used in last year's Formula 1 season. The prototype car, which is due to hit the test track in June, has a flywheel linked to its gears. When the driver wants to slow down, the flywheel can be used to recover the rotational energy of the wheels and store it as kinetic energy. When more power is

needed the system works in reverse, drawing energy from the flywheel and feeding it back to the driveshaft through the gears. The system reacts automatically to gas and brake pedal movements, thus storing power without needing control from the driver.

Like the Formula 1 version, the mechanism is built by Flybrid Systems based near the British Grand Prix race circuit in Silverstone.

Chris Brockbank of project partner Torotrak, based in Leyland, UK, says over 70 per cent of the energy recovered by the system can be converted into motive force to drive the car. This makes it more than twice as efficient as conventional hybrid cars, which can only recover about 30 per cent of the braking energy, he says.

The team claim the system will reduce fuel consumption and greenhouse gas emissions by more than 30 per cent compared with conventional gasoline engines. What's more, unlike batteries, the flywheel will not need regular replacement, says Brockbank.

Shape-shifting engine

But perhaps the biggest efficiency savings could be made by changing the shape of the engine itself. The traditional cylinder-piston design used in engines means that only the piston head itself produces motive force, as it is pushed up and down by the expansion of the burning fuel-and-air mixture. The remaining 75 per cent of the cylinder's surface area – the chamber walls – absorb energy from the burning fuel in the form of heat, reducing the amount that is available to produce motive force.

This has prompted IRIS Engines, based in Washington DC, to design a combustion chamber called the internally radiating impulse structure (IRIS). The walls of the hexagonal chamber would be overlapping, hinged panels; as the burning mixture in the chamber expanded it would push the panels outward, forcing them to rotate on their hinges and so provide motive force. This means that more of the engine's surface area would be used to produce motion, says Iris's CEO Levi Tillemann-Dick.

Computer simulations of the IRIS design by automotive research and development consultants AVL, based in Graz, Austria, suggest the it should have a fuel efficiency of up to 45 per cent, he says. "Our goal is to prototype and license an engine that will allow vehicle manufacturers to double the efficiency of their vehicles and so halve their emissions."

<http://www.newscientist.com/article/dn18769-green-machine-rethinking-internal-combustion-engines.html?full=true&print=true>

Bumpology: Why do I loathe lettuce?

- 12:59 14 April 2010 by **Linda Geddes**

Halfway through my pregnancy, and I'm relieved to say that I am finally starting to look pregnant – rather than just fat. My waistline appears to have grown 2 inches in a week, and my expanding belly is a fertile topic of conversation among friends and strangers. After "When is it due?" and "Do you know its sex yet?" the question I get asked most is "Have you had any strange food cravings?" Even my dad is getting in on the act: the first thing he asked me upon learning I was pregnant was "Have you been licking any coal?"

Apparently, some pregnant women develop a taste for minerals or even metallic objects during pregnancy, a phenomenon known as "pica". This could be a result of anaemia.

Junk-food yearnings

I haven't been craving coal, but I have developed a taste for cakes and junk food. I also, rather weirdly, went off salad for about six weeks during the first trimester, when I usually love the stuff. Pregnant friends affirm similar cravings for junk food and a voracious appetite.

So has anyone come up with a persuasive explanation for these cravings? A review paper in the latest issue of *Chemosensory Perception* explores the issue in detail. Surprisingly, very little research has been done on the dietary quirks of pregnant women, but studies on rats and insights from the hormonal changes that take place during women's menstrual cycles are providing some clues. Such studies consistently find that pregnant women develop an increased desire for salty foods, combined with a diminished sensitivity to their taste. This may be because pregnant women require slightly more salt to maintain osmotic pressure (or fluid balance) as their blood volume expands. Rats eat more salt during pregnancy, too. Pregnant women are also more sensitive to bitter foods. "This may be an adaptation in order to avoid intake of bitter-tasting, toxic compounds," says Marijke Faas of the University Medical Centre in Groningen, the Netherlands, and lead author of the *Chemosensory Perception* paper. She tells me my aversion to salad leaves may reflect increased sensitivity to bitterness – although she has never heard of other women shunning lettuce.

Eating for two?

As for my insatiable appetite, increased levels of progesterone may be to blame. Both human and animal studies have shown that this hormone increases appetite and oestrogen decreases it. "Although both hormones are increased during pregnancy, there is relatively more progesterone than oestrogen during pregnancy," Faas says.

This may be why I overindulged at Easter, and am now a couple of kilograms over the recommended target for weight gain at this stage of pregnancy. My friends assure me that I should be eating for two, but my fetus currently weighs only about 280 grams, which pretty much knocks that idea on the head. In fact, nutritionists recommend upping food intake by only about 300 calories a day during the last two trimesters, and excessive weight gain by women during pregnancy is linked to obesity in their kids.

So perhaps it's a good job that I'm able to face the lettuce leaves once more. Salad for dinner anyone?

<http://www.newscientist.com/article/dn18774-bumpology-why-do-i-loathe-lettuce.html?full=true&print=true>

Forensic DNA blow to commercial whaling proposals

- 00:01 14 April 2010 by **Andy Coghlan**
- Magazine issue 2756.

Proposals to resume commercial whaling have been dealt a blow by DNA detective work showing that restaurants in the US and South Korea illegally sold whale meat from Japan.

In June, Japan, Iceland and Norway are expected to ask the International Whaling Commission (IWC) for permission to resume commercial whaling. They say they can prevent smuggling by matching the DNA of whale meat sold in markets to a register of all legally caught whales. But all have refused to make their DNA registers public.

To find out the origin of whale meat being sold outside Japan, Scott Baker of Oregon State University in Corvallis and colleagues secretly took samples from two restaurants, one in Santa Monica, California, and another in Seoul, South Korea.

They compared the DNA with that from samples bought in Japan, and found that they came from the same animals – proving that meat from whales hunted in Japan's scientific programme have been illegally sold abroad. The findings resulted in police raids on the restaurants last month.

Baker says the monitoring system can only work if Japan, Iceland and Norway make their DNA registers publicly available, and hand them over to an independent body like the IWC so routine checks can be carried out.

Journal reference: *Biology Letters*, DOI: 10.1098/rsbl.2010.0239

<http://www.newscientist.com/article/dn18770-forensic-dna-blow-to-commercial-whaling-proposals.html?full=true&print=true>

Stellar 'pollution' may be remains of watery planets

- 00:01 13 April 2010 by [Stephen Battersby](#), Glasgow



Sucking up rocky pollutants (Image: NASA/JPL-Caltech)

A lost generation of planets may now be no more than a whiff of pollution in the atmospheres of their dead parent stars. If so, it would suggest that rocky planets are common, and hints that most such planets have water.

White dwarfs – the dense remnants of ordinary stars – usually have very pure atmospheres dominated by the lightweight elements hydrogen and helium, because heavier elements tend to sink into a star's interior. But about 20 per cent of white dwarfs are tainted by traces of heavier elements.

One explanation could be that these stars have picked up their pollution by sucking in interstellar gas and dust. "That theory has been around for a long time," says [Jay Farihi](#) of the University of Leicester, UK. "But I suspected it was bunk."

Calcium sign

Farihi and his team looked at 146 white dwarfs detected by the [Sloan Digital Sky Survey](#) that show the spectral signature of calcium pollution. For tens of millions of years, most have been far from the galactic disc where dust and gas resides, so heavy elements such as calcium should have sunk beyond detection long before.



So Farihi thinks that the trace elements must have come from another source: remnants of rocky planets, forming a ring of debris that slowly rains down on the white dwarf. He has seen evidence of these warm dusty rings in infrared radiation picked up by the Spitzer space telescope.

The white dwarfs in both studies are remnants of stars that were roughly the same mass as the sun, so if Farihi is right, rocky planets should be quite common around sun-like stars. The proportion could be even greater than 20 per cent, as some planetary systems might be entirely destroyed and leave no trace rather than leaving behind a debris ring to pollute their parent star.

Water, water

The evidence for planetary water comes from slightly more subtle reasoning. One class of white dwarfs has almost pure helium atmospheres. Among this group, most of those with traces of heavy elements also have traces of hydrogen. This is the most common element in the universe and so could come from many sources, but the fact that it tends to coincide with heavy-element pollution is telling.

It suggests to Farihi that both the hydrogen and the heavy elements come from the same source – planetary debris – which would be most likely to hold hydrogen in the form of water. So the ultimate fate of our own watery planet may be to briefly stain the atmosphere of the white-dwarf sun.

Farihi will present the work at the National Astronomy Meeting in Glasgow, UK, today

<http://www.newscientist.com/article/dn18765-stellar-pollution-may-be-remains-of-watery-planets.html?full=true&print=true>

How interfering humans helped Amazon diversity

- 08:00 13 April 2010 by [Anil Ananthaswamy](#)
- Magazine issue [2756](#).



Don't tell Sting, but human activity may not be all bad news for the Amazon. A study of South American savannahs suggests that even before Europeans arrived, farmers were changing ecosystems with a landscaping method previously unrecognised in the region. What's more, the pre-Columbian alterations may have increased biodiversity.

"Human actions cannot always be characterised as bad for biodiversity," says [Doyle McKey](#) of the University of Montpellier 2, France. "Some might be good."

McKey and his colleagues came to their conclusion after studying some strange features of the savannahs of French Guiana. These plains are flooded during the rainy season, dry and parched in the summer, and often burned by fires. It was while walking through this landscape that McKey started wondering about undulations in the terrain.

It turned out that they are mounds, mostly about 1.5 metres across and 30 centimetres high. McKey thinks that pre-Columbian farmers made them as beds for crops that drained well in the rainy season. Sure enough, when the team tested the mounds' drainage capacity, they found it was nine times as high as the seasonally flooded savannah.

New tenants

Once these fields were abandoned between 800 and 400 years ago, plants and animals colonised the mounds, creating a new ecosystem. Specifically, McKey's team found that the leaf-cutter ant *Acromyrmex octospinosus*, the predatory ant *Ectatomma brunneum* and the Nasutitermitinae subfamily of termites preferred to build their nests on the raised beds.

The *Acromyrmex*, which are fungus-growing ants, even transported large quantities of organic matter to their nest. This in turn has caused the plants on the mounds to grow bigger and their roots deeper. The consequent structural integrity of the mounds and their excellent permeability to water has protected them from erosion by flood waters.

McKey expects that the alterations have been beneficial for the biodiversity of the area. "It's clear that a savannah with this heterogeneity will have a higher biodiversity than just a flat savannah," he says.

Besides French Guiana, such mounds can be found in Surinam, Belize, Venezuela, Ecuador, Bolivia and Mexico. The new study is bound to further fuel the debate over whether most of the Amazon rainforest and the associated savannahs are pristine ecosystems. "To my mind, the debate has been too black-and-white," says McKey. "Nature and culture are interacting to produce interesting things, and maybe that is the way this debate should go."

Anna Roosevelt, an archaeologist at the University of Illinois, Chicago, and an expert on human prehistory in Amazonia, agrees. Her own research has shown "a long, complex sequence of human occupation in that area, despite the fact that many had assumed only a light and late occupation". The work of McKey's team and her own show that "not only have people lived in and altered most of the area of Amazonia, but several habitat types assumed to be natural were not", she says.

Journal reference: *Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.0908925107

<http://www.newscientist.com/article/dn18762-how-interfering-humans-helped-amazon-diversity.html?DCMP=NLC-nletter&nsref=dn18762>

Innovation: iPad is child's play but not quite magical

- 17:02 09 April 2010 by MacGregor Campbell



***Innovation** is our regular column that highlights emerging technological ideas and where they may lead*

Of the thousands of [reviews](#) of Apple's iPad [tablet computer](#), one of the most informative and ultimately convincing is a [YouTube video](#) of a two-and-a-half-year-old girl playing with the device for the first time.

In the clip, the girl's father hands her the book-sized device and within seconds she's navigating various apps through the now ubiquitous swipe, pinch and point gestures. Over the next 5 minutes, she plays a spelling game, looks at pictures, plays with virtual bubble-wrap and bangs on a virtual piano.

Seeing the little girl use both hands to manipulate virtual objects on a screen bigger than her head, it's hard not to think that this seemingly simple multi-touch screen will define her expectations about what a computer is and is for.

She will grow up in a world in which screens that don't react to touch seem broken, and devices that cannot be anything at any time to anybody will be annoying at best. She will expect virtual objects to behave as instantaneously and intuitively as their physical equivalents. This blurred distinction between real and virtual could very well seem like [magic](#), but could equally probably become the new "normal".

You'll get what you're given

However, not everyone thinks the iPad is a magic window showing us a future utopia of ideal human-computer interaction. As commentators like [Cory Doctorow on the Boing Boing blog](#) have pointed out, Apple seems to think that intuitive computing comes at the cost of giving users the freedom to modify hardware and software – a right held sacred by many techies.

"Clearly there's a lot of thoughtfulness and smarts that went into the design. But there's also a palpable contempt for the owner," writes Doctorow.

But as [Tim Wu](#) points out on the daily-magazine website *Slate*, hacker ethics and mass-market usability may forever be at loggerheads. "The ideology of the perfect machine and open computing are contradictory. They cannot coexist," he writes.



Sofatop device

After playing with a greasy-fingered demo at the Apple Store in downtown San Francisco, this reporter gets the sense that the iPad not for the tech set. It retains the rounded metal-and-glass aesthetic common to most Apple products, although you can feel sound reverberate inside it, which makes it feel slightly less solid than its smaller touchscreen cousins. The screen is crisp and reactive and the software interface is pleasantly unnoticeable.

The iPad does not attempt to replicate the multitasking, stacked-windows approach of our desktops and laptops in the way that previous tablets have – with mixed results. Designed less for productivity and more for entertainment, it isn't trying to be a computer of the sort we are used to. For the time being, it is a general-purpose media consumption device that is quite good at its job.

There are, of course, a few glitches that break any spells Apple might wish to cast. As most reviewers have pointed out, it's fine for sofa-computing but too large and heavy to hand-hold and use as you would an iPhone or a Kindle, its closest competitors in the "stand and read" division.

It's fast, but not crazy fast. The reaction speed is not noticeably different from an iPhone or iPod Touch, though the web does load quite quickly over Wi-Fi.

Finally, while many of the available apps, such as the Marvel Comics reader, display content in novel ways, most seem to miss the opportunity for richer multi-touch interaction. The larger screen should allow for more creative use of the gesture-based interface than in smaller devices, and one gets the sense that developers will eventually take advantage of this.

Quibbles aside, the iPad succeeds at being usable and intuitive in ways that even the best-designed laptop or netbook is not. If Apple's claimed 300,000 first-day sales are any indication, users don't need the view from this "magic window" to be perfect.

<http://www.newscientist.com/article/dn18756-innovation-ipad-is-childs-play-but-not-quite-magical.html>

Molten metal batteries to be clean energy reservoirs

- 09 April 2010 by **David C. Holzman**
- Magazine issue 2755.

A BATTERY able to match the output of those used in cellphones from 1/20th of their electrode area may have you dreaming of more talk time.

But putting it in your pocket would be a bad idea - it's full of molten metal. Instead, its inventors hope it will provide much-needed storage capacity for electricity grids.

Grid-scale batteries would boost efficiency by allowing solar energy to be used at night, for example, or excess power from a nuclear plant to be stored for later.



Engineers led by Donald Sadoway at the Massachusetts Institute of Technology were inspired by the way aluminium is smelted using electricity. They created a similar but reversible process that can either consume or release energy.

Their batteries are simply tanks filled with three separate layers of liquid at 700 °C that float on top of one another: the top one is molten magnesium, the bottom antimony and the one in between a salt containing magnesium antimonide, a dissolved compound of the two metals.

When the battery is being charged, magnesium antimonide in the middle layer breaks down into the pure elements and so the upper and lower layers deepen. Discharging the battery reverses the process and releases electrons to provide power. Once heated up to its operating temperature, the battery generates enough heat on its own to keep the liquids molten.

A small prototype provided up to 20 times as much current as a lithium-ion battery - the kind used in portable devices and electric cars - from the same area of electrode, says team member Luis Ortiz. The materials used are much cheaper than lithium (*New Scientist*, 12 December 2009, p 23), making scaling to up to grid scale feasible, he says.

"Cost-effective storage is the holy grail of the electricity grid," says Matthew Nordan, a specialist in clean technology at venture-capital firm Venrock in Cambridge, Massachusetts, who has not invested in the technology.

The MIT team calculates that a battery the size of a shipping container could deliver a megawatt of electricity - enough to power 10,000 100-watt light bulbs - for several hours.

A battery the size of a shipping container could deliver a megawatt of electricity

<http://www.newscientist.com/article/mg20627555.500-molten-metal-batteries-to-be-clean-energy-reservoirs.html>

Surround Vision gives TV viewers off-camera window

- 15:16 15 April 2010 by Colin Barras



Take the shot selection into your own hands

Surround-sound systems immerse TV viewers in the action by extending the audio off-screen. Now a new system extends the concept to pictures by allowing viewers to peek beyond the screen during a TV broadcast.

Using the Surround Video system developed by Michael Bove and Santiago Alfaro at the Massachusetts Institute of Technology Media Lab, a viewer can point a smartphone screen beyond the TV screen to see what is happening off camera.

It could help sports fans to watch off-the-ball action during live broadcasts.

In the action

If broadcasters take the idea up, viewers will see a logo stamped in the corner of the TV picture when a suitable programme – probably a big sports event – is on their TV screen. Then they'll just point their smartphone's camera at the screen to show it the logo, says Bove. "The phone figures out from the logo where the TV is and also what channel it's tuned to," he says.

When the viewer moves the phone to the left or right, a software app installed on the phone uses its built-in accelerometer and compass to establish the movement and orientation of the phone relative to the TV.

The app will then link via the internet to whichever of the programme-maker's cameras is pointing in the direction of the phone. As well as views of areas not in the current shot, viewers might be able to choose from cameras with wide views, for example from cameras in a stadium's roof.

This will be possible because sports programme-makers stuff stadiums full of cameras to ensure they can cut between them and not miss a second of the action.

Programme-makers already use most of the equipment needed for such a service, Bove says, so providing software to allow phones to access unused feeds would be the main barrier.

Social event

Allowing users to take control of their own view makes it possible to combine the big-screen experience with personalised control, says Bove. "The fellow sitting next to you on the sofa doesn't have to get distracted; it preserves the social shared experience, but also allows for individual action."

Blair MacIntyre at the Georgia Institute of Technology in Atlanta says it's a "nice simple idea" that "hits a balance between the capabilities of current technology and the long-term vision of immersive video you can pan around".

"Where all this other video comes from is an interesting problem," he says. "Some would immediately point to processed, crowd-sourced video from the event as one possible source."

The team have successfully tried the system out on the MIT campus and now hope to forge partnerships with TV broadcasters to develop the technology.

<http://www.newscientist.com/article/dn18781-surround-vision-gives-tv-viewers-offcamera-window.html?full=true&print=true>

Jackhammer 'superdrill' could speed mine rescues

- 14 April 2010 by **Phil McKenna**
- Magazine issue 2756..



Help will be at hand sooner for miners trapped underground (Image: KPA/Zuma/Rex Features)

FATAL coal mine accidents over the past month in West Virginia and China offer a grim reminder of how difficult it can be to reach workers underground when their usual route to the surface is cut off. In many such accidents, even the best rescue technology can fail to get to people quickly enough - so how could it be improved?

When people are trapped below ground, it can often be a race against time for the rescue teams above them to drill narrow boreholes through which they can lower food and water, blow in oxygen, or suck out dangerous gases such as methane or carbon monoxide.

Though no two mines are alike, it typically takes 10 hours to bore every 300 metres. Conventional rotary drills are limited in how fast they can cut, and they slow right down when drilling through granite or other hard rock. In 2007, a rescue effort at the Crandall Canyon mine in Utah failed after it took about 40 hours to drill 500 metres. Nine miners and rescue workers died.

A "superdrill" now under development could help. On 30 April, researchers at Sandia National Laboratories in New Mexico are due to deliver preliminary results to federal mine safety officials on a drill that can penetrate hard rock significantly faster than conventional drills. "It can go through granite like it's cutting butter," says Gerald Finfinger of The National Institute for Occupational Safety and Health (NIOSH), the US federal agency that is funding Sandia's research. "In a normal drill operation, you could sit there and read a book and barely see it penetrate."



In laboratory tests, Sandia's high-speed drill bored a hole 10 to 15 centimetres in diameter through 30 centimetres of granite in 6 seconds. This means it should be able to penetrate 300 metres of hard rock in under 2 hours.

Unlike the shearing or chipping employed by conventional rotary drills developed for the oil and gas industry, the new drill employs a high-powered pneumatic jackhammer with button-shaped tungsten carbide bits to fracture the rock and break it into a fine powder.

The drill could be available for mine rescues within two years. However, it wouldn't have significantly changed the outcome in West Virginia, where rescue teams were able to drill down in a relatively short time, or China, where many miners escaped through partially flooded mineshafts.

NIOSH has also commissioned Sandia to develop a robotic scout that rescue teams could send into a mine to check for survivors and assess whether it is safe to enter. The plan now is to test it under realistic conditions with a mine rescue team. Finfinger says that if it is to be of any use, "it has to make rescue faster or safer".

<http://www.newscientist.com/article/mg20627565.500-jackhammer-superdrill-could-speed-mine-rescues.html?full=true&print=true>

Hand-held projector images respond to the real world

- 14 April 2010
- Magazine issue 2755.



POWERPOINT presentations are about to get a sprinkle of fairy dust. A hand-held projector can now create virtual characters and objects that interact with the real world.

The device - called Twinkle - projects animated graphics that respond to patterns, shapes or colours on a surface, or even 3D objects such as your hand. It uses a camera to track relevant elements - say a line drawn on a wall - in the scene illuminated by the projector and an accelerometer ensures it can sense the projector's rapid motion and position.

The device projects animations that respond to patterns, shapes or colours on a surface

Software then matches up the pixels detected by the camera with the animation, making corrections for the angle of projection and distance from the surface.

The device could eventually fit inside a cellphone, says Takumi Yoshida of the University of Tokyo. A prototype which projects a cartoon fairy that bounces off or runs along paintings on a wall or even the surface of a bottle (pictured) was presented at the recent Virtual Reality 2010 meeting in Waltham, Massachusetts.

Yoshida and his colleagues are also developing a way for graphics from several projectors to interact, which could be used for gaming.

Anthony Steed of University College London is impressed. Many researchers have been attempting to create virtual graphics that can interact with a real surface, he says, but Twinkle can cope with a much greater range of environments.

<http://www.newscientist.com/article/mg20627555.100-handheld-projector-images-respond-to-the-real-world.html>

Do Dartmoor's ancient stones have link to Stonehenge?

- 14 April 2010 by **Linda Geddes**
- Magazine issue 2756.

The Cut Hill stones were placed around the same time as Stonehenge (Image: Tom Greeves)

LITTERED across the hills of Dartmoor in Devon, southern England, around 80 rows and circles of stones stand sentinel in the wild landscape. Now, striking similarities between one of these monuments and Stonehenge, 180 kilometres to the east, suggest they may be the work of the same people.

The row of nine stones on Cut Hill was discovered in 2004 on one of the highest, most remote hills of Dartmoor national park. "It is on easily the most spectacular hill on north Dartmoor," says Andrew Fleming, president of the Devon Archaeological Society. "If you were looking for a distant shrine in the centre of the north moor, that's where you would put it."

Ralph Fyfe of the University of Plymouth and independent archaeologist Tom Greeves have now carbon-dated the peat surrounding the stones. This suggests that at least one of the stones had fallen - or been placed flat on the ground - by between 3600 and 3440 BC, and another by 3350 to 3100 BC (*Antiquity*, vol 84, p 55).

That comes as a surprise to archaeologists, who, on the strength of artefacts found nearby, had assumed that Dartmoor monuments like Cut Hill and Stall Moor (pictured) dated from the Bronze Age, around 2100 to 1600 BC. Instead, Fyfe suggests that Cut Hill is from the Neolithic period, the same period that Stonehenge was built.

Unlike Stonehenge, the 2-metre-tall Cut Hill stones lie flat on the ground, parallel to each other and between 19 metres and 34.5 metres apart, like the sleepers of a giant railway track. Packing stones discovered at the end of one of the megaliths suggest at least one of them stood erect at some point, but the regularity of their current layout makes it likely they were deliberately placed that way, Greeves says.

What's more, the stones' alignment with the summer and winter solstices seems identical to that of Stonehenge, Newgrange in Ireland and Maes Howe in Scotland. "It could be coincidence, but it's striking," says archaeologist Mike Pitts.

<http://www.newscientist.com/article/mg20627565.200-do-dartmoors-ancient-stones-have-link-to-stonehenge.html?full=true&print=true>



Time waits for no quasar – even though it should

- 08 April 2010 by [Marcus Chown](#)
- Magazine issue [2755](#). [Subscribe](#) and get 4 free issues.



Is the big bang theory wrong? (Image: Lynette Cook/Science Photo Library)

WHY do distant galaxies seem to age at the same rate as those closer to us when big bang theory predicts that time should appear to slow down at greater distances from Earth? No one can yet answer this new question, but one controversial idea is that the galaxies' light is being bent by intervening black holes that formed shortly after the big bang.

Space has been expanding since the big bang, stretching light from distant objects to longer, redder wavelengths - a process called "red shift". The expansion means that distant events appear to occur more slowly than those nearby. For example, the interval between light pulses leaving a faraway object once per second should have lengthened by the time they reach Earth because space has expanded during their trip.

Supernovae show this "time dilation" in the speed at which they fade - far-off explosions seem to dim more slowly than those nearby. But when [Mike Hawkins](#) of the Royal Observatory in Edinburgh, UK, looked at light from quasars he found no time dilation (*Monthly Notices of the Royal Astronomical Society*, in press).

Quasars are galaxies so bright they can be seen across most of the universe. Using observations of nearly 900 quasars made over periods of up to 28 years, Hawkins compared patterns in the light between quasars about 6 billion light years from us with those at 10 billion light years away.

All quasars are broadly similar, and their light is powered by matter heating up as it swirls into the giant black holes at the galaxies' cores. So one would expect that a brightness variation on the scale of, say, a month in the closer group would be stretched to two months in the more distant group. "To my amazement, the [light signatures] were exactly the same," he says. "There was no time dilation in the more distant objects."

So what's going on? Hawkins classes possible explanations as "wacky" or "not so wacky". The wacky ideas include the possibility that the universe is not expanding, or that quasars are not at the distances indicated by the red shifts of their light - an idea that has previously been discredited.

Among the not-so-wacky theories is the idea that the brightness variations are not caused by the quasars themselves but by the gravitational distortion of bodies about the mass of a star floating between Earth and the quasars.

But this explanation raises its own problems. If all of the quasars in the study are "microlensed" in this way, that would suggest there are a huge number of these invisible lensing objects floating around - enough to account for all of the universe's dark matter. The best candidates, says Hawkins, would be black holes formed shortly after the big bang. If these exist, they could have a similar mass to the suggested lensing objects. "This is a controversial suggestion," says Hawkins. "Most physicists favour dark matter consisting of hitherto undiscovered subatomic particles rather than primordial black holes."

Scott Gaudi of Ohio State University in Columbus says this explanation does not square with microlensing observations of the Milky Way, which suggest that no more than 20 per cent of the galaxy's dark matter halo can be made up of massive, compact objects such as primordial black holes. The black hole idea would get a boost if quasars that are definitely microlensed - identifiable as the lenses produce multiple, yet slightly different, images of the quasar - show the same light signature as those in this study.

The lack of a time delay in light signatures from quasars could be due to primordial black holes

<http://www.newscientist.com/article/mg20627554.200-time-waits-for-no-quasar--even-though-it-should.html?full=true&print=true>

Magnetic poles may once have been at equator

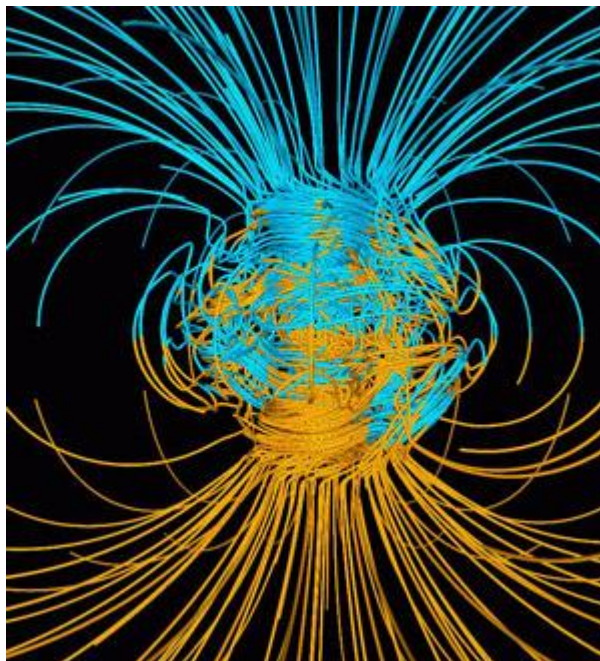
- 12 April 2010 by **Jeff Hecht**
- Magazine issue 2755.

Magnetic poles haven't always been here
(Image: Los Alamos National Laboratory)

DID the Earth's magnetic poles once lie near the equator? That could explain puzzling changes in the magnetism of rocks millions of years ago.

The Earth's magnetic poles are aligned along roughly the same axis as its rotational poles. Geologists have assumed this was also true in the past, so they use volcanic rocks, which when they formed took on an imprint of the direction and strength of the Earth's magnetic field, to infer the rocks' original latitude and to trace continental motions over the past billion years.

But doing this for rocks in North America and eastern Europe is turning up a conundrum. In both regions, there appear to be rocks that were at the equator at some points between 550 and 600 million years ago and near the poles for other parts of this time period.



There appear to be rocks that moved from the poles to the equator several times in 50 million years

That would imply that the ancient continents sped across the surface at more than 45 centimetres a year - twice as fast as the top speed of plate tectonics - then returned at a similarly impossible clip. That speed is also too fast to be explained by a phenomenon called true polar wander, in which the Earth's entire crust and mantle reorient, moving a different geographic region to the north pole.

Instead, Alexandra Abrajevitch at Kochi University in Japan and Rob Van der Voo of the University of Michigan in Ann Arbor suggest the magnetic pole itself shifted by 90 degrees, so that it lined up along the equator (*Earth & Planetary Science Letters*, DOI: 10.1016/j.epsl.2010.02.038).

The planet's magnetic field is generated by the motion of molten iron flowing around a superhot, solid iron core. Changes in the thickness, viscosity and conductivity of the outer core in the past could have led to convection patterns that caused the magnetic pole to tilt.

David Stevenson of the California Institute of Technology in Pasadena says an equatorial pole is possible but says it is not clear what would cause the field to point at a single longitude long enough to leave a magnetic signature in the rocks.

<http://www.newscientist.com/article/mg20627554.000-magnetic-poles-may-once-have-been-at-equator.html?full=true&print=true>

NASA's Cassini Sees Lightning on Saturn

NASA's Cassini spacecraft captured the first lightning flashes on Saturn when it captured these images on August 17, 2009. (Credit: NASA/JPL-Caltech/SSI)

ScienceDaily (Apr. 15, 2010) — NASA's Cassini spacecraft has captured images of lightning on Saturn. The images have allowed scientists to create the first movie showing lightning flashing on another planet.

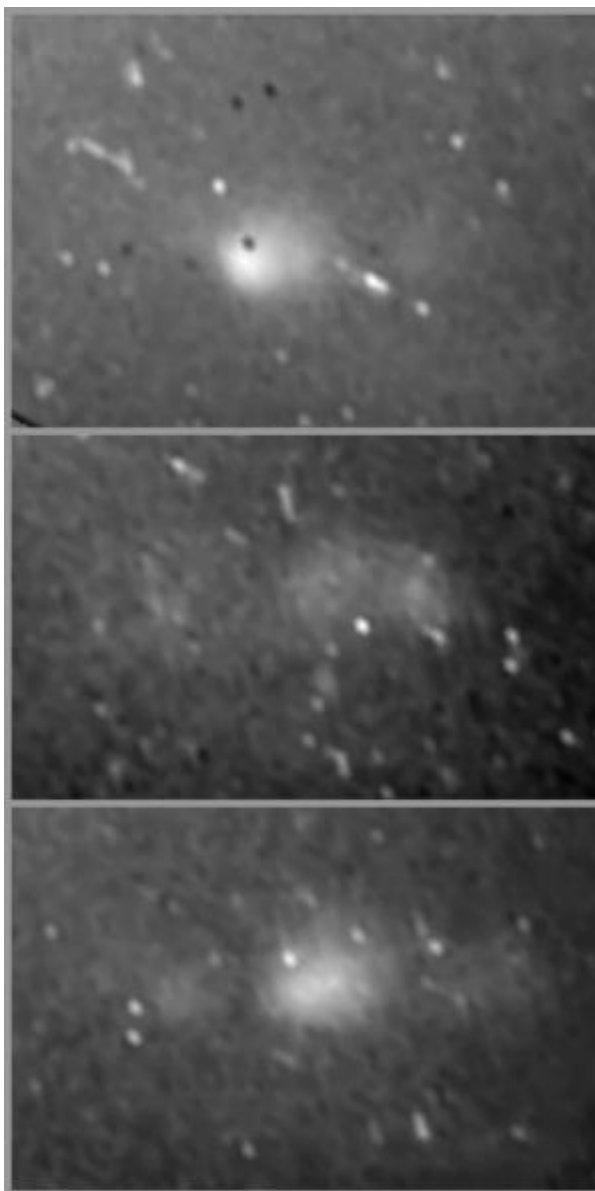
After waiting years for Saturn to dim enough for the spacecraft's cameras to detect bursts of light, scientists were able to create the movie, complete with a soundtrack that features the crackle of radio waves emitted when lightning bolts struck.

"This is the first time we have the visible lightning flash together with the radio data," said Georg Fischer, a radio and plasma wave science team associate based at the Space Research Institute in Graz, Austria. "Now that the radio and visible light data line up, we know for sure we are seeing powerful lightning storms."

The movie and radio data suggest extremely powerful storms with lightning that flashes as brightly as the brightest super-bolts on Earth, according to Andrew Ingersoll, a Cassini imaging science subsystem team member at the California Institute of Technology in Pasadena. "What's interesting is that the storms are as powerful -- or even more powerful -- at Saturn as on Earth," said Ingersoll. "But they occur much less frequently, with usually only one happening on the planet at any given time, though it can last for months."

The first images of the lightning were captured in August 2009, during a storm that churned from January to October 2009 and lasted longer than any other observed lightning storm in the solar system. Results are described in an article accepted for publication in the journal *Geophysical Research Letters*.

To make a video, scientists needed more pictures with brighter lightning and strong radio signals. Data were collected during a shorter subsequent storm, which occurred from November through mid-December 2009. The frames in the video were obtained over 16 minutes on Nov. 30, 2009. The flashes lasted less than one second. The images show a cloud as long as 3,000 kilometers (1,900 miles) across and regions illuminated by lightning flashes about 300 kilometers (190 miles) in diameter. Scientists use the width of the flashes to gauge the depth of the lightning below the cloud tops.



When lightning strikes on Earth and on Saturn, it emits radio waves at a frequency that can cause static on an AM radio. The sounds in the video approximate that static sound, based on Saturn electrostatic discharge signals detected by Cassini's radio and plasma wave science instrument.

Cassini, launched in 1997, and NASA's Voyager mission, launched in 1977, had previously captured radio emissions from storms on Saturn. A belt around the planet where Cassini has detected radio emissions and bright, convective clouds earned the nickname "storm alley." Cassini's cameras, however, had been unable to get pictures of lightning flashing.

Since Cassini's arrival at Saturn in 2004, it has been difficult to see the lightning because the planet is very bright and reflective. Sunlight shining off Saturn's enormous rings made even the night side of Saturn brighter than a full-moon night on Earth. Equinox, the period around August 2009 when the sun shone directly over the planet's equator, finally brought the needed darkness. During equinox, the sun lit the rings edge-on only and left the bulk of the rings in shadow.

Seeing lightning was another highlight of the equinox period, which already enabled scientists to see clumps in the rings as high as the Rocky Mountains.

"The visible-light images tell us a lot about the lightning," said Ulyana Dyudina, a Cassini imaging team associate based at Caltech, who was the first to see the flashes. "Now we can begin to measure how powerful these storms are, where they form in the cloud layer and how the optical intensity relates to the total energy of the thunderstorms."

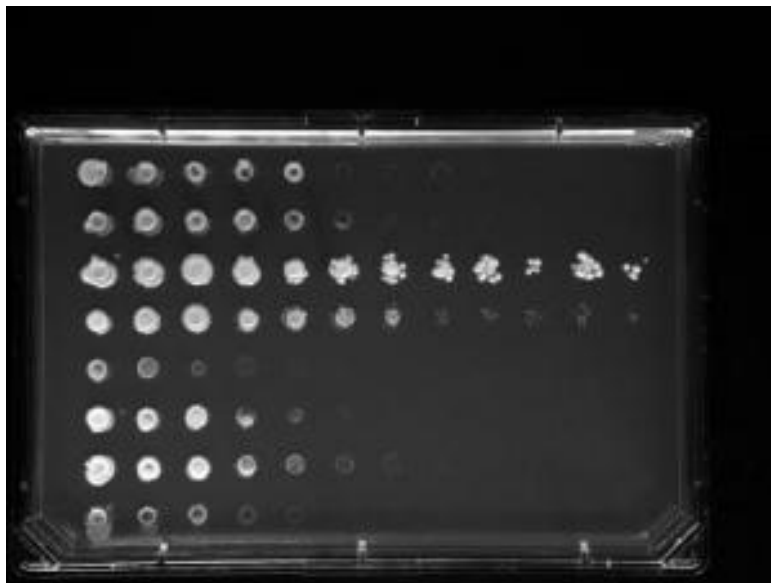
The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the Cassini-Huygens mission for NASA's Science Mission Directorate in Washington. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL.

For more information about the Cassini-Huygens mission visit: <http://www.nasa.gov/cassini> and <http://saturn.jpl.nasa.gov>.

Story Source:

Adapted from materials provided by [NASA/Jet Propulsion Laboratory](http://www.nasa.gov/cassini).
<http://www.sciencedaily.com/releases/2010/04/100414144621.htm>

Scientists Devise Way to Link Complex Traits With Underlying Genes



The plating experiment in this image shows how yeast strains vary in resistance to a drug. Different strains (horizontal rows) were grown at cell densities that decrease from left to right. Sensitive strains only are capable of growing when plated at high density, while resistant strains are capable of growing even at low density. By studying very large populations of yeast, Princeton scientists have developed a new way to identify the hidden genetic material responsible for genetically complex drug resistance traits. (Credit: Ian Ehrenreich/Kruglyak Lab)

ScienceDaily (Apr. 15, 2010) — Princeton University scientists have developed a new way to identify the hidden genetic material responsible for complex traits, a breakthrough they believe ultimately could lead to a deeper understanding of how multiple genes interact to produce everything from blue eyes to blood pressure problems.

Writing in the April 15 edition of *Nature*, scientists led by Leonid Kruglyak, a professor in Princeton's Department of Ecology and Evolutionary Biology and Lewis-Sigler Institute for Integrative Genomics, report that they developed a straightforward method for studying millions of yeast cells at the same time.

Their method allows them to identify regions of the genome that cause a specific trait in the offspring of two yeast strains that have been mated. In using such a large group, the scientists have been able to identify subtle patterns that could not be detected before.

"One of the important insights gained from research enabled by the sequencing of the human genome is that, rather than being obvious, the connections between genes and most traits are very complicated," Kruglyak said. "Our results show, however, that it is possible to identify many of the factors underlying complex traits using straightforward techniques."

The Princeton team's finding could help illuminate the answers to the current difficulties inherent in tying traits to genes, known as the "missing heritability problem," Kruglyak said.

There are some cases, he said, where scientists have identified mutations in single genes that produce a specific trait, such as a susceptibility to cystic fibrosis or Huntington's disease. In most cases, however, scientists believe that large numbers of genes working in concert produce trait variation. Some genes play a major role while others are more "quiet" but still are important. Scientists want to know all of the genes involved in producing a given complex trait, but they have not been able to find these groupings, leading to the "missing" problem.

Kruglyak was part of an expert panel the National Human Genome Research Institute convened last year on the missing heritability problem. When the Human Genome Project was completed in 2003, it provided an entire sequence of human DNA. The panel discussions centered upon the idea that, despite major technology advances made possible by the project and studies of tens of thousands of individuals, the great majority of the genetic factors responsible for differences between individuals have not yet been found.

"In many cases, the effects of genes are so small that detecting them is extremely difficult," said Ian Ehrenreich, a postdoctoral research fellow who is the first author on the Nature paper. "Under conventional methods, we just don't have the power to identify many of these genes. We knew we had to find a different way."

The method described in the paper is "a creative adaptation of existing family-based, genome-wide methodology," said Yin Yao, who is chief of the molecular and genetic epidemiology program in the division of neuroscience and basic behavioral science at the National Institute of Mental Health. She and Thomas Lehner, chief of the genomic research branch at the institute, said Kruglyak's work is highly valued and described him as a pioneer in the field of statistical genomics.

Scientists in Kruglyak's lab conduct experiments on organisms like yeast, as well as perform computational analyses, aimed at understanding how changes in DNA are shaped by molecular and evolutionary forces. They also study how these changes lead to the observable differences among individuals within a species. For this research project, the team looked to develop a process that would identify genetic associations with observable traits.

"We know in the human genome there are 20,000 genes, but I can't ask someone to point out to me which genes account for most of the variation in human height, for example, because we just don't know," Kruglyak said. "The underlying goal of what we are trying to do is both understand how complicated these patterns are and try to come up with some concrete examples where we can take some traits and nail down most of the variations, as opposed to only finding a small percentage."

Studies in model organisms like yeast -- just as in humans -- have failed to detect a large fraction of the genes believed to underlie most complex traits. So Kruglyak and his team developed a method using a sample size of yeast that went beyond the scale of any human studies. They crossed two strains of yeast, generating about 10 million offspring. Each of these progeny was genetically distinct as opposed to being a clone.

To find a subset offspring that shared a trait, the scientists grew the progeny on a chemical that causes breaks in DNA, killing most of them. They then sequenced the genomes of the few thousand yeast that survived, looking to see what genes they inherited from each parent.

Mendel's laws, which explain the principles of heredity, state that most of the genetic material should be randomly inherited from one or the other parent in a manner equivalent to a coin flip --half of the cells should have one parent's genes and half the other parent's. But, at the locations of the genes that protect yeast from the chemical, most of the cells should have genetic material from the parent with the version of the gene that produces greater resistance.

The surviving yeast cells' genomes were placed on tiny chips and scanned on automated laboratory machines, a process known as genotyping. The machines surveyed each yeast cell's genome for strategically selected markers of genetic variation. They found certain genetic variations to be significantly more frequent in the surviving yeast, serving as a powerful pointer to the regions of the genome where the genes underlying the trait resided.

The scientists repeated this experiment with other chemicals that were toxic to most of the yeast, looking again and again for skewed genetic patterns of inheritance. Each time, they were able to locate gene regions pointing to specific traits, confirming that the method worked.

Viewing their success, Ehrenreich said, "It's really been a combination of having the technology to do this genotyping precisely and also being able to survey such a large number of individuals simultaneously."

From here, the team intends to use the information it has on gene regions and markers to fine tune the method and identify the specific genes associated with each trait, and to extend the method to many other yeast strains.

Detlef Weigel, director of the Max Planck Institute for Developmental Biology in Germany, already sees additional applications for the technique. "The new work by Dr. Kruglyak and colleagues beautifully showcases how new sequencing technologies are revolutionizing genetics," he said. "While the work was carried out with yeast, I am convinced that it can be easily extended to any other genetically tractable organism, including crop plants."

Other Princeton scientists on the paper were: Noorossadat Torabi, a graduate student; Amy Caudy, a Lewis-Sigler fellow; Joshua Shapiro, a postdoctoral research fellow; Yue Jia, a research specialist; and Jonathan Kent and Stephen Martis, undergraduate students. Another author, David Gresham, who participated in the effort as a postdoctoral research fellow, is now at the Center for Genomics and Systems Biology at New York University.

The research was supported by the National Institutes of Health, a James S. McDonnell Centennial Fellowship and the Howard Hughes Medical Institute.

Story Source:

Adapted from materials provided by [Princeton University](#), via [EurekAlert!](#), a service of AAAS.

Journal Reference:

1. Ehrenreich et al. **Dissection of genetically complex traits with extremely large pools of yeast segregants.** *Nature*, 2010; 464 (7291): 1039 DOI: [10.1038/nature08923](https://doi.org/10.1038/nature08923)

<http://www.sciencedaily.com/releases/2010/04/100414152138.htm>

Environmentally Friendly Way to Produce Propylene Oxide Using Silver Nanoclusters



Argonne scientists (from left) Stefan Vajda, Larry Curtiss and Jeff Greeley have developed a new way of creating propylene that eliminates the many environmentally unfriendly by-products. (Credit: Image courtesy of DOE/Argonne National Laboratory)

ScienceDaily (Apr. 15, 2010) — Scientists at the U.S. Department of Energy's Argonne National Laboratory have identified a new class of silver-based catalysts for the production of the industrially useful chemical propylene oxide that is both environmentally friendly and less expensive.

"The production of propylene oxide has a significant amount of by-products that are harmful to the environment, including chlorinated or peroxycarboxylic waste," said chemist Stefan Vajda of Argonne's Materials Science Division and Center for Nanoscale Materials. "We have identified nanoclusters of silver as a catalyst that produce this chemical with few by-products at low temperatures."

Propylene oxide is commonly used in the creation of plastics and propylene glycols for paints, household detergents and automotive brake fluids.

The study is a result of a highly collaborative team that involved five Argonne Divisions and collaborators from the Fritz-Haber-Institut in Berlin and from the University of Illinois in Chicago, including a collaboration between the experimental effort led by Stefan Vajda and the theoretical analysis led by materials chemist Larry Curtiss and nanoscientist Jeff Greeley.

Large silver particles have been used to produce propylene oxide from propylene, but have suffered from a low selectivity or low conversion to propylene oxide, creating a large amount of carbon dioxide. Vajda discovered that nanoscale clusters of silver, consisting of both three atoms as well as larger clusters of 3.5 nanometers in size, are highly active and selective catalysts for the production of propylene oxide.

Curtiss and Greeley then modeled the underlying mechanism behind why these ultrasmall nanoparticles of silver were so effective in creating propylene oxide. They discovered that the open shell electronic structure of the silver catalysts was the impetus behind the nanoclusters selectivity.

"Propylene oxide is a building block in the creation of several other industrially relevant chemicals, but the current methods of creating it are not efficient," Curtiss said.

"This is basically a holy grail reaction," remarked Greeley. "The work opens a new chapter in the field of silver as a catalyst for propene epoxidation," added Curtiss.

Funding for this project was from the U.S. Department of Energy Office of Science and from the U.S. Air Force Office of Scientific Research. A paper on this work will be published in the April 9 issue of the journal *Science*.

Story Source:

Adapted from materials provided by [DOE/Argonne National Laboratory](#).

Journal Reference:

1. Y. Lei, F. Mehmood, S. Lee, J. Greeley, B. Lee, S. Seifert, R. E. Winans, J. W. Elam, R. J. Meyer, P. C. Redfern, D. Teschner, R. Schlögl, M. J. Pellin, L. A. Curtiss, and S. Vajda. **Increased Silver Activity for Direct Propylene Epoxidation via Subnanometer Size Effects**. *Science*, 2010; 328 (5975): 224 DOI: [10.1126/science.1185200](https://doi.org/10.1126/science.1185200)

<http://www.sciencedaily.com/releases/2010/04/100408160909.htm>

The New T. Rex: A Leech With an Affinity for Noses



This single jaw of *Tyrannobdella rex* was taken with a stereomicrograph and showing large teeth. Scale bar is 100 micrometers. (Credit: Phillips, et al. PLoS ONE 2010)

ScienceDaily (Apr. 15, 2010) — The new *T. rex* has ferociously large teeth lining a single jaw. But its length is less than 2 inches. *Tyrannobdella rex*, which means tyrant leech king, is a new species of blood sucker that lives in the remote parts of the Upper Amazon. Although its regular host remains unknown, it was discovered three years ago in Perú when a 44.5 millimeter leech was plucked from the nose of a girl who had recently been bathing in a river.

The new species, described in *PLoS ONE*, has led to revising the group of leeches that has a habit of feeding from body orifices of mammals.

