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Spend, Spend, Spend

There is only one way out of the global recession, and government must lead the way.

By Joseph E. Stiglitz|Posted Monday, Oct. 3, 2011, at 5:52 PM ET

A project at the Oakland International Airport financed by the American Recovery and Reinvestment Act

Photo by Justin Sullivan/Getty Images.

As the economic slump that began in 2007 continues, the question persists: Why? Unless we have a better understanding of the causes of the crisis, we can't implement an effective recovery strategy. So far, we have neither.

We were told that this was a financial crisis, so governments on both sides of the Atlantic focused on the banks. Stimulus programs were sold as being a temporary palliative, needed to bridge the gap until the financial sector recovered and private lending resumed. But, while bank profitability and bonuses have returned, lending has not recovered, despite record-low long- and short-term interest rates.

The banks claim that lending remains constrained by a shortage of creditworthy borrowers. And key data indicate that they are at least partly right. After all, large enterprises are sitting on a few trillion dollars in cash, so money is not what is holding them back from investing and hiring. Some (perhaps many) small businesses are, however, in a very different position: Strapped for funds, they can't grow, and many are being forced to contract.

Still, overall, business investment—excluding construction—has returned to 10 percent of GDP (from 10.6 percent before the crisis). With so much excess capacity in real estate, confidence will not recover to its pre-crisis levels anytime soon, regardless of what is done to the banking sector. The financial sector's inexcusable recklessness, given free rein by mindless deregulation, was the obvious precipitating factor of the crisis. The legacy of excess real-estate capacity and over-leveraged households makes recovery all the more difficult.

But the economy was very sick before the crisis; the housing bubble merely papered over its weaknesses. Without bubble-supported consumption, there would have been a massive shortfall in aggregate demand. Instead, the personal savings rate plunged to 1 percent, and the bottom 80 percent of Americans were spending, every year, roughly 110 percent of their income. Even if the financial sector were fully repaired, and even if these profligate Americans hadn't learned a lesson about the importance of saving, their consumption would be limited to 100 percent of their income. So anyone who talks about the consumer "coming back"—even after deleveraging—is living in a fantasy world.

Fixing the financial sector was necessary, but far from sufficient, for economic recovery. To understand what needs to be done, we have to understand the economy's problems before the crisis hit.

First, America and the world were victims of their own success. Rapid productivity increases in manufacturing had outpaced growth in demand, which meant that manufacturing employment decreased. Labor had to shift to services. The problems are not dissimilar to those of the early 20th century, when rapid productivity growth in agriculture forced labor to move from rural areas to urban manufacturing centers. With a decline in farm income in excess of 50 percent from 1929 to 1932, one might have anticipated massive migration. But workers were "trapped" in the rural sector: They didn't have the resources to move, and their declining incomes so weakened aggregate demand that urban/manufacturing unemployment soared.

For America and Europe, the need for labor to move out of manufacturing is compounded by shifting comparative advantage: Not only is the total number of manufacturing jobs limited globally, but a smaller share of those jobs will be local.

Globalization has been one, but only one, of the factors contributing to the second key problem: growing inequality. Shifting income from those who would spend it to those who won't lowers aggregate demand. By the same token, soaring energy prices shifted purchasing power from the United States and Europe to oil exporters, who, recognizing the volatility of energy prices, rightly saved much of this income.

The final problem contributing to weakness in global aggregate demand was emerging markets' massive buildup of foreign-exchange reserves—partly motivated by the mismanagement of the 1997-98 East Asia crisis by the International Monetary Fund and the U.S. Treasury. Countries recognized that without reserves, they risked losing their economic sovereignty. Many said, "Never again." But, while the buildup of reserves—currently around $7.6 trillion in emerging and developing economies—protected them, money going into reserves was money not spent.

Where are we today in addressing these underlying problems? To take the last one first, those countries that built up large reserves were able to weather the economic crisis better, so the incentive to accumulate reserves is even stronger.

Similarly, while bankers have regained their bonuses, workers are seeing their wages eroded and their hours diminished, further widening the income gap. Moreover, the United States has not shaken off its dependence on oil. With oil prices back above $100 a barrel this summer (and still high), money is once again being transferred to the oil-exporting countries. And the structural transformation of the advanced economies, implied by the need to move labor out of traditional manufacturing branches, is occurring very slowly.