"Because of our analysis of morphology and DNA, we think that *Tyrannobdella rex* is most closely related to another leech that gets into the mouths of livestock in Mexico," says Anna Phillips, a graduate student affiliated with the American Museum of Natural History and the first author of the paper. "We think the leech could feed on aquatic mammals, from their noses and mouths for example, where they could stay for weeks at a time."

Discoveries of new leech species are not uncommon occurrences. Although there are 600 to 700 species of described leeches, it is thought that there could be as many as 10,000 species throughout the world in marine, terrestrial and fresh water environments. *Tyrannobdella rex* was first brought to the attention of Mark Siddall, curator in the Division of Invertebrate Zoology at the Museum, when he received a specimen collected by Dr. Renzo Arauco-Brown, a Peruvian medical doctor from the School of Medicine at the Universidad Peruana Cayetano Heredia in Lima who was working at a clinic in Chanchamayo province. Siddall immediately recognized it as a new species. His student Alejandro Ocegüera-Figueroa described its weird morphology -- a single jaw with eight very large teeth, and extremely small genitalia.

Two earlier cases from 1997 were re-discovered from different clinics in the western Amazon, one from Lamas province and the other from Yochegua province.

The new genus and species, *Tyrannobdella rex*, has led to a revision of the phylogenetic relationships among several leech families. Both morphological and genetic data show that this species is most closely related to *Pintobdella chiapasensis*, a leech from Chiapas that is typically hosted by tapir but also infests cows. Part of the research for this paper involved a Mexican expedition by Phillips and Ocegüera-Figueroa to gather new specimens for DNA analysis. Close by on the phylogenetic tree, this group is related to leeches found in India and Taiwan like *Dinobdella ferox*, the terrible, ferocious leech that is well-known for feeding on mucus membranes and getting into various human orifices. All of these species, and others from Mexico, Africa, and the Middle East, make up the family Praobdellidae, a group of leeches that seems to share this feeding behavior and which can pose a risk to human health in certain parts of the world.

The evolutionary relationship among leeches that currently inhabit distant regions suggests that the common ancestor of this group must have lived when the continents were pressed together into a single land mass, before Pangaea broke up.

"We named it *Tyrannobdella rex* because of its enormous teeth. Besides, the earliest species in this family of these leeches no-doubt shared an environment with dinosaurs about 200 million years ago when some ancestor of our *T. rex* may have been up that other *T. rex*'s nose," says Siddall. "The new *T. rex* joins four other species that use this abbreviated name, including two Miocene fossils (a snail and a scarab beetle), a living Malaysian formicid ant, and, of course, the infamous Cretaceous theropod dinosaur that was described in 1905 by an earlier curator of the American Museum of Natural History."

In addition to Phillips, Siddall, Ocegüera-Figueroa, and Arauco-Brown, authors include Gloria P. Gomez of the Department of Microbiology at the Universidad Peruana Cayetano Heredia in Lima, María Beltrán of the Enteroparasitology Laboratory at the Peruvian Public Health Center, and Lai Y-Te of the National Taiwan University in Taipei. The research was funded by the National Science Foundation, the Stavros Niarchos fund for Expeditionary Research, a Theodore Roosevelt Memorial Grant, and a CUNY Science Fellowship.

Story Source:

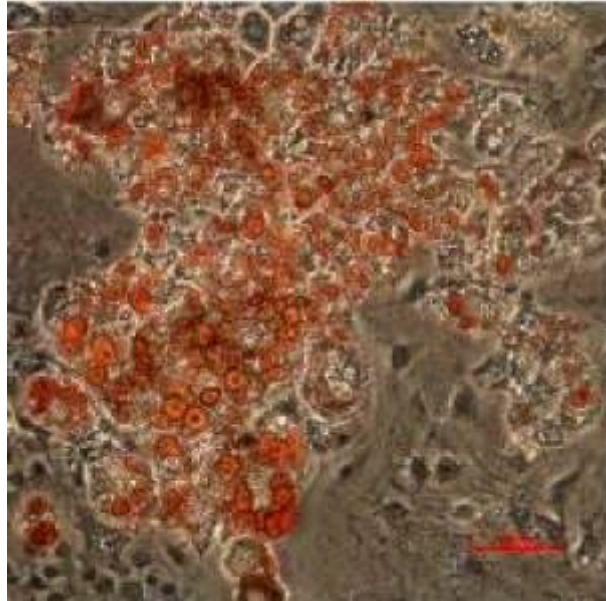
Adapted from materials provided by [American Museum of Natural History](#), via [EurekAlert!](#), a service of AAAS.

Journal Reference:

1. Anna J. Phillips, Renzo Arauco-Brown, Alejandro Ocegüera-Figueroa, Gloria P. Gomez, María Beltrán, Yi-Te Lai, Mark E. Siddall. **Tyrannobdella rex** N. Gen. N. Sp. and the Evolutionary Origins of Mucosal Leech Infestations. *PLoS ONE*, 2010; 5 (4): e10057 DOI: [10.1371/journal.pone.0010057](https://doi.org/10.1371/journal.pone.0010057)

<http://www.sciencedaily.com/releases/2010/04/100414184205.htm>

Bioengineering Tissues as an Alternative to Animal Testing



Fat cells (dyed orange) produced in a lab setting by Prof. Amit Gefen. (Credit: Image courtesy of American Friends of Tel Aviv University)

ScienceDaily (Apr. 15, 2010) — Health products with medical formulations cannot be accepted by the U.S. Food and Drug Administration without tests on animals -- a situation that arguably has ethical and moral implications. New research in the field of tissue engineering by Prof. Amit Gefen of Tel Aviv University's Faculty of Engineering holds a promise that far fewer lab animals may one day be needed for the necessary experimental trials.

Dr. Gefen's research into fat cells, published in a recent issue of *Tissue Engineering*, has led him to conclude that the necessary tissue can be produced from fat, skin, bone and muscle cells. His breakthrough study could have hundreds of applications in the pharmaceutical and medical world.

"Drugs make our lives better, and basic science is needed to push new drugs through clinical trials. But there is no doubt that an untold number of animals are sacrificed in the laboratory setting -- both in basic research and in applied conditions when testing particular molecules," says Prof. Gefen, who heads TAU's Teaching Laboratory for Cell and Tissue Engineering. As a medical researcher himself, he was dependent on animal trials for testing new hypotheses he developed for living systems -- until recently.

A more efficient road to scientific research

Bridging the worlds of biology and engineering, Prof. Gefen is now using adult rat stem cells -- cells that can be stimulated to create skin, bone, fat and muscle tissue from an animal in a laboratory setting. In his own work on studying the mechanical properties of pressure ulcers, many tissue replications were needed. His new approach no longer requires the sacrifice of large numbers of animals. When an experiment is over, not one animal life has been lost.

The use of engineered tissues, says Prof. Gefen, may also be more scientifically efficient than using those from a living source. "The model we've created offers a very reliable method for researchers asking questions about basic science, and those investigating new drugs. We can injure tissue in a very controlled environment and grow muscle tissue without blood vessels, thereby neutralizing certain variables that often cloud what's happening in an experiment."

Saving lives and improving research at the same time

Though Prof. Gefen's method may not completely eliminate the need for animal testing, as few as 5% of the animals used today will need to be sacrificed in future tests, he predicts.

"It's a matter of proportion. Our tools spare an enormous number of lives," Prof. Gefen says. He is currently bringing together a number of discrete research directions from the separate fields of mechanics, tissue engineering and biology. He is also developing a new tool for researchers to investigate fat accumulation in cells (an important question for diabetes researchers) and weight loss drugs. Among his devices is one that can tell doctors how much mechanical stress is being placed on a person's foot, buttocks or other soft tissues. Another measures how much sensation is left in a diabetic limb. For all these approaches, Prof. Gefen has adopted tissue engineering methods to use fewer animals in his trials.

"We are now able to build a number of 'simplified' living tissues quite readily, and we're able to keep them 'alive,'" Prof. Gefen says. "They're genetically similar to the biological tissue of the animal, so we can factor out irrelevant physiological elements such as bleeding and pain response in an experiment. The fact that this tissue is genetically identical and the environmental factors are so well-controlled means that we can obtain far more experimental reproducibility than with experiments done on live animals."

In the future, Prof. Gefen hopes that similar models can be based on live human tissue, but that could be a number of years down the road.

Story Source:

Adapted from materials provided by [American Friends of Tel Aviv University](#).

Journal Reference:

1. Shira Or-Tzadikario, Ran Sopher, Amit Gefen. **Quantitative Monitoring of Lipid Accumulation Over Time in Cultured Adipocytes as Function of Culture Conditions: Toward Controlled Adipose Tissue Engineering.** *Tissue Engineering Part C: Methods*, 2010: 100324175921082 DOI: [10.1089/ten.tec.2009.0755](https://doi.org/10.1089/ten.tec.2009.0755)

<http://www.sciencedaily.com/releases/2010/04/100413121330.htm>

Geraniums Could Help Control Devastating Japanese Beetle

ARS scientists have discovered that geraniums could be useful in helping control the Japanese beetle, a costly pest that feeds on nearly 300 plant species. (Credit: Image courtesy of USDA/Agricultural Research Service)

ScienceDaily (Apr. 15, 2010) — Geraniums may hold the key to controlling the devastating Japanese beetle, which feeds on nearly 300 plant species and costs the ornamental plant industry \$450 million in damage each year, according to scientists with the Agricultural Research Service (ARS).

The beetle, *Popillia japonica Newman*, can feast on a wide variety of plants, including ornamentals, soybean, maize, fruits and vegetables. But within 30 minutes of consuming geranium petals, the beetle rolls over on its back, its legs and antennae slowly twitch, and it remains paralyzed for several hours. The beetles typically recover within 24 hours when paralyzed under laboratory conditions, but they often succumb to death under field conditions after predators spot and devour the beetles while they are helpless.

ARS entomologist Chris Ranger at the agency's Application Technology Research Unit in Wooster, Ohio, is working on developing a way to use geraniums to control the beetles.



Ohio and neighboring Michigan are some of the largest producers of horticultural plants, most of them grown in greenhouses. Other research to benefit the horticultural industry includes that of Susan Stieve, curator of Ohio State University's Ornamental Plant Germplasm Center in Columbus, Ohio.

Stieve is working with OSU collaborators and horticulturist Jonathan Frantz of the ARS Greenhouse Production Research Group in Toledo, Ohio, to see whether a specialized breed of begonias can tolerate colder temperatures.

The scientists are screening the begonias at two production temperatures: 5 degrees Fahrenheit colder than normal, and 10 degrees F colder than normal. Begonias are found naturally in a wide variety of climates and altitudes -- ecological clues that can be used to identify promising germplasm. Being able to grow begonias at cooler temperatures could reduce greenhouse heating bills for ornamental growers in northern climates.

Story Source:

Adapted from materials provided by [USDA/Agricultural Research Service](http://www.usda.gov).
<http://www.sciencedaily.com/releases/2010/03/100308132134.htm>

The Onion, a Natural Alternative to Artificial Preservatives



Onions are a natural alternative to artificial preservatives, new research shows. (Credit: Santas et al.)

ScienceDaily (Apr. 14, 2010) — Some components of the onion have antioxidant and antimicrobial properties, making it possible to use this bulb for food preservation. This is demonstrated by researchers from the Polytechnic University of Cataluña (UPC) and the University of Barcelona (UB) in a study that has just been published in the *International Journal of Food Science and Technology*.

"The antioxidant and antimicrobial properties of the flavonoids of the raw onion make it a good candidate for use in food preservation," says researcher Jonathan Santas from the Department of Nutrition and Bromatology at UB and co-author of a project carried out in the Department of Agrifood Engineering and Biotechnology at UPC.

The study, that has just been published by the *International Journal of Food Science and Technology*, shows that the flavonoids of onion, in addition to having beneficial properties for health, increase the life of foods, and so "they are a natural alternative to artificial additives used in the food industry." Flavonoids are phenolic compounds (with the phenol group) which are synthesized by plants.

The results confirm that, especially the yellow variety, is "a good source of these types of substances, and there is a positive correlation between the presence of flavonoids and their antioxidant capacity."

"The onion can be effective for delaying lipid oxidation in emulsions of oil and water -a model system of foods like margarines and mayonnaises-, and it also inhibits the growth of microorganisms that alter foods," Santas indicates.

The scientific team analysed onions of the White varieties "Fuentes de Ebro" and "Caçot de Valls" and the yellow variety "Grano de Oro." Using them the researchers demonstrated that phenolic compounds in the onion prevent the development of bacteria such as *Bacillus cereus*, *Staphylococcus aureus*, *Micrococcus luteus* and *Listeria monocytogenes*, microorganisms typically associated with the deterioration of foods.

Previous studies indicate that flavonoids have beneficial effects for health due to their antioxidant, anti-inflammatory, cardioprotective, vasodilatory and anti-carcinogenic properties, making it of special interest in the prevention of chronic illnesses, such as cardiovascular illnesses, and some types of cancer.



A more stable component

The flavonoids of the onion are more stable than some of its other components, such as sulphur compounds. Traditionally it was indicated that these sulphuric compounds are good for the health, as they are responsible for the characteristic taste, aroma and lacrimogenic effects of the plant. These substances, which are very volatile and unstable, are released when the onion is damaged or cut.

The onion (*Allium cepa*) is one of the most cultivated and consumed vegetables on the planet (around 66 million tonnes in 2008, of which 1.1 million were produced in Spain, especially in Castilla-La Mancha), and one of the main ingredients of the Mediterranean diet.

Story Source:

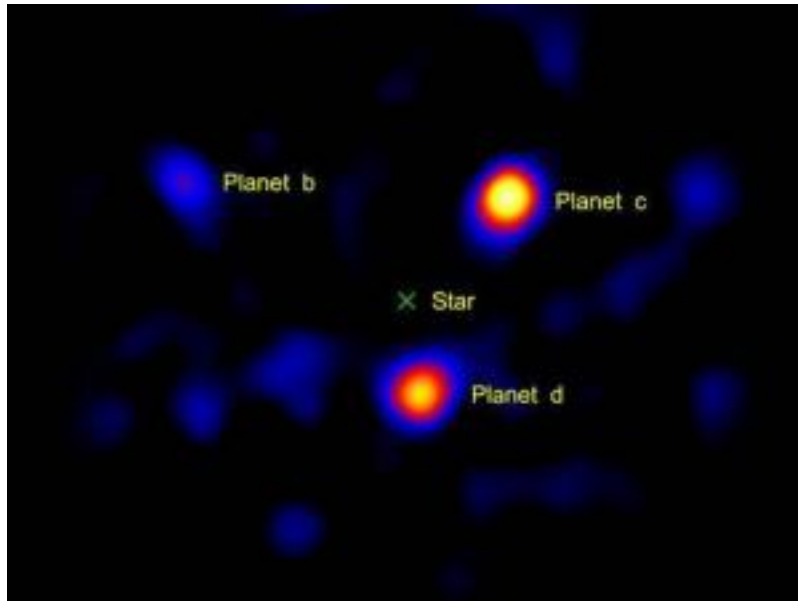
Adapted from materials provided by [FECYT - Spanish Foundation for Science and Technology](#), via [EurekAlert!](#), a service of AAAS.

Journal Reference:

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<http://www.sciencedaily.com/releases/2010/04/100414111028.htm>

Small, Ground-Based Telescope Images Three Exoplanets



This image shows the light from three planets orbiting a star 120 light-years away. The planets' star, called HR8799, is located at the spot marked with an 'X.' (Credit: NASA/JPL-Caltech/Palomar Observatory)

ScienceDaily (Apr. 14, 2010) — Astronomers have snapped a picture of three planets orbiting a star beyond our own using a modest-sized telescope on the ground. The surprising feat was accomplished by a team at NASA's Jet Propulsion Laboratory in Pasadena, Calif., using a small portion of the Palomar Observatory's Hale Telescope, north of San Diego.

The planets had been imaged previously by two of the world's biggest ground-based telescopes -- one of the two 10-meter (33-foot) telescopes of W.M. Keck Observatory and the 8.0-meter (26-foot) Gemini North Observatory, both on Mauna Kea in Hawaii. The planets, which orbit the star HR 8799, were among the very first to be directly imaged, a discovery announced in Nov. of 2008.

The new image of the planets, taken in infrared light as before, was captured using just a 1.5-meter-diameter (4.9-foot) portion of the Hale telescope's mirror. The astronomy team took painstaking efforts to push current technology to the point where such a small mirror could be used. They combined two techniques -- adaptive optics and a coronagraph -- to minimize the glare from the star and reveal the dim glow of the much fainter planets.

The picture is online at <http://www.nasa.gov/topics/universe/features/exoplanet20100414-a.html>.

"Our technique could be used on larger ground-based telescopes to image planets that are much closer to their stars, or it could be used on small space telescopes to find possible Earth-like worlds near bright stars," said Gene Serabyn, an astrophysicist at JPL and visiting associate in physics at the California Institute of Technology in Pasadena. Serabyn is lead author of a report on the findings in the April 15 issue of the journal *Nature*.

The three planets, called HR8799b, c and d, are thought to be gas giants similar to Jupiter, but more massive. They orbit their host star at roughly 24, 38 and 68 times the distance between our Earth and sun, respectively (our Jupiter resides at about five times the Earth-sun distance). It's possible that rocky worlds like Earth circle closer to the planets' star, but with current technology, they would be impossible to see under the star's glare.



The star HR 8799 is a bit more massive than our sun, and much younger, at about 60 million years, compared to our sun's approximately 4.6 billion years. It is 120 light-years away in the constellation Pegasus. This star's planetary system is still active, with bodies crashing together and kicking up dust, as recently detected by NASA's Spitzer Space Telescope (<http://spitzer.caltech.edu/news/1000-feature09-16-Unsettled-Youth-Spitzer-Observes-a-Chaotic-Planetary-System>). Like fresh-baked bread out of the oven, the planets are still warm from their formation and emit enough infrared radiation for telescopes to see.

To take a picture of HR 8799's planets, Serabyn and his colleagues first used a method called adaptive optics to reduce the amount of atmospheric blurring, or to take away the "twinkle" of the star. This technique was optimized by using only a small piece of the telescope. Once the twinkle was removed, the light from the star itself was blocked using the team's coronagraph, an instrument that selectively masks out the star. A novel "vortex coronagraph," invented by team member Dimitri Mawet of JPL, was used for this step. The final result was an image showing the light of three planets.

"The trick is to suppress the starlight without suppressing the planet light," said Serabyn.

The technique can be used to image the space lying just fractions of a degree from a star (about one degree divided by roughly 10,000). This is as close to the star as that achieved by Gemini and Keck -- telescopes that are about five and seven times larger, respectively.

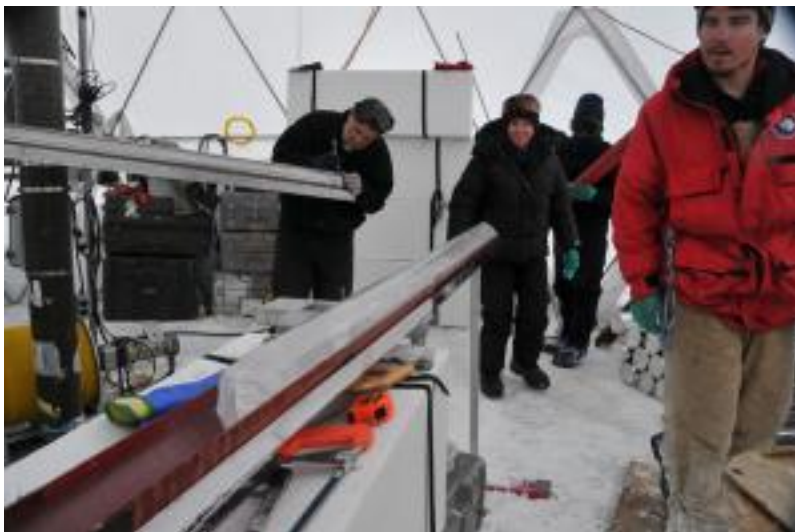
Keeping telescopes small is critical for space missions. "This is the kind of technology that could let us image other Earths," said Wesley Traub, the chief scientist for NASA's Exoplanet Exploration Program at JPL. "We are on our way toward getting a picture of another pale blue dot in space."

Story Source:

Adapted from materials provided by [NASA/Jet Propulsion Laboratory](http://www.sciencedaily.com/releases/2010/04/100414144504.htm).
<http://www.sciencedaily.com/releases/2010/04/100414144504.htm>



Deepest Core Drilled from Antarctic Peninsula; May Contain Glacial Stage Ice



Members of the LARISSA drilling project working inside the geodesic dome on the Bruce Plateau. Note the retrieved core section held on the table in the center of the image and team member Victor Zagorodnov examining the drill itself. (Credit: Ellen Mosley-Thompson, Ohio State University)

ScienceDaily (Apr. 14, 2010) — Researchers here are hopeful that the new core they drilled through an ice field on the Antarctic Peninsula will contain ice dating back into the last ice age. If so, that record should give new insight into past global climate changes. The expedition in early winter to the Bruce Plateau, an ice field straddling a narrow ridge on the northernmost tongue of the southernmost continent, yielded a core that was 445.6 meters (1,462 feet) long, the longest yet recovered from that region of Antarctica.

And while remarkably successful, the field work tested the researchers' resilience more than most of their previous expeditions. "It was the field season from hell," explained Ellen Mosley-Thompson, professor of geography at Ohio State University and leader of the project. "Everything that could go wrong did, and almost everything that could break did."

Bad weather delayed their transport to the remote drill site and snowstorms were a recurrent problem, preventing support flights in to the team. Twice, their drills became stuck deep in the ice, a drill motor broke and all three of the drill gearboxes failed, causing them to cannibalize those devices to construct a new one. Their ice core drilling effort was part of the much larger Larsen Ice Shelf System, Antarctica (LARISSA) project, designed to unravel past climate conditions in this part of the continent and monitor current ocean and atmospheric processes to better understand what likely caused portions of the massive Larsen Ice Shelf to disintegrate in 2002.

This large, interdisciplinary National Science Foundation project involved experts in the oceanography, biology and geology of the region, in addition to the ice core effort. The goal is to build a climate history of the region, hopefully determining if the ice shelf break-up was part of a long-term natural cycle or linked to the recent warming in this part of the world. After an earlier team of LARISSA researchers had used ground-penetrating radar to map the bedrock under the ice field, and identified a suitable drill site, the six-person team was flown to the Bruce Plateau from the British research station, Rothera, on the west side of the Antarctic Peninsula.

Arriving at the location, the team set up sleeping tents, a cook tent and the large geodesic dome that protected the drilling and core processing operations. The team began drilling on New Year's Eve, December 31, 2009.

Two days later, the team had drilled 140 meters (459 feet) when the drill became stuck in the ice. Leaving that drill in the ice, they began drilling a second hole and by January 21, they had retrieved 383 meters (1,256 feet) of core before that drill also became stuck.

They modified a device normally used to bale water from the drill hole to carry ethylene glycol (antifreeze) down to the top of the stuck drill. After several days, the drill broke free and drilling resumed.

"The guys on our team, Victor Zagorodnov and Vladimir Mikhaleenko, engineered through each problem that arose and were really very creative," explained Mosley-Thompson, a researcher with Ohio State's Byrd Polar Research Center.

On January 28th, the team reached the bedrock at the bottom of the ice sheet. The same day, they recovered the first drill that had become stuck in early January. Both ice cores were cut into roughly 1-meter-long segments that were packaged in plastic sleeves and cardboard tubes and stored in a snow pit adjacent to the drilling dome.

Periodically, as weather allowed, the planes would come pick up the ice-filled tubes, packed in insulated boxes, and return them to freezers at Rothera. Still stored at the Rothera station, the cores will be transferred to the U.S. research ship Nathaniel B. Palmer, shipped to the U.S. West Coast and brought to Columbus by refrigerated truck. The cores are expected to reach Ohio State by mid-summer.

When the ice arrives, researchers here will begin their analyses, measuring oxygen-isotopic ratios -- a proxy for temperature, and concentrations of dust and various chemicals -- including volcanic tracers, that collectively will reveal past climate conditions.

They're hoping for answers to some specific questions:

- Have the climate trends around the Antarctic Peninsula been similar or dissimilar to those experienced by the rest of the continent? Some evidence has suggested conditions have been considerably different;
- Was the climate on the peninsula warm during the early Holocene period, some 8,000 to 6,000 years ago, as it was elsewhere around the globe?
- Can evidence trapped in the ice cores shed light on what caused the Larsen Ice Sheet to begin to disintegrate in recent years?
- Do the cores contain ice formed during the last glacial stage, or "ice age"? If so, it might yield clues to what caused the change from those earlier, much colder climate conditions.

"My gut feeling is that the ice at the Bruce Plateau site might have built up during the latter part of the last glacial stage," Mosley-Thompson said.

"But to date, only two cores drilled in the Antarctic Peninsula, one in 2007 to 363 meters depth by the British Antarctic Survey, and ours, have the potential to answer that question and neither has been analyzed yet to make that determination."

Along with Mosley-Thompson, Zagorodnov and Mikhaleenko, other members of the team included Roberto Filippi, Thai Verzone and Felix Benjamin Vicencio Maguina.

Story Source:

Adapted from materials provided by [Ohio State University](http://www.sciencedaily.com/releases/2010/04/100412111627.htm). Original article written by Earle Holland. <http://www.sciencedaily.com/releases/2010/04/100412111627.htm>

Childhood Obesity Linked to Stiff Arteries

ScienceDaily (Apr. 14, 2010) — Children with more body fat and less endurance than their fitter, leaner counterparts have stiffer arteries at a young age, Medical College of Georgia researchers said.

Stiff arteries are a hallmark of atherosclerosis, a typically adult condition in which blood vessels become clogged.

"When children at such a young age start getting diseases only adults used to get, it's like the sky is falling," said Dr. Catherine L. Davis, clinical health psychologist in MCG's Georgia Prevention Institute and principal investigator on the study. The findings were presented during the 31st Annual Society of Behavioral Medicine Meeting.

Using a non-invasive measure of pulse wave velocity, Davis discovered that children with a greater body mass index, more body fat and less endurance had stiffer central arteries compared to leaner and fitter children. Identifying these children early could hasten preventive measures, she noted.

Her most recent National Heart, Lung and Blood Institute-funded study involves overweight or obese 8-11-year-old children, half of whom participate in aerobic exercises such as jumping rope and shooting hoops weekdays after school while the other half participate in sedentary activities, including board games and crafts.

Among a similar cohort of children, Davis also found that regular exercise decreases metabolic risks linked to cardiovascular disease and diabetes. The new study will examine the effects of exercise on nonalcoholic fatty liver disease and atherosclerosis.

Nonalcoholic fatty liver disease, which affects about 40 percent of obese children, initially is often symptomless. But its long-term risk of inflammation and scarring, which can cause liver damage and failure, also is related to hardening of the arteries.

"It's essentially another aspect of the metabolic imbalance these children are experiencing when they're overweight and inactive and is a signal they're at very high risk for diabetes," Davis said.

She already found that exercise reduces inflammation, visceral fat (a type of fat situated between the organs), body mass index and insulin levels. Children who exercised showed improvement on virtually all of those measures after just 20 to 40 minutes of daily aerobic exercise for 12 weeks. She presented the findings at the American Heart Association's Nutrition, Physical Activity and Metabolism Conference in March.

Davis is working with Dr. Sudipta Misra, MCG pediatric hepatologist, to use novel ultrasound technology instead of the traditional biopsies to gauge liver fibrosis.

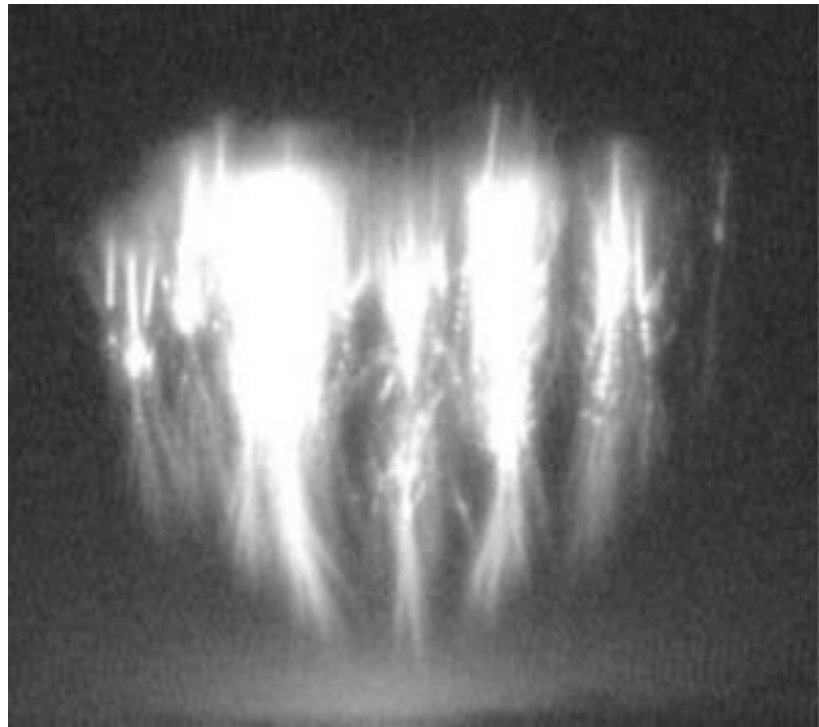
"A gentle pulse will pass through the liver, and the echo will determine if the liver is stiff (indicating disease) or nice and soft," Davis said.

Davis hopes her research will encourage programs to keep children active and hold lifestyle-related diseases at bay.

Story Source:

Adapted from materials provided by [Medical College of Georgia](http://www.medicalcollegeofgeorgia.edu), via [EurekAlert!](http://www.eurekalert.com), a service of AAAS. <http://www.sciencedaily.com/releases/2010/04/100412095536.htm>

Giant Natural Particle Accelerator Above Thunderclouds



A lightning researcher at the University of Bath has discovered that during thunderstorms, giant natural particle accelerators can form 40 km above the surface of the Earth. On Wednesday 14th April Dr. Martin Fullekrug will present his new work at the RAS National Astronomy Meeting (NAM 2010) in Glasgow. The image shows a transient airglow or 'sprite' above a thunderstorm in France in September 2009. (Credit: Serge Soula / Oscar van der Velde)

ScienceDaily (Apr. 14, 2010) — A lightning researcher at the University of Bath has discovered that during thunderstorms, giant natural particle accelerators can form 40 kilometers above the surface of the Earth.

On April 14, Dr. Martin Fullekrug presented his new work at the RAS National Astronomy Meeting (NAM 2010) in Glasgow.

When particularly intense lightning discharges in thunderstorms coincide with high-energy particles coming in from space (cosmic rays), nature provides the right conditions to form a giant particle accelerator above the thunderclouds.

The cosmic rays strip off electrons from air molecules and these electrons are accelerated upwards by the electric field of the lightning discharge. The free electrons and the lightning electric field then make up a natural particle accelerator.

The accelerated electrons then develop into a narrow particle beam which can propagate from the lowest level of the atmosphere (the troposphere), through the middle atmosphere and into near-Earth space, where the energetic electrons are trapped in the Earth's radiation belt and can eventually cause problems for orbiting satellites. These are energetic events and for the blink of an eye, the power of the electron beam can be as large as the power of a small nuclear power plant.

The trick to determining the height of one of the natural particle accelerators is to use the radio waves emitted by the particle beam, explains Dr. Fullekrug.



These radio waves were predicted by his co-worker Dr. Robert Roussel-Dupré using computer simulations at the Los Alamos National Laboratory supercomputer facility.

A team of European scientists, from Denmark, France, Spain and the UK helped to detect the intense lightning discharges in southern France which set up the particle accelerator. They monitored the area above thunderstorms with video cameras and reported lightning discharges which were strong enough to produce transient airglows above thunderstorms known as sprites. A small fraction of these sprites were found to coincide with the particle beams.

The zone above thunderstorms has been a suspected natural particle accelerator since the Scottish physicist and Nobel Prize winner Charles Thomson Rees Wilson speculated about lightning discharges above these storms in 1925.

In the next few years five different planned space missions (the TARANIS, ASIM, CHIBIS, IBUKI and FIREFLY satellites) will be able to measure the energetic particle beams directly.

Dr Fullekrug comments: "It's intriguing to see that nature creates particle accelerators just a few miles above our heads. Once these new missions study them in more detail from space we should get a far better idea of how they actually work. They provide a fascinating example of the interaction between the Earth and the wider Universe."

Story Source:

Adapted from materials provided by Royal Astronomical Society (RAS). Original article written by Robert Massey.

<http://www.sciencedaily.com/releases/2010/04/100413202850.htm>



Only Known Living Population of Rare Dwarf Lemur Discovered



Sibree's dwarf lemur. The elusive species was "rediscovered" a century after its first sighting. (Credit: Image courtesy of McGill University)

ScienceDaily (Apr. 14, 2010) — Researchers have discovered the world's only known living population of Sibree's Dwarf Lemur, a rare lemur known only in eastern Madagascar. The discovery of approximately a thousand of these lemurs was made by Mitchell Irwin, a Research Associate at McGill University, and colleagues from the German Primate Centre in Göttingen Germany; the University of Antananarivo in Madagascar; and the University of Massachusetts.

The species was first discovered in Madagascar in 1896, but this tiny, nocturnal dwarf lemur was never studied throughout the 20th century. Following the destruction of its only known rainforest habitat, scientists had no idea whether the species still existed in the wild -- or even whether it was a distinct species. The study will be published in the current issue of the journal *Molecular Phylogenetics and Evolution*.

Irwin first observed dwarf lemurs at Tsinjoarivo, Madagascar, in 2001, shortly after setting up a long-term rainforest research site. "Even then we knew something was unusual about them," Irwin said. "Instead of the rainforest species we expected to see, our lemur resembled the species known from dry western forests, only it was much larger."

In 2006, Irwin began collaborating with Marina Blanco, University of Massachusetts at Amherst who trapped dwarf lemurs at several sites throughout Tsinjoarivo. This work led to the further surprise that two morphologically distinct dwarf lemur species were present, living side-by-side. Further work by geneticist Linn Groeneveld, German Primate Center confirmed the existence of the more common Crossley's dwarf lemur, and the elusive Sibree's dwarf lemur.

The new study showed the mystery lemurs to be very similar to the only known specimen of Sibree's dwarf lemur, now in The Natural History Museum in London, England. Genetic analysis shows the mystery lemurs to be highly distinct from all other known species. In fact, the genetic analyses confirmed

that of the four known dwarf lemur species, this is the most genetically unique and probably closely resembles the ancestor that gave rise to the other species.

Irwin is hopeful that this new discovery will lead to increased conservation efforts. "On one hand, you want to get the taxonomy right, just to determine how many dwarf lemur species are out there," said Irwin. But protecting this newly rediscovered species from extinction in a country ravaged by habitat destruction is the next challenge. "Without the recognition provided by this study, this species probably would have gone extinct in the near future. Protecting its only known population and determining how many individuals are left are now top priorities, especially since much of this region's forests have already disappeared."

Story Source:

Adapted from materials provided by [McGill University](#).

Journal Reference:

1. Linn F. Groeneveld, Marina B. Blanco, Jean-Luc Raharison, Vololonirina Rahalinarivo, Rodin M. Rasoloarison, Peter M. Kappeler, Laurie R. Godfrey, Mitchell T. Irwin. **MtDNA and nDNA corroborate existence of sympatric dwarf lemur species at Tsinjoarivo, eastern Madagascar.** *Molecular Phylogenetics and Evolution*, (in press) DOI: [10.1016/j.ympev.2010.03.004](https://doi.org/10.1016/j.ympev.2010.03.004)

<http://www.sciencedaily.com/releases/2010/04/100413162914.htm>

Blinded by Jealousy?

ScienceDaily (Apr. 14, 2010) — Jealousy really is "blinding," according to a new study by two University of Delaware psychology professors. They found that women who were made to feel jealous were so distracted by unpleasant emotional images they became unable to spot targets they were trying to find.

The researchers suggest that their results reveal something profound about social relationships and perception: It has long been known that the emotions involved in social relationships affect mental and physical health, but now it appears that social emotions can literally affect what we see.

The research appears in the April issue of the journal *Emotion*, published by the American Psychological Association. UD psychology professors Steven Most and Jean-Philippe Laurenceau and their colleagues tested heterosexual romantic couples in a lab experiment. The romantic partners sat near each other at separate computers. The woman was asked to detect targets (pictures of landscapes) amid rapid streams of images, while trying to ignore occasional emotionally unpleasant (gruesome or graphic) images.

The man was asked to rate the attractiveness of landscapes that appeared on his screen. Partway through the experiment, the experimenter announced the male partner would now rate the attractiveness of other single women.

At the end, the females were asked how uneasy they felt about their partner rating other women's attractiveness.

The finding? The more jealous the women felt, the more they were so distracted by unpleasant images that they could not see the targets. This relationship between jealousy and "emotion-induced blindness" emerged only during the time that the male partner was rating other women, helping rule out baseline differences in performance among the women.

The researchers don't yet know what will happen when the roles are reversed; in these experiments, it was always the women who searched for a target. Future research might reveal whether men tend to be less or more blinded by jealousy.

Story Source:

Adapted from materials provided by [University of Delaware](http://www.universityofdelaware.edu/), via [EurekAlert!](http://www.eurekalert.com/), a service of AAAS.
<http://www.sciencedaily.com/releases/2010/04/100413160859.htm>

New Material Is a Breakthrough in Magnetism; Step Closer to 'Magnetic Monopole'

Physicists have created a structure that acts like a single pole of a magnet -- a step closer to isolating a 'magnetic monopole.' (Credit: Image courtesy of Imperial College London)

ScienceDaily (Apr. 14, 2010) —
Researchers from Imperial College London have created a structure that acts like a single pole of a magnet, a feat that has evaded scientists for decades.

The researchers say their new *Nature Physics* study takes them a step closer to isolating a 'magnetic monopole.'

Magnets have two magnetic poles, north and south. 'Like' poles, such as north and north, repel one another and 'opposite' poles, such as north and south, attract. Whichever way a magnet is cut, it will always have these two poles.

Scientists have theorised for many years that it must be possible to isolate a 'magnetic monopole', either north or south on its own, but until recently researchers have been unable to show this in experiments.

Researchers at Imperial have now enabled tiny nano-sized magnets to behave like magnetic monopoles, by arranging them in a honeycomb structure.

In late 2009, various teams of scientists reported they had created monopole-like behaviour in a material called 'spin ice'. In these materials, monopoles form only at extremely low temperatures of -270 degrees Celsius.

The Imperial researchers' structure contains magnetic monopoles at room temperature.

Story Source:

Adapted from materials provided by [Imperial College London](#). Original article written by Lucy Goodchild.

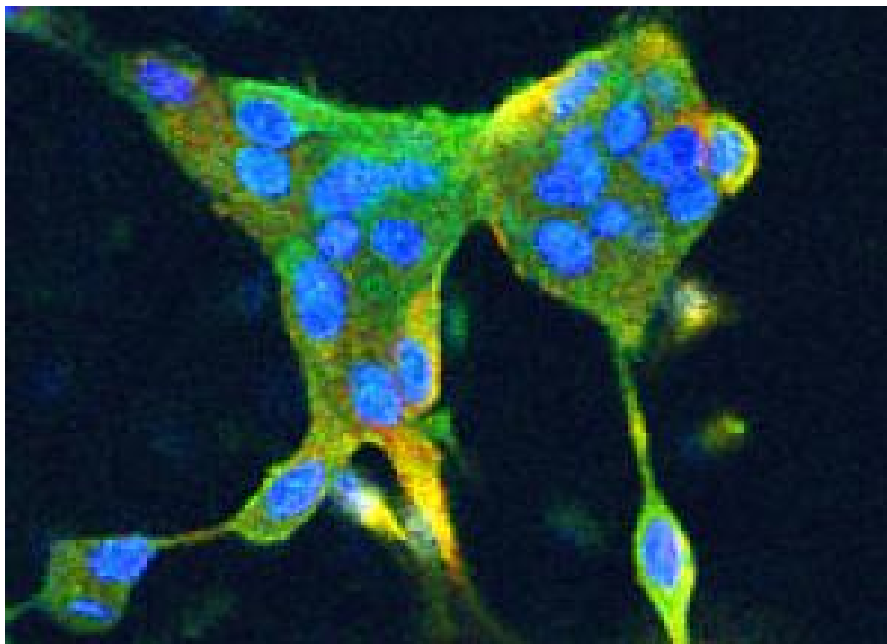


Journal Reference:

1. S. Ladak, D. E. Read, G. K. Perkins, L. F. Cohen & W. R. Branford. **Direct observation of magnetic monopole defects in an artificial spin-ice system.** *Nature Physics*, 2010; DOI: [10.1038/nphys1628](https://doi.org/10.1038/nphys1628)

<http://www.sciencedaily.com/releases/2010/04/100413212833.htm>

New Tool to Help Study Prostate Cancer Developed



Van Andel Research Institute (VARI) researchers have developed a new method to better study the cells that line and protect the prostate in relation to the development of cancer. Using the model, they found that normal cells and cancer cells depend on different factors to survive, which could aid in discovering how to target cancer cells without affecting normal cells when developing treatments. (Credit: Image courtesy of Van Andel Research Institute)

ScienceDaily (Apr. 14, 2010) — Van Andel Research Institute (VARI) researchers have developed a new method to better study the cells that line and protect the prostate in relation to the development of cancer. Using the model, they found that normal cells and cancer cells depend on different factors to survive, which could aid in discovering how to target cancer cells without affecting normal cells when developing treatments.

Prostate cancer is the most common form of cancer in men, with more than 192,000 new cases and more than 27,000 deaths reported in the United States in 2009 (Source: National Cancer Institute).

"This new model will serve as a valuable tool for understanding secretory prostate epithelial cells, which until now have not been available for extensive analysis," said VARI Scientific Investigator Cindy Miranti, Ph.D., whose lab published its study in a recent issue of the *Journal of Cell Science*.

Epithelial cells line and protect the internal and external organs and structures of the body. The prostate contains two types of epithelial cells, basal and secretory, and prostate cancers arise from abnormal cells as they are converted from basal into secretory cells in the body.

Prior to this study, scientists were able to culture basal cells, but not secretory cells. Using the model, researchers found that, unlike cancer cells, normal secretory cells are not dependent on the male sex hormone androgen for survival, but are dependent for survival on binding to each other via the protein E-cadherin.

"Prostate cancers are dependent on androgen for survival, so we were interested in whether normal secretory prostate epithelial cells also depend on androgen," said Dr. Miranti. "However, the cell culture models available didn't allow us to study secretory cells, so we generated them by reconstructing the natural conversion process from basal into secretory cells in a petri dish."



The differences in how cancer cells and normal cells control their survival can be exploited to develop therapies that preferentially target the tumor cells, but not the normal cells.

"This cell model will be extremely useful to investigators who are interested in studying the cell biology of prostate cancer as well as benign prostate hyperplasia," said Donald J. Tindall, Ph.D., Professor, Director & Vice Chair of Urologic Research at the Mayo Clinic College of Medicine. "Such studies should facilitate our understanding of the cellular mechanisms involved in progression of these diseases and may lead to new prognostic capabilities and therapeutic interventions."

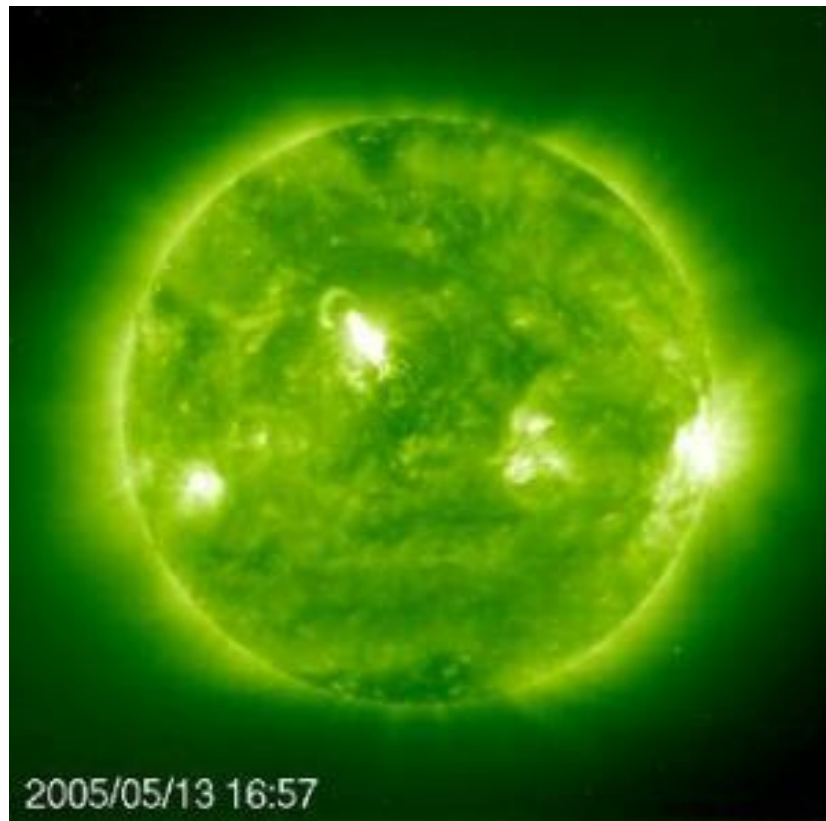
This work was supported by a Prostate Cancer Research Program Training Award from the Department of Defense Congressionally Directed Medical Research Programs (CDMRP) of the U.S. Army Medical Research and Materiel Command. Approximately 72% of this project has been funded by federal funds in the amount of \$97,801. The remaining 28% has been contributed by Van Andel Research Institute in the approximate amount of \$38,367.

Story Source:

Adapted from materials provided by [Van Andel Research Institute](http://www.sciencedaily.com/releases/2010/03/100311141220.htm).
<http://www.sciencedaily.com/releases/2010/03/100311141220.htm>



Solar Explosion Tracked All the Way from the Sun to Earth



The Sun imaged with the EIT instrument on the SOHO spacecraft. The eruption event studied by the team originated in the brighter active region slightly above and to the left of centre. (Credit: CDAW/ESA/NASA/Solar Physics)

ScienceDaily (Apr. 14, 2010) — An international group of solar and space scientists has built the most complete picture yet of the full impact of a large solar eruption, using instruments on the ground and in space to trace its journey from the Sun to Earth.

Dr Mario Bisi of Aberystwyth University presented the team's results, which include detailed images, on the 13th of April at the RAS National Astronomy Meeting in Glasgow.

Coronal mass ejections (CMEs) are giant eruptions of the Sun's atmosphere from its 'surface' which are ejected out into space. They are many times larger than Earth and typically contain over a billion tonnes of matter. CMEs travel away from the Sun at speeds of up to several million kilometres an hour (between 200 and 2000+ kilometres per second) and can impact on comets, asteroids, and planets -- including Earth.

Our planet is normally protected from CMEs by the terrestrial magnetic field, but the twisted magnetic fields carried by CMEs can break through this protective shield, causing particles to stream down over Earth's polar regions. They can also lead to displays of the northern and southern lights (aurora borealis and australis). But CMEs can also have less appealing consequences such as power outages on the ground, interference with communications, damage to Earth-orbiting satellites, as well as being a possible health risk to any astronauts who happen to be conducting a "space walk" at the time an event interacts with Earth.

The scientists came together to study one event in great detail in an attempt to gain an enhanced understanding of CMEs, to gain an insight into their prediction and more importantly, when and how they may interact with and cause effects on and in the vicinity of Earth. After a painstaking analysis of the observations and measurements from all the different spacecraft and facilities on the ground, they have assembled an incredibly detailed picture.

They chose an eruption which lifted off from the Sun on the 13th May 2005 and headed in our direction. As it approached our planet, it interacted with the solar wind, the material which is constantly flowing out from the Sun at relatively steady rates. This particular CME deflected some of the solar wind northward as it headed in the direction of Earth and was itself slowed as a result of the solar wind ahead of it.

The mass expelled in the event was not that different from many other solar eruptions but its magnetic field was very intense, and as such, this event caused the largest geomagnetic storm (rapid changes in the shape and strength of Earth's magnetic field) during the year 2005. At that time solar activity was in decline from the maximum period between the years 2002 and 2004 to the recent minimum between 2008 and 2010.

Data used to conduct this study came from many sources and in many forms. These included images of the Sun and its vicinity from instruments aboard the SOHO spacecraft; radio-burst data from the Wind spacecraft, GOES satellite, and ground-based instrumentation, solar wind measurements from the SOHO, ACE, and Wind spacecraft and measurements of Earth's magnetosphere and ionosphere from the Cluster and IMAGE spacecraft and ground-based magnetometers.

At the start of the event the outburst was thought to be a 'simple CME', but the unprecedented coverage revealed it to be extremely complex, with many small parts which when looked at individually, make up the bigger picture from its launch through to its arrival at Earth. The event was caused by multiple flare-type events near the solar surface which released magnetic energy and mass out into the solar wind in the form of the CME.

The material then travelled through interplanetary space out towards Earth (in this phase it is described as an Interplanetary CME or ICME). With the magnetic field frozen inside it in the form of a 'flux rope', or 'magnetic cloud' (MC), when the ICME reached our planet it began to compress Earth's magnetic field in to a distance of about 38000 km (in comparison, the field on the Sun-ward side would normally extend to 95000 km). The arrival of the CME also caused some minor effects on satellites and communications as well as wonderful auroral displays.

Dr Bisi sees the new analysis as a key step forward in our understanding of the way solar eruptions develop and affect Earth. "We learned an enormous amount from the 2005 event. Even an apparently simple CME turned out to be incredibly complex. And the intense reaction of Earth's magnetic field to a fast but not particularly powerful event was a surprise."

"We're now also much better prepared for future events and if nothing else know how to handle such a large amount of data. All of this adds to our knowledge of the way CMEs originate, develop, and sometimes even have an impact on everyday life."

Story Source:

Adapted from materials provided by Royal Astronomical Society (RAS). Original article written by Robert Massey.

<http://www.sciencedaily.com/releases/2010/04/100413202852.htm>

Early hopes from three-way IVF

By Fergus Walsh
Medical correspondent, BBC News

Embryos containing DNA from a man and two women have been created by scientists at Newcastle University.

They say their research, published in the journal Nature, has the potential to help mothers with rare genetic disorders have healthy children.

The aim is to prevent damaged DNA in mitochondria - the "batteries" which power the cell - from being passed on by the mother.

IVF clinics are not currently permitted to carry out the procedure.

Around one in 200 children is born each year with mutations in the mitochondrial DNA.



In most cases this causes only mild disease, sometimes without symptoms.

But around one in 6,500 children is born with mitochondrial disease, which can cause serious and often fatal conditions, including muscular weakness, blindness and heart failure.

“ If the Newcastle results are taken forward to medical application, they need to be applied under very strict controls, and only where serious disease is otherwise likely to result ”

Dr Donald Bruce, ethics expert

The scientists have developed a technique which would potentially allow them to replace defective mitochondria during IVF.

The research, funded by the Muscular Dystrophy Campaign, Medical Research Council and the Wellcome Trust, used newly fertilised eggs left over from IVF treatment.

The nuclei from the father's sperm and the mother's egg, which contain the parents' DNA, were removed, leaving behind the faulty mitochondria.

The nuclei were put into another egg from which the nucleus had been removed, but which retained its mitochondria.

This new embryo contained the genes from both parents plus a tiny amount of mitochondrial DNA from the donor egg.

"What we've done is like changing the battery on a laptop," said lead author Professor Doug Turnbull.

"The energy supply now works properly, but none of the information on the hard drive has been changed.

"A child born using this method would have correctly functioning mitochondria, but in every other respect would get all their genetic information from their father and mother."

Legal hurdles

The Newcastle team created a total of 80 embryos. These were cultured for up to eight days in the laboratory under the terms of a licence granted by the Human Fertilisation and Embryology Authority (HFEA).

Mitochondria

- Tiny bodies in cells that act like batteries to produce energy
- Contain their own DNA, which is distinct from nuclear DNA
- Contains only 37 genes compared with around 23,000 in the cell nucleus

The team is planning further studies to check the safety and efficiency of the procedure.

The law currently prevents the technique being used in fertility treatment. A licence to carry out the study was refused on two occasions before being granted five years ago.

Ethics expert, Dr Donald Bruce, former director of the Society, Religion and Technology Project of the Church of Scotland, said the research raised important ethical issues as well as potential risks.

He said: "If the Newcastle results are taken forward to medical application, they need to be applied under very strict controls, and only where serious disease is otherwise likely to result."

The work raised several ethical problems, he explained, including safety risks, children with DNA from two mothers, and making genetic changes to unborn children.

'Too late'

The Newcastle team say that the DNA from the second woman would be only a few genes, compared with at least 23,000 genes inherited from a parent.

But although the genetic changes produced by the technique would be small, they would be permanent and passed on down the generations.

Sharon Bernardi, aged 44, from Sunderland, inherited mitochondrial disease from her mother. The condition has claimed the lives of six of her children, all of them dying within a few days of birth.

Her only surviving child, Edward, who is 20, suffers from a serious mitochondrial disease and needs constant care.

Sharon said: "It was devastating to lose my children, and this happened again and again. I feel lucky to have Edward, but he has very serious health problems as a result of the faulty DNA.

"It will be too late for me but it would be amazing if scientists can prevent this in the future so that others don't have to go through what I did."

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8619533.stm>

Published: 2010/04/14 17:00:40 GMT

Video games 'hardly affect sleep'

Playing a video game before bed appears to have only a mild effect on how long it takes a male teenager to fall asleep, a preliminary study suggests.



Those who played a relatively violent video game took only marginally longer to fall asleep than those who watched a relaxing nature documentary.

The Journal of Clinical Sleep Medicine study pitted Call of Duty 4 against March of the Penguins.

There is little scientific data on the effects of video games on sleep.

But anecdotal evidence has long suggested that playing such games at night could have a detrimental impact on sleep because the stimulation keeps one awake even after the game has ceased.

To test the theory, researchers at Flinders University in Adelaide, Australia, recruited 13 males between the aged of 14 and 18 with no existing sleep problems.

Soldiers v penguins

On one night they sat beneath the covers playing Call of Duty 4: Modern Warfare for 50 minutes - a game in which the player takes on the role of an SAS recruit among others carrying out various violent missions.

“ What happens to the teen's virtual character could begin to evoke feelings of anxiety or frustration that could have larger effects on their sleep ”

Michael Gradisar Study leader

On a second night a week later they spent an equal amount of time watching March of the Penguins, the award-winning French documentary which follows the yearly journey of the emperor penguins of Antarctica across vast swathes of ice to their breeding grounds.

Three fell asleep while watching the film, while none dozed off while playing Call of Duty.

The majority of the teenagers did take longer to fall asleep after playing the video game, but most were asleep within seven-and-a-half minutes - only four minutes longer than when they watched March of the Penguins.

"We purposefully chose a very tranquil film to contrast against the very stimulating effect of playing a violent video game in the hope of producing the greatest effect on sleep," said Michael Gradisar, a senior lecturer in clinical child psychology who led the research.

"We were surprised that playing the violent video game did not lead to a much longer time taken to fall asleep."

However he acknowledged there were limitations to the small study, notably that very few teenagers who played would limit their playing time to just 50 minutes a night.

"With greater time invested there could be a greater emotional investment in the game. What happens to the teen's virtual character could begin to evoke feelings of anxiety or frustration that could have larger effects on their sleep."

And however tranquil March of the Penguins may be, some sleep experts urge no screen activity before bed - be it computer, game or TV.

There has been increasing focus on the quality and length of young people's sleep, in part because of the impact on concentration but also amid mounting suggestions that poor sleep may be contributing to obesity levels.

A French study published this week found that young men ate 25% more calories a day when they had four hours of sleep the night before compared to when they had slept for eight hours.

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/-/2/hi/health/8620949.stm>

Published: 2010/04/14 23:00:36 GMT

Parasite 'a growing stroke risk'

A tropical parasitic disease is becoming an increasingly common cause of stroke, experts say.



Some 18m people worldwide have Chagas disease, caused by an infection with the parasite *Trypanosoma cruzi*.

Recently, researchers discovered having this disease puts the individual at increased risk of stroke due to heart complications and blood clots.

In *Lancet Neurology*, the Spanish team warns of a growing but neglected stroke burden as the infected population ages.

Chagas disease is endemic in Latin America.

“ Its prevalence in these communities is worrying ”

Sharlin Ahmed of The Stroke Association

But emigration of millions of people to Europe, North America, Japan and Australia over the past 20 years has also made Chagas disease an emerging health problem in these countries with the potential to cause a substantial disease burden, say the investigators.

One study estimates that more than 300,000 Latin American immigrants with Chagas disease could be living in the US.

Another problem, say the research team, is that many patients with Chagas disease do not know they are infected.

Silent killer



Dr Francisco Javier Carod-Artal from the Virgen de la Luz hospital in Cuenca said a recent study showed that in just under half of Chagas patients treated for a stroke had not yet been diagnosed with the infection.

He and colleague Joaquim Gascon, from Barcelona, say stroke patients from endemic countries should be screened for Chagas.

And doctors and the public need to be made aware of the increased risk of stroke with this disease.

"Clinical trials are needed," they add, to assess if blood thinning drugs might help prevent stroke in Chagas.

Sharlin Ahmed of the Stroke Association said Chagas disease could lead to severe heart problems, which then put people at risk of stroke.

"The heart becomes weaker and is unable to pump blood as strongly resulting in the formation of blood clots, which if transported to the brain can cause a stroke.

"Its prevalence in these communities is worrying and it is vital that education on the symptoms of stroke is included as part of ongoing health awareness programs."

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8617267.stm>

Published: 2010/04/14 00:59:14 GMT

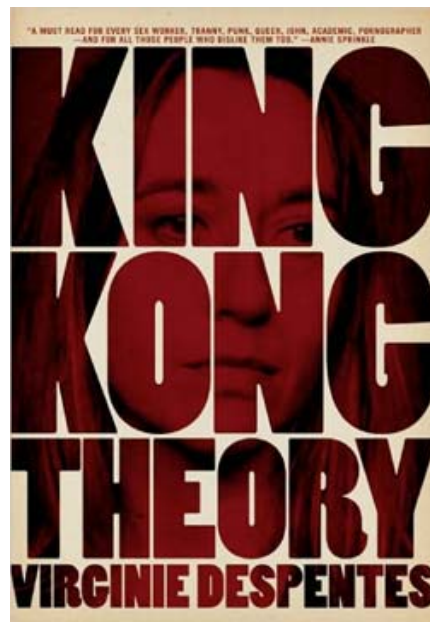


Beauty and the Beast

On the unacceptability of ugliness.

By Jessa Crispin

There are many lies you will hear when you're newly single. Your girlfriends — the ones that have been married since they were in their early 20s and can't have dinner without their husbands, meaning you are forever making reservations for three — will tell you that you'll find someone the minute you stop thinking about it. Of course they don't mean once you give up. The difference is the frequency with which you shave your legs, how long your "Buy Ten Pedicures & Get One Free!" card goes unpunched, and whether you allow yourself to be approachable on the subway or just bury your face in a book. Your (loving, well meaning) friends are setting up a Zeno-like paradox in which you are supposed to care enough to "turn on your inner light!" and actually brush your hair every day, and at the same time not care on a conscious level or be aware of the indifference of the male sex. After six months of Not Caring, if you lash out at their bullshit, well, that's is just proof that you *do care* and are thereby not following the rules.



- ***King Kong Theory* by Virginie Despentes. 160 pages. Feminist Press at CUNY. \$15.95.**
- ***Baba Yaga Laid an Egg* by Dubravka Ugresic. 256 pages. Canongate Books Ltd. \$20.99.**

The other lie, which you will hear from your male friends, is that a woman can get laid whenever she wants. This is meant to be comforting, I think. A woman permits and denies access to sex, and all she has to do is want it bad enough. Bad enough to make the effort, of course. One can't just have a line of men appear on your doorstep just by trying to attract them all *The Secret*-like, although Craigslist can come in handy for that. But it, too, is a lie. There is such a thing as being unfuckable and female, whether because of weight or lack of femininity or age or poverty or that desperation you start to emit in waves after a few years without anyone trying to get into a dark corner. Because if you are unfuckable — and let's use the right word here — if you are a *hag*, you have no voice.

"I think it's wonderful that there are also women who love to seduce, who know how to seduce, others who know how to get a husband... I am not remotely ashamed of not being a hot sexy number but I am livid that — as a girl who doesn't attract men — I am constantly made to feel as if I shouldn't even be around." So writes Virginie Despentes in *King Kong Theory: A Manifesto for Women Who Can't or Won't Obey the Rules*.

There are no ugly girls, no old hags in popular culture. Every week we are supposed to pretend like Tina Fey is ugly on *30 Rock*, that America Ferrera was hideous even beneath the glasses and the braces on *Ugly Betty*, that every homely girl is a pair of contact lenses, short dress, and good haircut away from being prom queen.

If that is the epitome of public ugliness, well, then the actual hags are way below the line of visibility. Women are allowed to have some power, but only if they're hot. So we have 12-year-old girls in thongs and an emphasis on perfect femininity that we haven't seen in decades. Despentes writes, "The overbranding of femininity is an apology for the loss of masculine prerogative, a way of reassuring

ourselves by reassuring them... 'Don't be afraid of us.'" Of course no matter how hot you are now, no matter how many times you go under the knife to restore tautness and smoothness, if you live long enough, you'll find yourself slowly disappearing. In *Baba Yaga Laid an Egg* — a meditation on aging, crones versus hags, and invisibility — Dubravka Ugresic writes, "You don't see them at first. Then suddenly a random detail snags your attention like a stray mouse: an old lady's handbag, a stocking slipping down a leg, bunching up on a bulging ankle..." All of these invisible old women, widows and spinsters, fending for themselves. We are in Baba Yaga's territory here, the crazy old Russian folk tale of the wise but cruel, decrepit yet horny hag who rides around in a mortar and pestle.

If you find yourself in Baba Yaga's house it never ends, even if in your invisibility you manage to change the world. Even if you are centuries-old-dead. Emily Dickinson and Jane Austen are still routinely referred to as "spinsters" in articles and essays about their work. In this very publication, a writer recently said of Cleopatra's nose that "today [it] would make her an advertisement for cosmetic surgery." Cleopatra! If that's what dead ladies are going through, imagine carrying the same nose on your face all day every day, a living breathing creature in front of other living breathing creatures. It's easier to follow the rules than to overcome your shame of being unfuckable. Yet there are consequences for making an offering of your original face to the outside world. Ugresic writes, "By assenting to plastic surgery on their noses — and rhinoplasty was the first massively popular cosmetic procedure — women consciously disown their (own) symbolic power and submit to a male concept of beauty. The folk saying 'My nose — my pride' expresses the judgment that... by disowning their noses, women disown their pride and power." Best to try to fit into that sliver of respectability: not invisible, but not too brash or memorable, either. From *King Kong Theory*: "Since time immemorial, leaving the cage has been brutally punished." Let's think for one second that it's possible Jung's collective unconscious does exist. What exactly do you think the deaths of a million women — the unfuckable, the hags, the spinsters, the disposable — over hundreds of years during the witch hunts dumped into the water there? I have this useless bit of information jammed into my head: Feminism is to blame for serial killers. It was an interview with some serial killer expert, and the question was, "Why are there so many more serial killers today than there were 100 years ago?" I don't remember who the expert was or the name of the publication, but the information is branded into my brain: it's a male response to his inability to control women who no longer stay in their place. The Green River serial killer targeted prostitutes because "no one would miss them." No wonder women don't want to be marginalized, invisible, and unprotected because unwanted. While hitchhiking, Despentes was raped at gunpoint by three men. Ugresic was labeled a witch and forced into exile for speaking her mind about the nationalist turn her native Croatia was taking. And here they are, and they are calling for revolution. From *Baba Yaga*:

So let us imagine women, those Baba Yagas, plucking the swords from beneath their heads and sallying forth to settle the accounts?! For every smack in the face, every rape, every affront, every hurt, every drop of spittle on their faces. Can we imagine all those Indian brides and widows rising from the ashes where they were burned alive and going forth into the world with drawn swords in their hands?! Let's try to imagine all those invisible women peering out between their woven bars, from their dark bunker-burkas... Let's imagine a million-strong army of "madwomen," homeless women, beggar women, women with faces scorched by acid, because self-styled righteous men took offence at the expression on a bare female face... Let's now imagine all those women lifting their robes and drawing their swords. Despentes titled the introduction to *King Kong Theory* "A Gun for Every Girl." And next time? Next time your friend is finding herself two years into involuntary celibacy, wandering the woods around Baba Yaga's house without a male protector, forget the platitudes about soul mates or chastising her for not trying anymore, and instead of a gift certificate for a facial and a bikini wax, get that girl a gun. And copies of *King Kong Theory* and *Baba Yaga Laid an Egg*. Because the marginalized and the de-sexualized may lack the power of seduction, but if you're going to be moving in the margins, voluntarily or not, it's best to be forearmed. It's easy to pick off one prostitute, one old coot at a time, but if Hags International raised an army branch, it wouldn't just make that life less terrifying or less dangerous. It'd be fucking hot. • 14 April 2010

Jessa Crispin is editor and founder of [Bookslut.com](http://www.bookslut.com). She currently resides in Berlin, but spent many years in Chicago.

<http://www.thesmartset.com/article/article04141001.aspx>

Aspirin 'reduces migraine pain'

Taking aspirin can reduce the pain of a migraine headache within two hours for over 50% of people, research says.



The results come from a Cochrane Systematic Review using data from 13 studies.

Researchers found that a high dose of aspirin also reduces nausea, vomiting and sensitivity to light or sound - other symptoms of a migraine.

But experts stress aspirin can cause side effects and some people will still need to rely on migraine medication.

Pain relief

In the review, which looked at the data from 4,222 participants, researchers found that severe or moderate migraine headache pain was completely relieved in one in four people.

This happens within two hours, by taking a single dose of 900-1,000mg aspirin alone (a standard tablet is 300mg).

In comparison, one in 10 had complete pain relief taking placebo.

And for one in two people, the headache pain was reduced to no worse than mild pain, compared to one in three taking placebo.

Researchers also found that a combination of aspirin plus an anti-emetic, which stops people feeling sick, was particularly good at reducing the migraine symptoms of nausea and vomiting. However, it did not produce any greater pain relief.

“Migraine sufferers should consult their GP to get a firm diagnosis of their headache even if over the counter medication is effective”

Wendy Thomas, The Migraine Trust

Co-author of the study, Sheena Derry, who works in pain research at the John Radcliffe Hospital in Oxford, said the use of aspirin would not be an effective therapy for everyone with acute migraine attacks.

"This is largely down to genetic differences," she said. "Different people respond to different drugs in different ways, and at different times."



Researchers say that further studies are needed to establish the effectiveness of aspirin compared with other drugs.

Firm diagnosis

"We are currently doing reviews of how paracetamol and ibuprofen impact on migraines," Ms Derry added.

Taking aspirin resulted in only a small increase in mostly mild side effects in the participants in the studies.

However the authors said: "While short-term use of aspirin probably does not pose a large problem the potential for gastrointestinal harm with long-term use is well documented."

Wendy Thomas, chief executive of The Migraine Trust, said the first stop for migraine sufferers should always be their GP, "to get a firm diagnosis of their headache even if they find over the counter medication to be effective".

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8617254.stm>

Published: 2010/04/14 00:49:47 GMT

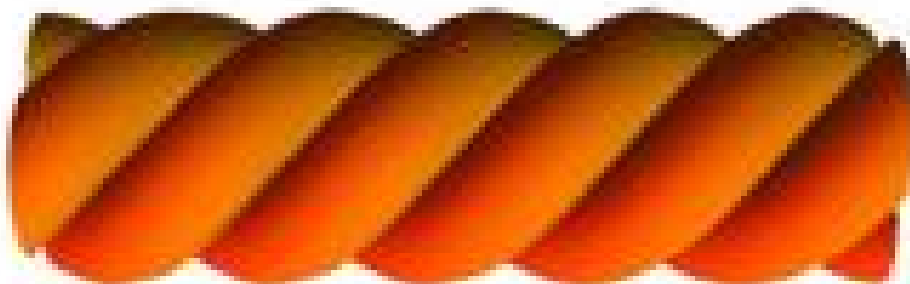


Physicists untangle the geometry of rope

Twine, string, cord or cable, it all winds up the same way

By [Alexandra Witze](#)

Web edition : Tuesday, April 13th, 2010



Twisted skein A triple-stranded rope, like the one shown here, reaches a “zero-twist configuration” when its individual strands are rotated to their maximum — resulting in a rope that’s 68 percent shorter than the length of its individual strands, no matter the material. Jakob Bohr and Kasper Olsen/Technical University of Denmark

Researchers have unraveled the mathematics that keeps ropes from unwinding.

The trick lies in the number of times each strand in a rope is twisted, say Jakob Bohr and Kasper Olsen, physicists at the Technical University of Denmark in Lyngby. Their paper was posted online April 6 at [arXiv.org](#).

In a traditional rope, each individual strand is twisted as much as possible in one direction. The twisted strands are then wound together in a spiral shape called a helix, which itself rotates in the opposite direction. The interlocking of these twists and countertwists gives the rope strength so that when yanked, it does not unwind.

By plotting a rope’s length against the number of twistings in each strand, Bohr and Olsen discovered that there is a maximum number of times each strand can be twisted — resulting in what they call the “zero-twist point” for the overall rope. A good rope is always in the zero-twist configuration.

A triple-stranded rope in the zero-twist configuration, they found, is 68 percent the length of its untwisted component strands.

That figure stays the same no matter what the rope is made of, says Bohr. “If you have an old Egyptian rope or one made by modern petrochemical industries, they all look the same,” he says. “It is beyond material — it is geometry.”

Physicist Henrik Flyvbjerg of the Technical University of Denmark, who was not on the research team but is familiar with the work, agrees: The rule of the zero-twist point is universal.



“If there is life on other planets in the solar systems, their rope makers must follow the same rules,” Flyvbjerg says.

The work also explains why rope makers need to feed in the strands at angles higher than that of the final zero-twist structure, Bohr says; the tensile stress in the rope will automatically adjust the newly added portion to the zero-twist configuration. For example, medieval rope-making tools used a grooved wooden cone to feed strands in this way.

Because rope manufacturers have perfected their art over time, the new study is unlikely to result in any new and better ways to make rope, Bohr says. But the research does illuminate the physical principles underlying how and why rope can be made functional.

“The rules of the ancient craft of laying ropes find today a scientific explanation,” declares Piotr Pieranski, a physicist at the Poznan University of Technology in Poland who was not involved in the work.

Bohr and Olsen came to the question of rope winding via their research on the behavior of DNA, a rope-like molecule. In earlier work, they showed that DNA doesn’t try to unwind when stretched; it does the opposite, “overwinding” itself by rotating even further in the same direction as its helical winding. And that got them thinking about how rope holds itself together.

http://www.sciencenews.org/view/generic/id/58291/title/Physicists_untangle_the_geometry_of_rope

Backward planets may have flipped into place

Reverse orbits could make Earthlike neighbors unlikely

By [Lisa Grossman](#)

Web edition : Tuesday, April 13th, 2010



Common differenceA suite of new exoplanets that orbit their stars backward shows that these bodies aren't so unusual.ESO/L. Calçada

A bevy of backward-orbiting exoplanets could challenge theories of planet formation, new research suggests. The planets' wonky orbits might also rule out the presence of Earthlike bodies in some planetary systems.

The wrong-way planets got where they are by cartwheeling over their stars' heads, Andrew Collier Cameron of the University of St Andrews in Scotland proposed in an April 13 presentation at the Royal Astronomical Society's National Astronomy Meeting in Glasgow, Scotland.

Planets are thought to form from the disk of gas and dust that surrounds a young star. Because the star and the disk both coalesce from the same cloud of material, theory holds that both should spin in the same direction — and so should any planets that arise. The “disk migration theory” posits that some planets should end up close to their stars by gently migrating inward over time, maintaining an orbital plane in line with the star's rotation.

Last summer, astronomers first discovered a handful of planets that threw that idea for a loop. These planets orbit backward, opposite to the direction of their stars' spin ([SN: 9/12/09, p. 12](#)). And other newly discovered planets that did have “forward” orbits were tilted 20 degrees or more with respect to the plane of the stellar disk where they were born.

These planets belong to a class of extrasolar planets called hot Jupiters — giants that sit scorchingly close to their stars.

“If I had to stick my neck out and make a prediction, it’s probably not a good idea to go looking for terrestrial planets in systems that have hot Jupiters in them,” Cameron says.

Cameron and his colleagues think a single mechanism pushed the tilted and backwards planets into their offbeat orbits and also drew them close to their stars. If these slanted orbits are common, it could be a death knell for the migration theory, says study coauthor Didier Queloz of the Geneva Observatory.

“Migration cannot produce misaligned systems,” Queloz says. The new study brings the total number of planets for which astronomers have angle data up to 27. Of those many are misaligned, with half tilted at steep angles and six orbiting backwards.

“Since most hot Jupiters are indeed misaligned, most cannot be formed by migrations,” Queloz says. “We’re kind of killing this first idea of migration.”

The more likely explanation, the researchers say, is the Kozai mechanism. In this scenario, a second, distant large body like a planet or a companion star gravitationally perturbs a planet’s orbit. The orbital plane can flip over the top of the star like a jump rope. When the orbit is flipped more than 90 degrees, the planet is orbiting backwards. At the same time, the shape of the orbit squishes and stretches like a rubber band. As the planet gets closer to the star, its orbit gets more circular, and the cartwheels become less dramatic. When the orbit finally settles into a circle near the star the tilt freezes.

Earlier research predicted that most orbits of giant planets perturbed by the Kozai mechanism should end up tilted around either 40 degrees — a forward but slanted orbit — or 140 degrees — a backwards orbit.

“That looks very much like what we’re now observing,” Cameron says. “It looks almost too good to be true.”

Some critics think he’s right — it *is* too good to be true. “I think they’re eliminating the standard mechanism of disk migration prematurely,” says Adam Burrows of Princeton University. Some combination of migration, scatter and the Kozai mechanism is still possible, he says. “Their data isn’t that definitive to eliminate any other possibilities.”

Astronomers had hoped that smaller, more Earthlike planets could be hiding in the neighborhoods of hot Jupiters, but the recent slug of orbital data suggests that may be unlikely. The giant planets’ orbits can take hundreds of thousands of years to settle, “during which you have a rampaging Jupiter on a cometlike crazy tumbling orbit, which would simply fling any remaining debris out of the system,” Cameron says.

http://www.sciencenews.org/view/generic/id/58275/title/Backward_planets_may_have_flipped_into_place

Mutation effects often depend on genetic milieu

Other genes at least as important as environment, study shows

By [Tina Hesman Saey](#)

Web edition : Tuesday, April 13th, 2010



Wing and a mutationA mutation in the *scalloped* gene alters the wings of two different strains of fruit flies from their normal, or wild-type, appearance (left). The genetic background of the Oregon R (center) and Samarkand (right) strains was the main determining factor in how the mutation affected the wing shape. I. Dworkin

The genetic differences that make each individual unique may be even more important than scientists previously thought, a new study of fruit flies suggests.

In two strains of the fruit fly *Drosophila melanogaster*, underlying genetic makeup outweighs any other factor in dictating how a specific mutation will affect wing shape, geneticists Sudarshan Chari and Ian Dworkin of Michigan State University in East Lansing reported in Washington, D.C., April 8 at the 51st Annual *Drosophila* Research Conference.

Researchers have known that the environment has the potential to influence a mutation's effects. But the new study suggests that a vast majority of the time, the interaction between two mutations is influenced by all the other genetic variations in an organism's DNA — what scientists refer to as genetic background.

To determine the importance of genetic background, Chari and Dworkin compared the effect of a mutation in a gene called *scalloped* on two common laboratory strains of *Drosophila melanogaster*. The Oregon R strain is often used in genetic experiments, while Samarkand-strain flies are common research subjects for evolution and ecology experiments.

The wings of both flies are normally long and oval. But while a mutation in the *scalloped* gene turns the wings of Oregon R flies into stubby, multilobed nubbins, the same mutation in Samarkand flies results in long, rectangular wings.

Interactions between *scalloped* and another gene called *optomotor blind* are also influenced by the genetic background, the researchers discovered.

But it wasn't clear if underlying genetic makeup is important only in rare cases or if it is a major factor influencing how a mutation may affect an organism. The researchers did experiments to find other mutations that interact with *scalloped* and alter wing shape. About 75 percent of those mutations had differing effects in the two strains. The rest of the mutations had the same effect in both strains.

If the finding holds in humans, it could help explain why some people who carry a particular genetic variant develop disease while others with the same variant stay well, or why drugs have variable effects in different people.



This places a number on the importance of genetic diversity, says David Angelini, a developmental geneticist at American University in Washington, D.C. But the magnitude of the effect may vary from species to species, he says.

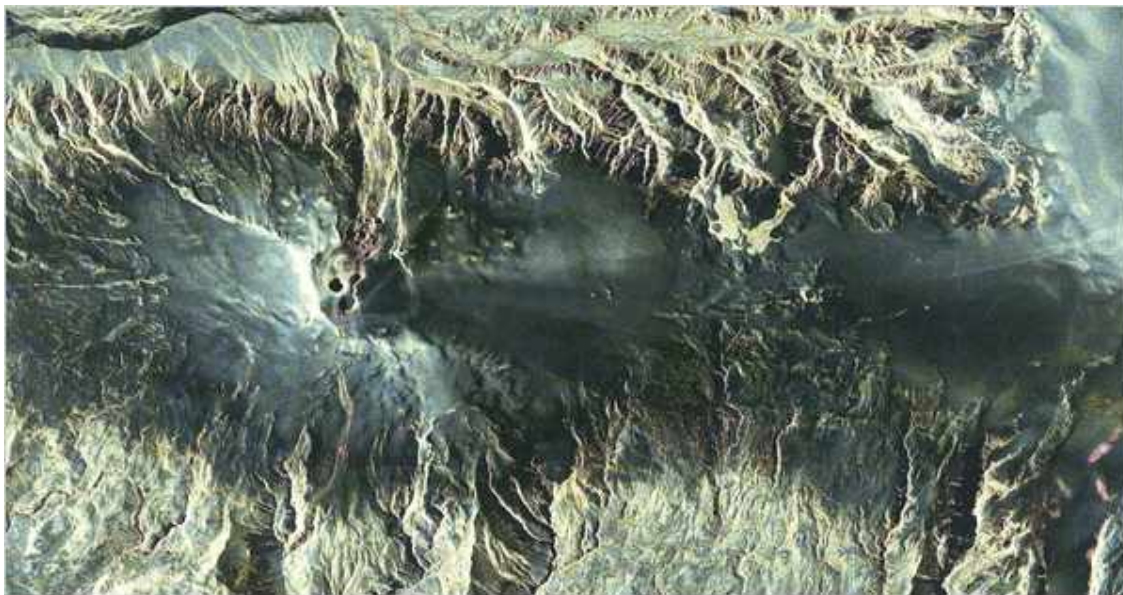
“Genetic diversity is going to be important in all organisms. Exactly what the number will be, I don’t know,” Angelini says.

Scientists who perform experiments in only one strain of fruit fly may not uncover all the genetic interactions that shape an organism, he says. “What it might mean is that we are some missing some players in these interactions.”

http://www.sciencenews.org/view/generic/id/58272/title/Mutation_effects_often_depend_on_genetic_milieu

Experts Seek Clues to How Long Eruption Will Go On

By HENRY FOUNTAIN and ELISABETH ROSENTHAL



The volcanic eruption that has disrupted air travel in Europe for two days shows no signs of abating, an Icelandic geophysicist said Friday.

"It is quite variable, it goes up and down a bit," Pall Einarsson of the Institute of Earth Sciences at the University of Iceland, said in a telephone interview. "But on the whole the vigor of the eruption seems very little changed."

As the volcano, near Iceland's south-central coast, spewed more ash into the atmosphere on Friday, the big question for scientists was how long the eruption might continue, particularly at its current strength. The answer will go a long way toward determining any lasting impact on air travel, climate and health. But Dr. Einarsson and others said that, for now, the question was unanswerable.

"There is really no way to know that," Dr. Einarsson said. "We have quite good measurements to know what's going on. We can see where the stresses are changing due to earthquakes and so on. But how it will develop is a very difficult thing to say."

Jennie Gilbert, a professor at the University of Lancaster in England who has studied Icelandic volcanoes, said: "I don't think there's any general feeling for how this volcano will operate. My best guess is that it will be explosive for a few days and then might continue at a reduced level."

Iceland, which is situated along the mid-Atlantic ridge, where the spreading of two tectonic plates allows molten rock, or magma, to rise, has many volcanoes, and their eruptions often follow a pattern, Dr. Einarsson said.

"Usually they are most vigorous in the beginning," he said. "But this volcano is very different from that." Both the current eruption, which began on Wednesday, and an earlier one on the volcano's flank that began March 20, started very quietly, he said.

Dr. Einarsson said researchers were monitoring the volcano for indications that the eruption was continuing or starting to taper off. Tremors, for example, are a sign that hot magma is still coming up through the volcano, cracking the ground as it moves. Slight deformations in the volcano's surface, as measured by Global Positioning System devices, suggest that gases are continuing to build up below as they bubble out of the magma, causing the surface to bulge.

One complicating factor is that the eruption is occurring under an ice sheet, the Eyjafjallajökull glacier. Melting of the underside of the ice has caused flooding, forcing evacuations and destroying bridges and roads.

But of more concern for the rest of Europe is how the meltwater might be affecting the volcano and the ash it is generating.

"Certainly the fact that the eruption is going on underneath the ice sheet is likely to have an effect on the explosivity of the volcano," said Colin Macpherson, a professor in the department of earth science at Durham University in England.



He likened the situation to putting a hot pan under the kitchen faucet — as the hot magma hits the cold water it rapidly creates steam. If the steam is contained by rock, the pressure can build up and a localized explosion can occur.

Dr. Gilbert said the presence of water can also affect the characteristics of the sand-like ash that is produced. As the molten rock hits the cold water it is rapidly quenched, fusing into a glassy material. Then when the pressure builds up and the volcano explodes, this material breaks up into very fine particles. “It’s like this sort of shattering effect,” she said.

In Britain, the Department of Health’s Health Protection Agency warned that some low level of these particles might settle to ground level, particularly in Northern Scotland — although they might well not be visible to the naked eye.

As a precaution, the agency on Friday advised people — particularly those with respiratory conditions like asthma and emphysema — to have medicines on hand and to limit outdoor activities if they noted signs that particles were present. They might include a dusty haze or a smell of rotten eggs as well as symptoms like irritated eyes, runny nose or dry cough.

“Mainly this concerns people with lung conditions who can find the dust difficult to deal with,” said Dr. Michael Clark, an agency spokesperson. “Any volcanic rock tends to be sharp particles, so they can trigger asthmatic reactions.” The ash also contains chemicals that can irritate airways, like sulfur dioxide, he said.

But, he added, there was so far no evidence of increased emergency room visits, and the agency was not worried about any long-term health problems from exposure to the ash. “What we’re talking about are early acute effects,” he said, “nothing long term.”

<http://www.nytimes.com/2010/04/17/science/17plume.html?ref=science>



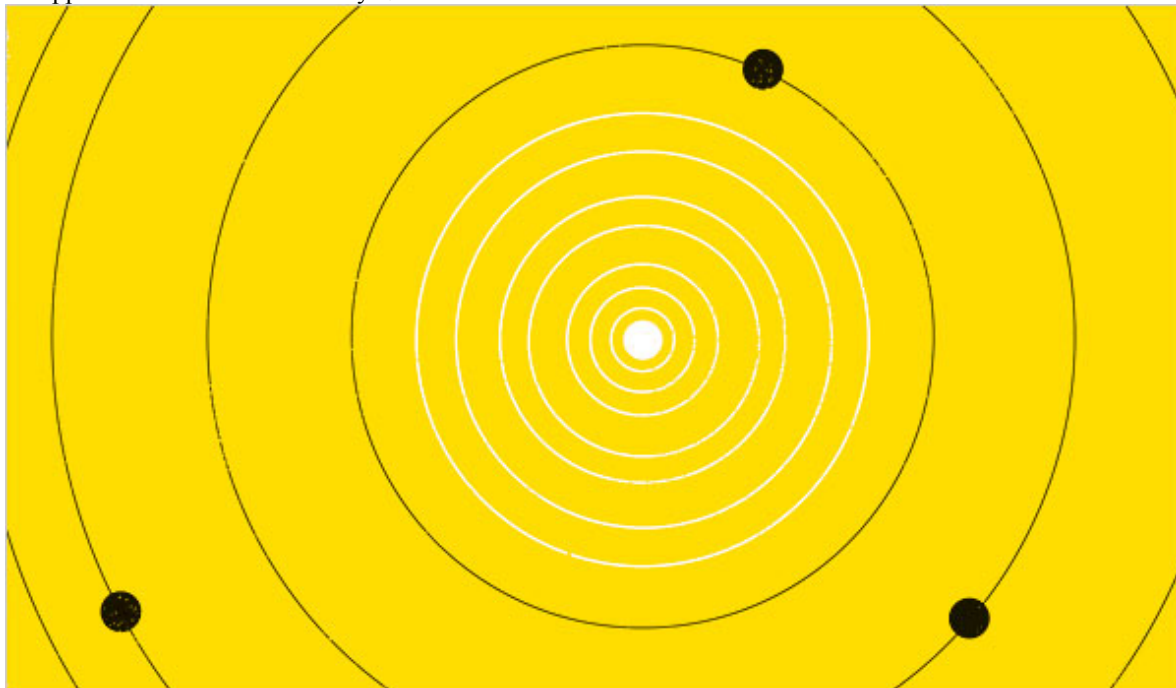
Human Orbits

By WALTER KIRN

SOLAR

By Ian McEwan

287 pp. Nan A. Talese/Doubleday. \$26.95



According to the perverse aesthetics of artistic guilty pleasure, certain books and movies are so bad — so crudely conceived, despicably motivated and atrociously executed — that they’re actually rather good. “Solar,” the new novel by [Ian McEwan](#), is just the opposite: a book so good — so ingeniously designed, irreproachably high-minded and skillfully brought off — that it’s actually quite bad. Instead of being awful yet absorbing, it’s impeccable yet numbing, achieving the sort of superbly wrought inertia of a Romanesque cathedral. There’s so little wrong with it that there’s nothing particularly right about it, either. It’s impressive to behold but something of a virtuous pain to read.

“Solar” tells the story of Michael Beard, a [Nobel Prize](#)-winning British physicist who’s stumbling comfortably through middle age as a purveyor of expensive lectures, a member of prestigious boards and panels, and the titular head of a government-funded institute devoted to combating [global warming](#) with innovative “green” power technologies for which Beard holds out little hope, although he’s happy to be paid for pushing them.

The man is a cynic, by nature and by experience. His prominence and the lifestyle it affords him (which resembles a never-ending Mensa society wine-and-cheese reception marked by lofty table talk and naughty cloakroom trysts) stem from a youthful scientific insight that he never repeated and knows he never will. Perhaps to escape the self-loathing of his predicament, he’s let himself become a monster: a five-times-married, childless, overweight, heavy-drinking, amoral solipsist who holds to the pre-Copernican belief that the cosmos revolves around his ego. Like the hedonistic eggheads who populate the works of Bellow and Roth, he’s ripe for comeuppance on every front: romantic, professional, spiritual and physical. How, by whom and with what symbolic overtones these abundant rebukes will be delivered are the only questions the story leaves open.

What makes “Solar” such a noble nullity is that it answers these challenges so easily, with such a quotient of stress-free mastery that they feel less like challenges than like problems in a literary exam the author has devised as a means of proving his own prowess. This may be Beard’s story, but it’s McEwan’s

vehicle, constructed to let him pull all the showy turns of the major contemporary novelist and ambitious public intellectual: personalizing the political, politicizing the personal and poeticizing everything else. The tip-off is Beard, who's endowed by his creator with precisely the vices — apathy, slothfulness, gluttony and hypocrisy — that afflict the society the book condemns, threatening to cook the human race in the heat-trapping gases released by its own arrogance. Because a fictional character can exhibit only so much awareness of his own thematic utility, Beard doesn't notice any of this, merely regarding himself as a colorful eccentric. But readers will see him for what he is: a figure so stuffed with philosophical straw that he can barely simulate lifelike movement.

There's little that's lifelike about "Solar," despite its relentless pretensions to relevance. The story is structured like a crossword puzzle, in rows and columns of little empty boxes that McEwan helps us fill in by providing witty riddles whose solutions flatter our intelligence. The process feels pleasantly antic and cerebral, but in time its premeditated quality becomes preposterously artificial, as do its swerves into heady slapstick humor.

Take Beard's extended voyage to the Arctic, where he and an elite collection of other Davos-level thinkers get to witness, at first hand, the shrinking ice floes and threatened animal species of Planet Oil and Coal.

The sequence occasions much calculated zaniness, none of it surprising or spontaneous, most of it as dreary as a diagram. The do-gooders' snowmobiles, belching CO₂, arouse the ire of an endangered polar bear, while the subzero air that penetrates his clothing cools Beard's overheated libido to the point that his male organ freezes and snaps off — or so he believes until he finally undresses and we learn that the object in his pants (nothing but a frigid tube of lip salve) is really Beard's unconscious terror of castration made materially manifest. In the meantime, a storage room for boots and gloves devolves into a model Hobbesian jungle as the supposedly liberal junketeers steal the best gear for themselves, placing their own survival before the group's and putting the lie to man's altruistic posturing.

These scenes are typical of "Solar," a novel assembled from high-concept vignettes and grad-school-level thought experiments formulated as dramatic set pieces. Taken one by one, they're tolerable, but when they're placed end-to-end to form a narrative they cross a crucial boundary where the willing suspension of disbelief turns into the stubborn resistance to instruction. The McEwan of "Solar" can't just tell a tale, he has to teach a truth at the same time, ceaselessly, compulsively. His confidence in his supreme facility seems to convince him that we won't see the trick no matter how often he plays it.

When Beard returns to London from the Arctic, he finds his brightest disciple from the institute lounging in his house, where the kid has been sleeping with Beard's faithless wife, whom we've already learned has been carrying on with the burly, violence-prone builder recently responsible for remodeling the place.

The primal confrontation that we expect, and that any competent novelist could deliver, quickly mutates into a heady colloquy that only McEwan would dare attempt. The guilty fornicator begs Beard's forgiveness not by appealing to him on human grounds but by arguing that their shared concern with environmental degradation obliges them to set aside emotion and go on to work together for the welfare of the planet. Then the disciple takes a slapstick tumble, fatally impaling his neck on the edge of a glass table after slipping on — of all the unsteady surfaces that could be brought to use — a polar-bear-skin rug. Does such a coincidental catastrophe even qualify as irony? Or is this just a joke? But aren't jokes funny? What genre is McEwan working in, anyway? Geek tragedy? Before the reader bogs down, Beard snatches up a hefty hammer left behind by rival No. 1, the surly, jealous workman, and incriminatingly smears it with the blood of rival No. 2.

This act is an atom-splitting plot device, unleashing shock waves of suspense from what thus far has been a character study masking a succession of tutorials on moral philosophy and other weighty matters. The collision of heraldic rug and handy hammer changes everything. It leads to the builder's unjust incarceration, raising the prospect that he'll take revenge someday and end Beard's run in honorifics. It also gives the faded genius the opportunity to expropriate the younger man's research into a revolutionary

solar cell that might — if enough money can be raised to perfect its design and finance its mass production — elevate Beard from a scientific has-been to a global savior.

Between the winding of this great clock and the striking of its gigantic chimes, McEwan's novel of *Decline and Fall* becomes a case study in *Decline and Stall*, lapsing into a display of his finesse as a spinner of silken sentences and composer of sonatalike paragraphs. The performance is an exquisite bore, with all the overchoreographed dullness of a touring ice ballet cast with off-season Olympic skaters. Sexual moments abound, but their bravado blend of lyricism and clinical detail is queasy-making. So too, and in a similar way, is this description of a toilet bowl over which a nauseated Beard leans in the hope of relieving his discomfort. To help himself vomit, he looks down and imagines "the chocolate arabesque of another man's excrement." This fine flourish of scatology is not only verbally overripe but also, if one pictures its real-life referent, visually inaccurate. "Arabesque," which denotes the sinuous, interlaced forms of Islamic design, may be a gourmet literary word that's wryly incongruous in this filthy setting, but it doesn't describe a smear of fecal matter.

In "Solar," McEwan's Cordon Bleu prose is like that: a buttery, rich sauce ladled onto overcooked, dry meat to help readers swallow an otherwise indigestible meal. Beard's fall is at once so generic and so contrived that its climax feels neither inevitable nor cathartic but, rather, overbearing and schematic. In the remote New Mexico desert, where Beard is only moments away from throwing the switch on the magical machine that may stave off the world's destruction, all the fates and furies he's aroused during his life of cautionary carelessness rush in exactly on schedule. The long-awaited disaster stands revealed as the last phase of a carefully crafted lesson plan.

Walter Kirn is a regular contributor to the Book Review and the author, most recently, of a memoir, "Lost in the Meritocracy." His 2001 novel "Up in the Air" is the basis for the film of the same name.

<http://www.nytimes.com/2010/04/18/books/review/Kirn-t.html?nl=books&emc=booksupdateema1>

Eve of Destruction**By DANIEL GROSS****THE BIG SHORT****Inside the Doomsday Machine**

By Michael Lewis

266 pp. W. W. Norton & Company. \$27.95

THE END OF WALL STREET

By Roger Lowenstein

339 pp. The Penguin Press. \$27.95

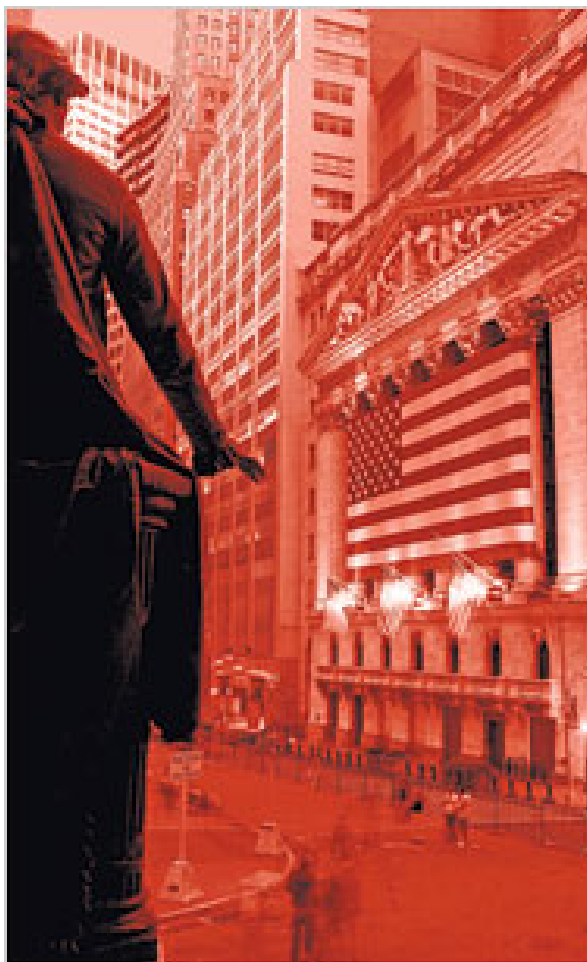
Eighteen months after the failure of Lehman Brothers, writers seeking to make sense of the debacle have had their say: the first responders and e-booksters, the polemicists and shoe-leather reporters, the boardroom whisperers and I-told-you-so scolds, the would-be screenwriters and former policy makers. For those fortunate enough to be on the receiving end of publishers' entreaties, a certain amount of Panic of 2008 fatigue has set in. I've read at least five times that the JPMorgan Chase chief executive Jamie Dimon's 52nd-birthday dinner at the midtown Greek restaurant Avra was interrupted by a call about Bear Stearns's travails.

So if you're showing up late to this party, you had better come either with a strikingly original take that offers an enhanced understanding of the debacle or with an elegantly constructed narrative that covers the story from origins to bailout. Michael Lewis has done the former; Roger Lowenstein has done the latter.

Since his first book, the autobiographical "Liar's Poker," Lewis has tackled big, engaging stories — the 1980s Wall Street collapse, the 1996 presidential campaign, the dot-com boom, the use of quantitative analysis in baseball — by finding and developing characters whose personal narratives reveal a larger truth. He's done it again. The story of the crash is, overwhelmingly, a tale of failure.

But Lewis managed to find quirky investors who minted fortunes by making unpopular, calculated bets on a financial meltdown. Ditching the aloof irony of his earliest works, he constructs a story that is funny, incisive, profanity-laced and illuminating — full of difficult-to-like underdogs whose vindication and enrichment we end up cheering.