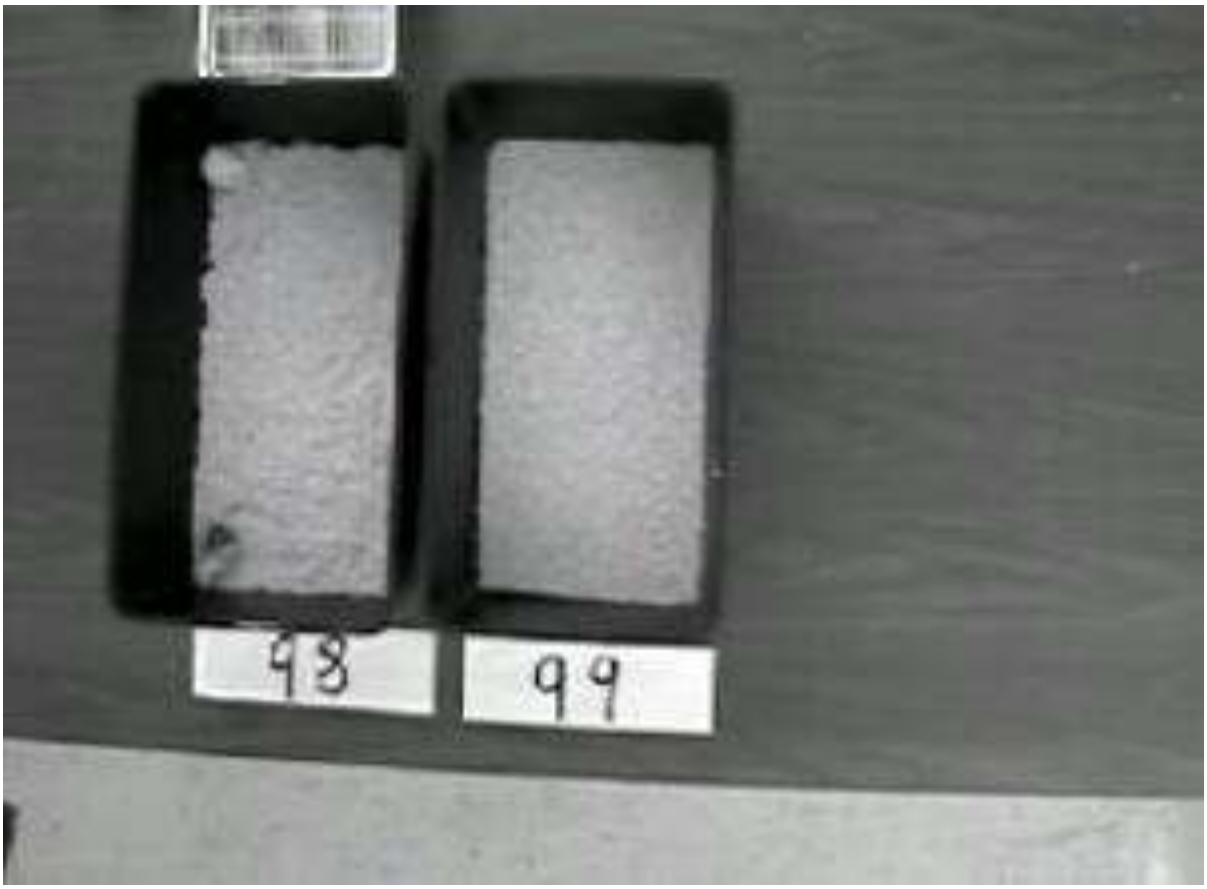
Government plays a central role in financing the services that people want, such as education and health care. And government-financed education and training, in particular, will be critical in restoring competitiveness in Europe and the United States. But both have chosen fiscal austerity, all but ensuring that their economies' transitions will be slow.

The prescription for what ails the global economy follows directly from the diagnosis: strong government expenditures, aimed at facilitating restructuring, promoting energy conservation, and reducing inequality, and a reform of the global financial system that creates an alternative to the buildup of reserves. Eventually, the world's leaders, and the voters who elect them, will come to recognize this. As growth prospects continue to weaken, they will have no choice. But how much pain will we have to bear in the meantime?

This article is also available at Project Syndicate.

http://www.slate.com/articles/business/project_syndicate/2011/10/how_to_end_the_global_recession_more_public_spending_and_financi.single.html

Sociability May Depend Upon Brain Cells Generated in Adolescence



The social behavior of mice seems to be dictated by creation of new neurons in adolescence. (Credit: Courtesy of Yale University)

ScienceDaily (Oct. 5, 2011) — Mice become profoundly anti-social when the creation of new brain cells is interrupted in adolescence, a surprising finding that may help researchers understand schizophrenia and other mental disorders, Yale researchers report.

When the same process is interrupted in adults, no such behavioral changes were noted, according to research published in the Oct. 4 issue of the journal *Neuroscience*.

"This has important implications in understanding social development at the molecular level," said Arie Kaffman, assistant professor of psychiatry and senior author of the study.

Scientists have known for quite some time that new brain cells are continually generated in specific brain regions after birth. This process, called neurogenesis, occurs at a significantly greater rate during childhood and adolescence than in adulthood, yet most research has focused upon the function of these neurons in older brains.

The Yale team decided to explore the function of these new brain cells in mice of different ages. Normal adult mice tend to spend a lot of time exploring and interacting with unfamiliar mice. However, adult mice that had neurogenesis blocked during adolescence showed no interest in exploring other adult mice and even evaded attempts made by other mice to engage in social behavior.

"These mice acted like they did not recognize other mice as mice," Kaffman said.

Blocking adult neurogenesis had no effect on social behavior, suggesting that brain cells generated during adolescence make a very different contribution to brain function and behavior in adulthood, note the scientists.

Intriguingly, schizophrenics have a deficit in generating new neurons in the hippocampus, one of the brain areas where new neurons are created. Given that symptoms of schizophrenia first emerge in adolescence, it is possible that deficits in generating new neurons during adolescence or even in childhood holds new insights into the development of some of the social and cognitive deficits seen in this illness, Kaffman said.

Other Yale authors include Lan Wei and Ronald S. Duman.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Yale University**.

http://www.sciencedaily.com/releases/2011/10/111004180115.htm

At Tate Britain

Peter Campbell

I begin to write about *John Martin: Apocalypse* (at Tate Britain until 15 January) before looking at the pictures. Maybe, I say to myself, if I set memories of Martin's pictures against the words in the catalogue (Tate, £19.99), if I learn what he achieved in more than a century and a half of (variable) success, I'll find that we owe his memory some kind of apology. Maybe, and maybe there are plenty of people who remember his work well enough, but isn't it as something they scurried away from?

The catalogue provides a full, non-committal rundown on what he did, the palaeontology as well as the brimstone, the civil engineering as well as the images. So, first move: remind myself what there was. Paintings and engravings of biblical and classical histories, some of them very, very large; aquatints, technical triumphs of a kind (it was a great medium for storm and ash clouds); illustrations pointed up by human figures, often very, very small, given curiously slug-like silhouettes by dragging drapery. All these are played out against a glowing compost of theatrical hells and heavens: glistening cataracts, twisted forest trunks, cloud-stormed, city-topped outcrops, bleak mountain gullies. Heaven is distant and rather bright, its waters very blue. When it's shown close up, herbaceous borders grow by placid waters. Cataclysms bring volcanic lava flows. Veils of pumice rain down thunderously in orange and pink on red. Very rigid white lightning pierces voluminous clouds. Complex architecture – fancies like Gandy's more extravagant perspectives – tumbles down on you or billets the hordes of Milton's Satan.

Take the measure of what he did from the catalogue and you are left with evidence of tremendous activity. He finished his life as he had begun it, a painter, but there was long, unrewarded, work on a new London water supply and sewage system that antedated (and influenced) Bazalgette. He made money but sometimes approached bankruptcy. In the exhibition there is a large ebonised cabinet to hold, among other things, all his medals and certificates. Not a man to dismiss for slackness.

If I still say it is clear he was a bad painter, I'm not being original. He was never one whose limitations were obscure. It wasn't snobbery that motivated those who, from the first, found his success and the style that

drove it questionable. Critics wrote about the 'struggle after mere effect'. Martin Myrone's introduction points out that Hazlitt and Constable, among others saw in Martin's work 'a false understanding of the principles of the Sublime'. Popular writers treated him more kindly. But while Bulwer-Lytton called him 'the greatest, the most lofty, the most original genius of the age', a review in Shelley's *Edinburgh Literary Journal* found that 'all Martin's productions are rather imposing at first sight and when more closely examined something very like a piece of humbug.'