"The Big Short" is a group portrait of misfits at the margins of the business. In Wall Street parlance, going short means betting that stocks — or any other financial instrument — will fall. And in 2005 and 2006, shorting the massive, heavily subsidized housing and lending industries required not just fortitude, but a kind of sociopathy. Steve Eisman, a graduate of the University of Pennsylvania and Harvard Law School, "identified with the little guy and the underdog without ever exactly being one himself." The death of an infant son and his experience analyzing the early subprime lending industry had made him suspicious, dyspeptic, contrarian. "Even on Wall Street, people think he's rude and obnoxious and aggressive," his wife says. Soon after setting up a small hedge fund in 2004, backed by Morgan Stanley,



Eisman looked for ways to bet against the crop of bold new subprime lenders. He decided the best way to do so was by shorting the debt backed by newly issued mortgages.

In California, Michael Burry reached a similar conclusion. Burry, who had an eye removed when he was a toddler, had difficulty picking up on social cues and was prone to obsessions. “His mind had no temperate zone; he was either possessed by a subject or not interested in it at all.” Later in life, when he learned his son had Asperger’s syndrome, Burry realized the description fit him perfectly. “Only someone who has Asperger’s would read a subprime mortgage bond prospectus,” he said. Trained as a physician, Burry began posting on stock message boards in the 1990s and became a value-investing savant. Starting an investment fund with \$40,000 of his own cash, he won backing from prominent New York investors and achieved excellent results. In early 2005, Burry, like Eisman, was seeking to short the subprime market. But how?

At the time, investors could bet against bonds of corporations through credit-default swaps — contracts that function as insurance policies that pay off in the event of default. But credit-default swaps didn’t exist on subprime bonds. Burry pestered Wall Street firms until Deutsche Bank agreed to sell him swaps on a batch of subprime bonds in May 2005. By July, he had amassed credit-default swaps on \$750 million in bonds. Deutsche Bank’s Greg Lippmann, a living caricature of a bond trader, was at the middle of this booming market. “If you mapped the spread of the idea, as you might a virus, most of the lines pointed back to Lippmann,” Lewis writes. “He was Patient Zero.”

We follow Burry, Eisman and other investors as they build their credit-default-swap positions. As our guide, Lewis provides the best description to date of the way mortgages, and side bets on the health of those mortgages, turned into gigantic liabilities that sank the mighty insurance group A.I.G. Wall Street firms sold the credit-default swaps on bonds cheaply, then repackaged them into collateralized debt obligations. When certain chunks of them got the right stamp of approval from credit rating agencies, A.I.G. was willing to insure them for even less. But the pace of lending, frenetic as it was, couldn’t keep up with Wall Street firms’ demands for raw material. And so they began to sell credit-default swaps and package those into collateralized debt obligations. Eisman suddenly understands after attending a mortgage investing meeting in (where else?) Las Vegas. There weren’t enough subprime borrowers out there “taking out loans to satisfy investors’ appetite for the end product. Wall Street needed his bets in order to synthesize more of them.”

Shorting is difficult. “When you’re short, the whole world is against you,” as Eisman put it. And as John Maynard Keynes noted, the market can stay irrational longer than an investor can stay solvent. The short bets on subprime mortgages didn’t pay off in 2006, even as the underlying housing market began to weaken. Burry’s investors, who expected him to ferret out undervalued stocks, were angry when they learned of his large position in credit-default swaps. When some asked for their money back, Burry essentially ignored them.

In 2007, however, it all came down: marginal lenders defaulted, subprime firms went belly up, two Bear Stearns hedge funds that invested heavily in subprime collapsed. The big short positions paid off handsomely. Not all the shorts stuck with their bets. Howie Hubler, a Morgan Stanley trader who built up a big position in credit-default swaps on subprime bonds, sought to book some short-term profits by selling swaps on \$16 billion of highly rated collateralized debt obligations. When Hubler resigned in October 2007, he left behind \$9 billion in losses, “the single largest trading loss in the history of Wall Street.” For those who stuck it out, however, the collapse was a life-changing event. In 2007, Lewis writes, Eisman’s subprime short paid off so well that his fund’s assets rose “from a bit over \$700 million to \$1.5 billion,” and Eisman’s wife noted that her vindicated husband suddenly developed a capacity for tact. Michael Burry racked up \$720 million in profits for his investors, but took little satisfaction in it. In October 2008 he closed down his fund with a cryptic farewell message. “What had happened was that he had been right, the world had been wrong, and the world hated him for it,” Lewis writes.

“The Big Short” ends just as “The End of Wall Street” begins to gain momentum. Roger Lowenstein, a contributor to The New York Times Magazine and the author of previous books on Warren Buffett and on the failure of Long-Term Capital Management, is a connoisseur of investing intelligence and folly. In constructing a precise, condensed version of the origins, climax and fallout of the “dark and powerful storm front that had long been gathering at Wall Street’s shores,” he finds much more folly than intelligence.

Lowenstein nicely sets up the kindling. Deregulation starting in the 1970s transformed finance from “a static business that played merely a supporting role in the U.S. economy” into a powerful engine. The names so familiar to credit-bubble cognoscenti played their part: Fannie Mae and Freddie Mac and their

Washington patrons; Angelo Mozilo, the heavily tanned C.E.O. of Countrywide Financial; the Federal Reserve chairman Alan Greenspan and his successor, Ben Bernanke, with their easy money and regulation-lite policies. Reckless lenders met reckless borrowers. In a great little passage, Lowenstein does what Eisman and Burry did: He looks into a pool of mortgages he calls Subprime XYZ, issued in the spring of 2006 and packaged into bonds. On 43 percent of the loans, the lender hadn't bothered to get written verification of the borrower's income.

But it took Wall Street chief executives, a bunch of feckless dolts, to light the bonfire. The Merrill Lynch C.E.O. Stanley O'Neal, taking a break from his frequent golf games, was completely surprised in the summer of 2007 when he learned Merrill was stuck with \$48 billion of collateralized debt obligations it couldn't sell. Chuck Prince, the chief executive of Citigroup, wrote a shareholder letter in early 2007 in which "he devoted precisely two sentences to credit markets, which, he forecast, without elaboration, would most likely suffer 'moderate deterioration' in 2007."

Farce turned into tragedy in the summer and fall of 2008 when the chief executives were forced to band together to save themselves, one another and the system. The book's highlight is a blow-by-blow account of the frenzied, exhausting, demoralizing weekend before Lehman Brothers' failure in September 2008. "We're here to facilitate," the Federal Reserve Bank of New York's president, Tim Geithner, told Wall Street's top bankers as they met that September to try to avert Lehman's collapse. "You guys need to come up with a solution." They didn't. The chief executive, Richard Fuld, "nervously hung back at Lehman, like a general who didn't know which of his officers would report next with news from the front." Learning that his firm would be allowed to fail, a Lehman banker turned to a New York Fed official and warned, "You're unleashing the forces of evil."

Indeed — and this is another theme — federal officials charged with supervising Wall Street were continually caught unprepared. In the summer of 2008, when Kendrick Wilson, a former Goldman banker brought on as an aide to Treasury Secretary Henry Paulson, asked a colleague what would happen in the case of a repeat of the Bear Stearns failure, the response was that they had no plan. In the weeks after Lehman failed, Lowenstein reports, the Federal Reserve governor, Kevin Warsh, called Wachovia's chief executive, Robert Steel, "and urged him to sell his bank to Goldman Sachs," and Geithner and Paulson called Morgan Stanley's C.E.O., John Mack, and "ordered him to sell his company to either JPMorgan or Citigroup." Absurd ideas, both: none of those firms were in a position to buy.

Careful and meticulous, "The End of Wall Street" covers a lot of well-trodden ground. Still, there's plenty of telling detail. John Thain, the button-down Merrill Lynch chief executive, slammed a door when he heard about poor results. Well into the crisis, with Citi's stock price in single digits, its chief executive, Vikram Pandit, was spotted having lunch "at Le Bernardin, the top-rated restaurant in New York." Seeing nothing he wanted by the glass, he "ordered a \$350 bottle so that, as he explained, he could savor 'a glass of wine worth drinking.' Pandit drank just one glass." The tableau suggests that Lowenstein's book is misnamed. Judging by the recent bonuses; by the Goldman Sachs chief executive Lloyd Blankfein's declaration that investment bankers are "doing God's work"; and by the opposition to comprehensive reform as well as by Pandit's \$350 glass of wine, Wall Street is still very much alive.

Wall Street didn't end because, after the big shorts came good, the Federal Reserve and American taxpayers stepped in with extraordinary assistance. In a somewhat discordant note, Lowenstein concludes that the bailouts mean the "government is playing a conspicuous role in formerly private affairs" and that there's a throwback to "industrial planning of the '70s." But we've always had an industrial policy of incentivizing, subsidizing and bailing out the housing and credit industries. Whether we realize it or not, the public has always been long on Wall Street.

"The Big Short" also circles around to a lunch with a banker. Lewis sits down with his former boss, John Gutfreund, the former chief executive of Salomon Brothers, who tartly sums up Wall Street's enduring philosophy. Laissez-faire is all well and good until something goes wrong.

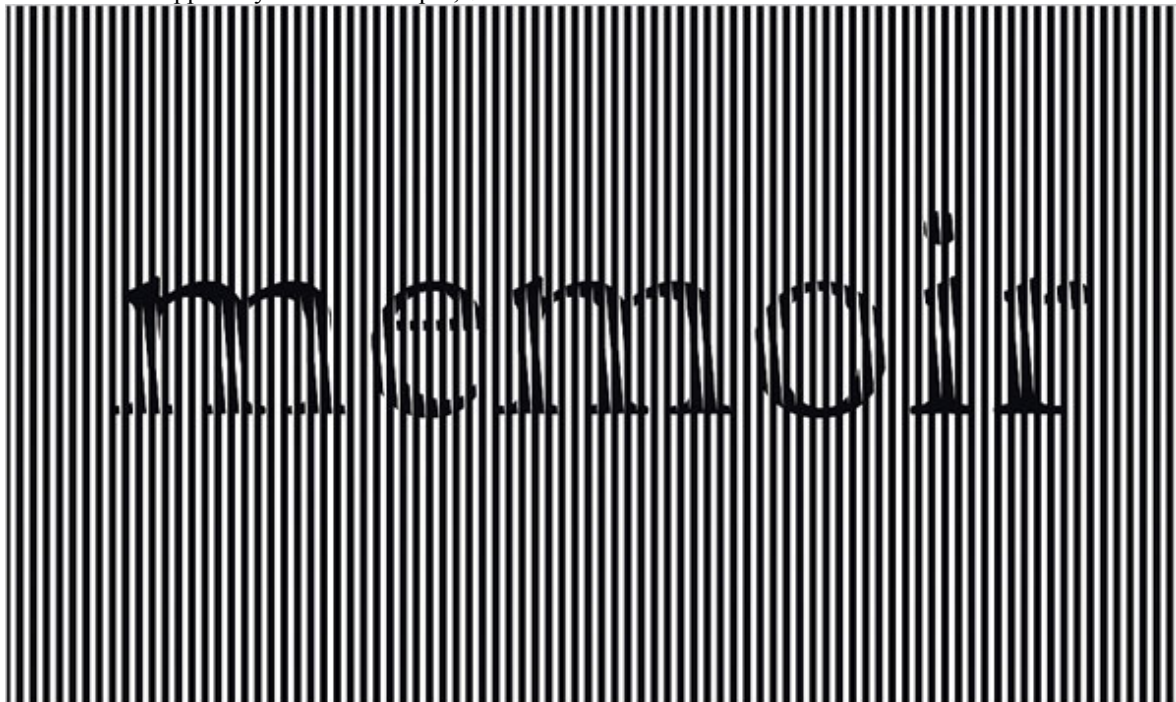
Daniel Gross, a columnist at Newsweek and Slate, is the author of "Dumb Money: How Our Greatest Financial Minds Bankrupted the Nation."

<http://www.nytimes.com/2010/04/18/books/review/Gross-t.html?ref=books>

'I' Exam**By DAVID SHIELDS****VANISHING POINT****Not a Memoir**

By Ander Monson

Illustrated. 191 pp. Graywolf Press. Paper, \$16



Over the last 25 years, the memoir — or *The Story of My Life*, as [Vivian Gornick](#) calls it — has become one of the major gestures of American writing. In direct opposition to the literal-minded, linear and epistemologically naïve nature of many such works, there has emerged in the last dozen years a vital countertradition, what John D’Agata labels the “lyric essay.” It’s a form with ancient roots. Heraclitus, anyone?

In D’Agata’s words, “what the lyric essay inherits from the public essay is a fact-hungry pursuit of solutions to problems, while from the personal essay what it takes is a wide-eyed dallying in the heat of predicaments. . . . Lyric essays seek answers, yet seldom seem to find them.”

This is an exact and useful description of the work now being done by, among many others, Ander Monson, who in “*Vanishing Point*” performs the same crucial inversion his fellow travelers do: he turns the banality of nonfiction inside out and thereby makes nonfiction a staging area to investigate claims of fact and truth, an extremely rich theater for exploring the most serious ontological questions.

“The unreality, the misrememberings, the act of telling in starts and stops,” Monson writes, “the pockmarked surface of the I: that’s where all the good stuff is, the fair and foul, that which is rent, that which is whole, that which engages the whole reader. Let us linger there, not rush past it.” In this collection, Monson proves to be a marvel of not rushing past it.

In one essay, Monson’s jury duty becomes the occasion for a pointillistic meditation on his own adolescent conviction for felony credit fraud, his confusion as to whether his mother died of colon cancer or ovarian cancer, the pros and cons of fact-checking, the mediation of life by TV and film, the inability of the defendant to narrate his own story (thus sealing his guilt), the lure and blur of story. Monson also discusses his weariness with the hundred-plus manuscripts he has to read as judge for a nonfiction prize: “I don’t object to the use of I (how could I?), but to its simple, unexamined use, particularly in nonfiction where we don’t assume the I is a character, inherently unstable, self-serving, possibly unreliable.” This leads him to reflect on the fading difference between we and I, on memory as a dream machine, on composition as a fiction-making operation. In short, “What do we know, and how can we know we know it?”

Elsewhere in the book, Monson acknowledges his long-held desire to vanish and his predilection for “periodic alcoholic obliteration.” Found texts proliferate: a photo of an infant, a Post-it that says “Wiped 2/4/08,” some hilariously undergraduate marginalia on “To the Lighthouse,” Monson’s own youthful and self-serious outline for a cyberpunk novel (which he eviscerates), a psychological (self-?)assessment of someone named Mrs. Jenetta Woodward, a page ripped from a notebook, a list of young women who have vanished. “The essay perishes. It perforates, is perforated by bullet holes. As the body perishes so does the essay, which is like a body. . . . And what of you, you who are already forgetting?” This essay, like this book, is both theory and practice. “Vanishing Point” argues for the demolition of the neat resolution of much memoir at the same time it embodies in its very form and freedom the literary and existential excitement of which the open-ended essay is capable.

Monson’s work as a graphic designer becomes the launching point for questions about “self and production and process and absorption.” “Out,” he urges himself and us, “always out: my penchant is for opening, not closing, sentences (and parentheses — and em dashes, so that this I can spawn or take on other Is, to expand toward the size of the big starry X that is whatever is coming after this, but not have to reduce back to the previous state, to vanish back into its once and former singularity.” This is as close as he is going to get to a direct articulation of his aesthetic and metaphysic. He wants writing to be equal to the chaos and contradiction of the cultural wiki we all contribute and subscribe to, and to be equal as well to the nothingness of nonexistence to which we all are destined.

From dozens of memoirs Monson culls hundreds of sentences into three assemblages, effectively dissolving the sanctum sanctorum to which memoir so often consigns the self. Throughout the book, “daggers” — glyphs — adorn various words, redirecting the reader to images, video and evolving text on the book’s Web site. Interstitial mini-sections appear among and within chapters, providing the work’s theoretical apparatus. An elegy for Gary Gygax, the co-creator of Dungeons & Dragons, transforms persuasively into an assertion that the ascendancy of *The Story of My Life* is an outgrowth of “a generation growing up playing first-person shooters.”

Monson posits and furnishes a “post-postmodern world” that is “starting to secede away from memoir, from the illusion of representation. . . . Let’s make rules so we can follow them and then so we can break through them. By breaking through them we may start to feel alive again.” For Monson and for us, that’s the crux: he’s trying to make himself, make us, feel something, feel anything, do whatever he can to vanquish the numbness that is a result of enforcing “order, decorum,” ceremony, formula, expectation, genre-prison.

As Lauren Slater wrote in her book “Lying,” “There’s only one kind of memoir I can see to write, and that’s a slippery, playful, impish, exasperating text, shaped, if it could be, like a question mark.”

Memoir is dead. Long live the anti-memoir, built from scraps.

David Shields’s new book, “Reality Hunger: A Manifesto,” was published in February.

<http://www.nytimes.com/2010/04/18/books/review/Shields-t.html?ref=books>

Indecision-Making

By **VIRGINIA POSTREL**
THE ART OF CHOOSING

By Sheena Iyengar
 329 pp. Twelve. \$25.99



Sheena Iyengar is the psychologist responsible for the famous jam experiment. You may have heard about it: At a luxury food store in Menlo Park, researchers set up a table offering samples of jam. Sometimes, there were six different flavors to choose from. At other times, there were 24. (In both cases, popular flavors like strawberry were left out.) Shoppers were more likely to stop by the table with more flavors. But after the taste test, those who chose from the smaller number were 10 times more likely to actually buy jam: 30 percent versus 3 percent. Having too many options, it seems, made it harder to settle on a single selection.

Wherever she goes, people tell Iyengar about her own experiment. The head of Fidelity Research explained it to her, as did a McKinsey & Company executive and a random woman sitting next to her on a plane. A colleague told her he had heard [Rush Limbaugh](#) denounce it on the radio. That rant was probably a reaction to Barry Schwartz, the author of “The Paradox of Choice” (2004), who often cites the jam study in antimarket polemics lamenting the abundance of consumer choice. In Schwartz’s ideal world, stores wouldn’t offer such ridiculous, brain-taxing plenitude. Who needs two dozen types of jam? “The study hardly seems mine anymore, now that it has received so much attention and been described in so many different ways,” Iyengar, a professor at Columbia Business School, writes in “The Art of Choosing.” “From the various versions people have heard and passed on,” she adds, “a refrain has emerged: More is less. That is, more choice leads to less satisfaction or fulfillment or happiness.” Now Iyengar is having her own say about the jam experiment and the many other puzzles and paradoxes of choice. More choice is not always better, she suggests, but neither is less. The optimal amount of choice lies somewhere in between infinity and very little, and that optimum depends on context and culture. “In practice, people can cope with larger assortments than research on our basic cognitive limitations might suggest,” Iyengar writes. “After all, visiting the cereal aisle doesn’t usually give shoppers a nervous breakdown.”

A congenial writer, Iyengar is less hard-edged and ideological than Schwartz and less glib than Malcolm Gladwell, who she says encouraged her to write this book. “The Art of Choosing” should appeal to fans of both writers. It’s full of the experimental results that make for good cocktail party chatter, but it offers fewer explicit lessons. Iyengar favors exploration over conclusions. “Isn’t this interesting?” she asks, rather than “Isn’t this awful?” or “Isn’t this useful?”

Take a mundane question: Do you choose to brush your teeth in the morning? Or do you just do it? Can a habit or custom be a choice? When Iyengar asked Japanese and American college students in Kyoto to record all the choices they made in a day, the Americans included things like brushing their teeth and hitting the snooze button. The Japanese didn’t consider those actions to be choices. The two groups lived similar lives. But they defined them differently.

The daughter of Indian immigrants, Iyengar is drawn to such cross-cultural comparisons. Consider an experiment she conducted with elementary-school children in San Francisco’s Japantown. Half were what

Iyengar calls Anglo American, and half were the children of Japanese or Chinese immigrants who spoke their parents' native language at home.

"Ms. Smith" showed each child six piles of word puzzles and six marking pens. Each pile contained one category of anagram — words about animals, food, San Francisco, etc. — and each marker was a different color. A third of the children were told to pick whichever category and marker they wanted to play with. Another third were told they should work on a specific category with a specific marker. With the final third, Ms. Smith riffled through some papers and pretended to relay instructions from the child's mother. In the latter two cases, the category and marker were in fact the ones picked by the most recent child to select freely.

The two ethnic groups reacted differently. The Anglo kids solved the most anagrams and played the longest when they could pick their own puzzles and markers, while the Asian children did best when they thought they were following their mothers' wishes.

To the Anglo children, their mothers' instructions felt like bossy constraints. The Asians, by contrast, defined their own identities largely by their relationship with their mothers. Their preferences and their mothers' wishes, Iyengar writes, "were practically one and the same." Doing what they thought their mothers wanted was, in effect, their first choice.

Anglos and Asians did share one important reaction: "When the choices were made by Ms. Smith, a stranger, both groups of children felt the imposition and reacted negatively." Just because people happily comply with the choices of an intimate — or, for that matter, an authority they've selected themselves — does not mean they want bureaucratic strangers making their decisions. Advocates who want to use psychology experiments to justify choice-limiting public policy should keep that lesson in mind.

Iyengar began her scholarly exploration of choice with an undergraduate research project. She suspected that religiously observant people who obey lots of behavioral restrictions would feel unable to control their own lives and thus pessimistic. To test this hypothesis, she interviewed more than 600 people from nine different religions, ranging from fundamentalists to liberals. She surveyed their religious beliefs and practices, asked questions to test optimism and had them fill out a mental health questionnaire. What she found surprised her.

"Members of more fundamentalist faiths experienced greater hope, were more optimistic when faced with adversity and were less likely to be depressed than their counterparts," she writes. "Indeed, the people most susceptible to pessimism and depression were the Unitarians, especially those who were atheists. The presence of so many rules didn't debilitate people; instead, it seemed to empower them. Many of their choices were taken away, and yet they experienced a sense of control over their lives."

In retrospect, the result seems obvious. Even many atheists would agree that believing that God cares about you or that your life is part of a cosmic plan can be a powerful source of hope (or, to put it pejoratively, a crutch). Meaning is as important as choice. Besides, Iyengar conducted her survey in the United States, where people are free to switch religions and often do. If keeping kosher or refraining from alcohol makes you feel constrained and helpless, you can abandon those strictures. The only people left in the restrictive groups are those who value the rules. In a modern, liberal society, religious observance does not "take away" choice. It is a choice.

Unlike "provocative" books designed to stir controversy, "The Art of Choosing" is refreshingly thought-provoking. Contemplating Iyengar's wide-ranging exploration of choice leads to new questions: When is following custom a choice? How costly must a decision be to no longer qualify as a choice? Did Calvinism spur worldly achievement because its doctrine of predestination removed all choice about the hereafter? Do contemporary Americans adopt food taboos like veganism because they crave limits on an overabundance of choices?

Human beings, Iyengar suggests, are born to choose. But human beings are also born to create meaning. Choice and meaning are intertwined. We use choice to define our identities, and our choices are determined by the meanings we give them, from advertising-driven associations to personal relationships and philosophical commitments. Some meanings we can articulate, while others remain beyond words. "Science can assist us in becoming more skillful choosers," Iyengar cautions, "but at its core, choice remains an art."

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<http://www.nytimes.com/2010/04/18/books/review/Postrel-t.html?ref=books>

Tocqueville: The Life**By DAVID S. REYNOLDS****TOCQUEVILLE'S DISCOVERY OF AMERICA**

By Leo Damrosch

Illustrated. 277 pp. Farrar, Straus & Giroux. \$27

Glimpsing the human side of major historical figures is endlessly fascinating. As Melville noted, Shakespeare in his own day wasn't Shakespeare. He was Master William Shakespeare, the harried writer — mocked as an “upstart crow” by a critic — who churned out plays for the proprietors of the Globe Theater.

Humanizing Alexis de Tocqueville poses special challenges. His magnum opus, “Democracy in America,” has gained prophetic stature since its publication in two volumes (1835 and 1840). Its grand pronouncements about America roll before us in chapter after sweeping chapter, each ringing with authority. Tocqueville covered many topics — government, commerce, law, literature, religion, newspapers, customs — in elegant prose that captured the essence of democracy. His insights, while sometimes debatable, are often eerily prescient.

In “Tocqueville's Discovery of America,” Leo Damrosch, the Ernest Bernbaum professor of literature at Harvard, reveals the man behind the sage. Damrosch shows us that “Democracy in America” was the outcome of a nine-month tour of the United States that Tocqueville, a temperamental, randy 25-year-old French apprentice magistrate of aristocratic background, took in 1831-32 with his friend Gustave de Beaumont.

The French government commissioned the pair to report on American prisons. But Tocqueville confided that he wanted to examine “all the workings of that vast American society that everyone talks about and no one knows.”

Drawing from Tocqueville's private writings, Damrosch presents the young traveler as insatiably curious. After landing in Newport, R.I., in May 1831, Tocqueville and Beaumont visited 17 of America's 24 states and three of its sparsely settled territories. Writing down their impressions of the many Americans they met, including notables like John Quincy Adams and Sam Houston, they accumulated a huge store of information.

Along the way, they fulfilled their original mission of exploring America's penitentiaries. The two main kinds of prisons they analyzed — one introduced in Auburn, N. Y., the other in Philadelphia — had special rigors. In the Auburn plan, which was employed at Sing Sing penitentiary, prisoners worked together for 11 hours a day but were not allowed to speak to or look at one another. “It felt like walking through the catacombs,” Tocqueville wrote. “There were a thousand living beings there and yet it was a solitude.” Whips were always ready for the recalcitrant. The Philadelphia system offered an even harsher discipline: perpetual solitary confinement. Every prisoner inhabited a thick-walled cell and had no contact with anyone but a chaplain who visited occasionally. Tocqueville called this punishment “at once the mildest and the most terrible ever invented” — a comment substantiated by reports of the many prisoners who lost their minds or committed suicide.

The prison tour was secondary to Tocqueville's purpose of exploring American life in all its dimensions. Every place Tocqueville went, north and south, yielded valuable insights that found their way into his book. His visits to cities made it clear to him that Americans “value everything on earth in response to this sole question: How much money will it bring in?” He found that Americans were a restless, practical people, hungry for novelty and change yet committed to working hard to get ahead. With its energetic



population and abundant resources, Tocqueville wrote, America “will someday become one of the richest and most powerful countries on earth.” His excursions into the frontier and the Deep South exposed him to Indian culture, which he regarded sympathetically, and to slavery, which he accurately predicted would produce “the most horrible of all civil wars.”

While Damrosch’s book doesn’t come close to identifying real-life sources for all of Tocqueville’s arguments — no book of such concision could do that — it usefully connects specific themes to certain American locales. Cincinnati, for instance, was a particularly rich trove of information. A rapidly expanding city of 25,000, it struck Tocqueville as a place of “absolute social equality,” without social hierarchies. But it enforced what he called “very severe laws against the blacks” and thus exemplified the racism then rampant in America.

The contradictions Tocqueville found in Cincinnati fed into his larger conclusions. America, he found, was a nation of paradoxes. It proclaimed that all men were created equal, yet was suffused by racial prejudice. It placed unparalleled faith in the individual yet was conformist and controlled by the majority. It was materialistic yet deeply religious, commercial but puritanical. It had a carefully conceived Constitution and a well-defined political system, yet its most important decisions sprang from public opinion and mores, not the government.

Damrosch is an acute observer of Tocqueville, whose generalizations, he notes, don’t always stand up to scrutiny. Although Tocqueville was right about the importance of America’s middle class, he minimized widening divisions between the rich and the poor. Tocqueville took an overly harsh view of Andrew Jackson, dismissing him as “a man of violent temperament and mediocre abilities,” ignoring his charisma and his political abilities. An agnostic raised as a Catholic, Tocqueville exaggerated the oddness of evangelical religion, misreading its social meaning for Americans.

Still, as Damrosch suggests, Tocqueville’s responses to America were more perceptive and appreciative than those of other European travelers, like Frances Trollope and Charles Dickens. These visitors made pungent, informational comments about America but showed a provincialism that Tocqueville rose above. The fastidious Trollope portrayed America as a nation of boorish tobacco-chewers, bellowing revivalists and swaggerers. Dickens complained about the grunting pigs and screaming newsboys on the streets of Manhattan. For Tocqueville, such excesses were part of the liveliness and brashness of an ever-changing democratic society.

Returning to France in March 1832 full of enthusiasm for the American system, Tocqueville set himself to writing his two large volumes. He told a friend, “I’ve hurled myself at America in a sort of fury. . . . I think about hardly anything else.” The books made him famous, and he rose in the French government, which he hoped to help redesign. He said in a speech that he had seen in America that democracy could be “living, active and triumphant,” and he urged his nation to follow America’s example. For a brief period after the democratic revolutions of 1848, it seemed that France would heed his advice. But when Louis-Napoleon dissolved the National Assembly and announced himself Emperor Napoleon III in 1852, Tocqueville’s democratic dreams were dashed and his political career was over.

He was beset by personal problems. His wife grew frantic over his affairs. Having told her that he had “vast desires” and “passions that lead me astray,” he was, in Damrosch’s words, “regularly (not to say compulsively) unfaithful.” Subject to mood swings, he became increasingly depressed about his nation, which he compared to a man traveling on a moonless, foggy December night. He bitterly recalled the youthful ardor that had driven the writing of “Democracy in America,” which he no longer even looked at except to make corrections for reprints. When he died of tuberculosis at 53 in 1859, he could not know that his penetrating observations on America would stand as timeless statements about democratic society.

David S. Reynolds is the author, most recently, of “Waking Giant: America in the Age of Jackson.” He is at work on a book on Harriet Beecher Stowe.

<http://www.nytimes.com/2010/04/18/books/review/Reynolds-t.html?ref=books>

Amazon Dam Project Pits Economic Benefit Against Protection of Indigenous Lands

By ALEXEI BARRIONUEVO

RIO DE JANEIRO — The indigenous leaders had a plan. They would unite for a last, desperate stand against the mammoth dam threatening their lands in the Amazon, vowing to give their lives, if necessary, to prevent it from being built.

“This will be our last cry for help,” said the chief of the Arara tribe, José Carlos Arara, after a meeting of leaders from 13 tribes last month. “We are not here to kill. We are here to defend our rights.”

For a moment this week, it looked as if they had won an unexpected reprieve. On Wednesday, a federal judge in Para State, where the third largest dam in the world would be built, halted the government’s April 20 auction to award contracts for its construction, saying the project could cause “irreparable harm” to indigenous peoples.

But by Friday, the dam was back on the table. A judge in the capital, Brasília, overturned the ruling and said the auction would take place as scheduled.

The judge in Brasília, Jirair Aram Meguerian, the president of the regional federal court, found that “there is no imminent danger for the indigenous community” because the auction “didn’t imply immediate construction” of the dam, “which involves numerous stages,” the court said in an announcement. The legal seesaw was part of a protracted battle here over the future of such dams in indigenous territories as the government tries to meet the growing energy needs in far-away cities like São Paulo and Rio de Janeiro.

Halting the auction for the project, known as the Belo Monte dam, “would do grave harm to the economy,” the court said, forcing Brazil to procure other forms of energy that are “more expensive and polluting.”

Brazil uses hydroelectric power for more than 80 percent of its energy, and President Luiz Inácio Lula da Silva has said that more dams are needed. Dilma Rousseff, the presidential candidate that Mr. da Silva is backing as his successor, has also pushed for more dams, including Belo Monte, which would represent about 10 percent of Brazil’s total power generation.

“This project is very important for Brazil’s future energy supply, and policymakers are counting on it, particularly now that the Brazilian economy is recovering so vigorously from the economic downturn,” said Christopher Garman, analyst at Eurasia Group.

Without it, Mr. Garman said, the government could be forced to rely on dirtier energy sources, or go in the other direction and accelerate the development of renewable sources like wind and biofuel from sugar cane.

Belo Monte comes at a very different time in Brazil’s history from when it was first dreamed up under the military government some 30 years ago. With the world watching more closely, the country has struggled to find a balance between the push to develop and the demand to protect the delicate ecosystems and indigenous peoples of the Amazon.

Most previous Amazon dam projects were set in motion before Brazil’s latest Constitution was ratified in 1988, granting protections to indigenous peoples.

To build Belo Monte, builders would have to excavate two huge channels larger than the Panama Canal to divert water from the main dam to the power plant. The reservoir would flood more than 160 square miles of forest while drying up a 60-mile stretch of the Xingu River, displacing more than 20,000 people, many from indigenous communities, according to non-governmental groups citing government figures. Government planners have revised the plant’s design several times to try to reduce its environmental impact. But before his decision was overturned, Judge Antônio Carlos de Almeida Campelo ruled



Wednesday that Congress would have to pass a law changing the Constitution's limits on building dams that negatively affect indigenous communities.

The project has also drawn a storm of criticism from advocates and celebrities, including James Cameron. Studies by nongovernmental groups have shown that the plant would be inefficient, producing less than 30 percent of its capacity during the dry season and an average of 39 percent annually. Environmentalists fear the government would need to construct other dams upstream to guarantee enough water — dams that would flood more forest and affect yet more indigenous peoples.

Eletronorte, the government utility directing the Belo Monte project, has denied that more dams would be necessary, saying Belo Monte would be part of the national electric grid and draw capacity from other pre-existing dams when necessary.

For indigenous groups, the drying out of the Xingu would change life as they know it. So at their meeting last month, leaders from 13 tribes made an unusual decision: They decided to create a new tribe of about 2,500, and then station it directly on the construction site, occupying it for years, if need be. "If we lose this river we have no idea what will happen to us," the chief said. "The river provides us with fish and food. How will we eat if we no longer have fish? And how will we ever leave here if we no longer have the river to travel on?"

<http://www.nytimes.com/2010/04/17/world/americas/17brazil.html?ref=science>



At Upstate Campus, Saving Energy Is Part of Dorm Life

By LISA W. FODERARO



ITHACA, N.Y. — The Energy Star label, the federal government’s nod of approval for energy-efficient products, usually calls to mind household appliances like refrigerators and air-conditioners. But at Ithaca College, a campus known for its embrace of all things sustainable, two dormitories proudly wear the Energy Star label, too.

The residence halls, Clarke and Hood, feature six-way zoned heating, energy-efficient boilers, digitally controlled heating systems and ample weather-stripping. They also benefit from a brigade of students on campus, known as eco-reps, who cajole and exhort their peers to reduce their carbon footprints. Among their duties is the posting of fliers inside bathroom stalls, called installments. A recent missive urged students to “beware of the phantom load,” energy used by appliances that are turned off but still plugged in.

“Instead of someone talking at you, it’s someone your own age who says, ‘This is a good idea,’ ” said Becky Webster, a junior from Troy and one of a half-dozen eco-reps on campus.

Ithaca is one of only two colleges in New York State with dormitories that have earned the Energy Star label so far; the other is Hamilton College. And administrators here say they have submitted an application for a third dormitory whose energy use has recently met the Energy Star requirements for buildings.

While the Environmental Protection Agency is widely known for its Energy Star program for appliances, the agency has rated commercial buildings — perhaps less visibly — for more than a decade. Dormitories are among 22 building categories eligible for an Energy Star label, along with bank branches, courthouses, hospitals, hotels, petroleum refineries and schools. Dormitories joined the program in 2006; so far, more than 50 residence halls nationwide have won Energy Star approval, out of more than 9,800 buildings and plants.

The ratings system for buildings works differently from appliances. Using 12 months of utility bills, colleges enter information into the E.P.A.’s Web site about a dormitory’s energy consumption. The computer program takes into account factors like building size, computer use local climate and occupancy and then compares the energy use with similar buildings nationwide. A score of 75 or higher, on a scale of 1 to 100, means the dormitory is Energy Star eligible, and the agency system invites the college to apply for the label. A professional engineer must also perform an audit of the building, at the institution’s expense.

The Energy Star label for buildings is intended to raise awareness and prompt colleges to set energy goals.

“Colleges and universities spend almost \$2 billion a year on energy,” said Maura Beard, a spokeswoman for the Energy Star program. “A lot of people think the solution lies in the latest gizmo or newest

technology. But there are things as simple as, who's paying attention to the lights being on all night? The idea is extricating this waste."

Ithaca College's quest for green dormitories is part of a broader agenda to be environmentally sensitive, one of the hottest social causes on campuses. Set in the Finger Lakes in a college town that likes to call itself "10 square miles surrounded by reality," the campus has a new platinum certification in Leadership in Energy and Environmental Design, known as LEED, for a business school building, the highest available, from the United States Green Building Council, an environmental group. A second new building is expected to earn a platinum rating shortly. The college also has an active composting program, an environmentally themed residence hall and a new organic garden. And administrators are considering a major in sustainability.

The Energy Star labels for dormitories, which come with a plaque, are one way for college administrators to get recognition for investing in improvements that are not necessarily visible. At Ithaca, for instance, the college has spent \$1.3 million in the last decade on dormitories and academic buildings to upgrade boilers, insulate attics and create a digitally controlled heating system that allows for automatic thermostat adjustments.

"It lets us make a visual statement that, 'Hey, we are doing these things,'" said Marian M. Brown, special assistant to the provost and vice president for academic affairs at Ithaca, referring to the Energy Star plaques.

One of the keys to the Energy Star label for dormitories is submetering. While every dormitory at Ithaca College is individually metered for electricity, only about 15 percent have submeters for natural gas. The parsing of energy use is crucial because without information from both meters, a dormitory cannot compete for an Energy Star label.

Indeed, Ms. Brown suspects that some of the college's other dormitories would earn a score of 75 or higher if they were individually metered like Clarke and Hood Halls. But such meters would cost the college about \$1,000 each, she said. And in deciding how to allocate limited funds, one question for administrators is whether to spend money on things that yield actual energy savings or, in the case of submeters, provide feedback.

"I could easily spend \$20 million on new windows if I had the money, and we have a number of boilers that need to be replaced," said Rick Couture, the college's associate vice president for facilities. "These are all the things that people don't see and aren't glamorous, but they're the guts of the building."

With Ithaca College's commitment to instituting practices that do not have a negative impact on the global climate, more investments are needed. Some of the money will come from energy savings that the college has already achieved. Mr. Couture estimated that the college had saved about a half-million dollars annually in the last five years as a result of the building improvements.

While the Energy Star appliance labels have been criticized for their potential for fraud, the rating system for buildings has earned mostly praise. A Congressional report released in late March detailed how auditors posing as fictitious companies managed to get Energy Star approval for a number of phony appliances, including a gasoline-powered alarm clock.

"The building program uses actual utility bill data, so there really isn't room for abuse," said Merrilee Harrigan, vice president for education at the Alliance to Save Energy, a nonprofit group in Washington. "It's a fantastic tool."

Ms. Harrigan said Energy Star allowed colleges to see how their dormitories stacked up to others nationwide. "Even if you know the energy use of your building, you don't have any context," she said. "That's the great value of the Energy Star program. It gives you an apples-to-apples comparison with other schools in the country, and that's the piece that is extremely difficult to get any other way."

<http://www.nytimes.com/2010/04/17/nyregion/17ithaca.html?ref=science>

Einstein's Theory Fights Off Challengers



This composite image of the galaxy cluster Abell 3376 shows X-ray data from the Chandra X-ray Observatory and the ROSAT telescope in gold, an optical image from the Digitized Sky Survey in red, green and blue, and a radio image from the VLA in blue. The "bullet-like" appearance of the X-ray data is caused by a merger, as material flows into the galaxy cluster from the right side. The giant radio arcs on the left side of the image may be caused by shock waves generated by this merger. (Credit: X-ray (NASA/CXC/SAO/A. Vikhlinin; ROSAT), Optical (DSS), Radio (NSF/NRAO/VLA/IUCAA/J.Bagchi))

ScienceDaily (Apr. 17, 2010) — Two new and independent studies have put Einstein's General Theory of Relativity to the test like never before. These results, made using NASA's Chandra X-ray Observatory, show Einstein's theory is still the best game in town.

Each team of scientists took advantage of extensive Chandra observations of galaxy clusters, the largest objects in the Universe bound together by gravity. One result undercuts a rival gravity model to General Relativity, while the other shows that Einstein's theory works over a vast range of times and distances across the cosmos.

The first finding significantly weakens a competitor to General Relativity known as "f(R) gravity."

"If General Relativity were the heavyweight boxing champion, this other theory was hoping to be the upstart contender," said Fabian Schmidt of the California Institute of Technology in Pasadena, who led the study. "Our work shows that the chances of its upsetting the champ are very slim."

In recent years, physicists have turned their attention to competing theories to General Relativity as a possible explanation for the accelerated expansion of the universe. Currently, the most popular explanation for the acceleration is the so-called cosmological constant, which can be understood as energy that exists in empty space. This energy is referred to as dark energy to emphasize that it cannot be directly detected.

In the f(R) theory, the cosmic acceleration comes not from an exotic form of energy but from a modification of the gravitational force. The modified force also affects the rate at which small enhancements of matter can grow over the eons to become massive clusters of galaxies, opening up the possibility of a sensitive test of the theory.

Schmidt and colleagues used mass estimates of 49 galaxy clusters in the local universe from Chandra observations, and compared them with theoretical model predictions and studies of supernovas, the cosmic microwave background, and the large-scale distribution of galaxies.

They found no evidence that gravity is different from General Relativity on scales larger than 130 million light years. This limit corresponds to a hundred-fold improvement on the bounds of the modified gravitational force's range that can be set without using the cluster data.

"This is the strongest ever constraint set on an alternative to General Relativity on such large distance scales," said Schmidt. "Our results show that we can probe gravity stringently on cosmological scales by using observations of galaxy clusters."

The reason for this dramatic improvement in constraints can be traced to the greatly enhanced gravitational forces acting in clusters as opposed to the universal background expansion of the universe. The cluster-growth technique also promises to be a good probe of other modified gravity scenarios, such as models motivated by higher-dimensional theories and string theory.

A second, independent study also bolsters General Relativity by directly testing it across cosmological distances and times. Up until now, General Relativity had been verified only using experiments from laboratory to Solar System scales, leaving the door open to the possibility that General Relativity breaks down on much larger scales.

To probe this question, a group at Stanford University compared Chandra observations of how rapidly galaxy clusters have grown over time to the predictions of General Relativity. The result is nearly complete agreement between observation and theory.

"Einstein's theory succeeds again, this time in calculating how many massive clusters have formed under gravity's pull over the last five billion years," said David Rapetti of the Kavli Institute for Particle Astrophysics and Cosmology (KIPAC) at Stanford University and SLAC National Accelerator Laboratory, who led the new study. "Excitingly and reassuringly, our results are the most robust consistency test of General Relativity yet carried out on cosmological scales."

Rapetti and his colleagues based their results on a sample of 238 clusters detected across the whole sky by the now-defunct ROSAT X-ray telescope. These data were enhanced by detailed mass measurements for 71 distant clusters using Chandra, and 23 relatively nearby clusters using ROSAT, and combined with studies of supernovas, the cosmic microwave background, the distribution of galaxies and distance estimates to galaxy clusters.

Galaxy clusters are important objects in the quest to understand the Universe as a whole. Because the observations of the masses of galaxy clusters are directly sensitive to the properties of gravity, they provide crucial information. Other techniques such as observations of supernovas or the distribution of galaxies measure cosmic distances, which depend only on the expansion rate of the universe. In contrast, the cluster technique used by Rapetti and his colleagues measure in addition the growth rate of the cosmic structure, as driven by gravity.

"Cosmic acceleration represents a great challenge to our modern understanding of physics," said Rapetti's co-author Adam Mantz of NASA's Goddard Space Flight Center in Maryland. "Measurements of acceleration have highlighted how little we know about gravity at cosmic scales, but we're now starting to push back our ignorance."

The paper by Fabian Schmidt was published in *Physics Review D*, Volume 80 in October 2009 and is co-authored by Alexey Vikhlinin of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, and Wayne Hu of the University of Chicago, Illinois. The paper by David Rapetti was recently accepted for publication in the *Monthly Notices of the Royal Astronomical Society* and is co-authored by Mantz, Steve Allen of KIPAC at Stanford and Harald Ebeling of the Institute for Astronomy in Hawaii.

NASA's Marshall Space Flight Center in Huntsville, Ala., manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

More information, including images and other multimedia, can be found at: <http://chandra.harvard.edu> and <http://chandra.nasa.gov>

Story Source:

Adapted from materials provided by [Chandra X-ray Center](#).

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<http://www.sciencedaily.com/releases/2010/04/100414130830.htm>

Discovery Could Help Diabetics and Others With Slow-to-Heal Wounds

ScienceDaily (Apr. 17, 2010) — A new discovery about the wound-healing process could lead to better treatments for diabetics and other patients who have wounds that are slow to heal.

Loyola University Health System researchers found that certain immune system cells slow the wound-healing process. Thus, it might be possible to improve healing by inactivating these immune system cells, said Elizabeth Kovacs, PhD, who heads the laboratory team that made the discovery.

The findings by Kovacs and colleagues are reported online, in advance of print, in the *Journal of Surgical Research*.

In the study, the immune system cells that impeded the healing process are called natural killer T (NKT) cells. NKT cells perform beneficial functions such as killing tumor cells and virus-infected cells. However, researchers discovered that NKT cells also migrate to wound sites and impede the healing process.

Kovacs and colleagues used an animal model to examine the effects of NKT cells on healing. Healing was significantly slower in normal mice that had NKT cells than it was in a special breed of mice that lacked NKT cells.

"We demonstrated that early wound closure was accelerated in the absence of NKT cells," Kovacs and colleagues wrote. "Importantly, we also made the novel observation that NKT cells themselves are a constituent of the early wound inflammatory infiltrate."

Certain conditions, such as diabetes and infections, can slow or prevent wounds from healing. The study found that NKT cells may be at least partially to blame. Researchers don't know how NKT cells slow healing. But they believe they may be able to inactivate NKT cells using an antibody. They are testing this prediction in a follow-up study.

Kovacs is a professor and vice chair of research in the Department of Surgery at Loyola University Chicago Stritch School of Medicine. She also is director of research of Loyola's Burn & Shock Trauma Institute.

Co-authors of the study are Jessica Palmer, Julia Tulley, Dr. John Speicher, Douglas Faunce, PhD, first author Dr. David Schneider and Dr. Richard Gamelli. Schneider is a resident at Loyola and Gamelli is dean of the Stritch School of Medicine and director of the Burn & Shock Trauma Institute.

The study was supported by the National Institutes of Health (NIH) and by the Ralph and Marion C. Falk Medical Research Trust.

Scott Somers, Ph.D., who manages wound healing research and training grants supported by the NIH's National Institute of General Medical Sciences, said, "Beyond the novel finding of a fundamental mechanism controlling wound healing, this work also highlights the contributions of physician-scientists like Dr. Schneider, a surgical resident who is training to do hypothesis-based, cutting-edge scientific investigation."

Story Source:

Adapted from materials provided by [Loyola University Health System](#).

Journal Reference:

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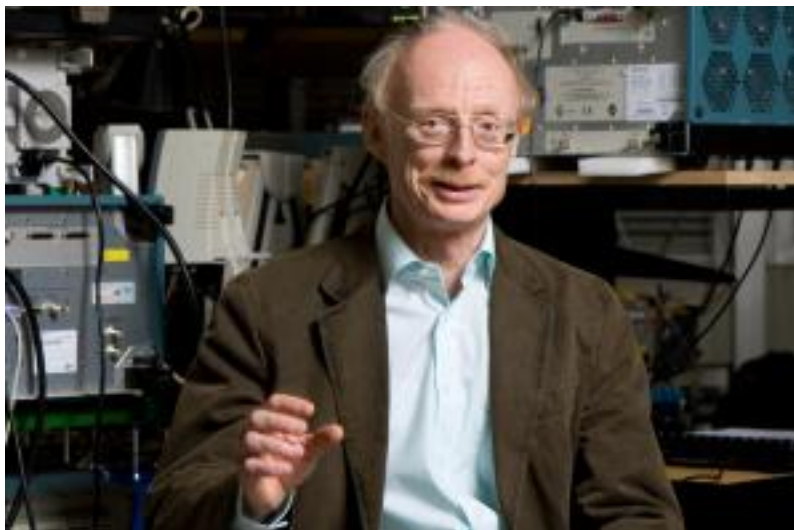
New Way to Generate Tunable Wavelengths Using Quantum-Dot Technology

Researchers led by Professor Wolfgang Elsaesser are providing new insights into laser physics. (Credit: Photo by Katrin Binner)

ScienceDaily (Apr. 17, 2010) — Researchers at the Technische Universität Darmstadt have found a new method for generating tunable wavelengths, as well as more easily switching back and forth between two wavelengths, employing quantum-dot lasers.