So it is time to sort things out, to visit the work in the flesh. Best start almost at the end with the Last Judgment Triptych – *The Last Judgment*, *The Great Day of His Wrath* and *The Plains of Heaven* (1845–53) – the second and third of which are reproduced here. These are hung in a long dark hall (hell-fire sermons, preached visually or verbally, resonate best in large spaces); a preacher's voiceover describes the torment and bliss they illustrate, but there is thunder too, if I remember rightly, and startling effects as bits of one picture after another are lit by lurid, projected light. Then the main lights come up and you can have a proper look at the artwork. This attempt to re-create the atmosphere of the triptych's life as a travelling show is suitably brash. Leave this gallery, go back to the beginning and take a quiet, high-art look knowing that the low-art core of the show, the theatrical, preaching aspect of it, is to follow.

Martin's impact, made by the prints he sold, the crowded exhibitions, the world tours, produced a reputation that was not sustainable. His influence has survived mainly in the extravagance of disaster movies, but not only there. Glenn Brown's reworking of *The Great Day of His Wrath* as *The Tragic Conversion of Salvador Dalí* is the last picture in the exhibition; the catalogue reproduces a poster for the disaster movie *2012* and a still from a computer game, *Hellgate: London*. Martin the serious entrepreneur would have liked to have held his own as a visionary. But his designs for the reconstruction of London's sewers are not something Blake or Turner would have taken on.

The directors of our own cultural establishments have not given up the notion that there is a place for gatekeepers, but they are more curious and less severe than the directors of the Royal Academy were in Martin's day. They need the crowds that have filled the Turbine Hall, but wish the sun, the sunflower seeds, the murmuring walls, the crack in the floor to be more than curious sideshows. But even these huge installations cannot match Martin's biblical enthusiasm. The public, which can no longer look for common standards of taste, high craft and skill, is left interpreting a very mixed set of signals; that any bedrock exists

at all is without doubt an illusion – new schools and styles build on the rubble of old ones. But those pieces of breccia can mark out territories on which it is possible to feel that judgment is more than the exceptional acuity of individual critics or canny dealers.

Does an audience that can affirm the excellence of Martin's populism exist any more? Could anyone believe that the sublime can again serve as a subject for representational art? We can only laugh now, or sigh at the all too possible end of the world. Compared with Turner's, Martin's sublime was vulgarly overstated: the buildings are too big, the fires and lava flows too bright. The paint in both may have depicted the might of rough nature, but Martin's is garish. It is as though he was preparing a travel agent's advertisement: 'Join Heaven and Hell Tours for the thrill of a lifetime.'

http://www.lrb.co.uk/v33/n20/peter-campbell/at-tate-britain

Last Universal Common Ancestor More Complex Than Previously Thought

What might have been in Earth's ancient 'chemical soup'? Scientists don't know much about LUCA, the Last Universal Common Ancestor, the great-grandparent of all living things. Many believe LUCA was little more than a crude assemblage of molecular parts, a chemical soup out of which evolution gradually constructed more complex forms. New evidence suggests that LUCA was a sophisticated organism, with a complex structure recognizable as a cell. (Credit: © Dave / Fotolia)

ScienceDaily (Oct. 5, 2011) — Scientists call it LUCA, the Last Universal Common Ancestor, but they don't know much about this great-grandparent of all living things. Many believe LUCA was little more than a crude assemblage of molecular parts, a chemical soup out of which evolution gradually constructed more complex forms. Some scientists still debate whether it was even a cell.

New evidence suggests that LUCA was a sophisticated organism after all, with a complex structure recognizable as a cell, researchers report. Their study appears in the journal *Biology Direct.*

The study builds on several years of research into a once-overlooked feature of microbial cells, a region with a high concentration of polyphosphate, a type of energy currency in cells. Researchers report that this polyphosphate storage site actually represents the first known universal organelle, a structure once thought to be absent from bacteria and their distantly related microbial cousins, the archaea. This organelle, the evidence indicates, is present in the three domains of life: bacteria, archaea and eukaryotes (plants, animals, fungi, algae and everything else).

The existence of an organelle in bacteria goes against the traditional definition of these organisms, said University of Illinois crop sciences professor Manfredo Seufferheld, who led the study.

"It was a dogma of microbiology that organelles weren't present in bacteria," he said. But in 2003 in a paper in the Journal of Biological Chemistry, Seufferheld and colleagues showed that the polyphosphate storage structure in bacteria (they analyzed an agrobacterium) was physically, chemically and functionally the same as an organelle called an acidocalcisome (uh-SID-oh-KAL-sih-zohm) found in many single-celled eukaryotes.

Their findings, the authors wrote, "suggest that acidocalcisomes arose before the prokaryotic (bacterial) and eukaryotic lineages diverged." The new study suggests that the origins of the organelle are even more ancient.