Prospective application fields are biomedicine and nanosurgery.

Darmstadt physicists have discovered an effect that turns the physics of semiconductor lasers "upside down." Laser action in



semiconductor lasers usually starts off with emission of photons corresponding to transitions originating from the lowest energy level. Emission of high energetic, i.e., short-wavelength, photons does not normally commence until the pumping current has been increased to well above the lasing threshold.

Under the EU's "FAST-DOT" project, researchers from the Semiconductor Optics Group at the Technische Universität Darmstadt's Institute for Applied Physics headed by Prof. Dr. Wolfgang Elsaßer have recently discovered that, under some circumstances, quantum-dot lasers do emit first short-wavelength photons and then long-wavelength photons. Elsaßer explained that "this inverted hierarchy of emission states that we are the first to discover effectively allows generating intentionally custom-tailored wavelengths covering a wavelength range of interest in many applications. Furthermore, the method not only allows switching back and forth between two wavelengths and but also exploiting beneficially effects occurring in the laser systems involved for improving pulse parameters."

Following up on that work, the Darmstadt researchers engaged in the "FAST-DOT" project plan to explore applications of the easier means for switching between wavelengths, whose underlying physics they have discovered.

Medical applications of nanostructured quantum-dot lasers

Quantum-dot lasers operable at high pulse-repetition rates are capable of reaching pulse energies that will allow modifying living cells, e.g., making accurately controlled incisions in cell structures, while minimizing the attendant effects on cellular environments. Summarizing their capabilities, Elsaßer stated that, "They may be employed as high-precision scalpels, with which cell structures may be parted in controlled manners."

In addition, certain cell organelles might be deactivated or individual intracellular or extracellular molecules activated, which would open up unforeseen opportunities in molecular surgery, which allows making incisions two-thousand times finer than a human hair. In the future, these quantum dot lasers might allow destroying cancer cells very specifically or applying them simultaneously either for corneal surgery or diagnostics.

Story Source:

Adapted from materials provided by [Technische Universität Darmstadt](#), via [AlphaGalileo](#).

<http://www.sciencedaily.com/releases/2010/04/100414083537.htm>

Clues from Green Algae on the Origin of Males and Females



The image shows a vegetative female colony. *Volvox carteri* forms spherical colonies, which are composed of 2,000 to 4,000 individual cells embedded in an extracellular matrix. During non-sexual reproduction, so-called gonidia in both male and female (pictured) colonies produce juvenile colonies through repeated division. (Credit: Courtesy of the Umen laboratory, Salk Institute for Biological Research)

ScienceDaily (Apr. 16, 2010) — A multicellular green alga, *Volvox carteri*, may have finally unlocked the secrets behind the evolution of different sexes. A team led by researchers at the Salk Institute for Biological Studies has shown that the genetic region that determines sex in *Volvox* has changed dramatically relative to that of the closely related unicellular alga *Chlamydomonas reinhardtii*. Their findings, which will be published in the April 16th issue of the journal *Science*, provide the first empirical support for a model of the evolution of two different sexes whereby expansion of a sex-determining region creates genetic diversity followed by genes taking on new functions related to the production of male and female reproductive cells termed gametes.

"Until now, sex-determining chromosomes had generally been viewed as regions of decay, steadily losing genes that are not involved in sexual reproduction," explains James Umen, Ph.D., assistant professor in the Plant Molecular and Cellular Biology Laboratory at the Salk Institute, who led the team conducting the study. "Our study shows the opposite—that such regions can expand and generate new genetic material much more rapidly than the rest of the genome."

Most multicellular organisms such as plants and animals have two distinct sexes with females producing large immotile eggs and males producing small motile sperm. While unicellular organisms can also reproduce sexually, the two sexes of single-celled species are typically indistinguishable from each other and are thought to represent an ancestral or early evolutionary state. However, the large distances that separate plants or animals from their closest unicellular relatives have precluded understanding the evolutionary transition to male-female dimorphism.

"In unicellular organisms like *Chlamydomonas*, the gametes look the same. In contrast, multicellular organisms, including *Volvox*, produce eggs and sperm—they are distinctly male and female. Yet no one really has any idea how the evolution of males and females occurs or what genetic changes were required to achieve it," explains Umen.

Although the genomes of *Chlamydomonas* and *Volvox* are similar in most ways, there is one glaring exception that provided the Salk researchers with an entrée into the origin of male and female sexes—the so-called mating locus that functions in much the same way as human X and Y chromosomes to determine gender.

When Umen and his colleagues examined the mating locus genes in *Chlamydomonas* and *Volvox* they found that they shared some of the same genes, as you would expect from closely related species. However, *Volvox* also now possessed a surprising variety of new genes that were added to its expanded

mating locus, and expression of many of these genes had come under the control of the male or female differentiation programs.

"We found that the *Volvox* mating locus is about five times bigger than that of *Chlamydomonas*," says postdoctoral researcher and co-first author Patrick Ferris, Ph.D. "We wanted to understand the evolutionary basis of this. How did it happen? And where did these new genes come from?"

To trace the origin of the added genes, the team looked to see if they could also find them in *Chlamydomonas*. "We found that although some of the mating locus genes in *Volvox* are completely new, many of them have counterparts in *Chlamydomonas* that are near the mating locus," explains co-first author Bradley Olson, Ph.D. "So *Volvox* has taken these genes that initially had nothing to do with sex, incorporated them into its mating locus, and started using some of them in its sexual reproductive cycle." The team is now studying these new mating locus genes to understand their individual roles in sex determination and sexual development.

They have already identified a *Volvox* mating locus gene named MAT3 that appears to have evolved a new role in sexual differentiation. MAT3 is related to a human gene called the retinoblastoma tumor suppressor that controls cell division and is frequently mutated in cancer cells. In *Volvox*, MAT3 probably has a role in controlling cell division as it does in animals and plants, but has also acquired intriguing gender-specific differences in its sequence and expression pattern that correlate with differences in male/female reproductive development. Umen's laboratory is following up on this finding to determine the newly evolved role of MAT3 in *Volvox* gender specification.

"This study shows that *Volvox* and its relatives are a powerful model in which to study the evolution of sex," says Umen. "It provides us with a system in which we can retrace evolutionary history to ask questions about the origin of gender and other traits that are difficult to approach in groups such as plants and animals."

The team is also working with collaborators to examine the mating locus of an evolutionary intermediate between *Chlamydomonas* and *Volvox* called *Gonium*, which has between four and 16 cells. "*Gonium* allows us to look at the evolutionary steps between *Chlamydomonas* and *Volvox* to better understand how the evolutionary process happened," says Ferris.

In addition to Ferris, Olson and Umen, contributors to this work were Peter L. De Hoff, Ph.D., and Sa Geng, Ph.D. at the Salk Institute; Stephen Douglass, David Casero and Matteo Pellegrini at UCLA; Simon Prochnik at the U.S. Department of Energy (DOE) Joint Genome Institute (JGI), Rhitu Rai at the Salk Institute and the Indian Agricultural Research Institute, New Delhi; Jane Grimwood and Jeremy Schmutz at Hudson Alpha Institute for Biotechnology, Alabama; Ichiro Nishii at Nara Women's University, Nara, Japan; and Takashi Hamaji and Hisayoshi Nozaki at the University of Tokyo, Japan.

Story Source:

Adapted from materials provided by [Salk Institute](#), via [EurekAlert!](#), a service of AAAS.

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<http://www.sciencedaily.com/releases/2010/04/100415141125.htm>

Texas Doctors Magnetically Lengthen Nine-Year-Old's Leg as She Grows



Nine-year-old Morgan LaRue prepares for her groundbreaking bone lengthening procedure. (Credit: Image courtesy of Texas Children's Hospital)

ScienceDaily (Apr. 16, 2010) — Nine-year-old Morgan LaRue is the first cancer patient in Texas to benefit from a groundbreaking procedure that will magnetically lengthen her leg, sparing her the possibility of up to 10 future surgeries as her body grows. The implant and extension took place at Texas Children's Cancer Center in Houston, Texas.

On March 29, 2010, Morgan lost a portion of the bone in her upper leg to osteosarcoma (bone cancer) and was facing the potential of numerous surgeries in order to keep her left leg even with her right, as she grows into adulthood. In her initial surgery two weeks ago, Dr. Rex Marco, an oncologic orthopedic surgeon at Texas Children's Hospital and the University of Texas Health Science Center at Houston, implanted a prosthetic device that saved Morgan from a lower limb amputation and allowed her cancerous bone to be replaced with a metal implant. The device, a Stanmore Implants Extendable Distal Femoral Replacement, can be extended as Morgan grows, saving her from ongoing invasive procedures. This week at Texas Children's Cancer Center, Morgan underwent her first outpatient procedure to magnetically extend her leg. By placing her leg into a magnetized "donut" in the outpatient clinic, doctors were able to extend the implanted prosthesis without having to do any surgery. The magnet extender, manufactured by Stanmore Implants, is a reversible extender that is the first and only device of its kind to be used in Texas.

"The difference this device makes for Morgan is incredible," said Dr. Marco. "Her quality of life is so much higher than it would be if she were constantly undergoing surgery."

While the device has been approved and is regularly being used in Europe, it is still pending U. S. Food and Drug Administration approval and has only been used for approximately 15 patients in this country. Dr. Wang, pediatric oncologist at Texas Children's Cancer Center and Assistant Professor, Department of Pediatrics, Section of Hematology/Oncology, Baylor College of Medicine, and Dr. Marco, advocated for and received a "compassionate use" exception for the young girl, in order to implant the groundbreaking device.

"Morgan has already been through a lot of treatment for her cancer," said Dr. Wang, Morgan's oncologist, "and this will prevent her from future uncomfortable surgeries."

Story Source:

Adapted from materials provided by [Texas Children's Hospital](http://www.texaschildrenshospital.org).

<http://www.sciencedaily.com/releases/2010/04/100415171414.htm>

Weight Training-Related Injuries Increasing



Dawn Comstock, PhD, watches LeJuan and his spotter practice proper weight lifting techniques. (Credit: Image courtesy of Nationwide Children's Hospital)

ScienceDaily (Apr. 16, 2010) — The popularity of weight training has grown over the past decade. A new study conducted by the Center for Injury Research and Policy of The Research Institute at Nationwide Children's Hospital has found that the number of injuries from weight training has increased as well. The study found that more than 970,000 weight training-related injuries were treated in U.S. hospital emergency departments between 1990 and 2007, increasing nearly 50 percent during the 18-year study period.

Data from the study, available online as a Preview Publication-Before-Print in the *American Journal of Sports Medicine*, showed that males (82 percent) and youths aged 13 to 24 years (47 percent) sustained the largest proportion of weight training-related injuries. The majority of injuries occurred during the use of free weights (90 percent), and the most common mechanism of injury were weights dropping on a person (65 percent). Injuries to the upper (25 percent) and lower trunk (20 percent) were the most common followed by injuries to the hand (19 percent). The most frequent injury diagnoses were sprains and strains (46 percent) followed by soft tissue injuries (18 percent).

While youths (ages 13-24) had the highest number of injuries, the largest increase in the incidence of injuries occurred among those aged 45 years and older. People aged 55 and older were more likely than their younger counterparts to be injured while using weight-training machines, and to sustain injuries from overexertion and lifting or pulling. On the other hand, youths 12 years and younger were more likely to be injured while using free weights. This age group had a higher proportion of lacerations and fractures, and were more likely to sustain injuries as a result of having a weight drop or fall on them than those aged 13 years and older.

"Before beginning a weight training program, it is important that people of all ages consult with a health professional, such as a doctor or athletic trainer, to create a safe training program based on their age and capabilities," said study author Dawn Comstock, PhD, principal investigator in the Center for Injury Research and Policy at Nationwide Children's Hospital. "Getting proper instruction on how to use weight lifting equipment and the proper technique for lifts, as well as providing trained supervision for youths engaging in weight training, will also reduce the risk of injury."

The study also found that while males had the highest number of injuries, there was a larger increase in the incidence of injury among female participants.



"Weight training may still be a male dominated activity," said Dr. Comstock, also a faculty member of The Ohio State University College of Medicine. "However, the increase in incidence among female participants is likely the result of more women weight training as it becomes a more accepted fitness activity for women."

"The Arnold Sports Festival commends the Center for Injury Research and Policy at Nationwide Children's Hospital for taking a close look at injuries related to weight training and weightlifting," said Jim Lorimer, co-promoter of the Arnold Sports Festival, the largest multi-sport festival in the nation with more than 18,000 athletes competing in 44 sports and events. "We want all of our athletes to train and compete in a safe environment, and it is invaluable that Nationwide Children's works to raise awareness in these important areas."

The 2010 Arnold Sports Festival was held in March in Columbus, and attracted more than 175,000 sports and fitness enthusiasts. Nationwide Children's and the Arnold Sports Festival have a five-year partnership initiated this year that names the hospital as both a philanthropic beneficiary and official youth sports health partner for the Festival.

This is the first published analysis of the epidemiology of injuries directly related to weight training across all age groups of the general population treated in U.S. emergency departments during the last two decades. Data for this study were collected from the National Electronic Injury Surveillance System (NEISS), which is operated by the U.S. Consumer Product Safety Commission. The NEISS dataset provides information on consumer product-related and sports and recreation-related injuries treated in hospital emergency departments across the country.

Story Source:

Adapted from materials provided by [Nationwide Children's Hospital](#).

<http://www.sciencedaily.com/releases/2010/03/100330115925.htm>



Initiation Ceremonies Don't Build Team Spirit, Study Finds

ScienceDaily (Apr. 16, 2010) — Team building activities in sport are carried out for tradition's sake and don't help players to bond, according to results of a new study presented April 16 at the British Psychological Society's Annual Conference in Stratford-Upon-Avon.

Research into initiation practices in sport by Dr Moira Lafferty, from the University of Chester, and Dr Caroline Wright, from Liverpool Hope University, reveals that there is no positive relationship between team building activities and better team cohesion.

Dr Lafferty explained: "Initiation ceremonies have often been described as 'rites of passage' for new players joining sporting groups or teams. Despite attempts to eradicate inappropriate team building activities there is still evidence that they take place and are perceived to promote team cohesion." The researchers examined the level of appropriate and inappropriate activities engaged in across a range of sports and then explored their relationship to team cohesion to discover whether differences exist between co-active sports, such as badminton, tennis and horse riding, and interactive sports such as football, rugby and cricket. The study involved surveying 100 athletes from across the country aged between 18 and 24.

The results showed little to suggest that team building activities, which can be as basic as having a meal together, helped significantly promote team unity.

"Our findings suggest that, despite there being no positive relationship to team cohesion, team building activities, both positive and negative, are still conducted," Dr Lafferty said.

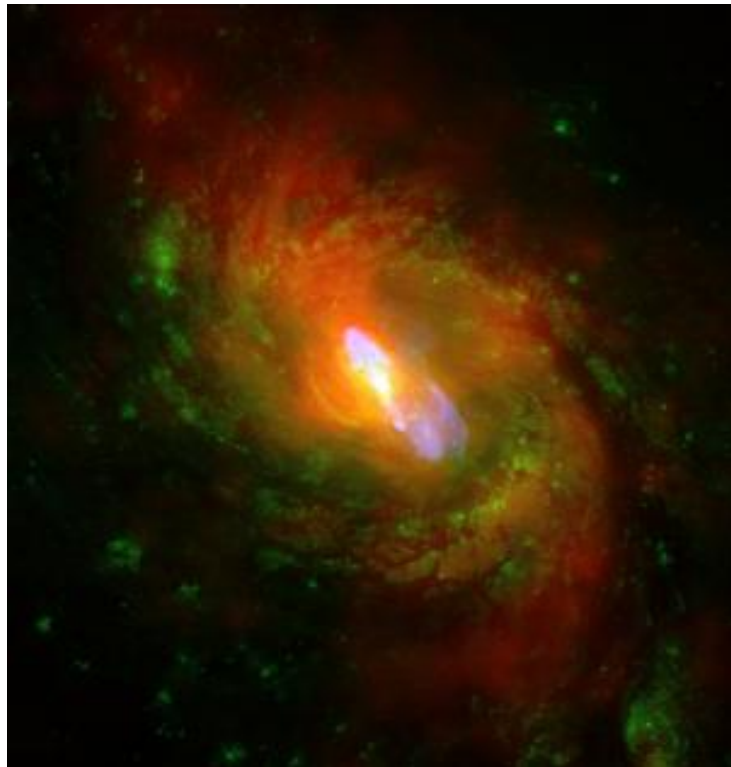
"Interactive sports players are more likely to be subjected to inappropriate team building activities, which suggests that the idea of initiation may be embedded in the tradition of these teams and is seen as part of their cultures."

Story Source:

Adapted from materials provided by [British Psychological Society \(BPS\)](#), via [AlphaGalileo](#).

<http://www.sciencedaily.com/releases/2010/04/100415191442.htm>

Supermassive Black Holes Strip Massive Galaxies of Star-Forming Gases



Composite image of NGC 1068, one of the nearest and brightest galaxies containing a rapidly growing supermassive black hole. (Credit: X-ray (NASA/CXC/MIT/C.Canizares, D.Evans et al), Optical (NASA/STScI), Radio (NSF/NRAO/VLA))

ScienceDaily (Apr. 16, 2010) — Black holes have long been beloved of science fiction writers for their destructive capabilities and peculiar ability to warp space time. Now a study led by researchers from The University of Nottingham reveals the awesome power of supermassive black holes -- the ability to strip massive galaxies of the cool gases required to form new stars, leaving ageing red giants to splutter out of existence with no stars to replace them..

The study, led by Asa Bluck in the School of Physics and Astronomy, used images of unprecedented depth and resolution from the Hubble Space Telescope and the Chandra X-Ray Observatory to detect black holes in distant galaxies. Researchers looked for galaxies emitting high levels of radiation and x-rays -- a classic signature of black holes devouring gas and dust through accretion, or attracting matter gravitationally.

As this matter swirls around the event horizon of a black hole it heats up and radiates energy -- as an accretion disc. The study, which was funded by the Science and Technology Facilities Council and NASA and was a collaboration between researchers at The University of Nottingham and Imperial College London, gleaned some startling results. In supermassive black holes this radiation can reach huge proportions, emitting X-ray radiation in far greater quantities than is emitted by the rest of the objects in the galaxy combined -- meaning that the black hole 'shines' far brighter than the entire galaxy it lies at the heart of. In fact, the amount of energy released is sufficient to strip the galaxy of gas at least 25 times over.

Results have also shown that the vast majority of the X-ray radiation present in the universe is produced in these accretion discs surrounding supermassive black holes, with a small proportion produced by all other objects, including galaxies and neutron stars.



The accretions discs surrounding supermassive black holes produce so much energy that they heat up the cold gases lying at the heart of massive galaxies. The accretion disc shines across all wavelengths -- from radio waves to gamma waves. This speeds up the random motions of the gas, making it rise in temperature and pushing it away from the galactic centre, where it becomes less dense. Gas needs to be cold and dense to collapse under gravity to form new stars, this resulting hot, low-density material must cool down before gravity will take effect -- a process which would take longer than the age of the universe to achieve.

Old stars are therefore left to die out with no new stars replacing them, leaving the galaxy to grow dark and die. And by pushing gas away from the galactic centre, the accretion disc starves the supermassive black hole of new material to devour, leading to its eventual demise.

"It's thought that black holes form inside their host galaxies and grow in proportion to them, forming an accretion disc which will eventually destroy the host. In this sense they can be described as viral in nature," said Asa Bluck, a PhD student at the University and a Fellow of the Royal Astronomical Society. "Massive galaxies are in the minority in our visible universe -- about one in a thousand galaxies is thought to be massive, but it may be much less. And at least a third of these have supermassive black holes at their centre. That's why it's so interesting that this type of black hole produces most of the X-ray light in the universe. They are the minority but they dominate energy output."

Asa presented these results at the Royal Astronomical Society National Astronomy Meeting in Glasgow on April 16.

Story Source:

Adapted from materials provided by [University of Nottingham](#).

<http://www.sciencedaily.com/releases/2010/04/100416095800.htm>

Brain 'splits to multi-task'

By Helen Briggs
Health reporter, BBC News

An inability to deal with more than two things at a time may be "hard-wired" into our brain, research suggests.



When we try to do two things at once, each half of the brain focuses on a separate task, French scientists say.

This division of labour could explain why we find it so difficult to multi-task, they report in the journal *Science*.

It might also explain why people are prone to make irrational decisions when choosing from a long list of items.

Lead author Dr Etienne Koechlin told the BBC: "You can cook and at the same time talk on the phone but you cannot really do a third task such as trying to read a newspaper.

“ Our result is likely to provide an explanation for why people are good in binary choice but not multiple choice ”

Dr Etienne Koechlin

"If you have three or more tasks you lose track of one task."

The French team used an imaging technique to monitor brain activity in 32 volunteers asked to perform a letter-matching test.

The scans looked at the frontal cortex, the part of the human brain associated with impulse control.

When the volunteers completed one task at a time, one side of a certain area of the frontal lobes lit up.

But, when they completed two tasks at the same time, the lobes divided the tasks between them.

'Irrational decisions'

Activity on the left frontal lobe matched the primary task (action A) and activity on the right corresponded to the secondary task (action B).

The brain was able to control switching between the two hemispheres when carrying out dual functions but accuracy suffered when a third was added.

Dr Koechlin, of Ecole Normale Supérieure in Paris, France, said this behaviour could explain why people make "some irrational decisions" when faced with more than two choices.

"My view is that it's critically related to this division of labour between the two hemispheres to keep track of two tasks or two options but not more," he explained.

"Our result is likely to provide an explanation for why people are good in binary choice but not multiple choice."

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8622137.stm>

Published: 2010/04/15 18:02:49 GMT

Vaccine hope over lung infection

A virus that causes wheezing and pneumonia claims the lives of up to 200,000 children worldwide each year, a study has found.



University of Edinburgh scientists found that about 3.4 million children were hospitalised after contracting respiratory syncytial virus (RSV).

RSV is the single largest cause of lung infection in children.

The scientists hope the research will help contribute to the development of a vaccine against the infection. The study, which has been published in *The Lancet*, confirmed that RSV - which infects most children before the age of two - usually causes mild cold-like symptoms, but can lead to serious illness in babies who are born prematurely or who have congenital heart disease.

“ This is the first time we have gathered information on such a global scale and is the best estimate we have for the number of children dying each year from this preventable illness ”

Dr Harish Nair University of Edinburgh

It is the first time that the numbers of children dying globally from RSV before the age of five have been quantified.

The international team analysed unpublished data from developing countries as well as all the published medical research on RSV infection.

They found that about 33.8 million children become infected with RSV each year and that 99% of RSV-related deaths occur in developing countries.

The team hopes that by identifying the numbers affected by the virus, it can contribute to the development of a vaccine against the infection.

Dr Harish Nair, of the University of Edinburgh's department of population health studies, said: "Our greatest hope of fighting this virus is to develop a vaccine, but before we can implement an immunisation programme, we need to understand exactly how big a problem RSV poses.

"This is the first time we have gathered information on such a global scale and is the best estimate we have for the number of children dying each year from this preventable illness."

Professor Warren Lenney, spokesman for the British Lung Foundation, the only charity helping people with all lung diseases, said: "Acute Viral Bronchiolitis (RSV) is a respiratory virus which is not well known, however it is the most common reason for tiny babies to be admitted to hospital within the first year of life - across England and Wales RSV causes 20,000 babies to be admitted to hospital each year during the winter months."

He welcomed the research as indicating the size of the problem on a global scale.

"RSV not only causes respiratory problems in early life but can lead to other long-term chest problems well into teenage years," the professor added.

Story from BBC NEWS:

http://news.bbc.co.uk/go/pr/fr/-/2/hi/uk_news/scotland/edinburgh_and_east/8623153.stm

Published: 2010/04/16 09:10:43 GMT

Doctors urge UK 'trans-fat ban'

By Emma Wilkinson
Health reporter, BBC News

Calls to ban trans-fats from all foods in the UK have been backed by US public health experts.



Trans-fats - solid fats found in margarines, cakes and fast food - are banned in some countries. An editorial in the British Medical Journal said 7,000 deaths a year could be prevented by a 1% reduction in consumption

But the Food Standards Agency said the UK's low average consumption made a complete ban unnecessary.

In January this year, the UK Faculty of Public Health called for the consumption of trans-fats (also known as trans fatty acids) to be virtually eliminated.

“ We still need to do more to make sure that the industrially produced trans-fats don't creep back into our nation's diets ”

Victoria Taylor, British Heart Foundation

It says that although trans-fats make up 1% of the average UK adult food energy intake - below the 2% advised as a dangerous level - there are sections of the population where intake is far higher and these groups are being put at risk.

In the BMJ article, doctors from Harvard Medical School backed this view and said bans in Denmark and New York City had effectively eliminated trans-fats, without reducing food availability, taste, or affordability.

Heart health

Many studies have shown harmful effects of trans-fats on heart health.

They are used to extend shelf-life but have no nutritional value and, like saturated fats, they raise blood cholesterol levels which increase the risk of coronary heart disease.

The BMJ article also points out there is no evidence that such legislation leads to harm from increased use of saturated fats.

The doctors wrote that based on current disease rates, a strategy to reduce consumption of trans-fats by even 1% of total energy intake would be expected to prevent 11,000 heart attacks and 7,000 deaths annually in England alone.

TRANS-FATS

- They are partially hydrogenated vegetable oils, turning oily foods into semi-solid foods
- Used to extend shelf life of products
- Can raise levels of "bad" cholesterol
- Even a small reduction in consumption can cut heart disease
- They have no nutritional benefit

Commenting on the article, Professor Alan Maryon-Davis, president of the UK Faculty of Public Health, said: "There are great differences in the amount of trans-fats consumed by different people and we are particularly concerned about young people and those with little disposable income who eat a lot of this type of food.

"This is a major health inequalities issue."

In 2007, the Food Standards Agency carried out a review of trans-fats and concluded UK consumption was lower than countries such as the US and that voluntary action from food manufacturers had been highly successful.

They said current UK average consumption "was not a concern".

Victoria Taylor, senior heart health dietician at the British Heart Foundation, said UK voluntary measures by the food industry had achieved significant reductions in the amount of trans-fats in food.

"This is good progress but we still need to do more to make sure that the industrially produced trans-fats don't creep back into our nation's diets."

Barbara Gallani, director of food safety and science at the Food and Drink Federation, said: "We agree that it is important to maintain a healthily balanced diet in which trans-fats are consumed within the safe levels recommended by the FSA and that is why artificial trans-fats have been virtually eliminated from processed foods in the UK."

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8622723.stm>

Published: 2010/04/16 06:56:58 GMT

Insulin pump and computer mated to regulate blood sugar

Test in people with type 1 diabetes suggests device might serve as 'artificial pancreas'

By Nathan Seppa

Web edition : Wednesday, April 14th, 2010

A combination of high-tech glucose sensors, a computerized dosing calculator and a small insulin pump may someday allow people with type 1 diabetes to skip the routine injections and blood sugar checks that are a hallmark of the disease.

Armed with software that uses ongoing blood sugar readings to determine hormonal needs, researchers report initial success using an automated “closed loop system” that basically mimics the workings of a healthy pancreas, scientists report in the April 14 *Science Translational Medicine*.

“The technology exists right now for this closed loop system,” says study coauthor Steven Russell, an endocrinologist at Harvard Medical School and Massachusetts General Hospital in Boston.

The final product, still several years away, would consist of a pager-sized device not much bigger than the insulin pumps some diabetics wear today. The device would house dual pumps for both insulin, which lowers blood sugar, and its hormonal counterpart glucagon, which has the opposite effect. Another compartment would receive real-time glucose readings from a sensor under the skin and pass that information to a computer chip. The chip would control the pumps, adjusting the individual’s insulin and glucagon dosages as needed without the person ever lifting — or pricking — a finger.

Current insulin pumps store the hormone in small reservoirs on a belt and deliver the hormone via a small tube poked through the skin and taped in place.

In the new study, Russell and his colleagues show that the mathematical algorithm contained in the software worked in 11 people who had type 1 diabetes. The volunteers ate three high-carbohydrate meals over 27 hours under close observation while researchers obtained blood sugar readings every five minutes via standard intravenous catheters placed in each patient’s arm. Those readings went into a laptop computer, which calculated the proper amount of insulin and glucagon needed. A nurse used that readout to manually trigger the pumps to dose each patient. This rather cumbersome hardware array and a full-time staff were required for an initial safe test that the algorithm works, says study coauthor Edward Damiano, a biomedical engineer at Boston University.

Six of the 11 patients stayed within the normal blood sugar range, with five showing some drops. After adjusting the algorithm to account for slower absorption of insulin in those five, a repeat test showed the technology prevented hypoglycemia and maintained blood sugar at a manageable level.

“Their findings suggest that the safe use of a bi-hormonal artificial endocrine pancreas to control blood glucose concentrations is possible,” say Larry Brown and Elazer Edelman of MIT, writing in the same *Science Translational Medicine* issue. Chronic high blood sugar can cause damage to the heart, kidneys and eyesight.

In addition to losing the vital beta cells that naturally make insulin, the pancreases of people with type 1 diabetes also fail to fine-tune glucagon production, Russell says. Brown and Edelman note that in the new tests, “Optimized algorithm-controlled infusion of glucagon with insulin enabled avoidance of hypoglycemia.”

Currently, patients with insulin pumps whose blood sugar has risen beyond the norm or who are about to eat a meal press a button to receive a dose of insulin. By eliminating manual dosing, the new technology avoids some of the vagaries of self-treatment, Damiano says. But in practice, there would be manual overrides with alarm beepers in case a mechanical failure by the automated system caused a sharp rise or fall in blood sugar, he says.

The research team plans further testing with more people over longer time periods and while exercising. Damiano estimates that a fully automated and exhaustively tested wearable version might be ready for regulatory approval in five years for insulin and seven years for a combination insulin and glucagon delivery system.

http://www.sciencenews.org/view/generic/id/58303/title/Insulin_pump_and_computer_mated_to_regulate_blood_sugar

Mercury surprise: Rice can be risky

Millions in China are at risk, and potentially elsewhere as well

By Janet Raloff

Web edition : Friday, April 16th, 2010

Ask toxicologists how best to avoid mercury poisoning and they'll almost certainly advise against eating too much of the wrong types of fish. (Never mind that there's considerable confusion about what the wrong types are.) But a new study out of China shows that for millions of people at risk of eating toxic amounts of mercury-laced food, fish isn't the problem. Rice is. And that's bad news because in their part of the world rice is the dietary staple

A team of Chinese and Norwegian researchers investigated dietary mercury contamination in rural, inland China — a region where few people eat fish. They focused on Guizhou province, which they describe as the “mercury capital of China.” The area is home to 12 large mercury-mining and smelting operations, not to mention other heavy coal-powered industry. All of these industrial operations belch out tons of air- and water pollution laced with substantial quantities of mercury. Hua Zhang and Xinbing Feng of the Chinese Academy of Sciences' Graduate University in Beijing and their coauthors measured mercury in the air, water and in all major foods from local markets. Then they modeled likely ingestion rates of these foods for residents of various communities across the province. These included a village located inside a nature preserve, a region downwind of a major coal plant, people living near a defunct zinc smelter and a community whose air was polluted by mercury-mining operations.

In an upcoming issue of *Environmental Health Perspectives*, the researchers report that although mercury exposures for these communities varied dramatically, in every one of them “rice accounted for 94 to 96 percent of the probable daily intake of methylmercury” — the most neurotoxic and readily absorbed form of mercury. Methylmercury poisoning has been linked with diminishing the IQ of children exposed in the womb and with raising blood pressure and other heart-disease risks among adults. Guizhou's heavy cereal contamination traces in large part, the study says, to the fact that rice paddies harbor the types of bacteria that can convert inorganic mercury to its more toxic, methylated form. Moreover, in Guizhou, more than 70 percent (27 million people) live in rural areas — impoverished communities where the annual household income averages less than the U.S. equivalent of \$300.

Not surprisingly, these rural families derive a large share of their calories from rice. And locally grown rice had high total mercury levels. It varied by region, with the highest contamination in Wanshan, the mercury-mining region. More importantly, some 11 percent of the mercury in the grain they sampled in Wanshan was methylated. It averaged 9.3 micrograms of this especially toxic mercury per kilogram of rice in an area where people down an average of more than a half-kilogram of the grain each day.

Meat, on a per-kilogram basis, contained even more total mercury than rice — an average of 220 micrograms versus 78 µg. However, meat contained a far smaller share that was methylated than in rice, just 0.85 µg/kg. Ironically, even though people don't eat much fish in Guizhou, area fish have relatively low methylmercury concentrations — 0.06 milligrams per kilogram, about one-tenth of China's recommended limit for dietary items. Bottom line: Guizhou diners probably don't face huge risks except from rice subjected to mercury-laced mega-fallout from Wanshan-type mercury-mining and –smelting. But in such communities, tainted rice could contribute more mercury in a typical year than will fish in coastal Japan or in Norway, the researchers observe. That said, intake of the methylated form of mercury in Guizhou still would be “much lower” than among heavy consumers of fish in coastal Asia and in many Western nations. The big question, of course, is whether mercury contamination of rice is unique to Guizhou. The authors suspect it isn't, but note that follow-up studies will be needed to confirm that. And, of course, any tainted rice may not stay put in our increasingly global economy.

http://www.sciencenews.org/view/generic/id/58350/title/Mercury_surprise_Rice_can_be_risky

Pine pollen gets flight miles

Still viable after 41 kilometers of travel

By Susan Milius

Web edition : Friday, April 16th, 2010



Pollen power Spherical grains of pollen from loblolly pines show their vigor by sprouting elongated tubes. Floyd Bridgwater/USDA Forest Service

Without getting even a packet of nuts during the flight, pine pollen survives air travel pretty well.

Loblolly pine pollen can still do its pollination job after blowing in the wind for at least 41 kilometers, or 25 miles, forest biologist Claire Williams reports in the May *American Journal of Botany*. “It’s a world record,” Williams says, but she explains that for this type of real-world pollen study, it’s also the only record.

Williams’ new work is important because there’s very little information on how long pollen can remain viable, says evolutionary biologist Anna Kuparinen at the University of Helsinki. Biologists have certainly known that pollen travels far from home, but not how well it survives the trip.

Precision pine The reproductive parts of loblolly pines shed pollen into the wind and capture grains produced by other trees as part of a delicately timed cycle. Available via Creative Commons license on Wikimedia Commons

The loblolly’s vigor “will probably surprise a lot of people,” says population biologist Peter Smouse of Rutgers University in New Brunswick, N.J. “Perhaps it should not have been surprising, given that the function of pollen is to travel.”

Distance records for pollen are also a practical matter, says Williams, who works jointly with the Forest History Society and the National Evolutionary Synthesis Center, both in Durham, N.C. To understand



how tree populations might cope with climate change, she says, it helps to know how far pollen could spread genes that help trees adapt to warming.

What's more, scientists have already planted field trials of genetically modified, or transgenic, pine trees. Before commercial use, USDA regulators will need to consider how far pollen might carry engineered genes out into a wild population, Williams says.

Distance isn't everything, though, when talking about the possible escape of transgenes, Smouse says. What matters most is what far-flung pollen does when it reaches a wild population. Kuparinen notes that researchers will still need to know whether seedlings carrying an escaped transgene would be able to compete.

Williams has collected accounts of epic pollen travel, such as a 1937 study, sponsored in part by the Hoover vacuum cleaner company, that documented airborne pollen being sucked up aboard a ship in the middle of the Atlantic. And the south Atlantic islands of Tristan de Cunha are dusted by pollen from trees growing 4,500 kilometers away.

To add viability tests to the distance measurements, Williams took advantage of the geography of North Carolina's Outer Banks. On the mainland grow wide swaths of loblolly pines, the most commonly planted tree in the southern United States. The barrier island of Ocracoke has no loblolly stands, and the few pines on neighboring Hatteras shed pollen early. So Williams took her collecting equipment on the ferry out to Ocracoke and collected pollen wafting from mainland trees at least 41 kilometers away. Williams caught the pollen in lab dishes and found that at least a fraction of the well-traveled grains could still sprout a pollen tube, the projection that transmits sperm cells to the female organs.

What the work does not have, Williams emphasizes, is implications for people with pollen allergies. Fewer than 5 percent of people react to pollen from pines, and she is doing her best to stamp out what she calls urban myths about allergenic pines.

http://www.sciencenews.org/view/generic/id/58360/title/Pine_pollen_gets_flight_miles



'Java Man' takes age to extremes

New dating of Indonesian strata produces unexpected results

By Bruce Bower

Web edition : Friday, April 16th, 2010

ALBUQUERQUE — New age estimates for *Homo erectus* fossils on the Indonesian island of Java have physical anthropologists scratching their crania.

After convincing most of their colleagues that *H. erectus* may have persisted on the Indonesian island of Java as recently as 30,000 years ago — late enough to have coexisted in Asia with modern humans for more than 100,000 years — anthropologists presented new analyses April 14 suggesting the fossils in question may actually predate *Homo sapiens* by hundreds of thousands of years.

It all depends which radiometric method you use to assess the fossils' age, New York University anthropologist Susan Antón reported at the annual meeting of the American Association of Physical Anthropologists.

Antón and an Indonesian colleague lead a team that first announced in 1996 that sediment at two *H. erectus* sites on Java dates to between 50,000 and 30,000 years ago. Those “remarkably young” dates, based on analyses of radioactive elements in fossil-bearing sediment, suggest that *H. erectus* survived well into the era dominated by modern humans, Antón said. Many researchers now accept those dates.

But a new analysis, based on measurements of radioactive argon's decay in volcanic rock above and below the fossils, puts *H. erectus*' age on Java at roughly 550,000 years. It's not clear why these estimates differ so dramatically and which one is more accurate, Antón said.

“It's confusing right now, but I suspect that *Homo erectus*' age on Java is still relatively young,” said Christopher Stringer of London's Natural History Museum. A new analysis of sediment on Java suggests that animal fossils on the island date to between 200,000 and 150,000 years ago, providing a possible framework for when *H. erectus* lived there, he added.

http://www.sciencenews.org/view/generic/id/58346/title/Java_Man_takes_age_to_extremes



Why a rotten tooth is hard to find

Brain can't distinguish pain coming from top versus bottom tooth

By [Laura Sanders](#)

Web edition : Friday, April 16th, 2010

When it comes to a toothache, the brain doesn't discriminate. A new imaging study shows that to the brain, a painful upper tooth feels a lot like a painful lower tooth. The results, which will be published in the journal *Pain*, help explain why patients are notoriously bad at pinpointing a toothache.

For the most part, humans are exquisitely tuned to pain. The brain can immediately distinguish between a splinter in the index finger and a paper cut on the thumb, even though the digits are next-door neighbors. But in the mouth this can be more difficult, depending where and how intense the ache is.

"We don't know much about tooth pain," comments dentist and neuroscientist Alexandre DaSilva of the University of Michigan in Ann Arbor, who was not part of the new research. The new study is one of the first to address the puzzle of toothache localization, he says.

In the study, researchers led by Clemens Forster of the University of Erlangen-Nuremberg in Germany analyzed brain activity in healthy — and brave — volunteers as they experienced tooth pain. The researchers delivered short electrical pulses to either the upper left canine tooth (the pointy one) or the lower left canine tooth in the subjects. These bursts of electrical stimulation produced a painful sensation similar to that felt when biting into an ice cube, Forster says, and were tuned such that the subject always rated the pain to be about 60 percent, with 100 percent being the worst pain imaginable.

To see how the brain responds to pain emanating from different teeth, the researchers used fMRI to monitor changes in activity when the upper tooth or the lower tooth was zapped. "At the beginning, we expected a good difference, but that was not the case," Forster says.

Many brain regions responded to top and bottom tooth pain — carried by signals from two distinct branches of a fiber called the trigeminal nerve — in the same way. The V2 branch carries pain signals from the upper jaw, and the V3 branch carries pain signals from the lower jaw.

In particular, the researchers found that regions in the cerebral cortex, including the somatosensory cortex, the insular cortex and the cingulate cortex, all behaved similarly for both toothaches. These brain regions are known to play important roles in the pain projection system, yet none showed major differences between the two toothaches. "The activation was more or less the same," Forster says, although he adds that their experiments might have missed subtle differences that could account for why some tooth pain can be localized.

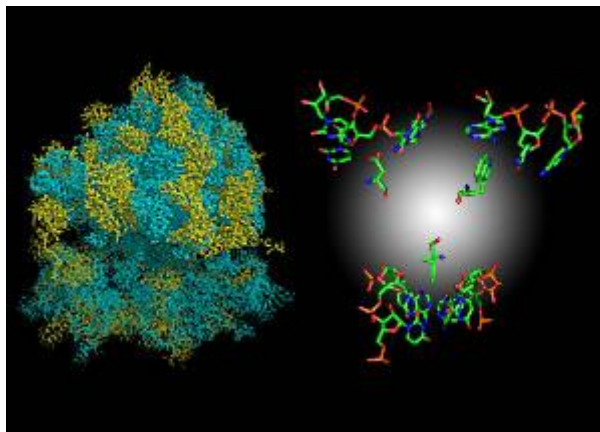
Because the same regions were active in both toothaches, the brain — and the person — couldn't tell where the pain was coming from. "Dentists should be aware that patients aren't always able to locate the pain," Forster says. "There are physiological and anatomical reasons for that."

DaSilva agrees that the brain's inability to tell top-tooth pain from bottom-tooth pain "pairs really well with what we see in the clinic."

Understanding the pathway from tooth to brain may help researchers devise better treatments for acute tooth pain, such as cavities or infections, and more chronic conditions, DaSilva says. One such condition is phantom pain that persists in the mouth after a tooth has been removed.

http://www.sciencenews.org/view/generic/id/58340/title/Why_a_rotten_tooth_is_hard_to_find

Elegantly Simple Organizing Principles Seen in Ribosomes



Analysis of ribosome structures (shown on the left) from four different species revealed a non-random affinity between anticodon-containing RNA triplets and their respective amino acids (shown on the right). (Credit: Courtesy of David Johnson, Salk Institute for Biological Studies)

ScienceDaily (Apr. 13, 2010) — With few exceptions, all known forms of life on our planet rely on the same genetic code to specify the amino acid composition of proteins. Although different hypotheses abound, just how individual amino acids were assigned to specific three-letter combinations or codons during the evolution of the genetic code is still subject to speculation.

Taking their hints from relics of this evolution left behind in modern cells, researchers at the Salk Institute for Biological Studies concluded that after only two waves of "matching" and some last minute fiddling, all 20 commonly used amino acids were firmly linked with their respective codons, setting the stage for the emergence of proteins with unique, defined sequences and properties.

Their findings, which will be published in next week's online edition of the *Proceedings of the National Academy of Sciences*, provide the first in vivo data shedding light on the origin and evolution of the genetic code.

"Although different algorithms, or codes, were likely tested during a long period of chemical evolution, the modern code proved so robust that, once it was established, it gave birth to the entire tree of life," says the study's lead author Lei Wang, Ph.D., an assistant professor in the Chemical Biology and Proteomics Laboratory.

"But the universality of the code makes it very hard for researchers to study its formation since there are no organisms using a primitive or intermediate genetic code that we could analyze for comparison," he explains.

Cells provide a dazzling variety of functions that cover all of our body's needs, yet they make do with a very limited number of molecular building blocks. With few exceptions, all known forms of life use the same common 20 amino acids -- and only those 20 -- to keep alive organisms as diverse as humans, earthworms, tiny daisies, and giant sequoias.

Each of the 20 amino acids is matched to its own carrier molecule known as transfer RNA (tRNA). During protein synthesis, which is coordinated by so-called ribosomes, amino acids are brought out one by one by their respective tRNAs and inserted in the growing protein chain according to the instructions spelled out in the universal language of life -- the genetic code. The code is "read" with the help of anticodons embedded in each tRNA, which pair up with their codon-counterparts.

Several hypotheses have been put forward to explain why codons are selectively assigned to specific amino acids. "One of the theories, the stereochemical hypothesis, gained some traction when researchers could show that short codon- or anticodon-containing polynucleotide molecules like to interact with their respective amino acids," says graduate student and first author David B. F. Johnson.

If chemical or physical interactions between amino acids and nucleotide indeed drove the formation of the genetic code, Johnson reasoned, then he should be able to find relics of this mutual affinity in modern cells. He zoomed in on ribosomes, large complexes consisting of some 50 proteins interacting closely with ribosomal RNAs.

"Also, the ribosome emerged from an early evolutionary stage of life to help with the translation of the genetic code before the last universal common ancestor," explains Wang, "and therefore is more likely to serve as a molecular fossil that preserved biological evidence."

When Wang and Johnson probed bacterial ribosomes for imprints of the genetic code, they found evidence that direct interactions between amino acids and nucleotide triplet anticodons helped establish matching pairs. "We now believe that the genetic code was established in two different stages," says Johnson.

Their data does not shed much light on the early code, consisting of prebiotically available amino acids -- the kind generated in Stanley Miller's famous "zap"-experiment. But once some primitive translational mechanism had been established, new amino acids were added to the mix and started infiltrating the genetic code based on specific amino acid/anticodon interactions.

"We found evidence that a few amino acids were reassigned to a different codon but once the code was in place it took over," says Johnson. "It might not have been the best possible solution but the only one that was viable at the time."

The work was supported in part by the Searle Scholar Program, the Beckman Young Investigator Program and the National Institutes of Health Director's New Innovator Award.

Story Source:

Adapted from materials provided by [Salk Institute](#).

Journal Reference:

1. David B. F. Johnson, Lei Wang. **Imprints of the genetic code in the ribosome.** *Proceedings of the National Academy of Sciences*, 2010; DOI: [10.1073/pnas.1000704107](https://doi.org/10.1073/pnas.1000704107)

<http://www.sciencedaily.com/releases/2010/04/100412151823.htm>

Tainted Produce More Likely for Shoppers in Low-Income Neighborhoods, Study Suggests



Ready-to-eat salads and strawberries sold in stores in the poorer neighborhoods had significantly higher counts of microorganisms, yeasts and molds than the same products purchased elsewhere. (Credit: iStockphoto/Leonel Bourque)

ScienceDaily (Apr. 13, 2010) — No one wants a mixed salad tossed with extra bacteria, mold and yeast, but those are just what you might find when you try to eat a healthier diet in poorer neighborhoods. A new study shows that the level of bacteria found on the fresh produce can vary according to the income level of the neighborhoods where it is for sale.

Researchers compared levels of bacteria, yeast and mold on identical products sold in six Philadelphia-area neighborhoods. They selected three of the neighborhoods because they had the city's highest poverty levels. In these, consumer options tended to be small markets that offered less variety in fruits and vegetables.

The result: ready-to-eat salads and strawberries sold in stores in the poorer neighborhoods had significantly higher counts of microorganisms, yeasts and molds than the same products purchased elsewhere, while cucumbers had a higher yeast count and mold and watermelon contained more bacteria.

“Food deteriorates when there is microbial growth,” said study co-author Jennifer Quinlan, a professor of nutrition and biology at Drexel University. “The bacterial count is used to determine the quality of the produce and it was poorer quality, closer to being spoiled. Three of the things that had a higher bacteria count — strawberries, ready-to-go salad and fresh-cut watermelon — have been associated with food-borne illnesses.”

The study appears online and in the May issue of the *American Journal of Preventive Medicine*.

When your access to produce is of inferior quality, it discourages you from adding more fruits and vegetables to your diet. Part of the problem, Quinlan said, is that much of the food available in poorer neighborhoods is for sale in smaller stores that might not have the infrastructure to handle produce in the safest way.



“The food may be of poorer quality to begin with; then it may be transported to the stores and not be refrigerated properly,” she said. “Large supermarkets have entire units focused on food safety, refrigeration, sanitation. While a small facility with only one or two people may not have the resources.”

Although the bacteria that can cause spoilage are not the same bacteria that are dangerous from a standpoint of food-borne illness, consumers can take some important steps to ensure they get the freshest produce.

“One thing consumers can look for is that fresh-cut produce be refrigerated at the point of sale,” said Shelley Feist, executive director of Partnership for Food Safety Education. “When they get fresh produce home, it’s important to clean it thoroughly. Whole fresh produce should be rinsed under running tap water just before eating and produce should be kept separate from meat, poultry, raw eggs and fish to avoid cross-contamination.”

Story Source:

Adapted from materials provided by [Health Behavior News Service](#). Original article written by Joan Vos MacDonald.