The study tracks the evolutionary history of a protein enzyme (called a vacuolar proton pyrophosphatase, or V-H+PPase) that is common in the acidocalcisomes of eukaryotic and bacterial cells. (Archaea also contain the enzyme and a structure with the same physical and chemical properties as an acidocalcisome, the researchers report.)

By comparing the sequences of the V-H+PPase genes from hundreds of organisms representing the three domains of life, the team constructed a "family tree" that showed how different versions of the enzyme in different organisms were related. That tree was similar in broad detail to the universal tree of life created from an analysis of hundreds of genes. This indicates, the researchers said, that the V-H+PPase enzyme and the acidocalcisome it serves are very ancient, dating back to the LUCA, before the three main branches of the tree of life appeared.

"There are many possible scenarios that could explain this, but the best, the most parsimonious, the most likely would be that you had already the enzyme even before diversification started on Earth," said study co-author Gustavo Caetano-Anollés, a professor of crop sciences and an affiliate of the Institute for Genomic Biology at Illinois. "The protein was there to begin with and was then inherited into all emerging lineages."

"This is the only organelle to our knowledge now that is common to eukaryotes, that is common to bacteria and that is most likely common to archaea," Seufferheld said. "It is the only one that is universal."

The study lends support to a hypothesis that LUCA may have been more complex even than the simplest organisms alive today, said James Whitfield, a professor of entomology at Illinois and a co-author on the study.

"You can't assume that the whole story of life is just building and assembling things," Whitfield said. "Some have argued that the reason that bacteria are so simple is because they have to live in extreme environments and they have to reproduce extremely quickly. So they may actually be reduced versions of what was there originally. According to this view, they've become streamlined genetically and structurally from what they originally were like. We may have underestimated how complex this common ancestor actually was."

The study team also included Kyung Mo Kim, of the Korea Research Institute of Bioscience and Biotechnology; and Alejandro Valerio, of the Museum of Biological Diversity in Columbus, Ohio.

The National Institute of Allergy and Infectious Diseases and the National Science Foundation provided funding for this study.

Story Source:

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Journal Reference:

1. Manfredo Seufferheld et al. **Evolution of Vacuolar Proton Pyrophosphatase Domains and Volutin Granules: Clues Into the Early Evolutionary Origin of the Acidocalcisomes**. *Biology Direct*, 2011 (in press)

http://www.sciencedaily.com/releases/2011/10/111005112145.htm

The New Ivies 2011

Schools where you'll find the next generation of excellence

Amherst College

With its dauntingly small acceptance rate and open curriculum, Amherst College is an ideal community for the country's top students to pursue their interests both in and out of the classroom. "The open curriculum is great for students who want to explore a little of everything and get a really well-rounded education. Intellectual curiosity is fed and encouraged, with many opportunities for students to conduct their own research and experiments on topics of their choice." One freshman has this to say of her time at Amherst so far: "I love Amherst, but it can definitely be very stressful at times. Most people here are huge overachievers; they're balancing schoolwork with a sport and another time-consuming extracurricular without neglecting their social lives."

Carnegie Mellon University

One of the biggest perks of heading off to college is the chance to surround oneself with like-minded individuals. For students who were considered outcasts in high school, Carnegie Mellon will feel right at home. According to one biology major, "Everyone is brilliant, everyone is a geek, everyone is driven, everyone is awkward, everyone is a work-a-holic." Carnegie Mellon is often named one of the country's most

elite college and students are challenged daily by both their professors and peers. "You walk in smart, you walk out smarter and you learn all you can."

Duke University

The only thing that can rival Duke University's academic reputation is the fierce school pride of its students. One junior boasts, "Academics are Duke's true selling point, with most departments improving constantly and many boasting some of the world's top scholars in their field." And while getting accepted to Duke may be an impressive feat, that is just the first of many challenges that await. One student put it a bit more bluntly: "Duke is a top notch college, so there's really no f*cking around when it comes to getting down to the grind. And kids here are really, really smart."

Macalester College

Macalester College is both one of the nation's smallest and top-rated liberal arts colleges that often flies under the radar, and students here like it that way. "Professors know your name, where you're from, what you did last weekend, and how you did on your last paper. The departments are not clique-ish in terms of friend groups. That leads to spirited and interdisciplinary discussions about everything from sex, to Kant, to the

Environment, to campus politics." The academic intimacy allows students to really immerse themselves in their chosen study, but also creates a challenging course load that leaves little room for slacking off. One sophomore anthropology student warns, "Most students study a LOT. Most classes here, and certainly upper level classes, require tons of reading and lots of out-of-class work in order to master the material and get a good grade. Macalester students definitely have lots of intellectual conversations outside of class as well."

Middlebury College

Located in the sleepy Vermont town of the same name, Middlebury College is ideal for pressure and distraction-free academic pursuit, and its small size creates an intimate learning environment. One theatre student says, "Academics at Middlebury are known to be top notch. Because the classes are usually pretty small, professors are more than willing to give you personal attention and most, if not all of them, come from amazing academic and worldly backgrounds." Students at Middlebury are excited about their education and unanimous in their praise of the school's academic life. Another student has this to say: "The classes are awesome here. Classes are engaging and challenging and push me to do my hardest. I always feel like I'm learning a lot and am generally very close with my professors."

Rice University

Rice University is both one of the nation's top research institutions and, by reputation, home to one of the most eccentric student bodies. This combination of intelligence and unique personalities makes for an exciting learning environment. According to a political science student, "Everyone at Rice is unbelievably smart and has worked their butt off to get where they are. Discussions in classes are robust, and the diverse student body ensures that there will be an interesting perspective on issues." Students here also take their academics very seriously and ensure that they leave Rice with as much new knowledge as possible. "Everyone here seems to be very intelligent and very committed to academics. People are sometimes overly ambitious (almost everyone double and triple majors) and very dedicated to their studies," claims one sophomore.

Swarthmore College

While Swarthmore doesn't calculate GPA or class rank, this does not mean that students coast through their course work. Instead, the school's unique academic system allows students to focus on their own studies and pursuit of knowledge. According to one pre-med student, the challenging coursework is enough without having to worry about competition. "It's true that the classes at Swarthmore are generally very tough...but the relationships with professors and the camaraderie (and lack of cut-throat competition) really makes things seem less bleak." One English major describes the academics at Swarthmore with a little more…enthusiasm: "I've had some classes that were so amazing I would basically walk out the door and have my head explode with all the insight and information I gleaned from that one class. Professors here truly love the material they're teaching."

Tufts University

"Tufts students (or at least a good portion) are really smart, sometimes intimidatingly so, and very active citizens. In fact, at times it's overwhelming how many causes everyone wants you to be involved in," says one international relations student. Whether spear-heading a new club, playing a sport, or taking advantage of internship opportunities in nearby Boston, students here take advantage of every opportunity offered at Tufts. On top of all the extracurricular activities, students somehow manage to squeeze in time for their regular studies as well. "Students definitely take their classes very seriously. However, there isn't much competition between students. It's primarily students being competitive with themselves and holding themselves to high standards."

Washington University in St. Louis

Students at Washington University in St. Louis are so passionate about their studies that the line between academic and social life is often blurred. "Students here are really smart, and it's not just in the classroom. People here talk about classes, academics, and current events all the time. At parties, it's funny to hear people talking about their most recent chemistry test or some funny lecture they had," claims one freshman. Another student has this to say: "As the 11th ranked school in the nation, people do take their academics seriously and you struggle to find a seat in the library come finals." That might read as a good warning for prospective students to make sure you really love the subject you're studying.

Williams College

Williams College provides a unique, rigorous academic experience that allows students to really become experts in their field of choice. As one senior explains, "Tutorials are a huge part of the Williams experience, and definitely deserve mention. They consist of two students who meet once a week with a professor and alternate writing papers (or doing problem sets if the tutorial happens to be math or science based) and critiquing their partner's paper. During the meeting, the students present their papers and critiques, and then discuss with the professor." Another student has this to say: "It's a lot of work, and most of your professors know you by name and are quite friendly, which makes slacking off difficult. Everyone works a lot, but classes are, for the most part, interesting and you have plenty of flexibility, so you rarely are forced to take classes on subjects that don't interest you." So if you're signed up to go to Williams, expect to have an intimate knowledge of the library, but be comforted in knowing that you'll at least be studying something interesting.

http://www.unigo.com/articles/the_new_ivies_2011?utm_source=outbrain&utm_medium=cpc&utm_campaign=Outbrain_Ivies

On Wall Street

Keith Gessen

When the protesters started occupying Wall Street, I was busy (sort of), and, to be honest, reluctant. I hate this stuff. I hate standing in the same spot, hemmed in by police barricades, shouting stupid slogans. 'No justice/No peace': really? 'Whose streets?/Our streets!' Well, yes and no. The futility too is a little frustrating. I have attended protests against the bombing of Kosovo; the bombing of Belgrade; the invasion of Afghanistan; the invasion of Iraq. I wish I had some more local protests to cite, but apparently I only come out when they start scrambling the F-15s. No, that's not true. I protested outside the Democratic National Convention in 2000. I thought Gore was too centrist. I guess that one we won.