Journal Reference:

1. Koro ME, Anandan S, Quinlan JJ. **Microbial quality of food available to populations of differing socioeconomic status**. *Am J Prev Med*, 38(5) 2010

<http://www.sciencedaily.com/releases/2010/04/100409152029.htm>



Many Adults Unaware They May Be Suffering from Chronic Obstructive Pulmonary Disease

ScienceDaily (Apr. 13, 2010) — As many as 20 percent of adults with known risk factors are currently undiagnosed but suffer from chronic obstructive pulmonary disease (COPD), states a research article in *CMAJ* (*Canadian Medical Association Journal*).

COPD is a common and costly respiratory condition that is estimated to affect 10% of people 40 years of age and older.

This study was conducted to measure the prevalence of COPD in an at-risk population of adults aged 40 years or more with a smoking history of at least 20 pack-years, the number of packs smoked per day, multiplied by the number of years smoked, who visited a primary practitioner for any reason. The study evaluated the accuracy of prior diagnosis or nondiagnosis of COPD and identified associated clinical characteristics.

In a study of 1003 participants, the researchers identified COPD in approximately one of every five adults. Although more than three-quarters of the patients with COPD reported at least one respiratory symptom, two-thirds were unaware of their diagnosis. "These findings suggest that adults who attend a primary care practice with known risk factors for COPD are important targets for screening and early intervention," write Dr. Roger Goldstein, West Park Healthcare Centre, Toronto, Ontario and coauthors.

Underdiagnosis of COPD has been previously reported but according to the authors the extent of it in their study was especially striking given that all of the patients had two important risk factors for COPD.

The authors conclude that early detection of COPD in high-risk patients in a primary care setting is feasible and successful early intervention could result in important reductions in mortality, morbidity and health care costs associated with COPD, although this remains to be demonstrated in future evaluations. Further research is indicated to define more clearly the reasons for underdiagnosis and overdiagnosis of COPD in primary care settings.

Story Source:

Adapted from materials provided by [Canadian Medical Association Journal](#), via [EurekAlert!](#), a service of AAAS.

Journal Reference:

1. Kylie Hill, Roger S Goldstein, Gordon H Guyatt, Maria Blouin, Wan C Tan, Lori L Davis, Diane M Heels-Ansdell, Marko Erak, Pauline J Bragaglia, Itamar E Tamari, Richard Hodder, and Matthew B Stanbrook. **Prevalence and underdiagnosis of chronic obstructive pulmonary disease among patients at risk in primary care.** *CMAJ*, 2010; DOI: [10.1503/cmaj.091784](#)

<http://www.sciencedaily.com/releases/2010/04/100406125532.htm>

Bringing Better Grapes a Step Closer to Reality



ARS researchers have developed a relatively fast and inexpensive way to identify genetic markers in grapes that can be linked with specific traits such as fruit quality, environmental adaptation, and disease and pest resistance, which can speed up breeding better grape varieties. (Credit: Photo by Scott Bauer)

ScienceDaily (Apr. 13, 2010) — Grapes are one of the world's most economically important fruit crops, but the woody perennial takes three years to go from seed to fruit, and that makes traditional breeding expensive and time-consuming.

A team of Agricultural Research Service (ARS) researchers has found a way to speed things up by developing a way to identify genetic markers in the grapevine's genome that can be linked with specific traits, such as fruit quality, environmental adaptation, and disease and pest resistance.

Computational biologist Doreen Ware, geneticists Edward Buckler and Charles Simon, and research leader Gan-Yuan Zhong have developed a relatively fast and inexpensive way to identify genetic markers not only in grapes, but also in other crops by using modern sequencing approaches. Ware and Buckler work at the ARS Robert W. Holley Center for Agriculture and Health in Ithaca, N.Y.; Simon works at the ARS Plant Genetic Resources Unit at Geneva, N.Y., and Zhong is at the ARS Grape Genetics Research Unit, also at Geneva.

The researchers used the technology to sequence representative portions of the genomes from 10 cultivated grape varieties, six wild varieties and the clone of Pinot Noir originally sequenced by scientists in 2007. They developed filters that allowed them to make corrections for common sequencing errors, and discovered thousands of high-quality single nucleotide polymorphisms, or SNPS, which are genetic markers that can serve as signposts for showing how plants are related to each other.

They then used 9,000 of those SNPs in a custom-designed assay to examine DNA patterns at defined points along each cultivar's genome. They found the SNPS contained enough data to identify the relationships and geographic origins of the cultivars. The work was published in *PLOS ONE*.

Improved technology is expected to make it possible to one day sequence the entire genomes of large numbers of grapes. But in the meantime, the work will help researchers identify portions of the grape genome where they can find genes that confer desirable traits, offering better information for breeders developing new varieties. The technique also should make it easier to identify the origins of other types of plants, characterize relationships in other plant collections, and accelerate genetic mapping efforts in a number of crop species.

Story Source:

Adapted from materials provided by USDA/Agricultural Research Service. Original article written by Dennis O'Brien.

Journal Reference:

1. Sean Myles, Jer-Ming Chia, Bonnie Hurwitz, Charles Simon, Gan Yuan Zhong, Edward Buckler, Doreen Ware, Pär K. Ingvarsson. **Rapid Genomic Characterization of the Genus *Vitis***. *PLoS ONE*, 2010; 5 (1): e8219 DOI: [10.1371/journal.pone.0008219](https://doi.org/10.1371/journal.pone.0008219)

<http://www.sciencedaily.com/releases/2010/03/100323105954.htm>

Massive Arctic Ice Cap Is Shrinking, Study Shows; Rate Accelerating Since 1985



Location of Devon Island in Arctic Canada. (Credit: Courtesy of Wikimedia Commons)

ScienceDaily (Apr. 13, 2010) — Close to 50 years of data show the Devon Island ice cap, one of the largest ice masses in the Canadian High Arctic, is thinning and shrinking.

A paper published in the March edition of *Arctic*, the journal of the University of Calgary's Arctic Institute of North America, reports that between 1961 and 1985, the ice cap grew in some years and shrank in others, resulting in an overall loss of mass. But that changed 1985 when scientists began to see a steady decline in ice volume and area each year.

"We've been seeing more mass loss since 1985," says Sarah Boon, lead author on the paper and a Geography Professor at the University of Lethbridge. The reason for the change? Warmer summers.

The High Arctic is essentially a desert with low rates of annual precipitation. There is little accumulation of snow in the winter and cool summers, with temperatures at or below freezing, serve to maintain levels. Any increase of snow and ice takes years.

This delicate equilibrium is easily upset. One warm summer can wipe out five years of growth. And though the accelerated melting trend began in 1985, the last decade has seen four years with unusually warm summers -- 2001, 2005, 2007 and 2008.

"What we see during these warm summers is the extent of the melt is greater," says Boon about the results of a five-year remote sensing study that ran between 2000 and 2004.

The white surfaces of snow and ice reflect heat -- a process known as the albedo effect. Retreating ice exposes dark soil and gravel, which absorb heat and increase the melt rate of ice along the periphery of the cap. But it's not only the edges of the cap that are losing ice. At lower altitudes the ice is thinning as well.



Changes to the Devon ice cap, which covers approximately 14,400 sq. km, could have multiple impacts on everything from ship traffic to sea level.

There has already been an increase in the number of icebergs calving off from outlet glaciers that flow into the ocean. Boon explains that melt water runs between the bottom of the glacier and the ground, creating a slippery cushion that allows the glacier to slide forward more rapidly than it would in colder conditions.

"There are a lot of things we need to consider. One is the iceberg calving and its implications for shipping. These things don't just go away, they float out into the ocean," says Boon. A second area of concern is the contribution of increased glacier melt to rising sea level.

The work of Boon and her colleagues demonstrates the importance of long-term research. Work on Devon Island began in 1961 with researchers from the Arctic Institute of North America, including long-time Arctic scientist Roy 'Fritz' Koerner, who was part of the current study until his death in 2008. This ongoing research, which is continuing thanks to federal International Polar year funding, has created a comprehensive dataset that contributes to the understanding of the complex play between the ice cap, the atmosphere and the ocean.

"We all know long-term studies are important but they are really hard to pay for."

Story Source:

Adapted from materials provided by [Arctic Institute of North America](#), via [EurekAlert!](#), a service of AAAS.

Journal Reference:

1. Boon, S. Burgess; D.O. Koerner, R.M.; Sharp, M.J. **Forty-seven years of research on the Devon Island ice cap, Arctic Canada.** *Arctic*, 2010; 63 (1): 13-29 [[link](#)]

<http://www.sciencedaily.com/releases/2010/04/100412121014.htm>

Sugarcane OK in Standing Water, Helps Protect Everglades

Sugarcane can tolerate flooded conditions for up to two weeks without damaging harvests, which gives phosphate time to settle out and reduces the potential for it to flow into the Everglades, according to ARS research. (Credit: Photo courtesy of Barry Glaz, ARS)

ScienceDaily (Apr. 13, 2010) — A study by Agricultural Research Service (ARS) scientists shows that sugarcane can tolerate flooded conditions for up to two weeks. That's good news for growers who are using best management practices for controlling phosphorous runoff into the Everglades.



Phosphorous stays attached to the soil for a long time even with the moderate rates of phosphorous fertilizer applied to sugarcane in Florida. If growers immediately drain their flooded fields after heavy rains have stirred up the soil, then soil particles -- with phosphorus attached -- flow from surrounding ditches and canals into the Everglades. Studies have reported that reducing phosphorus will help restore the large expanses of native sawgrass in the Everglades that were replaced with cattails.

Presently, Florida sugarcane growers are under strict regulations to reduce the amount of phosphorous runoff into the Everglades, so they often delay drainage for several days and reduce drainage rates from their fields to prevent large amounts of soil and phosphorous from getting caught in the runoff. However, growers are concerned about how standing water affects yield and sugar content of their crop.

Results from a lysimeter study conducted by agronomist Barry Glaz and soil scientist Dolen Morris (now deceased) at the ARS Sugarcane Field Station in Canal Point, Fla., show that sugarcane may be just the crop to help contribute positively to Everglades restoration. The researchers found that flooding for up to two weeks had no adverse effects on yield and sugar content. If lysimeter results translate to commercial fields, then growers can wait to drain standing water. This will allow the soil stirred up by the heavy rains to settle, resulting in less phosphorous entering the Everglades.

However, the problem is far from solved because results from this study, published in *Agronomy Journal*, also showed that while sugarcane yielded well with periodic flooding, its yields were substantially reduced by shallow water table depths. In other words, the water table is consistently close to the soil surface, so that a substantial portion of the plant's roots are always in water.

Further research by Glaz will focus on the effects of floods and shallow water tables on sugarcane roots as he seeks strategies aimed at sustaining sugarcane yields while keeping phosphorus discharge at acceptable levels.

Story Source:

Adapted from materials provided by [USDA/Agricultural Research Service](#). Original article written by Stephanie Yao.

<http://www.sciencedaily.com/releases/2010/03/100324113416.htm>

When Social Fear Is Missing, So Are Racial Stereotypes, Shows Study of Children With Williams Syndrome



New research suggests that children with Williams Syndrome -- who have unusually friendly natures because they lack the sense of fear that the rest of us feel in many social situations -- lack the proclivity to stereotype others based on their race. (Credit: iStockphoto/Stefanie Timmermann)

ScienceDaily (Apr. 12, 2010) — Children with the genetic condition known as Williams syndrome have unusually friendly natures because they lack the sense of fear that the rest of us feel in many social situations. Now, a study reported in the April 13th issue of *Current Biology*, a Cell Press publication, suggests that children with Williams Syndrome are missing something else the rest of us have from a very tender age: the proclivity to stereotype others based on their race.

The findings support the notion that social fear is at the root of racial stereotypes. The researchers say the results might also aid in the development of interventions designed to reduce discriminatory attitudes and behavior towards vulnerable or marginalized groups of society.

"This is the first study to report the absence of racial stereotypes in any human population," said Andreas Meyer-Lindenberg of the Central Institute of Mental Health, Mannheim/University of Heidelberg, who coauthored the paper with Andreia Santos and Christine Deruelle of the Mediterranean Institute of Cognitive Neuroscience in Marseille.

Previous studies have shown that stereotypes are found ubiquitously in typically developing children -- as early as age 3 -- as they are in adults, Meyer-Lindenberg explained. Even children with autism display racial stereotypes, despite profound difficulties in daily social interaction and a general failure to show adapted social knowledge.

In their study, the researchers showed children a series of vignettes with people differing in race or gender and asked the children to assign positive or negative features to those pictured. Typical children made strongly stereotypical assignments both for sex roles and for race, confirming the results of previous studies. On the other hand, children with Williams syndrome showed no evidence for racial bias.

"The unique hypersociable profile of individuals with Williams syndrome often leads them to consider that everybody in the world is their friend," Meyer-Lindenberg said. "In previous work, we have shown that processing of social threat is deficient in people with the syndrome. Based on this, we suspected that they would not show a particular preference for own-race versus other-race characters. The finding that racial stereotypes in children with Williams syndrome were completely absent was nevertheless surprising in its degree."

The children with Williams syndrome did make stereotypical sex role assignments just like normal children. That finding suggests that different forms of stereotyping arise from different brain mechanisms, the researchers say, and that those mechanisms are selectively affected in some way by the genetic alteration that causes Williams syndrome (the loss of about 26 genes on chromosome 7).

The researchers include Andreia Santos, University of Heidelberg/Medical Faculty Mannheim, Mannheim, Germany, Mediterranean Institute of Cognitive Neuroscience, CNRS, Marseille, France, Andreas Meyer-Lindenberg, University of Heidelberg/Medical Faculty Mannheim, Mannheim, Germany, & Christine Deruelle, Mediterranean Institute of Cognitive Neuroscience, CNRS, Marseille, France.

Story Source:

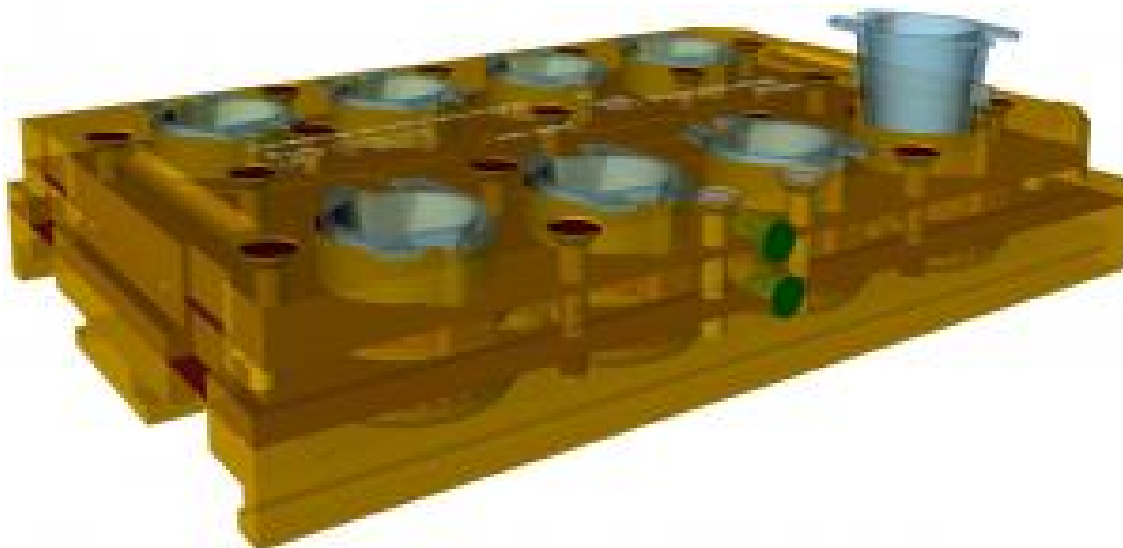
Adapted from materials provided by [Cell Press](#), via [EurekAlert!](#), a service of AAAS.

Journal Reference:

1. Andreia Santos, Andreas Meyer-Lindenberg, Christine Deruelle. **Absence of racial, but not gender, stereotyping in Williams syndrome children.** *Current Biology*, 2010; 20 (7): R307-R308
DOI: [10.1016/j.cub.2010.02.009](https://doi.org/10.1016/j.cub.2010.02.009)

<http://www.sciencedaily.com/releases/2010/04/100412124952.htm>

How Dangerous Are Air Pollutants Really?



The principle element is the culture plate, in the dimensions of commercially available multiwell plates. (Credit: Copyright Fraunhofer ITEM)

ScienceDaily (Apr. 12, 2010) — How severely do smog, diesel exhaust and secondhand smoke damage the lungs? What do pollen or nanoparticles trigger when they infiltrate the human body through inhaling? At this year's BIO Convention in Chicago from May 3 to 6, Fraunhofer researchers will present a new test system that can be used to investigate these questions.

Through this system, it will be possible for the first time ever to channel substances from the air, under precisely controlled conditions, through the lung cells or skin cells, and simultaneously observe the reactions of these cells under the microscope.

The air brings a plethora of chemical substances into contact with our bodies. Precisely how the skin and mucous membranes or bronchi and lungs respond to the forced contact with foreign matter can best be studied in cell cultures that originate from the respective tissues. "What you do is cultivate cells onto a porous plastic membrane coated on the bottom with a culture medium, and then from above you conduct air with the test substance over the cells," explains Detlef Ritter of the Fraunhofer Institute for Toxicology and Experimental Medicine ITEM in Hannover.

Quite simple, theoretically speaking. But in practical terms, this test procedure -- which had already conceived back in the 1970s -- still poses problems today: "With the conventional test systems, the atmosphere above the cells frequently is not separated cleanly enough from the culture medium, especially along the margins of the membrane. That's why the test substances sometimes react directly with the solution instead of the cell surface -- which adulterates the measurements," says Ritter. One other shortcoming of the systems currently available: If you want to study cells treated with air pollutants under the microscope, then you have to apply them to a new vessel beforehand -- a step that likewise influences test results.

The new test system, developed at Fraunhofer's ITEM and submitted for patent, bridges these pitfalls: The PRIT® Air/Liquid Interface Culture and Exposure System consists of several components. The principle element is the culture plate, in the dimensions of commercially available multiwell plates. It has an added exposure attachment, gas feed line and hotplate. "The culture vessel is constructed in a manner that prevents contact between the inflowing gas -- and thus the test substances carried in them as well -- and the culture medium. The support membrane forms a closed barrier with the adherent cells between both media," explains Detlef Ritter. Moreover, this system allows researchers for the first time to



precisely define and control all the important physical parameters -- such as composition, temperature, pressure and flow velocity of air and culture medium. "That elevates the robustness, reproducibility and sensitivity of the tests," says the Fraunhofer researcher.

Another advantage of the PRIT® system: Researchers can observe the cells directly during contact with air pollutants. In addition, they can strain the tissue prior to the test with certain fluorescent dyes that indicate various growth processes, toxic and stress reactions or deleterious changes to genetic material, within the shortest period of time using powerful illumination. The fluorescent light penetrates through the transparent base of the culture plate outward, and can be recorded and evaluated with the microscope. Through this "live imaging," the effect of certain air pollutants on the tissue being studied can be evaluated without further disturbance or time delay.

Story Source:

Adapted from materials provided by [Fraunhofer-Gesellschaft](#).

<http://www.sciencedaily.com/releases/2010/04/100408095459.htm>

Social Networking Utilized by Academic to Improve Student Satisfaction

ScienceDaily (Apr. 12, 2010) — Social media could provide a solution for dealing with dissatisfaction among students on the levels of academic feedback they receive at university.

A University of Leicester researcher is trialling the use of social media to enhance feedback -- through the provision of 'feed forward'.

Dr Alan Cann, Senior Lecturer in the School of Biological Sciences, has recently implemented a network on social aggregator site, FriendFeed with first year students in the School of Biological Sciences, trialling the success of using social media to deliver course-related information and provide a forum for discussion and feedback amongst students via a social media space.

The biology students use FriendFeed for reflection and development through a network of discussion between peers and academics. The social aggregator is used purely for work-related items and has already been a huge success within the department.

Dr Cann commented: "Since we introduced FriendFeed at the beginning of the month, the response has been incredible. Students are on it 24/7 and are being very social but extremely professional with the content of discussions solely work-related.

"I am quite excited about how this is going. An individual's homepage acts as their portfolio by storing all of their posts, forming reflection on what they are doing and explanations of what they do not understand. Only it doesn't feel like they are doing it as they are so used to doing it in a similar manner in their personal lives on Facebook.

"I have never seen anything like this level of interactivity with Blackboard before. It offers a forum for extended discussion, enabling them to have conversations with 200 other people on their course, providing a way for their questions to be answered as well as providing deeper knowledge useful for essays and other assessments."

It is hoped that interactions between staff and students via social networks such as FriendFeed will enhance the student experience, providing more regular feedback for their assessments. Academics will become more easily accessible on social networking sites, joining the online conversation, answering student queries and providing additional pointers leading to 'feed forward' from lectures as well as the traditional feedback, enhancing the discussion and development of students.

Dr Cann and colleagues have previously investigated the educational potential of Twitter praising it as an 'exceptional communication tool within academia'. He has also recently published a paper, 'Google Wave in Education', analysing Google's new social media venture in which he describes the educational potential as 'enormous', however he notes that educators are yet to embrace the potential of delivering a truly collaborative education experience mediated through information technology.

Story Source:

Adapted from materials provided by [University of Leicester](http://www.universityofleicester.ac.uk).

<http://www.sciencedaily.com/releases/2010/04/100412084529.htm>

Baby Stars in the Rosette Cloud



The Rosette molecular cloud, seen by Herschel. (Credit: ESA/PACS & SPIRE Consortium/HOBYS Key Programme Consortia)

ScienceDaily (Apr. 12, 2010) — Herschel's latest image reveals the formation of previously unseen large stars, each one up to ten times the mass of our Sun. These are the stars that will influence where and how the next generation of stars are formed.

The image is a new release of 'OSHI', ESA's Online Showcase of Herschel Images.

The Rosette Nebula resides some 5,000 light years from Earth and is associated with a larger cloud that contains enough dust and gas to make the equivalent of 10,000 Sun-like stars. The Herschel image shows half of the nebula and most of the Rosette cloud. The massive stars powering the nebula lie to the right of the image but are invisible at these wavelengths. Each colour represents a different temperature of dust, from -263°C (only 10°C above absolute zero) in the red emission to -233°C in the blue.

The bright smudges are dusty cocoons hiding massive protostars. These will eventually become stars containing around ten times the mass of the Sun. The small spots near the centre and in the redder regions of the image are lower mass protostars, similar in mass to the Sun.

ESA's Herschel space observatory collects the infrared light given out by dust. This image is a combination of three infrared wavelengths, colour-coded blue, green and red in the image, though in reality the wavelengths are invisible to our eyes. It was created using observations from Herschel's Photoconductor Array Camera and Spectrometer (PACS) and the Spectral and Photometric Imaging Receiver (SPIRE).

Herschel is showing astronomers such young, massive protostars for the first time, as part of the 'Herschel imaging survey of OB Young Stellar objects'. Known as HOBYS, the survey targets young OB class stars, which will become the hottest and brightest stars.



"High-mass star-forming regions are rare and further away than low-mass ones," says Frédérique Motte, Laboratoire AIM Paris-Saclay, France. So astronomers have had to wait for a space telescope like Herschel to reveal them.

It is important to understand the formation of high-mass stars in our Galaxy because they feed so much light and other forms of energy into their parent cloud they can often trigger the formation of the next generation of stars.

When astronomers look at distant galaxies, the star-forming regions they see are the bright, massive ones. Thus, if they want to compare our Galaxy to distant ones they must first understand high-mass star-formation here.

"Herschel will look at many other high-mass star-forming regions, some of them building stars up to a hundred times the mass of the Sun," says Dr Motte, who plans to present the first scientific results from HOBYS at ESA's annual ESLAB symposium to be held in the Netherlands, 4-7 May.

Story Source:

Adapted from materials provided by [European Space Agency](#).

<http://www.sciencedaily.com/releases/2010/04/100412112905.htm>

Clovis Mammoth Hunters: Out With a Whimper or a Bang?



Skeletal remains of mammoth, horse, camel, Dire wolf, and others tell of the megafauna that roamed southern Arizona during the Pleistocene Epoch until these large animals became extinct 13,000 years ago. The time of extinction coincides with the deposition of a black algal mat, visible as a black line just above the mammoth tooth in this photo, of Younger Dryas age, when hunter-gatherers of the Clovis culture inhabited the area. No remains of Pleistocene mammals have ever been found in sediments deposited above, and thus younger than, the black layer. UA scientists unearthed the fossil pictured here southeast of the Murray Springs Clovis site, where they sampled the black algal layer to test the hypothesis of cosmic impact as the cause of extinction and Younger Dryas cooling. (Credit: Photo courtesy of the Center for the Study of the First Americans)

ScienceDaily (Apr. 12, 2010) — A team of researchers from the University of Arizona has revisited evidence pointing to a cataclysmic event thought by many scientists to have wiped out the North American megafauna -- such as mammoths, saber tooth cats, giant ground sloths and Dire wolves -- along with the Clovis hunter-gatherer culture some 13,000 years ago.

The team obtained their findings following an unusual, multidisciplinary approach and published them in the *Proceedings of the National Academy of Sciences* (PNAS).

"The idea of an extraterrestrial impact driving the Pleistocene extinction event has recently caused a stir in the scientific community," said C. Vance Haynes, a professor emeritus at UA's School of Anthropology and the department of geosciences, who is the study's lead author. "We systematically revisited the evidence for an impact scenario and discovered it just does not hold up."

Haynes has dedicated his scientific career to the study of the Clovis people -- the first well-defined culture in the New World -- and discovered many sites with evidence of their presence in Arizona. One of the most prominent and most studied of those sites is the Murray Springs Clovis site in southeastern Arizona, where archaeologists and anthropologists have unearthed hundreds of artifacts such as arrowheads, spear points and stone tools. The site includes the remains of a Clovis hunters' camp close to a mammoth and a bison kill site, allowing the researchers to reconstruct the daily life of the Clovis culture to a certain extent.

When the last ice age came to an end approximately 13,000 years ago and the glaciers covering a large portion of the North American continent began melting and retreating toward the north, a sudden cooling period known as the "Big Freeze" or, more scientifically, the Younger Dryas, reversed the warming process and caused glaciers to expand again. Even though this cooling period lasted only for 1,300 years, a blink of an eye in geologic timeframes, it witnessed the disappearance of an entire fauna of large mammals.

The big question, according to Haynes, is "Why did those animals go extinct in a very short geological timeframe?"

"When you go out and look at the sediments deposited during that time, you see this black layer we call the Black Mat. It contains the fossilized remains of a massive algae bloom, indicating a short period of water table rise and cool climate that kept the moisture in the soil. Below the Black Mat, you find all kinds of fossils from mammoths, bison, mastodons, Dire wolves and so forth, but when you look right above it -- nothing."

Scientists have suggested several scenarios to account for the rapid Pleistocene extinction event. Some ascribe it to the rapid shift toward a cooler and dryer during the "Big Freeze," causing widespread droughts.

Haynes disagrees. "We find evidence of big changes in climate throughout the geologic record that were not associated with widespread extinctions."

Others have blamed the demise of the North American megafauna on pathogens brought onto the North American continent by animals from the Old World crossing the Bering Strait. "The disease hypothesis does not hold up well in the light of natural selection and evolution," Haynes said, "because some individuals would have been immune to the pathogens and survived."

The two attempts to account for the mass extinction event prevailing at this point include humans and celestial bodies. Many deem it possible that humans such as the Clovis culture hunted the Pleistocene mammals to extinction, as proposed by UA Professor Emeritus Paul S. Martin.

Alternatively, it is thought that a comet or asteroid slammed into the glaciers covering the Great Lakes area, unleashing firestorms that consumed large portions of vegetation. In addition, the dust and molten rock kicked up high into the atmosphere during the impact could have shrouded the Earth in a nuclear winter-like blanket of airborne dust, blocking sunlight and causing temperatures to plummet.

In the present study, Haynes and his coworkers set out to put the evidence for an impact scenario to the test: Unusually high concentrations of spherical magnetic particles in the soil samples taken at the Murray Springs Clovis site had been interpreted as indication of an extraterrestrial source.

Another hint in this direction was a spike in the Black Mat's iridium content -- an element rarely encountered on Earth but quite abundant in meteorites. In addition, the occurrence of nanodiamonds had been suggested as evidence of an extraterrestrial origin. Finally, a supposedly abundant charcoal content in the soil samples had been cited as evidence of widespread wildfires ravaging the land in the aftermath of the impact.

To ensure their samples were comparable, Haynes collected at the same locations in the Black Mat layer as the team proposing the impact scenario: "I sampled where they sampled and at the same times they sampled."

Using highly sensitive and sophisticated analytical methods, Haynes' coworkers at the department of geosciences and UA's Lunar and Planetary Lab then analyzed their samples for the evidence that had been presented in support of the impact scenario.

The team did find abundant magnetic spherules. But where did they come from? Was a meteorite the only possible source?

"Researchers have only begun to study those magnetic spherules recently, so we still don't know much about them," Haynes said. "What we do know is that they occur in exhaust from vehicles and power plants."

To determine whether the magnetic spherules found at Murray Springs could be of terrestrial origin, Haynes followed a tip from UA Geosciences Professor Anthony Jull, who suggested taking a sample of dirt from the rooftop of his house and examining it under the microscope.

Haynes remembers looking at the soil samples on a microscope slide, and "sure enough, there they were - among all the dust and grains and grit, they appeared like tiny, shiny ball bearings."

"We did confirm the other authors' findings that the magnetic spherules are concentrated in the samples at the Clovis site, but when you study the topography on which the sediments were laid down, you immediately see why: Rainwater washed them down into a river bed, where they accumulated over time. Since this is where the samples with the increased spherule content came from, we were not surprised to find more of the spherules there. The samples we took from the slopes do not have higher than normal concentrations of spherules."

What about the charcoal indicating vegetation burning?

"The only places we found charcoal were the campsites of the Clovis people, where they build their fires."

But where could the nanodiamonds come from? Again, Haynes' colleague, Anthony Jull, had the answer. A common ingredient of cosmic dust, nanodiamonds are constantly raining down onto the earth's surface, rendering them unsuitable as unequivocal evidence of an extraterrestrial impact.

"Something happened 13,000 years ago that we do not understand," said Haynes. "What we can say, though, is that all of the evidence put forth in support of the impact scenario can be sufficiently explained by earthly causes such as climate change, overhunting or a combination of both." Does this mean the results obtained by Haynes and his coworkers rule out the possibility of a cosmic event?

"No, it doesn't," Haynes said. "It just doesn't make it very likely." The co-authors of the study are: Jennifer Boerner (formerly at the UA's department of geosciences), Kenneth Domanik, Dante Lauretta and Julia Goreva from UA's Lunar and Planetary Laboratory in the department of planetary sciences and Jesse Ballenger in UA's School of Anthropology.

Story Source:

Adapted from materials provided by [University of Arizona](#).

Journal Reference:

1. Haynes et al. **The Murray Springs Clovis site, Pleistocene extinction, and the question of extraterrestrial impact.** *Proceedings of the National Academy of Sciences*, 2010; 107 (9): 4010 DOI: [10.1073/pnas.0908191107](https://doi.org/10.1073/pnas.0908191107)

<http://www.sciencedaily.com/releases/2010/04/100412100017.htm>

World's Deepest Known Undersea Volcanic Vents Discovered



First photograph of the world's deepest known 'black smoker' vent, erupting water hot enough to melt lead, 3.1 miles deep on the ocean floor (Credit: NOC)

ScienceDaily (Apr. 12, 2010) — A British scientific expedition has discovered the world's deepest undersea volcanic vents, known as 'black smokers', 3.1 miles (5000 metres) deep in the Cayman Trough in the Caribbean. Using a deep-diving vehicle remotely controlled from the Royal Research Ship James Cook, the scientists found slender spires made of copper and iron ores on the seafloor, erupting water hot enough to melt lead, nearly half a mile deeper than anyone has seen before.

Deep-sea vents are undersea springs where superheated water erupts from the ocean floor. They were first seen in the Pacific three decades ago, but most are found between one and two miles deep. Scientists are fascinated by deep-sea vents because the scalding water that gushes from them nourishes lush colonies of deep-sea creatures, which has forced scientists to rewrite the rules of biology. Studying the life-forms that thrive in such unlikely havens is providing insights into patterns of marine life around the world, the possibility of life on other planets, and even how life on Earth began.

The expedition to the Cayman Trough is being run by Drs Doug Connelly, Jon Copley, Bramley Murton, Kate Stansfield and Professor Paul Tyler, all from Southampton, UK. They used a robot submarine called Autosub6000, developed by engineers at the National Oceanography Centre (NOC) in Southampton, to survey the seafloor of the Cayman Trough in unprecedented detail. The team then launched another deep-sea vehicle called HyBIS, developed by team member Murton and Berkshire-based engineering company Hydro-Lek Ltd, to film the world's deepest vents for the first time.

"Seeing the world's deepest black-smoker vents looming out of the darkness was awe-inspiring," says Copley, a marine biologist at the University of Southampton's School of Ocean and Earth Science (SOES) based at the NOC and leader of the overall research programme. "Superheated water was gushing out of their two-storey high mineral spires, more than three miles deep beneath the waves." He added: "We are proud to show what British underwater technology can achieve in exploring this frontier -- the UK subsea technology sector is worth £4 billion per year and employs 40 000 people, which puts it on a par with our space industry."

The Cayman Trough is the world's deepest undersea volcanic rift, running across the seafloor of the Caribbean. The pressure three miles deep at the bottom of the Trough -- 500 times normal atmospheric pressure -- is equivalent to the weight of a large family car pushing down on every square inch of the creatures that live there, and on the undersea vehicles that the scientists used to reveal this extreme environment. The researchers will now compare the marine life in the abyss of the Cayman Trough with that known from other deep-sea vents, to understand the web of life throughout the deep ocean. The team will also study the chemistry of the hot water gushing from the vents, and the geology of the undersea volcanoes where these vents are found, to understand the fundamental geological and geochemical processes that shape our world.

"We hope our discovery will yield new insights into biogeochemically important elements in one of the most extreme naturally occurring environments on our planet," says geochemist Doug Connelly of the NOC, who is the Principal Scientist of the expedition.

"It was like wandering across the surface of another world," says geologist Bramley Murton of the NOC, who piloted the HyBIS underwater vehicle around the world's deepest volcanic vents for the first time. "The rainbow hues of the mineral spires and the fluorescent blues of the microbial mats covering them were like nothing I had ever seen before."

The expedition will continue to explore the depths of the Cayman Trough until 20th April.

In addition to the scientists from Southampton, the team aboard the ship includes researchers from the University of Durham in the UK, the University of North Carolina Wilmington and the University of Texas in the US, and the University of Bergen in Norway. The expedition members are also working with colleagues ashore at Woods Hole Oceanographic Institution and Duke University in the US to analyse the deep-sea vents.

The expedition is part of a research project funded by the UK Natural Environment Research Council to study the world's deepest undersea volcanoes. The research team will return to the Cayman Trough for a second expedition using the UK's deep-diving remotely-operated vehicle Isis, once a research ship is scheduled for the next phase of their project.

Additional information

(1) The expedition aboard the RRS James Cook began in Port of Spain, Trinidad on 21st March and ends in Montego Bay, Jamaica on 21st April. It is part of a £462k research project funded by the UK Natural Environment Research Council.

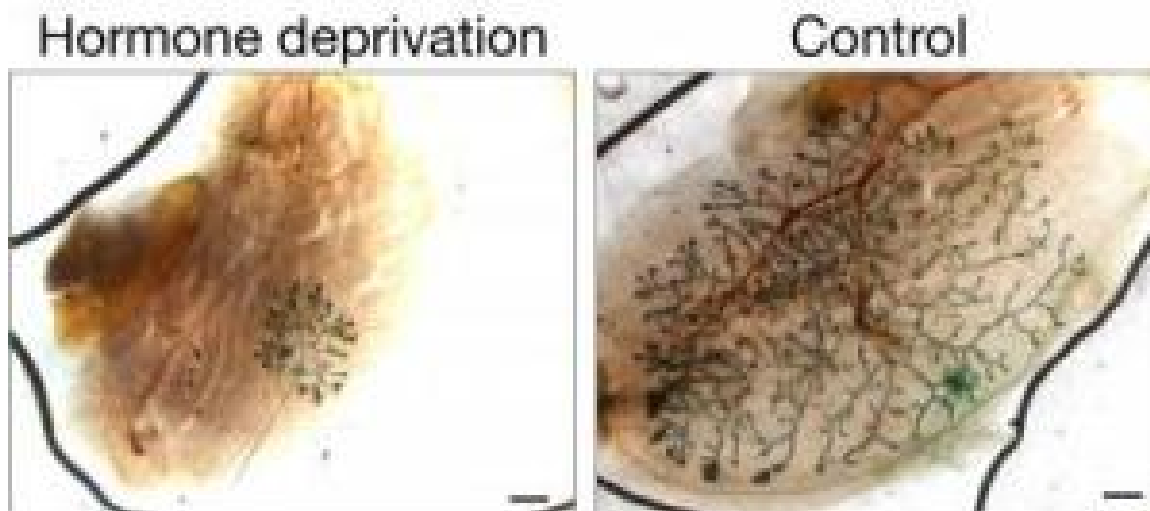
(2) The RRS James Cook is the UK's newest ocean-going research ship, operated by the Natural Environment Research Council. The current expedition is the 44th voyage of the ship.

Story Source:

Adapted from materials provided by [National Oceanography Centre, Southampton \(UK\)](#), via [EurekAlert!](#), a service of AAAS.

<http://www.sciencedaily.com/releases/2010/04/100411214117.htm>

Hormone Sensitivity of Breast Stem Cells Presents Drug Target



Breast stem cells retain a 'memory' of prior female hormone deprivation. These images show mammary (breast) outgrowths (blue branches) derived from stem cells. Stem cells from female mice whose ovaries had been removed produced fewer and smaller outgrowths (left panel) than control mice (right panel). (Credit: Marie-Liesse Asselin-Labat, Walter and Eliza Hall Institute)

ScienceDaily (Apr. 12, 2010) — Researchers at the Walter and Eliza Hall Institute have discovered that breast stem cells are exquisitely sensitive to the female hormones oestrogen and progesterone, a finding that opens the way for the development of new preventions and treatments for breast cancer.

The discovery, by scientists in the institute's Stem Cells and Cancer and Bioinformatics divisions, also explains decades of evidence linking breast cancer risk to exposure to female hormones.

It has been published online April 11 in the journal *Nature*.

Dr Jane Visvader, who led the research with Dr Geoff Lindeman, said sustained exposure to oestrogen and progesterone was a well-established risk factor for breast cancer. "There is a clear evidence that the more menstrual cycles a woman has the greater her breast cancer risk," Dr Visvader said. "There is even an increase in breast cancer risk in the short-term following pregnancy. However the cellular basis for these observations has been poorly understood."

In the mid-2000s, Drs Visvader and Lindeman discovered breast stem cells in both mice and humans. Unexpectedly, however, they also found that breast stem cells lacked 'receptors' that would allow them to be directly controlled by the female hormones oestrogen and progesterone.

Now, work by Drs Visvader and Lindeman in collaboration with Drs Marie-Liesse Asselin-Labat, Gordon Smyth and others at the institute, has revealed that despite lacking receptors for oestrogen and progesterone, breast stem cells are still remarkably sensitive to female hormones.

Using mouse models, they showed that when the ovaries were removed or the animals were treated with hormone inhibitors (which are in clinical use as anti-breast cancer agents), breast stem cell numbers dropped and the cells appeared to become dormant.

Dr Lindeman, who is also a medical oncologist at the Royal Melbourne Hospital, said this finding helped to explain why the effects of 'chemoprevention' -- a treatment aimed at breast cancer prevention continued long after anti-estrogen tablets have been stopped.

"Our research also revealed that during pregnancy there is a profound increase in breast stem cell numbers," Dr Lindeman said.

"This might account for the short-term increase in cancer risk associated with pregnancy."

Further studies, in collaboration with Dr Jack Martin at St Vincent's Institute Melbourne and Dr Hisataka Yasuda at the Nagahama Institute for Biochemical Science, identified the RANK ligand pathway as the key cell-signalling pathway responsible for the indirect control of breast stem cells in pregnancy.

Dr Lindeman said inhibitors of RANK signalling have been developed and are currently in clinical trials to help maintain bone strength and treat breast cancer that has spread to the bones. "Our discovery suggests that inhibitors of RANK or other stem cell pathways represent possible therapeutic strategies that could also be investigated as breast cancer prevention agents," Dr Lindeman said.

The research was supported by the Victorian Breast Cancer Research Consortium / Victoria Cancer Agency, Susan G. Komen Foundation, National Breast Cancer Foundation, National Health and Medical Research Council, and the Australian Cancer Research Foundation.

Story Source:

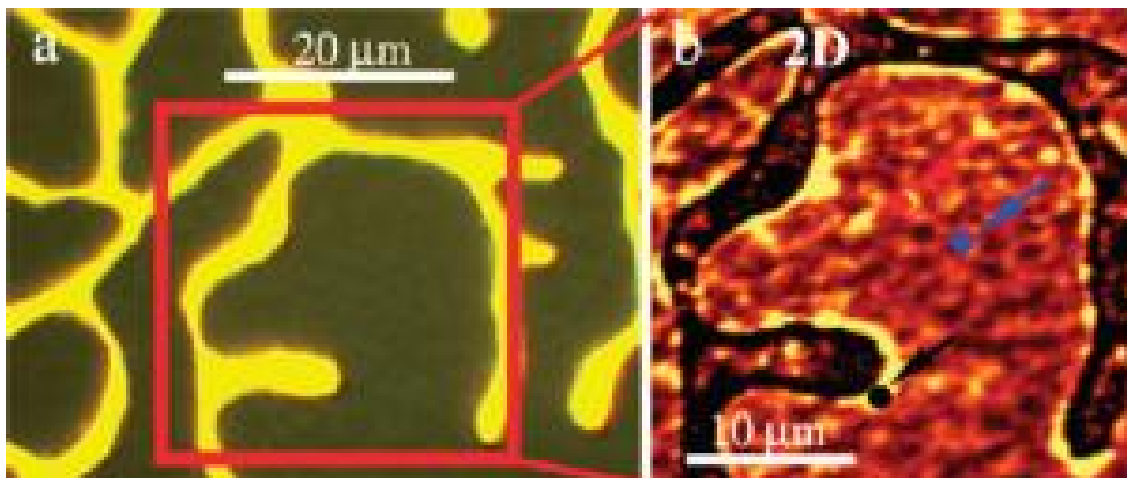
Adapted from materials provided by [Walter and Eliza Hall Institute](#).

Journal Reference:

1. Asselin-Labat et al. **Control of mammary stem cell function by steroid hormone signalling.** *Nature*, 2010; DOI: [10.1038/nature09027](https://doi.org/10.1038/nature09027)

<http://www.sciencedaily.com/releases/2010/04/100411143357.htm>

Graphene Films Clear Major Fabrication Hurdle



(a) Optical image of a CVD graphene film on a copper layer showing the finger morphology of the metal; (b) Raman 2D band map of the graphene film between the copper fingers over the area marked by the red square on left. (Credit: Image from Yuegang Zhang)

ScienceDaily (Apr. 12, 2010) — Graphene, the two-dimensional crystalline form of carbon, is a potential superstar for the electronics industry. With freakishly mobile electrons that can blaze through the material at nearly the speed of light -- 100 times faster than electrons can move through silicon -- graphene could be used to make superfast transistors or computer memory chips.

Graphene's unique "chicken wire" atomic structure exhibits incredible flexibility and mechanical strength, as well as unusual optical properties that could open a number of promising doors in both the electronics and the photonics industries. However, among the hurdles preventing graphite from joining the pantheon of star high-tech materials, perhaps none looms larger than just learning to make the stuff in high quality and usable quantities.

"Before we can fully utilize the superior electronic properties of graphene in devices, we must first develop a method of forming uniform single-layer graphene films on nonconducting substrates on a large scale," says Yuegang Zhang, a materials scientist with the Lawrence Berkeley National Laboratory (Berkeley Lab). Current fabrication methods based on mechanical cleavage or ultrahigh vacuum annealing, he says, are ill-suited for commercial-scale production. Graphene films made via solution-based deposition and chemical reduction have suffered from poor or uneven quality.

Zhang and colleagues at Berkeley Lab's Molecular Foundry, a U.S. Department of Energy (DOE) center for nanoscience, have taken a significant step at clearing this major hurdle. They have successfully used direct chemical vapor deposition (CVD) to synthesize single-layer films of graphene on a dielectric substrate. Zhang and his colleagues made their graphene films by catalytically decomposing hydrocarbon precursors over thin films of copper that had been pre-deposited on the dielectric substrate. The copper films subsequently dewetted (separated into puddles or droplets) and were evaporated. The final product was a single-layer graphene film on a bare dielectric.

"This is exciting news for electronic applications because chemical vapor deposition is a technique already widely used in the semiconductor industry," Zhang says.

"Also, we can learn more about the growth of graphene on metal catalyst surfaces by observing the evolution of the films after the evaporation of the copper. This should lay an important foundation for further control of the process and enable us to tailor the properties of these films or produce desired morphologies, such as graphene nanoribbons."

Zhang and his colleagues have reported their findings in the journal *Nano Letters*. Other co-authors of this paper were Ariel Ismach, Clara Druzgalski, Samuel Penwell, Maxwell Zheng, Ali Javey and Jeffrey Bokor, all with Berkeley Lab.

In their study, Zhang and his colleagues used electron-beam evaporation to deposit copper films ranging in thickness from 100 to 450 nanometers. Copper was chosen because as a low carbon solubility metal catalyst it was expected to allow better control over the number of graphene layers produced. Several different dielectric substrates were evaluated including single-crystal quartz, sapphire, fused silica and silicon oxide wafers. CVD of the graphene was carried out at 1,000 degrees Celsius in durations that ranged from 15 minutes up to seven hours.

"This was done to allow us to study the effect of film thickness, substrate type and CVD growth time on the graphene formation," Zhang says.

A combination of scanning Raman mapping and spectroscopy, plus scanning electron and atomic force microscopy confirmed the presence of continuous single-layer graphene films coating metal-free areas of dielectric substrate measuring tens of square micrometers.

"Further improvement on the control of the dewetting and evaporation process could lead to the direct deposition of patterned graphene for large-scale electronic device fabrication, Zhang says. "This method could also be generalized and used to deposit other two-dimensional materials, such as boron-nitride."

Even the appearance of wrinkles in the graphene films that followed along the lines of the dewetting shape of the copper could prove to be beneficial in the long-run. Although previous studies have indicated that wrinkles in a graphene film have a negative impact on electronic properties by introducing strains that reduce electron mobility, Zhang believes the wrinkles can be turned to an advantage.

"If we can learn to control the formation of wrinkles in our films, we should be able to modulate the resulting strain and thereby tailor electronic properties," he says. "Further study of the wrinkle formation could also give us important new clues for the formation of graphene nanoribbons."

This work was primarily supported by the DOE Office of Science.

The Molecular Foundry is one of the five DOE Nanoscale Science Research Centers (NSRCs), premier national user facilities for interdisciplinary research at the nanoscale. Together the NSRCs comprise a suite of complementary facilities that provide researchers with state-of-the-art capabilities to fabricate, process, characterize and model nanoscale materials, and constitute the largest infrastructure investment of the National Nanotechnology Initiative. The NSRCs are located at DOE's Argonne, Brookhaven, Lawrence Berkeley, Oak Ridge and Sandia and Los Alamos National Laboratories.

Story Source:

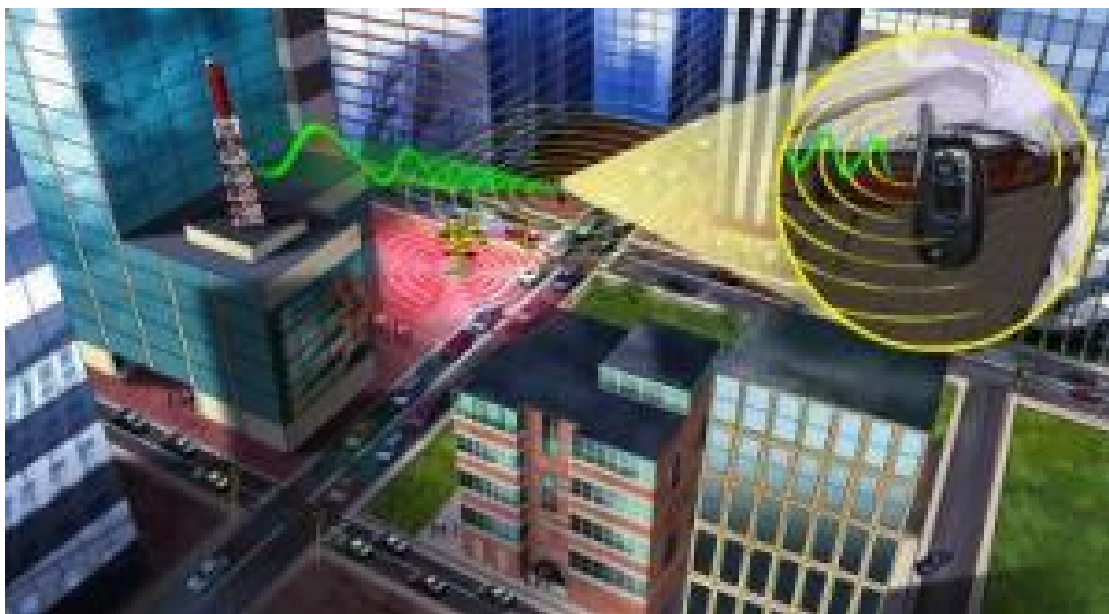
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Journal Reference:

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<http://www.sciencedaily.com/releases/2010/04/100408140856.htm>

Crowdsourcing: Cell Phones That Protect Against Deadly Chemicals?



The sensor in the chip would identify the toxic chemical and send an alert to a central station and the cell phone carrier. (Credit: DHS S&T)

ScienceDaily (Apr. 12, 2010) — Do you carry a cell phone? Today, chances are it's called a "smartphone" and it came with a three-to-five megapixel lens built-in -- not to mention an MP3 player, GPS or even a bar code scanner. This 'Swiss-Army-knife' trend represents the natural progression of technology -- as chips become smaller/more advanced, cell phones absorb new functions.

What if, in the future, new functions on our cell phones could also protect us from toxic chemicals?

Homeland Security's Science and Technology Directorate (S&T)'s *Cell-All* is such an initiative. *Cell-All* aims to equip cell phones with a sensor capable of detecting deadly chemicals. The technology is ingenious. A chip costing less than a dollar is embedded in a cell phone and programmed to either alert the cell phone carrier to the presence of toxic chemicals in the air, and/or a central station that can monitor how many alerts in an area are being received. One might be a false positive. Hundreds might indicate the need for evacuation.

"Our goal is to create a lightweight, cost-effective, power-efficient solution," says Stephen Dennis, *Cell-All*'s program manager.

How would this wizardry work? Just as antivirus software bides its time in the background and springs to life when it spies suspicious activity, so *Cell-All* would regularly sniff the surrounding air for certain volatile chemical compounds.

When a threat is sensed, an alert ensues in one of two ways. For personal safety issues such as a chlorine gas leak, a warning is sounded; the user can choose a vibration, noise, text message or phone call. For catastrophes such as a sarin gas attack, details -- including time, location and the compound -- are phoned home to an emergency operations center. While the first warning is beamed to individuals, the second warning works best with crowds. And that's where the genius of *Cell-All* lies -- in crowd sourcing human safety.

Currently, if a person suspects that something is amiss, he might dial 9-1-1, though behavioral science tells us that it's easier to do nothing. And, as is often the case when someone phones in an emergency, the

caller may be difficult to understand, diminishing the quality of information that's relayed to first responders. An even worse scenario: the person may not even be aware of the danger, like the South Carolina woman who last year drove into a colorless and poisonous ammonia cloud.

In contrast, anywhere a chemical threat breaks out -- a mall, a bus, subway or office -- *Cell-All* will alert the authorities automatically. Detection, identification, and notification all take place in less than 60 seconds. Because the data are delivered digitally, *Cell-All* reduces the chance of human error. And by activating alerts from many people at once, *Cell-All* cleverly avoids the long-standing problem of false positives. The end result: emergency responders can get to the scene sooner and cover a larger area -- essentially anywhere people are, casting a wider net than stationary sensors can.

And the privacy issue? Does this always-on surveillance mean that the government can track your precise whereabouts whenever it wants? To the contrary, *Cell-All* will operate only on an opt-in basis and will transmit data anonymously.

"Privacy is as important as technology," says Dennis. "After all, for *Cell-All* to succeed, people must be comfortable enough to turn it on in the first place."

For years, the idea of a handheld weapons of mass destruction detector has engaged engineers. In 2007, S&T called upon the private sector to develop concepts of operations. Today, thanks to increasingly successful prototype demonstrations, the Directorate is actively funding the next step in R&D -- a proof of principle -- to see if the concept is workable.

To this end, three teams from Qualcomm, the National Aeronautics and Space Administration (NASA), and Rhevision Technology are perfecting their specific area of expertise. Qualcomm engineers specialize in miniaturization and know how to shepherd a product to market. Scientists from the Center for Nanotechnology at NASA's Ames Research Center have experience with chemical sensing on low-powered platforms, such as the International Space Station. And technologists from Rhevision have developed an artificial nose -- a piece of porous silicon that changes colors in the presence of certain molecules, which can be read spectrographically.

Similarly, S&T is pursuing what's known as cooperative research and development agreements with four cell phone manufacturers: Qualcomm, LG, Apple and Samsung. These written agreements, which bring together a private company and a government agency for a specific project, often accelerate the commercialization of technology developed for government purposes. As a result, Dennis hopes to have 40 prototypes in about a year, the first of which will sniff out carbon monoxide and fire.

To be sure, *Cell-All's* commercialization may take several years. Yet the goal seems eminently achievable: Just as Gates once envisioned a computer on every desk in every home, so Dennis envisions a chemical sensor in every cell phone in every pocket, purse or belt holster.

And if it's not already the case, says Dennis, "Our smartphones may soon be smarter than we are."

Story Source:

Adapted from materials provided by US Department of Homeland Security - Science and Technology, via EurekAlert!, a service of AAAS.

<http://www.sciencedaily.com/releases/2010/04/100409162722.htm>

Inexpensive Highly Efficient Solar Cells Possible



Researchers have come up with solutions for two problems that, for the last twenty years, have been hampering the development of efficient and affordable solar cells. (Credit: iStockphoto/Kyu Oh)

ScienceDaily (Apr. 12, 2010) — Thanks to two technologies developed by Professor Benoît Marsan and his team at the Université du Québec à Montréal (UQAM) Chemistry Department, the scientific and commercial future of solar cells could be totally transformed. Professor Marsan has come up with solutions for two problems that, for the last twenty years, have been hampering the development of efficient and affordable solar cells.

His findings have been published in two scientific journals, the *Journal of the American Chemical Society (JACS)* and *Nature Chemistry*.

The untapped potential of solar energy

The Earth receives more solar energy in one hour than the entire planet currently consumes in a year. Unfortunately, despite this enormous potential, solar energy is barely exploited. The electricity produced by conventional solar cells, composed of semiconductor materials like silicon, is 5 or 6 times more expensive than from traditional energy sources, such as fossil fuels or hydropower. Over the years, numerous research teams have attempted to develop a solar cell that would be both efficient in terms of energy and inexpensive to produce.

Dye-sensitized solar cells

One of the most promising solar cells was designed in the early '90s by Professor Michael Graetzel of the Ecole Polytechnique Federale de Lausanne (EPFL) in Switzerland. Based on the principle of photosynthesis -- the biochemical process by which plants convert light energy into carbohydrate (sugar, their food) -- the Graetzel solar cell is composed of a porous layer of nanoparticles of a white pigment, titanium dioxide, covered with a molecular dye that absorbs sunlight, like the chlorophyll in green leaves. The pigment-coated titanium dioxide is immersed in an electrolyte solution, and a platinum-based catalyst completes the package.

As in a conventional electrochemical cell (such as an alkaline battery), two electrodes (the titanium dioxide anode and the platinum cathode in the Graetzel cell) are placed on either side of a liquid

conductor (the electrolyte). Sunlight passes through the cathode and the electrolyte, and then withdraws electrons from the titanium dioxide anode, a semiconductor at the bottom of the cell. These electrons travel through a wire from the anode to the cathode, creating an electrical current. In this way, energy from the sun is converted into electricity.

Most of the materials used to make this cell are low-cost, easy to manufacture and flexible, allowing them to be integrated into a wide variety of objects and materials. In theory, the Graetzel solar cell has tremendous possibilities. Unfortunately, despite the excellence of the concept, this type of cell has two major problems that have prevented its large-scale commercialisation:

- The electrolyte is: a) extremely corrosive, resulting in a lack of durability; b) densely coloured, preventing the efficient passage of light; and c) limits the device photovoltage to 0.7 volts.
- The cathode is covered with platinum, a material that is expensive, non-transparent and rare. Despite numerous attempts, until Professor Marsan's recent contribution, no one had been able to find a satisfactory solution to these problems.

Professor Marsan's solutions

Professor Marsan and his team have been working for several years on the design of an electrochemical solar cell. His work has involved novel technologies, for which he has received numerous patents. In considering the problems of the cell developed by his Swiss colleague, Professor Marsan realized that two of the technologies developed for the electrochemical cell could also be applied to the Graetzel solar cell, specifically:

- For the electrolyte, entirely new molecules have been created in the laboratory whose concentration has been increased through the contribution of Professor Livain Breau, also of the Chemistry Department. The resulting liquid or gel is transparent and non-corrosive and can increase the photovoltage, thus improving the cell's output and stability.
- For the cathode, the platinum can be replaced by cobalt sulphide, which is far less expensive. It is also more efficient, more stable and easier to produce in the laboratory.

Story Source:

Adapted from materials provided by [Université du Québec à Montréal](#).

Journal References:

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<http://www.sciencedaily.com/releases/2010/04/100406125545.htm>

Viruses Harnessed to Split Water



Angela Belcher, the Germeshausen Professor of Materials Science and Engineering and Biological Engineering. (Credit: Photo by Dominick Reuter)

ScienceDaily (Apr. 12, 2010) — A team of MIT researchers has found a novel way to mimic the process by which plants use the power of sunlight to split water and make chemical fuel to power their growth. In this case, the team used a modified virus as a kind of biological scaffold that can assemble the nanoscale components needed to split a water molecule into hydrogen and oxygen atoms.

Splitting water is one way to solve the basic problem of solar energy: It's only available when the sun shines. By using sunlight to make hydrogen from water, the hydrogen can then be stored and used at any time to generate electricity using a fuel cell, or to make liquid fuels (or be used directly) for cars and trucks.

Other researchers have made systems that use electricity, which can be provided by solar panels, to split water molecules, but the new biologically based system skips the intermediate steps and uses sunlight to power the reaction directly. The advance is described in a paper published on April 11 in *Nature Nanotechnology*.

The team, led by Angela Belcher, the Germeshausen Professor of Materials Science and Engineering and Biological Engineering, engineered a common, harmless bacterial virus called M13 so that it would attract and bind with molecules of a catalyst (the team used iridium oxide) and a biological pigment (zinc porphyrins). The viruses became wire-like devices that could very efficiently split the oxygen from water molecules.

Over time, however, the virus-wires would clump together and lose their effectiveness, so the researchers added an extra step: encapsulating them in a microgel matrix, so they maintained their uniform arrangement and kept their stability and efficiency.

While hydrogen obtained from water is the gas that would be used as a fuel, the splitting of oxygen from water is the more technically challenging "half-reaction" in the process, Belcher explains, so her team focused on this part. Plants and cyanobacteria (also called blue-green algae), she says, "have evolved highly organized photosynthetic systems for the efficient oxidation of water." Other researchers have tried to use the photosynthetic parts of plants directly for harnessing sunlight, but these materials can have structural stability issues.

Belcher decided that instead of borrowing plants' components, she would borrow their methods. In plant cells, natural pigments are used to absorb sunlight, while catalysts then promote the water-splitting reaction. That's the process Belcher and her team, including doctoral student Yoon Sung Nam, the lead author of the new paper, decided to imitate.

In the team's system, the viruses simply act as a kind of scaffolding, causing the pigments and catalysts to line up with the right kind of spacing to trigger the water-splitting reaction. The role of the pigments is "to act as an antenna to capture the light," Belcher explains, "and then transfer the energy down the length of the virus, like a wire. The virus is a very efficient harvester of light, with these porphyrins attached.

"We use components people have used before," she adds, "but we use biology to organize them for us, so you get better efficiency."

Using the virus to make the system assemble itself improves the efficiency of the oxygen production fourfold, Nam says. The researchers hope to find a similar biologically based system to perform the other half of the process, the production of hydrogen. Currently, the hydrogen atoms from the water get split into their component protons and electrons; a second part of the system, now being developed, would combine these back into hydrogen atoms and molecules. The team is also working to find a more commonplace, less-expensive material for the catalyst, to replace the relatively rare and costly iridium used in this proof-of-concept study.

Thomas Mallouk, the DuPont Professor of Materials Chemistry and Physics at Pennsylvania State University, who was not involved in this work, says, "This is an extremely clever piece of work that addresses one of the most difficult problems in artificial photosynthesis, namely, the nanoscale organization of the components in order to control electron transfer rates."

He adds: "There is a daunting combination of problems to be solved before this or any other artificial photosynthetic system could actually be useful for energy conversion." To be cost-competitive with other approaches to solar power, he says, the system would need to be at least 10 times more efficient than natural photosynthesis, be able to repeat the reaction a billion times, and use less expensive materials. "This is unlikely to happen in the near future," he says. "Nevertheless, the design idea illustrated in this paper could ultimately help with an important piece of the puzzle."

Belcher will not even speculate about how long it might take to develop this into a commercial product, but she says that within two years she expects to have a prototype device that can carry out the whole process of splitting water into oxygen and hydrogen, using a self-sustaining and durable system.

Funding was provided by the Italian energy company Eni, through the MIT Energy Initiative (MITEI)

Story Source:

Adapted from materials provided by [Massachusetts Institute of Technology](#). Original article written by David L. Chandler, MIT News Office.

Journal Reference:

1. Yoon Sung Nam, Andrew P. Magyar, Daeyeon Lee, Jin-Woong Kim, Dong Soo Yun, Heechul Park, Thomas S. Pollom Jr, David A. Weitz and Angela M. Belcher. **Biologically templated photocatalytic nanostructures for sustained light-driven water oxidation**. *Nature Nanotechnology*, April 11, 2010 DOI: [10.1038/nnano.2010.57](https://doi.org/10.1038/nnano.2010.57)

<http://www.sciencedaily.com/releases/2010/04/100411143403.htm>

Quick Nano-Bio-Chip Checks for Oral Cancer

Rice Professor John McDevitt holds the LabNow device to read nano-bio-chips that will look for signs of oral cancer and other diseases. (Credit: Jeff Fitlow)

ScienceDaily (Apr. 12, 2010) — The gentle touch of a lesion on the tongue or cheek with a brush can help detect oral cancer with success rates comparable to more invasive techniques, according to preliminary studies by researchers at Rice University, the University of Texas Health Science Centers at Houston and San Antonio and the University of Texas M.D. Anderson Cancer Center.

The test that uses Rice's diagnostic nano-bio-chip was found to be 97 percent "sensitive" and 93 percent specific in detecting which patients had malignant or premalignant lesions, results that compared well with traditional tests.

The study appeared online in the journal *Cancer Prevention Research*.

"One of the key discoveries in this paper is to show that the miniaturized, noninvasive approach produces about the same result as the pathologists do," said John McDevitt, the Brown-Wiess Professor of Chemistry and Bioengineering at Rice. His lab developed the novel nano-bio-chip technology at the university's BioScience Research Collaborative.



Oral cancer afflicts more than 300,000 people a year, including 35,000 in the United States alone. The five-year survival rate is 60 percent, but if cancer is detected early, that rate rises to 90 percent.

McDevitt and his team are working to create an inexpensive chip that can differentiate premalignancies from the 95 percent of lesions that will not become cancerous.

The minimally invasive technique would deliver results in 15 minutes instead of several days, as lab-based diagnostics do now; and instead of an invasive, painful biopsy, this new procedure requires just a light brush of the lesion on the cheek or tongue with an instrument that looks like a toothbrush.

"This area of diagnostics and testing has been terribly challenging for the scientific and clinical community," said McDevitt, who came to Rice from the University of Texas at Austin in 2009. "Part of the problem is that there are no good tools currently available that work in a reliable way."

He said patients with suspicious lesions, usually discovered by dentists or oral surgeons, end up getting scalpel or punch biopsies as often as every six months. "People trained in this area don't have any trouble finding lesions," McDevitt said. "The issue is the next step -- taking a chunk of someone's cheek. The

heart of this paper is developing a more humane and less painful way to do that diagnosis, and our technique has shown remarkable success in early trials."

The way forward is with nano-bio-chips -- small, semiconductor-based devices that combine the ability to capture, stain and analyze biomarkers for a variety of health woes that also include cardiac disease, HIV and trauma injuries. Researchers hope the eventual deployment of nano-bio-chips will dramatically cut the cost of medical diagnostics and contribute significantly to the task of bringing quality health care to the world.

The new study compared results of traditional diagnostic tests with those obtained with nano-bio-chips on a small sample of 52 participants, all of whom had visible oral lesions, leukoplakia or erythroplakia and had been referred to specialists for surgical biopsies or removal of the lesions. Of those patients, 11 were diagnosed as healthy.

The chips should also be able to see when an abnormality turns precancerous. "You want to catch it early on, as it's transforming from pre-cancer to the earliest stages of cancer, and get it in stage one. Then the five-year survival rate is very high," he said. "Currently, most of the time, it's captured in stage three, when the survivability is very low."

The device is on the verge of entering a more extensive trial that will involve 500 patients in Houston, San Antonio and England. That could lead to an application for FDA approval in two to four years.

Eventually, McDevitt said, dentists may be the first line of defense against oral cancers, with the ability to catch early signs of the disease right there in the chair. McDevitt's co-authors include Rice senior research scientist Pierre Floriano, Rice postdoctoral associate Shannon Weigum and Spencer Redding, a professor and chair of the Department of Dental Diagnostic Science at the University of Texas Health Science Center at San Antonio (UTHSC).

Also contributing were Chih-Ko Yeh, Stephen Westbrook and Alan Lin of the Department of Dental Diagnostic Science, H. Stan McGuff of the Department of Pathology and Frank Miller, Fred Villarreal and Stephanie Rowan of the Department of Otolaryngology, Head and Neck Surgery, all at the UTHSC at San Antonio; Nadarajah Vigneswaran of the Department of Diagnostic Science, UTHSC at Houston; and Michelle Williams of the Department of Pathology at M.D. Anderson Cancer Center.

The researchers received a Grand Opportunity Grant from the National Institute for Dental and Craniofacial Research Division of the National Institutes of Health for the work.

Story Source:

Adapted from materials provided by [Rice University](#).

Journal Reference:

1. Weigum et al. **Nano-Bio-Chip Sensor Platform for Examination of Oral Exfoliative Cytology**. *Cancer Prevention Research*, 2010; 3 (4): 518 DOI: [10.1158/1940-6207.CAPR-09-0139](https://doi.org/10.1158/1940-6207.CAPR-09-0139)

<http://www.sciencedaily.com/releases/2010/04/100405152753.htm>

Evacuating 70,000 Sports Fans in Less Than an Hour? Rehearse It With 70,000 Avatars



In the SportEvac simulation and training software, thousands of avatars are in motion at once, realistically representing the chaotic mix of sports fans, security staff, emergency responders and vehicles that interplay during a stadium evacuation. (Credit: SERRI)

ScienceDaily (Apr. 12, 2010) — What sports fan hasn't grumbled while waiting in a long, snaking line to get into the stadium for the big game? It's enough to discourage even a diehard fan. But if you think it's a hassle getting into a sold-out game, imagine trying to get out after a bomb explodes -- or even to get out under a bomb threat, for that matter.

Let's start with the emergency lights failing. If you're thinking of feeling your way out by the light of your cell phone, join the crowd -- they're right beside you, pushing fifty-across and a thousand-deep in a stampede. It's everyone for himself.

Scenes like this may sound like a trailer for a Hollywood thriller (think *Black Sunday*), but their grim prospect is all-too-real. Last year, the U.S. Department of Homeland Security (DHS) and the FBI jointly warned of terrorist interest in attacking crowded stadiums. Small wonder: A bomb or noxious plume released over a throng of captive sports fans would cause major-league mayhem and terror.

Mindful of the threat, stadium sentinels have been laying plans to manage and minimize the anarchy that would follow such an attack. Just how would authorities whisk 70,000 people out the gates and onto the roads quickly and safely? For an evacuation on this scale, there are no dress rehearsals or practice drills -- just simulation software.

Now, a new breed of simulation software -- dubbed SportEvac -- is being funded by the DHS Science and Technology Directorate (S&T) as part of the Southeast Region Research Initiative (SERRI), and developed and tested by the National Center for Spectator Sports Safety & Security (NCS4) at the University of Southern Mississippi.

"SportEvac isn't simply more realistic," says program manager Mike Matthews of S&T's Infrastructure and Geophysical Division. It will become a national standard."

Using blueprints from actual stadiums, the developers are creating virtual, 3D stadiums, packed with as many as 70,000 avatars -- animated human agents programmed to respond to threats as unpredictably as humans. Security planners will be able to see how 70,000 fans would behave—and misbehave—when spooked by a security threat.

But a SportEvac avatar need not be a sports fan. The simulation includes make-believe stadium workers, first responders, even objects, such as a fire trucks or a fan's car. SportEvac tracks them all, accounting for scenarios both probable and improbable.

Simulating thousands of people and cars can impose a crushing load on software and hardware. That's why, unlike SportEvac, most evacuation software apps are unable to simulate a crowd much larger than 5,000. For a college or NFL football game, that's bush-league.

Beyond scaling problems, earlier simulators did not account for the myriad variations that make human behavior hard to predict and human structures hard to simulate. How adversely, for example, would an evacuation be impaired if an audible were called -- a wet floor, a wheelchair, a stubborn aisle-seater, a fan fetching a forgotten bag, or an inebriated bleacher bum?

Conventional evacuation simulators couldn't say. SportEvac can. And like an open-source Web browser, the SportEvac software will get better and better because it's built on open, modular code. If your IT intern creates a module that can more accurately predict parking lot gridlock, just plug it in. This also means it can be customized for any sports arena.

By simulating how sports fans would behave in the minutes following an attack, SportEvac will help security experts across the country to plan and train and answer key questions, such as:

- How can my stadium be evacuated in the shortest time?
- How can civil emergency workers quickly get in as fans are dashing out?
- How can our stadium guards and ushers provide valuable information to civil responders and assist them as the evacuation unfolds?

"Interoperability is also a key goal," says Lou Marciani, NCS4 Director, who serves as the S&T project's principal investigator. Stadium security officers can use SportEvac to rehearse and refine procedures with civil responders. During a real evacuation, guards might use the same radios as the civil responders. And for every usher with a smartphone, a "SportEvac Lite" application will graphically show where fans or cars are bottlenecked.

Drawing on actual architectural CAD data, the Mississippi researchers are creating 3D virtual models of seven of the state's college sports stadiums. This year, in summits and workshops, security teams from the university athletic departments will test and refine SportEvac, with help from local police, Mississippi Homeland Security agents, the Mississippi Emergency Management Agency, and security specialists from pro sports. It will then be deployed to the seven state universities. Once the schools give it the green light, S&T will make the advanced version available to other universities, pro sports venues, and amateur sports organizations.

While not quite as immersive as the recent 3-D movie Avatar, SportEvac will create a safe, virtual stadium where security teams can practice guiding fans to safety, without risking life, limb, or lawsuit.

Story Source:

Adapted from materials provided by US Department of Homeland Security - Science and Technology, via EurekAlert!, a service of AAAS.

<http://www.sciencedaily.com/releases/2010/04/100410160121.htm>

Intentional weight loss in old age not detrimental, study finds

Among obese group, those who willfully shed pounds saw benefits

By Nathan Seppa

Web edition : Monday, April 12th, 2010

Losing weight on purpose in old age may provide a survival edge, at least for obese people, a new analysis shows.

Writing in an upcoming issue of the *Journal of Gerontology: Medical Sciences*, researchers tackled a long-held assumption that weight loss in old age is uniformly unhealthy. The idea stems from overpowering data linking rapid, unintentional weight loss in the elderly to a hidden underlying problem, such as the onset of type 2 diabetes.

“The loss of weight over six months without a specific cause is a very bad prognostic sign,” says study coauthor Stephen Kritchevsky, an epidemiologist at Wake Forest University School of Medicine in Winston-Salem, N.C.

That has ingrained the notion among doctors that *any* weight loss in the elderly is risky, he says. “I’ve been at meetings on nutrition in the elderly, and there have been reputable geriatricians who have said in public that if you ask an older person to lose weight you’re committing malpractice,” he says.

To assess the effects of intended weight loss, Kritchevsky and his colleagues analyzed data collected by a long-term trial in the 1990s. In the study 316 obese people, average age 70, were randomly assigned in roughly equal numbers to one of four interventions: a dieting program, dieting plus exercise, exercise only or health education only. . The people had arthritic knees but were otherwise free of major health problems.

After 18 months, people in the weight-loss groups had shed 10 pounds, on average, whereas the nondieters had lost three. Over the following eight years half as many of the dieters died as did people in the nondieting group.

“This is a really valuable randomized study in elderly people,” says epidemiologist Kenneth Adams of Health Partners Research Foundation in Minneapolis, Minn. “The result is kind of unexpected.”

“I think the findings show potential benefits in obese people,” says Lewis Kuller, an epidemiologist at the University of Pittsburgh School of Public Health. “But I don’t think this is going to change doctors’ views about weight loss in the elderly.” That’s because people who lose fat also invariably lose some muscle and bone mass, he says.

The long-term effects of weight loss are difficult to track in health care studies because many people fail to keep the weight off. That means the number of people who stay thinner dwindles, and the study loses statistical power. When coupled with a mortality analysis — waiting to count the number of people who die during the trial follow-up — numbers shrink even further. For example, in this trial only 15 people in the weight-loss group died over the eight-year follow-up period compared with 30 in the nondieting group. Even so, Adams says, “this is probably some of the best information we have on the effects of weight loss in the elderly.” Kritchevsky says the findings need to be replicated before being applied to the clinical setting.

http://www.sciencenews.org/view/generic/id/58253/title/Intentional_weight_loss_in_old_age_not_detrimental%2C_study_finds

Hiding patients in plain sight

Scrubbing detail could let researchers use records without privacy risk

By [Rachel Ehrenberg](#)

Web edition : Monday, April 12th, 2010

A new technique allows medical records to be used for research on the genetics of disease while still protecting patients from prying eyes.

Databases that link thousands of people's DNA profiles to their medical histories are a powerful tool for researchers who want to use genetics to individualize the diagnosis and treatment of disease. But this promise of personalized medicine comes with concerns about patient privacy. Now scientists have come up with a way to alter personal medical information so it's still meaningful for research, but meaningless to someone trying to ID an individual in a database.

"We're hoping that it's a game-changer," says Bradley Malin, a biomedical informatics specialist from Vanderbilt University in Nashville who helped develop the method.

The new method, published online April 12 in the *Proceedings of the National Academy of Sciences*, simply disguises parts of the medical history data that are not relevant to a geneticist's particular research question using an algorithm that combs through health records and makes some aspects of them more general.

For example, if scientists want to examine links between genes and asthma, parts of an individual's medical record that pertain to asthma are kept intact. But if that asthmatic patient also had a broken arm as a teenager, the algorithm changes the medical code for a broken left forearm to a code that indicates only a broken bone.

"What's really great about this is even though it anonymizes the data, it still allows you to go in and find an association with medical history," says Nils Homer of the University of California, Los Angeles, who was not involved with the research.

The researchers tested their algorithm against potential hackers using information from more than 2,600 patients. The team assumed a hacker might know a patient's identity, some of their medical history and maybe some of the medical codes associated with that history. The technique stymied efforts to ID an individual based on that information, the researchers report.

"There is definitely a need to de-identify individuals," says Homer, who was part of a team that demonstrated two years ago that it is possible to trace a genetic signature back to an individual even when that person's DNA profile was buried in a pool of thousands. The finding prompted the National Institutes of Health to restrict access to genetic databases that had previously been available to anyone with Internet access.

Genome-wide association studies, which comb through these giant databases looking for links between genetic and physical traits, have the potential to generate clinically valuable information. Establishing such links could help doctors understand, for example, why patients respond differently to certain drugs.

http://www.sciencenews.org/view/generic/id/58248/title/Hiding_patients_in_plain_sight

Breast implants may mask early cancer

But new data find no survival disadvantage

By Janet Raloff

Web edition : Monday, April 12th, 2010

Breast augmentation is the leading cosmetic surgery in North America, with roughly 400,000 procedures a year in the United States alone. A study now finds some evidence that breast implants may hinder early detection of breast malignancies. The good news: This didn't affect survival.

Some 83 to 84 percent of women in this study, regardless of implant status, survived their cancer through the followup period, which was typically at least 3.5 years. The findings appear in the May 1 International Journal of Cancer

A team of researchers from two Canadian universities, the Public Health Agency of Canada and Cancer Care Ontario pored over health data for almost 40,500 women who had elected to get some form of cosmetic surgery between the mid 1970s and end of 1989. The incidence of subsequent breast cancers differed little between women who had gotten breast implants and those who had other procedures, such as facelifts or surgeries to reshape the nose and ears. The researchers also found no change between the two groups in the size of breast tumors at diagnosis or the time between diagnosis and treatment.

What did differ was the stage of cancer — how advanced it was. Women with implants were almost 2.5 times as likely (13.2 percent) to have more advanced cancers — stage III or IV — as were those in the control group, women in a similar socioeconomic group who had undergone other cosmetic surgeries. And that's a potentially big deal since later-stage cancers tend to be more aggressive.

Implants can be relatively opaque to the x-rays used in mammography. So radiologists have been encouraged to make sure technicians push implants to the side, so to speak, when performing mammograms.

How successful technicians have been may explain, in part, why earlier studies have offered mixed evidence about any risk of delayed diagnosis associated with implants. Also hampering those earlier reports: None had data for as many women. Indeed, the new report's authors note: "Our study is the largest to date and the first to show a statistically significant shift toward later stage at diagnosis of breast cancer among breast implant patients."

What their data certainly suggest is that women who have implants should make sure that they mention them when they come in for mammograms, and encourage technicians to shove those implants out of the way as much as possible (as uncomfortable as that may be) to maximize the chance of revealing any nascent tumors.

http://www.sciencenews.org/view/generic/id/58246/title/Breast_implants_may_mask_early_cancer



The backstory behind a new element

Synthesizing ununseptium, element number 117, took more than a little legwork.

By Alexandra Witze

Web edition : Monday, April 12th, 2010

How hard is it to make a new element? Logistically, it's harder than you might think — especially if the groups collaborating on the work are formerly secret nuclear weapons laboratories in the United States and Russia.

The Physical Review Letters paper announcing the find is headed by Yuri Oganessian, a nuclear physicist at the Joint Institute for Nuclear Research in Dubna, Russia — a lab that was born in secrecy immediately after World War II and only emerged into daylight in the 1950s. Also notable on the author list are many names from the Oak Ridge National Laboratory in Tennessee, the descendant of one of several groups in Oak Ridge that developed materials during the Manhattan Project for the U.S. atomic bomb.

And Dubna and ORNL needed to work together if element 117 was going to get made. Oganessian knew he wanted to smash calcium-48 together with berkelium-249. The Dubna researchers were famous for their method of making calcium-48, but they would need ORNL's help to get the berkelium-249. The heavy, unstable element can be made in Oak Ridge's High Flux Isotope Reactor.

Joseph Hamilton, a nuclear physicist at Vanderbilt University in Nashville, says that Oganessian asked for his help in getting a berkelium target from ORNL. "The problem was, the typical cost for such a target was about \$3.5 million," Hamilton says. The cheapest way to get some would be to wait for another group to order up some californium-252, since berkelium-249 is a byproduct of making the californium. And it would cost only a few hundred thousand dollars to separate out. "So every four months I would call the reactor and ask is there any campaign on to make californium," Hamilton says. "And in the summer of 2008 they said yes." An oil company, which uses californium in geophysical exploration, had ordered up a batch of the stuff.

ORNL scientists let it all cool for three months and spent another three months painstakingly separating the berkelium from the californium. Then came an equally hard part: figuring out how to ship it to Russia. "When you're transferring 36 curies [a measure of radioactivity] of berkelium to Russia, you go through a lot of desks," says Krzysztof Rykaczewski, an ORNL physicist who helped coordinate the transfer.

Once the paperwork was finally sorted, Oak Ridge researchers packed the berkelium in five separate barrels, each with a minuscule 4.4 milligrams of the stuff heavily shielded by lead. In fact, Rykaczewski says, the shipment was so well protected against radioactivity leakage that when it arrived at customs, fresh off the Delta flight, Russian officials didn't believe it was berkelium because they couldn't detect any radioactivity. Only when they lifted the lid, and the Geiger counters started to click frantically, did they believe it, he says.

And off the berkelium target went to Dubna, where late last year it helped make a brand-new element never before seen on Earth.

http://www.sciencenews.org/view/generic/id/58239/title/The_backstory_behind_a_new_element



For This Doctor, 'DNR' Means Do Not Resign

by Dr. Boris Veysman

April 12, 2010



[Read Dr. Veysman's Entire Essay, Published In The "Narrative Matters" Section Of Health Affairs](http://content.healthaffairs.org/cgi/content/full/29/2/324) <http://content.healthaffairs.org/cgi/content/full/29/2/324>

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April 12, 2010

The emergency department is always noisy, but today the triage nurse is yelling "not breathing," as she runs toward us pushing a wheelchair.

A pale, thin woman is slumped over and looking gray.

"Anyone know of a DNR on her?" I ask. If there's a "Do Not Resuscitate" order, we won't prevent her impending death.

Blank stares all around. "Her daughter dropped her off with a chief complaint of weakness and went to park the car," the triage nurse says. "I think she has cancer and is on chemo."

Without concrete proof of a DNR, there's no hesitation. Click, klang, and the patient has a tube down her throat within seconds. I do the chest compressions. On the monitor, she is flat-lining — no heartbeat.

I synchronize my words with the compressions and call out for an external pacemaker. Pumping ... thinking: Cardiac standstill ... after walking in ... with cancer ... on chemo ...

This resuscitation isn't by the book. "Get two amps of bicarbonate," I say to the intern.

The jugular line takes seconds, and I flush it with sodium bicarbonate. This probably will correct the blood's extreme acidity, which I suspect is driving up the potassium.

The external pacemaker finally arrives. Potent electric shocks at 80 beats per minute begin to stimulate her heart. The vitals stabilize. She has a heart that works.

She gags, coughs and starts to reach for the breathing tube in her throat. She has a brain that works, too.

I order narcotics and sedatives. She is not only alive but comfortable — a bonus, as I happen to value the comfort of my patients.

But we're not done. "Where's the family?" I ask.

I introduce myself, and before I can go further, a man interrupts. "She has DNR orders," he says.

It's a bit of a shock. I didn't know this, and I erroneously saved my patient's life. I carefully explain that everything happened fast. We weren't aware of the DNR. She's stabilizing.

A Hard Decision

"Is the DNR still in effect?" I ask. Confusion overcomes the family. The labs and scans confirm renal failure, and major organ systems are intact. I feel hopeful and approach the family again.

"I think there's a good chance she is fixable in the short term," I say. I think her depression, weakness, appetite, dehydration and malnourishment can be effectively treated. She needs dialysis. Whatever her prognosis is from the cancer, I think she can probably get at least a few good weeks.

The family members spend the next two hours in discussion with the primary oncologist and the ICU team. They decide on comfort care only. No dialysis.

I see the burnout in their eyes. Their will to fight quit weeks ago, after the patient's minor symptoms from the chemo and cancer were left unaddressed, leaving the impression that her life wasn't worth living.

She died peacefully several hours later. The best resuscitation of my career turned into my most memorable professional disappointment.

Folks who say, "When I get that sick, unplug me, don't let me suffer" have never learned how the end of life can be done better.

This Doctor's Advice

And they should hear it from a medical professional before making up their minds about something this important. So here are my educated instructions:

Life is precious and irreplaceable. My version of DNR is "Do Not Resign." Don't give up on me if I can still think, communicate and enjoy life.



Treat my depression, dehydration, malnutrition and pain. Even severe, incurable illness can often be temporarily fixed, moderated or controlled, and most discomfort can be made tolerable or even pleasant, with simple drugs.

Surround me with people; bring the kids so I can teach and talk to them. Let me use my e-mail.

Recall the great people of our time who thrived with disability. People like Stephen Hawking, who has ALS and quadriplegia. People like Christopher Reeve.

Only after you make every effort to let me be happy and human, ask me again if my life is worth living. Then listen and comply. At that point, if I wish to die, let me die.

But until that happens, none of us realize what I can accomplish with another day, another week, another month. So do it all for me. Then ask someone to do it all for you.

Dr. Boris Veysman specializes in emergency medicine at the Robert Wood Johnson University Hospital in New Jersey. His [full essay](#) appeared in the February issue of the journal Health Affairs.

<http://www.npr.org/templates/story/story.php?storyId=125788057&sc=nl&cc=hh-20100419>

How Tackling Allergies Can Ease Asthma Suffering

by Joanne Silberner

April 12, 2010



Sure they're pretty, but flowers — as well as trees and grasses — release huge amounts of pollen, which isn't great news for pollen-allergy sufferers. For asthmatic kids, these allergies may further aggravate symptoms such as wheezing.

Sure they're pretty, but flowers — as well as trees and grasses — release huge amounts of pollen, which isn't great news for pollen-allergy sufferers. For asthmatic kids, these allergies may further aggravate symptoms such as wheezing.

April 12, 2010

About 4 million to 5 million American children have persistent asthma, and about 90 percent of them also have allergies. Studies have found that treating the allergies can not only make asthmatic children more comfortable, but it can even keep them out of the emergency room.

"For the vast majority of children with asthma, allergies are a very important, if not the most important factor in causing symptoms and determining risk for hospitalizations and emergency room visits," says asthma expert Dr. William Busse of the University of Wisconsin.

And federal guidelines for treating asthma say children with persistent asthma should be checked for allergies. Still, there are many asthmatic children whose allergies go undiagnosed and untreated. Dr. Karen DeMuth sees it every day at her clinic at Emory University. "I don't know if anyone has been keeping data," she says, "but there definitely is a lot of undermanaged asthma."

She points to 4-year-old Abbie Denham, who came to her office in February. Before Abbie saw DeMuth, she had drugs for asthma flare-ups and medicine for her skin allergy, eczema. But no one had even diagnosed her respiratory allergies.

Abbie's mother, Carla Denham, said that despite asthma medication, her daughter wheezed at night, and couldn't run or play without running out of breath. When DeMuth checked Abbie for allergies, she found that the girl was pretty much allergic to everything: all sorts of pollens, molds, cats, dogs, dust mites and cockroaches. DeMuth counseled the mother on avoiding allergens, kept Abbie on asthma medication, and gave her nasal sprays for the allergies.

Asthmatics have trouble breathing when their airways become inflamed and constricted (left; at right is what a normal airway looks like). The yellow stuff inside the airway is mucus; studies have found that many asthmatics have increased mucus-producing cells.

Asthmatics have trouble breathing when their airways become inflamed and constricted (left; at right is what a normal airway looks like). The yellow stuff inside the airway is mucus; studies have found that many asthmatics have increased mucus-producing cells.

"She's keeping up with everybody, and she's sleeping wonderfully — she's a different child at night," says Denham.

That experience is evidently pretty common. Busse estimates that 30 or 40 percent of children with allergic asthma never have their allergies diagnosed.

Dr. Stephen Teach of Children's National Medical Center says that among the inner-city kids he sees, it's a lot more. "The vast majority of inner-city children have not had a comprehensive evaluation for allergies," he says.

Tackling Allergies Is Tricky Business

One reason is that allergies are a challenge to diagnose. Doctors need to have a thorough understanding of what a child is exposed to. There are blood and skin tests, but they can be difficult to read. And once doctors identify a problem, allergies are a challenge to treat. Allergy shots offer relief to some, but patients need to continue to get a shot about once a month for three to five years to attain immunity. Allergy drugs have side effects, and can't be taken with certain other drugs. Avoiding allergens like pollen, dust or animal dander can also be hard.

There is, however, compelling evidence that avoidance helps with asthma. One such study appeared in the *New England Journal of Medicine* in 2004. Researchers trained parents of about 500 kids with asthma on how to protect their children from exposure to allergens like dust, cockroaches, mold and animals, as well as tobacco smoke. Compared to a similar group, the kids in the treatment group had an average of 21 fewer days of wheezing. A study last year in the *American Journal of Public Health* showed that when parents were trained in how to protect their kids from allergens and tobacco smoke, emergency room visits went down by 30 percent.

Teach says allergen avoidance is a good approach, but it takes a lot of effort. "In order to educate a family, you have to talk about a lot of different things," he says. "And primary care doctors have a limited amount of time." He estimates that it takes an hour to an hour and a half to fully educate parents on allergens and other things that can spark asthma. Most insurers don't pay doctors for that kind of time.

<http://www.npr.org/templates/story/story.php?storyId=125759694&sc=nl&cc=hh-20100419>

Mechanism of cobra hood revealed

Scientists have uncovered the mechanism behind the menacing "hood flare" which cobras use as a defensive display.



By measuring the electrical activity from the snakes' muscles, they found the precise group of muscles used by cobras to raise their hoods.

The researchers say that the cobra's hood evolved as its ribs were "co-opted" to be used in this visual display.

They report their findings in the *Journal of Experimental Biology*

Kenneth Kardong, professor of zoology from Washington State University in the US, was one of the authors of the study.

He explained that the cobra's hood was "an intriguing problem in evolutionary biology".

Snake ribs

"In the cobra, both the [rib bones] and the muscles that work them are deployed to erect this visual display," he explained to BBC News.

"We wanted to examine the way in which the ribs were 'freed up' to rotate into this presentation position, and to understand how the muscles were able to accomplish that and return them to a relaxed position."

To do this, the researchers took measurements of electrical activity from all of the muscles in the cobra's neck.

They had to embark on some very tricky surgery to implant tiny electrodes into the snake's neck muscles, with the animal very carefully anaesthetised.



Bruce Young from the University of Massachusetts Lowell, who also took part in the study, said that doing the surgery was "the riskiest part of the study".

"You have to work around the head but the snakes are prone to waking, which can be disconcerting," he explained.

Once the electrodes were in place, the scientists waited for the snake to recover before filming and recording the muscle activity as the animal flared its neck.

They found that just eight muscles were involved in "hooding" and that they were muscles that were also present in non-hooding snakes.

"This is an example of evolution's remodelling [as] derived species emerge," said Dr Kardong. "There's been a change in the nervous system's control over these muscles."

Professor Young explained that cobras were not the only snakes to hood. "Several groups of unrelated snakes show almost identical defensive behaviour," he said. He now hopes to study how these other snakes raise their hoods.

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8625553.stm>

Published: 2010/04/17 11:03:36 GMT



Robot 'helps arms after stroke'

Intensive therapy using a robot has helped patients improve arm movement years after having a stroke, according to a US study.



Researchers from Brown University, in Rhode Island, used the machine to provide three months of training.

The New England Journal of Medicine reported that many patients had improved quality of life.

UK stroke experts said the advance was "exciting" but added that robots were still at early stages of development.

“ This is giving stroke survivors new hope ”

Dr Albert Lo, Brown University

Strokes can leave people with long-lasting disability, which can include limited movement and weakness in upper limbs.

Intensive therapy, starting as soon as possible after the stroke, is the recommended way to maximise the amount of movement recovered.

However, providing the physiotherapist needed for at least a hour per patient per day places large demands on the NHS.

One possible solution is to use machines which help patients reproduce the necessary movements.

The Brown University trial tested a device called the MIT-Manus, specifically designed to help exercise the upper limbs.

The patient sits at a table with their upper arm in the device, and is then instructed to perform tasks with the arm. The robot senses their movement and helps if required.

The researchers described the robots as "power-steering" for the arms.

The study involved 127 patients who, on average, had suffered a stroke five years earlier.

They were split into three groups - one received "robot" therapy over a three month period, the next received the equivalent intensive therapy - carried out by a physiotherapist - while the third received "normal" healthcare, with no intensive treatment.

Quality of life

Both the "robot" group and the other intensive group had significantly improved upper-arm function - measured by how much better they could carry out everyday tasks such as using a knife and fork, opening jars or tying shoelaces.

The researchers involved have said they are delighted with the improvements - particularly given the years between stroke and treatment in the patients used in the research.

Dr Albert Lo, who led the study said: "We've shown that with the right therapy [patients] can see improvements in movement, everyday function and quality of life - this is giving stroke survivors new hope."

Dr Diane Playford, from the Institute of Neurology in London, is part of a team trying to develop similar robotic devices in the UK.

She is hopeful that, at some point, a machine compact enough to be used in the patient's home will be developed.

"The fact that these patients have improved function is exciting.

"We would normally think that patients who began therapy at an earlier stage could do even better."

However, she said that robots were still at an "early development" stage, and some years from full-scale use in the NHS.

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8626056.stm>

Published: 2010/04/18 00:10:45 GMT

UK water imports 'unsustainable'

By Richard Black
Environment correspondent, BBC News

The amount of water used to produce food and goods imported by developed countries is worsening water shortages in the developing world, a report says.



The report, focusing on the UK, says two-thirds of the water used to make UK imports is used outside its borders.

The Engineering the Future alliance of professional engineering bodies says this is unsustainable, given population growth and climate change.

It says countries such as the UK must help poorer nations curb water use.

"We must take account of how our water footprint is impacting on the rest of the world," said Professor Roger Falconer, director of the Hydro-Environmental Research Centre at Cardiff University and a member of the report's steering committee.

" If the water crisis becomes critical, it will pose a serious threat to the UK's future development "
Professor Peter Guthrie

"If we are to prevent the 'perfect storm', urgent action is necessary."

The term perfect storm was used last year by the UK government's chief scientist, Professor John Beddington, to describe future shortages of energy, food and water.

Forecasts suggest that when the world's population soars beyond 8bn in 20 years time, the global demand for food and energy will jump by 50%, with the need for fresh water rising by 30%.

But developing countries are already using significant proportions of their water to grow food and produce goods for consumption in the West, the report says.

"The burgeoning demand from developed countries is putting severe pressure on areas that are already short of water," said Professor Peter Guthrie, head of the Centre for Sustainable Development at Cambridge University, who chaired the steering group.

"If the water crisis becomes critical, it will pose a serious threat to the UK's future development because of the impact it would have on our access to vital resources."

Key to the report is the concept of "embedded water" - the water used to grow food and make things.

Embedded in a pint of beer, for example, is about 130 pints (74 litres) of water - the total amount needed to grow the ingredients and run all the processes that make the pint of beer.

A cup of coffee embeds about 140 litres (246 pints) of water, a cotton T-shirt about 2,000 litres, and a kilogram of steak 15,000 litres.

Using this methodology, UK consumers see only about 3% of the water usage they are responsible for.

The average UK consumer uses about 150 litres per day, the size of a large bath.

Ten times as much is embedded in the British-made goods bought by the average UK consumer; but that represents only about one-third of the total water embedded in all the average consumer's food and goods, with the remainder coming from imports.

The UK is not unique in this - the same pattern is seen in most developed countries.

The engineering institutions say it means nations such as the UK have a duty to help curb water use in the developing world, where about one billion people already do not have sufficient access to clean drinking water.

UK-funded aid projects should have water conservation as a central tenet, the report recommends, while companies should examine their supply chains and reduce the water used in them.

This could lead to difficult questions being asked, such as whether it is right for the UK to import beans and flowers from water-stressed countries such as Kenya.

While growing crops such as these uses water, selling them brings foreign exchange into poor nations.

In the West, the report suggests, concerns over water could eventually lead to goods carrying a label denoting their embedded water content, in the same way as electrical goods now sport information about their energy consumption.

The Engineering the Future alliance includes the Institution of Civil Engineers (ICE), the Royal Academy of Engineering (RAE) and the Chartered Institute of Water and Environmental Management (CIWEM).

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Story from BBC NEWS:
<http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8628832.stm>

Published: 2010/04/19 00:12:51 GMT

Study logs oceans' tiniest life

By Mark Kinver
Science and environment reporter, BBC News

An unprecedented number of tiny, ocean dwelling organisms have been catalogued by researchers involved in a global survey of the world's oceans.



One of the highlights was the discovery of a vast "microbial mat", covering an area equivalent to the size of Greece.

Microbes are estimated to constitute up to 90% of all marine biomass.

The findings form part of the Census of Marine Life (CoML), a decade-long project that will present its full results in October.