In Russia, where I have also protested against various things, it always felt different – there was something about being outside, usually in the cold, showing your face to the police; showing them you weren't afraid. It seemed worthwhile. I'm not sure it was. The police almost always outnumbered the protesters. There were never enough of us. This winter, when nationalist soccer hooligans swarmed in Manezh Square, beneath the walls of the Kremlin, it was a different story. They massively outnumbered the police: that they did not overpower them merely showed that they did not want to. If they'd wanted to take the Kremlin that night, they probably could have. (Instead they assaulted non-Slavic passersby.) It made every protest I'd attended in Moscow over the past four years seem brittle, petty, pathetic.

There must have been at least 10,000 people yesterday in Foley Square. It took your breath away. The neoclassical façades of five courthouses face onto the square; they usually give the place a desolate look, like you've suddenly been dropped into Washington DC. But with all these people on it, it felt … European. There were plenty of middle-aged union workers; there were representatives of community organisations from across the city; but there were also plenty of the sort of interesting-looking, serious-looking and (you secretly suspect) totally frivolous people more or less your age who you see walking around the city. Comrades, it turns out.

I hadn't thought of it in a while, and yet I wandered back in my mind to a protest we had all missed. I remember it from television: a group of young Republicans, men and women, in business attire, chanting outside a school cafeteria (I think it was) where the Florida recount was taking place, urging it to stop. The *Wall Street Journal* would celebrate them a short time later as a spontaneous 'bourgeois riot'; in fact, they were congressional aides flown down to Florida by the Republican Party. But where were we? We sat it out, while the bourgeois mob delivered its message: if the votes are counted and the results reversed accordingly, there will be civil war.

Yesterday it took the entire crowd two hours to walk six blocks to Zuccotti Park, where between 50 and 500 people – students, anarchists, anarchist students – have been camped out for three weeks. The first impression of the park is that the population of a different park – Washington Square Park – had transported itself here wholesale. But it was Washington Square weaponised. On the west side of the park, a drum circle pounded away. In Washington Square this would be the soundtrack merely of your wasted youth; here it was the drums of war. A good portion of Zuccotti Park was occupied by sleeping bags, many of them covered by blue tarpaulin to fend off the rain. (Tents are illegal without a permit in New York City, to keep homeless people, and now protesters, from getting too comfortable outdoors.) At the centre of the park is a makeshift buffet, with people standing in line and piling donated pizza and pasta onto their plates. No one seemed to be taking any apples from the big box. Nearby was the 'media center', a group of about a dozen young people hunched together over their laptops, with a small generator and several power strips hooked up to it, and wifi.

The occupied park is around the corner from Wall Street; it is across the street from the giant construction site at Ground Zero. Goldman Sachs's new headquarters is on the other side of the foundation pit. There is a Brooks Brothers to one side of the park, and a Men's Wearhouse on the other. Bankers have had to walk

through the park; one camper, a young oilman from Alaska, told me he'd hardly slept the night before because, first, one of the occupiers was making a lot of noise, and then the bankers started walking by his sleeping bag on the way to work around 5.30 a.m. If they were heading for Wall Street itself, they would have found that the security precautions established after 9/11 were bolstered by a series of police barricades, to prevent the spontaneous seizure of the plaza in front of the New York Stock Exchange by a sleeping-bag-toting mob. I don't know that bankers have become any more uncomfortable in New York in the past few weeks than in the past few years, but maybe they have. It's one thing to get berated by bearded Paul Krugman and irascible Barney Frank; it's another to be told to shut up ('Money talks … too much,' one poster read) by an ever growing group of nice-looking kids. For banking to stop siphoning off some of the brightest people around would be a good start; that Goldman Sachs built its new headquarters without putting the words 'Goldman' or 'Sachs' on the exterior of 200 West Street is, at least, a little telling.

Manhattan was built south to north, and the financial district, at the very southern tip of the island, is the oldest part of the city; Trinity Church, next door to Zuccotti Park, is the city's oldest, and so is the tiny cemetery next to it. (Buried there is Alexander Hamilton, founder of the Federal Reserve.) There is something grand, if also creepy, about the financial district. Paul Strand's famous 1915 photo of the bankers walking to work in the morning dwarfed by a giant building that seems to have been constructed for some other, larger race, still captures what it feels like, especially after the closing bell on the Stock Exchange has pushed the workers out of their offices and onto the train to New Jersey. There's never been much occasion to visit here; nothing *happens* here; but now there is.