"In no other realm of ocean life has the magnitude of Census discovery been as extensive as in the world of microbes," said Mitch Sogin, leader of the International Census of Marine Microbes (ICoMM).

"It is really only in the last decade that we have had the technology that allowed us to start asking who was out there"

Professor Paul Snelgrove, Leader of CoML Synthesis Group

"Scientists are discovering and describing an astonishing new world of marine microbial diversity and abundance."

The ICoMM was one of four of the Census's projects that focused on "hard to see" marine organisms.

The team, involving researchers from the Netherlands and the US, collected samples from more than 1,200 locations, which resulted in the compilation of a dataset containing in excess of 18 million DNA sequences.

CoML researchers suggested that the total number of marine microbes, based on molecular characterisation, could be in the region of one billion species.

They added that the micro-organisms were vital for sustaining life on Earth, as they are responsible for about 95% of respiration in the oceans.

"They play a really critical role in keeping the oceans working," said Paul Snelgrove, leader of CoML's Synthesis Group.

"Certainly, life in the oceans - and then life on Earth - would collapse very quickly without the microbes."

In the 1950s, scientists estimated that about 100,000 microbial cells inhabited in one litre of seawater. However, with the aid of modern technological advances, researchers now suggest that the figure is closer to one billion micro-organisms.

They have also calculated that the estimated total mass of marine microbes is equivalent to 240 billion African elephants.

As part of the CoML, Chile-based researchers found a "microbial mat" off the south-west coast of South America that covered a vast area, equivalent to the size of Greece.

The mats were found at a depth where "oxygen minimum layers" (OML) occurred. These are regions where there is very little oxygen, or none at all.

However, the researchers found that the communities of microbes thrived on hydrogen sulphide, which is toxic to most lifeforms, and is the product of the breakdown of organic material in an environment where there is no oxygen.

The team - led by Victor Gallardo, vice-chairman of the Census Scientific Steering Committee - said the mats resembled an ecosystem that existed between 2.5bn and 650m years ago.

As well as microbes, scientists working on Census projects also assessed the diversity of zooplankton species; collected samples from abyssal plains, and hydrothermal vents and seeps.

Decade of discovery

Professor Snelgrove said it was thanks to recent technological advances that it was now possible for scientists to study "hard to see" organisms.

"In the case of microbes, we could not tell them apart because they were so small and all looked the same," he told BBC News.

"Now we know that things that look identical do very different things in the oceans.

"It is really only in the last decade that we have had the technology that allowed us to start asking who was out there and what exactly were they doing."

He explained that information collected by the various projects will be listed on a open-access database called the Ocean Biogeographic Information System (Obis).

"Everyone who has participated in the Census has agreed to deposit their data into this database," he said.

Currently, Obis - which is accessible via the world wide web - has more than 27 million records covering in excess of 110,000 species.



It contains a wide range of information, including details of a species; where it was recorded, and at what depth.

"This has led to the building up of this global ocean biodiversity dataset," Professor Snelgrove observed.

"This is already allowing people to test predictions about where life is in the oceans, where are the biodiversity hotspots and lowspots?"

"I think it is going to be an extremely rich dataset to mine well into the future."

A final synthesis report will be published at the beginning of October to mark the end of the decade-long project involving in excess of 2,000 scientists from more than 80 nations.

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8622608.stm>

Published: 2010/04/18 16:59:56 GMT

Rewards 'work like drugs' in ADHD

The brains of children with attention-deficit disorders respond to on-the-spot rewards in the same way as they do to medication, say scientists.



A Nottingham University team measured brain activity as children played a computer game, offering extra points for less impulsive behaviour.

Their findings, published in *Biological Psychiatry*, could mean lower doses of drugs such as Ritalin in severe cases.

But they warn teachers and parents may often struggle to give instant rewards.

Estimates vary, but it is believed that up to 5% of children in the UK have some form of attention-deficit hyperactivity disorder (ADHD).

This can lead to behavioural problems including impulsive actions, fidgeting and poor attention span, and can affect a child's academic and social progress.

“ Our study suggests that both types of intervention may have much in common in terms of their effect on the brain ”

Professor Chris Hollis, Nottingham University

In severe cases, stimulant drugs such as Ritalin, which act on parts of the brain associated with attention and behaviour, can be given.

In addition, parents are often asked to try to influence the child's actions directly by rewarding positive behaviour and making sure that there are negative consequences if a child behaves badly.

Research has suggested that, unlike in non-ADHD children, these incentives and disincentives only work well if delivered on the spot, as opposed to later in the day or week.

The Nottingham team wanted to look at the effects of this "behaviour therapy" in the brain of the child.

They devised a computer game in which children had to "catch" aliens of a certain colour, while avoiding aliens of a different colour.

The game was designed to test the children's ability to resist the impulse to grab the wrong sort of alien.

To test whether incentives made a difference, in one variant of the game the reward for catching the right alien was increased fivefold, as was the penalty for catching the wrong one.

Lower doses

Activity in different parts of the brain was monitored using an electroencephalogram (EEG).

They found that the incentives helped the children perform better at the game, although not to the same extent as the child's normal dose of Ritalin.

However, the EEG revealed that both were "normalising" brain activity in the same regions.

Professor Chris Hollis, who led the research, said that the combination of drugs and incentives produced the best results, and might mean children with ADHD could take lower doses of drugs while maintaining control of their behaviour.

He said: "Although medication and behaviour therapy appear to be two very different approaches of treating ADHD, our study suggests that both types of intervention may have much in common in terms of their effect on the brain.

"Both help normalise similar components of brain function and improve performance."

However, he conceded that it might not always be practical to use behavioural therapy.

"We know that children with ADHD respond disproportionately less well to delayed rewards - this could mean that in the 'real world' of the classroom or home, the neural effects of behavioural approaches using reinforcement and rewards may be less effective."

Andrea Bilbow, from the National Attention Deficit Disorder Information and Support Service (Addiss), echoed this: "It means you have to be in front of that child 24/7, and you just can't do that - teachers and schools would have to totally change the way they deal with this."

Story from BBC NEWS:

<http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8625741.stm>

Published: 2010/04/18 23:40:39 GMT

Lung disease: A human cost of 'worn' denim

The industry that prematurely ages blue jeans hasn't always put safety first

By Janet Raloff

Web edition : Sunday, April 18th, 2010

Most teenage girls wouldn't deign to wear deep indigo or even crisp bleached jeans. They simply look too new. Fashion dictates that they don broken-in jeans, or at least pants that appear well-worn. So manufacturers have, for decades now, prematurely aged apparel by sandblasting the fabric. A new study out of Turkey finds that some workers charged with giving denim that well-worn look pay a high price: the development of silicosis – an irreversible and potentially lethal lung disease.

Their diagnosis is serious since this incurable illness often continues to worsen even after exposure to silica – in this case, sand – ends.

Over the course of a year, radiologist Cihan Özmen of the Dicle University School of Medicine, in Diyarbakir, and her colleagues recruited 60 sandblasters working at Istanbul denim factories to receive conventional chest X-rays and computed tomography (3-dimensional X-ray) scans. The workers had routinely faced heavy exposure to airborne silica for long periods in the absence of good ventilation or filtering masks. They volunteered to take part, the researchers note, “after learning about the severity of [silicosis] from our previously diagnosed patients.”

In general, the recruits were young, only an average of 26 years old. Their exposures had also been relatively short, just two months to five years.

Radiological exams confirmed silicosis in 44 of the men, and in every case their disease was clinically classified as accelerated, Özmen and her coworkers reported April 17 in Environmental Health, an online journal. Men receiving the diagnosis tended to have worked longer than those who remained silicosis-free, but were the same ages, as likely to have smoked – and if so, to have consumed as many cigarettes and for just as long.

Silicosis victims typically develop abnormal nodules in their lungs. And every silicosis victim in this study had such nodules. Other features of the patients' disease tended to match those seen in silicosis studies by others, including a high rate of emphysema.

The authors note that several earlier studies over the past seven years had linked Turkish sandblasting of denim to silicosis. Although those studied tended to uncover a lower incidence of disease, Özmen's team points out that its radiological techniques are more sensitive to uncovering early manifestations of this lung disease.

“Silicosis is one of the oldest occupational diseases and kills thousands of people worldwide every year,” the Dicle researchers observe. So risks associated with sandblasting fabric should come as no surprise to jeans makers – nor regulators. Indeed, some deaths have already occurred in this industry. The tragedy is that the health of hundreds of workers or more are being jeopardized not for some public good but for fickle fashion. And probably half a world away from where the jeans' wearers parade derrieres decked out in sand-abraded denim.

Let's hope manufacturers in Turkey and elsewhere begin to put safety first – investing not only in respiratory masks and ventilation, but also in their workers' education.

http://www.sciencenews.org/view/generic/id/58384/title/Lung_disease_A_human_cost_of_%E2%80%98worn%E2%80%99_denim

Dry Regions Becoming Drier: Ocean Salinities Show an Intensified Water Cycle



An Argo robotic profiling instrument being deployed from the research vessel, Southern Surveyor. (Credit: Alicia Navidad)

ScienceDaily (Apr. 18, 2010) — The stronger water cycle means arid regions have become drier and high rainfall regions wetter as atmospheric temperature increases.

The study, co-authored by CSIRO scientists Paul Durack and Dr Susan Wijffels, shows the surface ocean beneath rainfall-dominated regions has freshened, whereas ocean regions dominated by evaporation are saltier. The paper also confirms that surface warming of the world's oceans over the past 50 years has penetrated into the oceans' interior changing deep-ocean salinity patterns.

"This is further confirmation from the global ocean that the Earth's water cycle has accelerated," says Mr Durack -- a PhD student at the joint CSIRO/University of Tasmania, Quantitative Marine Science program.

"These broad-scale patterns of change are qualitatively consistent with simulations reported by the Intergovernmental Panel on Climate Change (IPCC).

"While such changes in salinity would be expected at the ocean surface (where about 80 per cent of surface water exchange occurs), sub-surface measurements indicate much broader, warming-driven changes are extending into the deep ocean," Mr Durack said.

The study finds a clear link between salinity changes at the surface driven by ocean warming and changes in the ocean subsurface which follow the trajectories along which surface water travels into the ocean interior.

The ocean's average surface temperature has risen around 0.4°C since 1950. As the near surface atmosphere warms it can evaporate more water from the surface ocean and move it to new regions to release it as rain and snow. Salinity patterns reflect the contrasts between ocean regions where the oceans lose water to the atmosphere and the others where it is re-deposited on the surface as salt-free rainwater.



"Observations of rainfall and evaporation over the oceans in the 20th century are very scarce. These new estimates of ocean salinity changes provide a rigorous benchmark to better validate global climate models and start to narrow the wide uncertainties associated with water cycle changes and oceanic processes both in the past and the future -- we can use ocean salinity changes as a rain-gauge," Mr Durack said.

Based on historical records and data provided by the Argo Program's world-wide network of ocean profilers -- robotic submersible buoys which record and report ocean salinity levels and temperatures to depths of two kilometres -- the research was conducted by CSIRO's Wealth from Oceans Flagship and partially funded by the Australian Climate Change Science Program. Australia's Integrated Marine Observing System is a significant contributor to the global Argo Program.

Story Source:

Adapted from materials provided by [CSIRO Australia](#).

Journal Reference:

1. Paul J. Durack and Susan E. Wijffels et al. **Fifty-year trends in global ocean salinities and their relationship to broad-scale warming**. *Journal of Climate*, (in press) DOI: [10.1175/2010JCLI3377.1](https://doi.org/10.1175/2010JCLI3377.1)

<http://www.sciencedaily.com/releases/2010/04/100416094050.htm>



First Evidence That Chitosan Could Repair Spinal Damage

ScienceDaily (Apr. 18, 2010) — Richard Borgens and his colleagues from the Center for Paralysis Research at the Purdue School of Veterinary Medicine have a strong record of inventing therapies for treating nerve damage. From Ampyra, which improves walking in multiple sclerosis patients to a spinal cord simulator for spinal injury victims, Borgens has had a hand in developing therapies that directly impact patients and their quality of life.

Another therapy that is currently undergoing testing is the use of polyethylene glycol (PEG) to seal and repair damaged spinal cord nerve cells. By repairing the damaged membranes of nerve cells, Borgens and his team can restore the spinal cord's ability to transmit signals to the brain.

However, there is one possible clinical drawback: PEG's breakdown products are potentially toxic. Is there a biodegradable non-toxic compound that is equally effective at targeting and repairing damaged nerve membranes? Borgens teamed up with physiologist Riya Shi and chemist Youngnam Cho, who pointed out that some sugars are capable of targeting damaged membranes.

Could they find a sugar that restored spinal cord activity as effectively as PEG? Borgens and his team publish their discovery that chitosan can repair damaged nerve cell membranes in the April 16 issue of *The Journal of Experimental Biology*.

Having initially tested mannose and found that it did not repair spinal cord nerve membranes, Cho decided to test a modified form of chitin, one of the most common sugars that is found in crustacean shells. Converting chitin into chitosan, Cho isolated a segment of guinea pig spinal cord, compressed a section, applied the modified chitin and then added a fluorescent dye that could only enter the cells through damaged membranes. If the chitosan repaired the crushed membranes then the spinal cord tissue would be unstained, but if the chitosan had failed, the spinal cord neurons would be flooded with the fluorescent dye. Viewing a section of the spinal cord under the microscope, Cho was amazed to see that the spinal cord was completely dark. None of the dye had entered the nerve cells. Chitosan had repaired the damaged cell membranes.

Next Cho tested whether a dose of chitosan could prevent large molecules from leaking from damaged spinal cord cells. Testing for the presence of the colossal enzyme lactate dehydrogenase (LDH), Borgens admits he was amazed to see that levels of LDH leakage from chitosan treated spinal cord were lower than from undamaged spinal cords.

Not only had the sugar repaired membranes at the compression site but also at other sites where the cell membranes were broken due to handling. And when the duo tested for the presence of harmful reactive oxygen species (ROS), released when ATP generating mitochondria are damaged, they found that ROS levels also fell after applying chitosan to the damaged tissue: chitosan probably repairs mitochondrial membranes as well as the nerve cell membranes.

But could chitosan restore the spinal cord's ability to transmit electrical signals to the brain through a damaged region? Measuring the brain's response to nerve signals generated in a guinea pig's hind leg, the duo saw that the signals were unable to reach the brain through a damaged spinal cord. However, 30-min after injecting chitosan into the rodents, the signals miraculously returned to the animals' brains. Chitosan was able to repair the damaged spinal cord so that it could carry signals from the animal's body to its brain.

Borgens is extremely excited by this discovery that chitosan is able to locate and repair damaged spinal cord tissue and is even more enthusiastic by the prospect that nanoparticles of chitosan could also target delivery of neuroprotective drugs directly to the site of injury 'giving us a dual bang for our buck,' says Borgens.



Story Source:

Adapted from materials provided by Journal of Experimental Biology, via EurekAlert!, a service of AAAS. Original article written by Kathryn Knight.

Journal Reference:

1. Cho, Y., Shi, R. and Borgens, R. B. **Chitosan produces potent neuroprotection and physiological recovery following traumatic spinal cord injury**. *Journal of Experimental Biology*, 2010; 213 (9): 1513 DOI: [10.1242/jeb.035162](https://doi.org/10.1242/jeb.035162)

<http://www.sciencedaily.com/releases/2010/04/100416094012.htm>

Chinese Scientists Discover Marker Indicating the Developmental Potential of Stem Cells

ScienceDaily (Apr. 18, 2010) — Researchers in China are reporting that they have found a way to determine which somatic cells -- or differentiated body cells -- that have been reprogrammed into a primordial, embryonic-like state are the most viable for therapeutic applications.

In a paper published online by the *Journal of Biological Chemistry*, two collaborating teams from institutes at the Chinese Academy of Sciences point to a marker they found in induced-pluripotent stem cells, or iPS cells, taken from mice. That marker is a cluster of small RNA whose expression appears strictly correlated with levels of pluripotency, or "stemness." (The more pluripotent, the more likely a stem cell will develop into the desired tissue, organ or being.)

"We identified a genomic region encoding several genes and a large cluster of microRNAs in the mouse genome whose expression is high in fully pluripotent embryonic stem cells and iPS cells but significantly reduced in partially pluripotent iPS cells, indicating that the *Dlk1-Dio3* region may serve as a marker," said Qi Zhou, a researcher at the CAS Institute of Zoology and co-author of the paper. "No other genomic regions were found to exhibit such clear expression changes between cell lines with different pluripotent levels."

After the creation of the first iPS cells in Japan in 2006, Zhou and others set out to determine whether the reprogrammed adult cells are versatile enough to generate an entire mammalian body, as embryonic stem cells can.

Then, last summer, Zhou announced that his team had reprogrammed somatic cells of mice, injected them into embryos and created 27 live offspring, which clearly demonstrated that iPS cells can, like embryonic stem cells, produce healthy adults. Though lauded as a huge step forward, they also found not all iPS cells were perfect: Many of the iPS cell lines used did not produce mice, and some of the mice that were produced had abnormalities.

"The success rate of obtaining iPS cells with full pluripotency was still extremely low, which significantly hindered the application of iPS cells in therapeutics and other aspects," Zhou said.

Believing that there might be some intrinsic gene expression difference between the lines of iPS cells with varying levels of pluripotency that could be identified at early culture stages, so that less viable lines could be abandoned and more viable lines focused on, Zhou teamed up with bioinformatics specialist Xiu-Jie Wang, who works at the Chinese academy's Institute of Genetics and Developmental Biology.

Together, their groups profiled the small RNA expression patterns of ES and iPS cell lines from different genetic backgrounds and with different pluripotent levels using Solexa technology.

"There are nearly 50 miRNAs encoded in this region, and those expressed miRNAs all exhibited consistent and significant expression differences between stem-cell lines with different pluripotency levels," Wang said. "With this discovery, iPS cells with different pluripotency can be distinguished in their early phases, which will, thus, significantly improve the production of full pluripotent iPS cells and promote their application in disease therapy," Wang said.

As stem cells can be applied in the treatment of many diseases related to tissue replacement or organ implantation, Zhou said, if the team's findings also are true for humans, "it will cause a revolution in stem-cell research and the application of it in the very near future."

The team's work is supported by China's National High-Technology Research and Development Program, Ministry of Science and Technology and National Natural Science Foundation. Their *Journal of Biological Chemistry* paper went online April 9 and will appear in a forthcoming print edition.



Other co-authors included Lei Liu, Guan-Zheng Luo, Wei Yang, Xiaoyang Zhao, Qinyuan Zheng, Zhuo Lv, Wei Li, Hua-Jun Wu and Liu Wang.

Story Source:

Adapted from materials provided by American Society for Biochemistry and Molecular Biology, via EurekAlert!, a service of AAAS.

Journal Reference:

1. L. Liu, G. Z. Luo, W. Yang, X. Zhao, Q. Zheng, Z. Lv, W. Li, H. J. Wu, L. Wang, X. J. Wang, Q. Zhou. **Activation of the imprinted Dlk1-Dio3 region correlates with pluripotency levels of mouse stem cells.** *Journal of Biological Chemistry*, 2010; DOI: [10.1074/jbc.M110.131995](https://doi.org/10.1074/jbc.M110.131995)

<http://www.sciencedaily.com/releases/2010/04/100416094016.htm>

Dance Therapy Improves Seniors' Gait, Balance, Researcher Finds

ScienceDaily (Apr. 17, 2010) — For seniors, dancing isn't just for fun; it also can be therapeutic. Two recent studies conducted by University of Missouri researchers found that participation in dance-based therapy can improve balance and gait in older adults. Improved functionality among seniors can decrease their risk of falling and reduce costly injuries.

"Creative interventions such as dance-based therapy have the potential to significantly reduce falls in older persons," said Jean Krampe, a registered nurse and doctoral student in the Sinclair School of Nursing. "In the studies, we found improved levels of balance, gait and overall functionality among seniors who participated in regular dance-therapy sessions. Nursing and eldercare professionals can help move these programs into practice to reduce the detrimental burden caused by falls."

The researchers used a dance-therapy program called The Lebed Method (TLM), which includes a combination of low-impact dance steps choreographed to music. Sessions were led by certified TLM instructors and adjusted to fit the specific needs of the seniors who participated.

The most recent study was conducted with residents at TigerPlace, an independent-living community developed by MU nursing researchers to help seniors age in place. The study included 18 dance sessions offered throughout a two-month period. Participants reported that they enjoyed the sessions and wanted to continue the program.

"We found that many seniors are eager to participate and continue to come back after attending sessions because they really enjoy it," Krampe said. "Among seniors that stand up and move during sessions, we found that dance therapy can increase their walking speed and balance, which are two major risk factors for falling."

In 2008, Krampe and MU researchers conducted a six-week pilot study with the Alexian Brothers PACE Program (Program of All-inclusive Care for the Elderly) in St. Louis. More than half of the eleven participants self-reported improvements in gait and balance.

TLM, also called Healthy Steps, was created by Shelley Lebed Davis and her two brothers who sought to improve range of motion and boost the spirits of their mother who was recovering from breast cancer. After seeing successful results, they shared the program with hospitals. Today Healthy Steps is used by many cancer patients and in nursing homes worldwide. The MU study is the first to examine the benefits of the program among seniors.

Story Source:

Adapted from materials provided by [University of Missouri-Columbia](#).

Journal Reference:

1. Krampe, Jean; Rantz, Marilyn J.; Dowell, Laura; Schamp, Richard; Skubic, Marjorie; Abbott, Carmen Nursing Administration Quarterly. **Dance-Based Therapy in a Program of All-Inclusive Care for the Elderly**. *Nursing Administration Quarterly*, 34(2):156-161, April/June 2010 DOI: [10.1097/NAQ.0b013e3181d91851](https://doi.org/10.1097/NAQ.0b013e3181d91851)

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The Imitation Economy

Innovation is overrated. It's time to appreciate the power of the copycat.

By Drake Bennett | April 18, 2010

Two weeks after it went on sale, the iPad is still the toast of the tech world, with its image gracing magazine covers, market analysts speculating about whether it will transform the worlds of publishing and entertainment, and consumers buying the gadget at a healthy clip. This at a cost of at least \$500 each, at a time when Americans are still cautious about large nonessential purchases, and for a device that remains difficult to succinctly describe, much less figure out the purpose of.

It's early yet, but it looks like another success for a company that, more than any other consumer brand, is synonymous with the new. Apple has forged a unique and lucrative reputation for creating irresistible, intuitive objects of techno-desire, shaping along the way how we work, communicate, and procrastinate, and the look and feel of the electronic gadgetry that increasingly fills our lives.

Apple's success, in short, is a testament to the allure and the power of innovation. And there are other examples wherever we care to look. Global businesses from Ford to Hewlett-Packard to Google are built on innovation. At the most basic level, innovators have made modern life what it is — conquering diseases, automating work, shrinking distance, putting vast stores of information at our fingertips. Innovative artists have given us cubism and hip-hop. Innovative social scientists and politicians have given us the earned-income tax credit and the charter school. Inventors have given us the antibiotic and the air bag, the plow and the Predator drone.

Little wonder, then, that politicians and business gurus alike sing the praises of innovation. President Obama, like President Bush before him, often talks of its value, pointing to the \$100 billion in last year's stimulus plan devoted to innovation projects like high-tech classrooms, high-speed rail, and a smart electricity grid, and describing the international race to develop reliable clean energy sources as a battle for control of the global economy. In business, failing to innovate is widely seen as a death sentence.

“Out there in some garage is an entrepreneur who's forging a bullet with your company's name on it,” Gary Hamel, a leading business strategy writer and consultant, has written. “You've got one option now — to shoot first. You've got to out-innovate the innovators.”

But invaluable though innovation may be, our relentless focus on it may be obscuring the value of its much-maligned relative, imitation. Imitation has always had a faintly disreputable ring to it — presidents do not normally give speeches extolling the virtues of the copycat. But where innovation brings new things into the world, imitation spreads them; where innovators break the old mold, imitators perfect the new one; and while innovators can win big, imitators often win bigger. Indeed, what looks like innovation is often actually artful imitation — tech-savvy observers see Apple's real genius not in how it creates new technologies (which it rarely does) but in how it synthesizes and packages existing ones.

The last decade has seen an explosion of copying in its various forms. Technology has made it easier to do everything from rip off a song to replicate the design of an engine, and rising powers like China and India are home to burgeoning industries dedicated to creating low-cost alternatives to cutting-edge, brand-name products, whether they're cars, computers, or drugs. At the same time, researchers in the fields of biology, business, and economics are looking in detail at how and why and when copying works.

What some are finding is that it is a strategy that works much better than we think — whether for businesses, people, or animals competing in the wild. At its best, copying spreads knowledge and speeds the process by which insights and inventions are honed, eliminating dead-end approaches and saving time, effort, and money.

“We hear so much about innovation, I don’t know how many hundreds if not thousands of books, articles, and so forth,” says Oded Shenkar, a professor at Ohio State’s Fisher College of Business and author of the forthcoming book “Copycats: How Smart Companies Use Imitation to Gain a Strategic Edge,” “but imitation is at least as important as innovation if you really want to grow efficiently and make a profit.”

And while we may dismiss imitation as the easy road — especially when compared to the path-breaking of the innovator — there is an art to copying well. Researchers modeling the dynamics of social systems have found that how one copies, and when, can be crucial, making the difference between overtaking one’s competitors and being written off as a pale, imitating also-ran.

“This is not just something that should happen, it’s something you have to know how to do,” says Shenkar. “What’s true for innovation is true for imitation: You’ve got to get it right.”

Shenkar traces our innovation fetish back to the late 18th century. Before that — for most of Western history, in other words — copying was valued just as highly as creation, and sometimes more. “In the Roman Empire, where imitation was used to align the diverse cultures and institutions of the far-flung empire under a single umbrella, it served as the official pedagogy,” he writes in his book. Centuries later, Adam Smith wrote that imitation should be given “the status of a creative art.” But the Romantic Age, with its celebration of the *sui generis* and the solitary genius — philosophers like Rousseau, poets like Shelley, and scientist-inventors like Humphry Davy — began to change that. Copying came to be seen as disreputable, as a refuge for the unimaginative.

The innovation bias is particularly strong in the United States, Shenkar argues. Partly this is thanks to a national mythology centered on the pioneer and the self-made man, partly because so many of the most transformative inventions of the 20th century — from the airplane to the television to the personal computer — were indeed hatched here.

But transformative innovations don’t come along very often. And while it’s important to foster them, it may not be realistic to think that a business, or any other enterprise, is going to be fueled solely by innovation. Often, the best one can hope for is incremental improvement, and the building blocks can come from many sources.

“If you’re a big, tired firm, don’t put lipstick on the pig, just be the pig. Accept yourself for what you are,” says Jonathan Zittrain, an internet law scholar at Harvard Law School.

The other danger for innovators is that they themselves often reap only a fraction of the benefits of their creations, as imitators crowd in after. In 2005, the management scholar Constantinos Markides and the economist Paul Geroski wrote a book laying out the advantages of what they called the “fast second,” the company that gets to a market just after the pioneer and can capitalize on the first mover’s mistakes and limitations.

Shenkar is quick to emphasize that his argument is limited to legal copying — he’s not making the case for actually stealing intellectual property. Still, he sees embarrassment about copycatting stifling open discussion among managers — and management scholars — about the details and techniques of imitation.

“What I’ve found from many interviews is that there were many executives who were reluctant to even use what I call the ‘i word,’ to admit that they were engaged in imitation,” he says.

That means when companies copy they often do it clumsily. Shenkar offers the example of the legacy airlines in the United States and their response to the low-cost threat of Southwest Airlines. Most set up copycat airlines of their own: United with TED, Continental with CALite, Delta with Song. All quickly failed.

The problem, Shenkar argues, is that in their scramble to copy Southwest, the bigger airlines failed to see the ways that central pillars of Southwest's strategy — lower pay, short point-to-point flights, a fleet of identical smaller planes — were incompatible with the union contracts, hub-and-spoke route structures, and larger craft the traditional carriers were saddled with.

Copying isn't just a business strategy, of course. We all do it: Human beings, by nature, are incorrigible mimics. From birth, we learn by aping the sounds we hear (a recent German study found that newborns' crying already echoes their parents' speech cadences, suggesting they start imitating while still in the womb), along with the facial expressions and gestures we see, the opinions and customs and biases we are exposed to. Neuroscientists researching brain cells called mirror neurons in monkeys hypothesize that higher human emotions like empathy and moral outrage might stem from a hard-wired instinct to imitate the bodily reactions — and through them the emotions — of those around us.

“Imitation is natural to man from childhood,” Aristotle wrote, “one of his advantages over the lower animals being this, that he is the most imitative creature in the world, and learns at first by imitation.”

Today there is a large body of literature exploring, at the broadest level, how copying works, whether among individuals or groups, in human societies or in the wild. The researchers are biologists, psychologists, economists, political scientists, anthropologists, mathematicians, computer programmers, and others, and their work involves both field studies (looking at monkeys or birds or fish or people) and complex computer simulations of social networks.

This research has yielded its own evidence of the particular power of imitation. In a provocative new paper from the journal *Science*, a team of researchers reports evidence that copying is the best survival strategy in a variety of social settings, including some traditionally seen as inhospitable to it. The finding emerged from a tournament set up by the behavioral biologists Kevin Laland and Luke Rendell of the University of St. Andrews. They invited scholars to submit “social learning strategies” that would compete against each other, for a prize of 10,000 euros, in a computer simulation of 100 individuals trying to survive in a dynamic environment.

The winner turned out to be a pure copier. Rather than take the time to decipher the environment, it instructed individuals to simply copy what others were doing and see how that worked. Indeed, all the best-performing strategies relied heavily on what network researchers call “social learning.”

“The really striking thing that comes out of the tournament is that there's an extraordinarily broad number of circumstances in which it pays to copy,” says Laland.

The trick, it turned out, was getting the timing right. During times of relative stasis, the winning algorithm exploited the information it had. But when the payoffs changed, it began to copy what others were doing, looking for a more effective new strategy. Interestingly, much of the most successful innovation in the simulation actually resulted from mistaken copying — one individual stumbling onto a new and better solution by incorrectly imitating someone else. We can see this dynamic at work, Laland suggests, in real-world examples like the discovery of penicillin, where a mistake in basic lab protocol by the biologist Alexander Fleming gave the world antibiotics.

The best copycats, the tournament suggests, are those that sample widely, and ruthlessly compare the available options against each other. And the best copycats, like the best innovators, aren't afraid to junk the current model for something new.

All of which would suggest that individuals and institutions in uncertain environments — whether they're citizens of nations in political turmoil, animals facing a changing habitat, or long-dominant firms unsettled by the Internet — should diligently apply themselves to copying everything they see.

Some social learning researchers, however, remain skeptical of the tournament and what it says about the value of copying. Luc-Alain Giraldeau, a specialist in animal social learning behavior at the Université du Québec à Montréal, submitted several strategies to the tournament, none of which did particularly well. While he's intrigued by the results, he suspects that they will not apply to the real world.

Copying, he points out, can be catastrophic — the history of market bubbles is testament to that. The human susceptibility to social cues means people often will follow their peers even when it leads to absurd results: In a well known study from the 1950s by the psychologist Solomon Asch, subjects gave the wrong answer in an extremely easy visual test when put in a group where everyone else did the same.

Shenkar argues that the best imitators don't lose sight of this. In his book, he examines what he sees as the master imitators of the business world — among them Wal-Mart, McDonald's, Ryanair, Samsung, and, yes, Apple — and distills from them the habits of highly successful copycats. The advice is largely common sense — keeping an open mind, not being fooled by appearances, and paying attention to the details of execution — but some of it runs counter to deeply ingrained instincts.

For example, while it's tempting to copy direct competitors, especially when they're doing well, it's often more helpful to look for models in far-flung fields: It's ground less likely to have been mined by competitors, but where unfamiliar ideas have already been tested. Shenkar points to how the toy firm Ohio Art has borrowed from the automotive industry and how the medical supply firm Cardinal Health copied the methods of food distributors, but there are plenty of examples beyond the business world: Today weapons designers imitate video game designers, traffic engineers borrow from particle physics, mechanical engineers copy the intricacies of plant structure, architects mimic airplane design, and psychologists use techniques perfected by magicians to design research studies.

It's also important, though, to remember that just because someone successful does something doesn't mean it should be copied. After all, the practice may be a result rather than a cause of that success, or totally incidental to it. Bringing a ping-pong table into the office and encouraging employees to wear jeans won't create a successful tech company any more than moving into a garret apartment and contracting tuberculosis will make someone a brilliant poet.

“You have to look further, and make sure you understand why something was successful, and whether its success applies,” Shenkar says. And if it does, he argues, you rip it off as quickly as you can.

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http://www.boston.com/bostonglobe/ideas/articles/2010/04/18/the_imitation_economy/

D.I.Y. Culture

By MICHAEL KIMMELMAN

Berlin



IT wasn't so many years ago that Europeans loved to moan about American culture overrunning homegrown art forms. In the 1990s and early 2000s some in Europe were arguing for regulatory barriers to hold off the New World barbarians, particularly from Hollywood. In France, President Jacques Chirac's culture minister, Jacques Toubon, warned about how the United States entertainment industry was trying "to impose domination by any means," and Régis Debray, among other French intellectuals to hop on the same bandwagon, predicted that "the American empire will pass, like the others."

"Let's at least make sure," Mr. Debray continued, "it does not leave irreparable damage to our creative abilities behind it."

That was then. The other day President Nicolas Sarkozy was reiterating the virtues of what the French call "l'exception culturelle," a modern policy of government protection and promotion of French culture, particularly the film industry. Mr. Sarkozy's poll numbers have been plummeting, and l'exception culturelle feeds into his current strategy to identify himself with whatever, in the midst of an increasingly diversified, fractious and disapproving French society, French people say makes France French.

But Sarko l'Amercain, as the French used to call him, is also the friendliest French president the United States has had in a while, and in America last month he stressed that rarely in history had "the community of views been so identical" between his country and the United States. Complaints about the American cultural juggernaut still arise across Europe, of course, but their intensity doesn't seem as fierce. Something has changed, and it's not just that Barack Obama has replaced George W. Bush or, in France's case, that the film industry is doing O.K.

It's a widening realization, I think, that globalism, beyond banking, climate change and warfare, has always been a dubious concept, a misleading catchall for how the world supposedly works, to which culture, in its increasing complexity, gives the lie.

The integration of markets and the Internet have certainly brought billions of people into closer contact. Everybody has access to the same American movies and music now, and not just American, also Indian, Romanian, South African and Chinese. But far from succumbing to some devouring juggernaut, culture — and Europe, with its different communities and nations living cheek by jowl, is a Petri dish to prove the point — has only atomized lately as a consequence of the very same globalizing forces that purportedly threaten to homogenize everything.

That's been my own subject over here for the last couple of years, and will regularly be this column's. Nationalism, regionalism and tribalism are all on the rise. Societies are splitting even as they share more common goods and attributes than ever before. Culture is increasingly an instrument to divide and differentiate communities. And the leveling pressures of globalization have at the same time provided more and more people with the technological resources to decide for themselves, culturally speaking, who they are and how they choose to be known, seen, distinguished from others.

Culture means many things in this context, but at heart it is a suite of traits we inherit and also choose to disavow or to stress. It consists in part of the arts. It is something made and consumed, in socially revealing ways. When Mats Nilsson, a Swedish product-design strategist for Ikea, not long ago told *The New York Times* that he loves to browse for handmade baskets in Spain, bird cages in Portugal, brushes in Japan and hardware on the Lower East Side of Manhattan, he was creating his own cultural identity out of the bric-a-brac of consumer choices made available by the globalizing forces of economic integration. Bricolage, it's called. Anyone may now pick through the marketplace of global culture.

This may sound like the essence of globalization, but the fact that everybody from Yerevan to Brasilia, Jakarta to Jerusalem, knows songs by the Black Eyed Peas or wears New York Yankees caps doesn't mean that culture is the same everywhere.

The common denominator of popular culture — which these days encompasses so many things that you could even include all sorts of high culture — seems to have just intensified the need people now feel to distinguish themselves from it. And global technology has made this easier by providing countless individuals, microcultures and larger groups and movements with cheap and convenient means to preserve and disseminate themselves. Years ago a language like Cimbrian, a Bavarian dialect today preserved by just a few hundred speakers in northern Italy, would have been doomed to extinction; now Cimbrian speakers, according to a recent German newspaper article, turn out to be getting their own online newspaper and television show. The language is being sustained by the same global forces that might promise to doom it.

Partly the problem with globalization has always been that the term, culturally speaking, is so vague. In one respect, it's another word for empire, or at least its effects are as old as empire. What's new is the power available to wide swaths of the populace, thanks above all to cheap travel and the Web, to become actors in the production and dissemination of culture, not simply consumers. A generation or more ago, aside from what people did in their home or from what's roughly called folk or outsider art, culture was generally thought of as something handed down from on high, which the public received.

Today it's made and distributed in countless different ways, giving not just governments and institutions but nearly everyone with access to the Web the means to choose and shape his or her own culture, identity, tribal fidelities — and then spread this culture, via Youtube or whatever else, among allies (and enemies) everywhere, a democratizing process. The downside of this democratization is how every political niche and fringe group has found a culture via the Web to reinforce its already narrow views, polarizing parts of society despite the widened horizon. Neo-Nazis across borders now bond around cultural artifacts available over the Internet. Democrats and Republicans move further apart, digesting news from their own cable network shows.

There are other consequences of this democratization. Generally speaking, culture operates within the mainstreams of power. The myth of an avant-garde serves the same market forces avant-gardism pretends to overthrow. Art may challenge authority; and popular culture (this includes clownish demagogues like Glenn Beck) sometimes makes trouble for those in charge, the way Thomas Nast's cartoons did for Boss Tweed in Tammany Hall. But art doesn't actually overthrow anything except itself, and never has, not in 19th-century France or 20th-century Russia or 21st-century China or Iran. Even when it manages to tilt popular thinking, it still ends up within the bounds of existing authority, and there has never been a true "outside" that really stayed outside: public consumption, by definition, adapts to the change, co-opts and normalizes all culture.

Instead culture (often unconsciously) identifies crucial ruptures, rifts, gaps and shifts in society. It is indispensable for our understanding of the mechanics of the world in this respect, pointing us toward those things around us that are unstable, changing, that shape how we live and how we treat one another. If we're alert to it, it helps reveal who we are to ourselves, often in ways we didn't realize in places we didn't necessarily think to look.

Shortly after I moved to Berlin from New York, for example, I noticed there were bookstores all over town. They were on nearly every other street in my neighborhood. There was one just below my bedroom window, next to the high-end pet-supply store, specializing in New Age and self-help literature, and there was another one, a biography bookstore, around the corner. Shakespeare & Company (Berlin's version) was beside the church square where the neighborhood children played when the weather was warm. And I began to stop into Marga Schoeller's bookshop at Savignyplatz, which has a nice English-language section, en route to the subway, where a large art bookstore sprawls below raised tracks.

Berliners looked nonplussed when I asked them to account for all the bookshops. Along with currywurst and nude saunas, bookstores have long been such a banal fact of life here, as they are across Germany, that only an outsider might bother to think their number was remarkable. The proliferation turned out to derive from a very conscious decision after the war to restore civilization in West Germany by supporting a kind of ecosystem of small publishers and small bookstores to which, in certain small towns, trucks that delivered books to the bookstores overnight also delivered drugs to the drugstores: drugs for the body, books for the mind, a metaphor of recovery.

This was more than just a system of distribution and sales; it was a cultural as well as economic affair. It influenced civic life and social relations in ways that browsing books on Amazon or Google can't. So what was to me as a clueless foreigner an urban curiosity, noticeable just because it wasn't my usual experience — it was for me a cultural rift or rupture — ended up suggesting some larger truth about the country's history and ambition. Culture is something we propagate but also something naturally there, existing in and around us, which makes us who we are but which may rise to the level of our consciousness only when one of those ruptures or rifts appear — when some little psychic clash happens between it and our more or less unconscious sense of the everyday world.

I also went to Gaza before the last Israeli incursion a couple of years ago. Naturally, the stories that tend to come from there revolve around one crisis or another: the rocket attacks, the border closures, clashes between Hamas and Fatah, Hamas and Israel. But what was life like, I wondered, under Hamas? What were the limits to Gazans' freedom? The effects of isolation? How did Gazans see themselves in relation to everybody else?

These seemed to me cultural questions. The people I spoke with there said that culture was not just an escape for them from the everyday hardships from deprivation and a repressive regime, but that it was essential to survival, a lifeline, their steady connection to an outside world, a glimpse of what was beyond the conflict.

It represented normalcy, in other words, a precious commodity in that place. In the garden of a restaurant in Gaza City where a sign on the front door said, "No weapons, please," I joined families of Gazans one evening watching episodes of "Friends" and a wildly popular Turkish soap opera, "Noor," on a big

screen. And in a video store nearby I thumbed through shelves of pirated Jennifer Lopez CDs and copies of “You Don’t Mess With the Zohan,” Adam Sandler’s comedy about a Mossad agent-turned-hairdresser in a New York City salon run by a Palestinian woman. There were also the predictable audiotapes extolling Fatah, Hamas and Islamic Jihad.

Some Gazans spoke sadly and nervously about their fears that extremists within Hamas, whose factional split was revealed by this cultural divide, had begun to crack down on local theaters and on art and the Web in Gaza, even as these same people spoke about culture being a fragile but essential link to the West. Via satellite dishes and the Internet, the West meant something to them other than guns and territory: culture was a potential bond, they suggested, through which some dialogue might yet arise.

Not incidentally, Gazans, like that Swedish Ikea designer, made their own culture from the bricolage of global choices. I thought most of what passed for art in Gaza wasn’t very good, truth be told, but quality seemed beside the point. We miss much about how culture works today — including how what might be called local standards of quality vie with the global aesthetic of sensationalism and fashion — if we stick only to seeing it as critics and consumers through our own aesthetic lens.

Hollywood and Broadway, the major museums and art fairs and biennials and galleries, buildings designed by celebrity architects and the music business are all the traditional focus of big media, and they tell us a lot about ourselves. They constitute our cultural firmament, the constellation of our stars. But scientists say most of the universe is composed not of stars but of dark matter. It is the powerful but invisible force that exists everywhere and requires some leap of imagination on our part, some effort, to identify.

Most culture is dark matter.

Put another way, whether in Berlin or Gaza or New York City, there’s a universe of life and death affairs beyond globalism. And culture is our window onto it.

<http://www.nytimes.com/2010/04/18/arts/18abroad.html?ref=arts>

Art Made at the Speed of the Internet: Don't Say 'Geek'; Say 'Collaborator'

By RANDY KENNEDY

When Robert Rauschenberg and a buttoned-down Bell Labs engineer named Billy Kluver began thinking, in the mid-1960s, about ways that people from the world of technology could help artists make art, Mr. Kluver surveyed the mighty gulf between the two groups and almost thought better of the idea. "I was scared," he said once in an interview. "The amazing thing was that it's possible for artists and scientists to talk together at all."

Nearly half a century after that influential experiment, one in the same spirit, though crazily compressed into a single day, was taking place on Friday in a chilly loft office on the Lower East Side of Manhattan. An artist and a technical whiz sat together at a long table, their faces made silvery by the glow from their laptops — the only tools they had brought, besides their digital cameras. Anyone unfamiliar with the pair — Evan Roth, a kind of Web-centric graffiti artist, and Matt Mullenweg, a creator of the popular blogging platform WordPress — would have had to listen a long time to figure out which one came from which world. They free-associated at Web speed, their conversation sprinkled with things like hex values, detection algorithms and executable code.



"Let's try to stay away from the Web-nerdy stuff," Mr. Mullenweg, 26, warned, as Mr. Roth, 32, trolling for help on Twitter, was compiling video clips for the work of art they had conceived that morning.

The two were part of Seven on Seven, a project conceived by Rhizome, the new-media art organization in New York, to match seven artists with seven "technologists," a Google engineer and an early Facebook developer among them. The pairs were given a reality-show-era deadline of 24 hours in which to sit together in rooms across Manhattan and come up with creations to present on Saturday to an audience at the New Museum, where Rhizome is based.

Whether the brainchildren of these collaborations ended up feeling more like apps or like art was up to the teams, and the distinction didn't seem to matter to artists nearly as much as it might have even 14 years ago, when Rhizome was founded to explore the emerging field of Web-based art, said Lauren Cornell, the organization's executive director.

But Ms. Cornell, who created the team-up project along with some of her tech-world board members and supporters, added that even now, after decades of increasing overlap between art and technology, the idea remained daunting to many of the artists and Web people she approached. "This was something we went into with the knowledge that it was an experiment and that it could end up being a failure," she said. "A lot of people I called to see if they were interested, people I know — friends of mine — didn't even get back to me."

More than 150 people turned out for the New Museum presentation, some paying as much as \$350 for tickets. With a couple of exceptions what they saw were not objects but ideas — some funny and entertaining, some deadly serious — situated at the fertile nexus where social networking and the Web's data-gathering power is providing artists and scientists with immense piles of raw material about society and psychology.

Joshua Schachter, a software engineer at Google, and Monica Narula, an artist from New Delhi, came up with a rough plan to convert private guilt into charitable giving, allowing Internet users collectively to assign dollar values to various misdeeds so that guilt might be assuaged through donations. (On Friday the team paid Web users small amounts to help come up with categories of misbehavior and attendant

finer. They arrived at \$47 for forgetting one's mother's birthday, for example, and \$20 for "being mad at my spouse because of a dream.")

The artist Ryan Trecartin and David Karp, a creator of the short-form blogging platform Tumblr, came up with a streaming video site that feels like plugging YouTube directly into the cerebral cortex. The artist Kristin Lucas and Andrew Kortina, who builds social Web applications, proposed a way for people to exchange identities — in essence, to take a break from themselves — via Twitter. Ayah Bdeir, an engineer and designer, and Tauba Auerbach, her artist collaborator, made a randomly moving moiré-pattern sculpture designed to freeze when a viewer enters the room, leaving its actions when unwatched a mystery.

Jeff Hammerbacher, a former Facebook engineer, and Aaron Koblin, an artist specializing in data visualization, theorized about Wiki ways to improve the Diagnostic and Statistical Manual of Mental Disorders. And Hilary Mason, a computer scientist, and Marc André Robinson, a sculptor, both intrigued by trying to change the culture of disposable goods in the United States, took on the "cheap umbrella issue" in New York. They created a prototype for an umbrella-sharing service in which the umbrellas would record their own histories, using embedded cameras and GPS.

Mr. Roth and Mr. Mullenweg, who like the other teams were not allowed to confer before meeting — they had a brief Skype chat only to say hello — arrived Friday morning at the offices of Kickstarter, a Web fund-raising service, which had loaned its spare, tin-ceilinged back room as a workspace. Both men knew they had a resource that most artists throughout history could only envy: a potential audience of 12 million people, the number who use WordPress to create blogs, which Mr. Mullenweg could tap into as easily as tapping his keyboard.

Their idea, one that might seem a little esoteric to the nonblogging populace but that drew a hearty round of applause when introduced on Saturday, was to create a new function on WordPress called "Surprise Me. (Funmode)," so that when a blogger hits the publish button — an act that Mr. Roth described as a moment of great existential loneliness, "like sending the bottle out to sea" — a random congratulatory video suddenly fills the screen. (The example they showed on a large screen was a heartwarming slow-clap locker-room clip from the movie "Hoosiers." Mr. Mullenweg and Mr. Roth also collected feel-good video from "The Price Is Right," "American Idol" and the Beijing Olympics.)

They described their creation as an "emotional plug-in," a virtual artwork to celebrate the "sacred act of publishing," which the Web has transformed as fundamentally as Gutenberg did and which is, in turn, transforming society. After some highly anti-climactic code programming by Mr. Mullenweg and a lot of cackling by Mr. Roth, who sat with his earphones in, compiling clips — "there's way too much happiness on the Web," he said at one point — the two finished their project at 3:30 Saturday morning and introduced it on WordPress, announcing its existence by blog, mostly to users in Europe and on the Indian subcontinent, who were awake.

By Sunday afternoon New York time, more than 11,000 people had decided to turn on the "surprise me" feature and experience some randomized positive-reinforcement art, a response that heartened its creators. Though Mr. Mullenweg, in perhaps his first professional encounter with art critics, noted worriedly that 563 of those people had already decided to turn the art off.

"The opt-out rate," he said, recasting the age-old language of creative rejection in the precise words of the technologist, "is higher than I would like."

<http://www.nytimes.com/2010/04/19/arts/design/19rhizome.html?ref=design>