The day before yesterday, the day of the big march from Foley Square, we left before a much smaller group of activists made its way further downtown and tried to storm a police barricade onto Wall Street itself. I saw it that night on YouTube: a police officer swinging his baton like it was a baseball bat and connecting with human flesh. The next day, occupations of civic spaces began in Philadelphia, Austin, Washington, Los Angeles – even Boston.

I was back in Zuccotti Park that evening for the daily General Assembly. I had expected some tedious discussion of the ideology and demands of the protest – passage of a revivified Glass-Steagall Act? – and was delighted to find that the meeting was mostly concerned with logistics. About 80 people listened to (and repeated, via 'the people's mic') reports from various highly practical 'committees'. The young man from Internet reported that a new website was on its way and also proposed to put to a vote whether the west side of the park (the drum circle) should get an internet connection; Legal reported that more lawyers were on their way and that the department would be reorganising into a series of sub-departments. Public Relations asked whoever was making harassing phone calls to Associated Press to cut it out. 'Our goal here is not to attack the press; it is to manipulate the press into spreading our message across the world.' (He further asked that anyone planning any actions against the press come talk to PR first, for advice.) The Arts and Culture Committee announced that 'the poetry of the Revolution must be unforgettable,' informed everyone about an upcoming art show, and promised a big surprise after General Assembly – this turned out to be the rapper Talib Kweli. Community Relations gave a sobering but optimistic report: they had attended the local community board meeting, and heard the concerns of local residents – they had been through 9/11, the residents said, when life in the neighbourhood was badly disrupted, and now found their lives being disrupted again. The tall buildings around Zuccotti Park created a cascade of noise, and some of the barricades erected by the police to keep the protesters off Wall Street were also keeping the local residents from streets they ordinarily used. For the moment, the young man and woman from Community Relations reported, the residents had decided not to pass a resolution against the protests – but CR urged the occupiers to continue being as neighbourly as possible. Without the support of the local population, the occupation would be on much thinner ice. It was clear that the occupiers' must only demand to remain where they are: our office on Wall Street. Let the other occupations make the other demands. The first occupation's goal is to stay where it is.

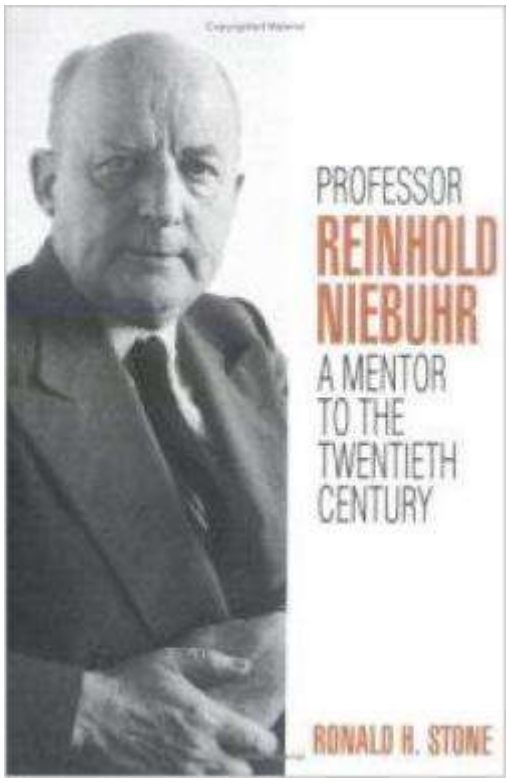
To that end I especially enjoyed the report from Sanitation, which, with every line repeated twice by the volunteer criers who made up the people's mic, sounded like the most lapidary clean-up schedule I'd ever heard. 'Tomorrow,' the young woman said ('tomorrow, tomorrow,' echoed the people's mic), 'we are doing a clean out of the entire area. So everyone's who sleeping here, if you could pick up everything you've brought in by noon, so we can take away all the trash and mouldy cardboard, that would be awesome.'

http://www.lrb.co.uk/v33/n20/keith-gessen/on-wall-street

The Philosopher of the Post-9/11 Era

Why have the right and the left resurrected Reinhold Niebuhr?

By Jordan Smith|Posted Monday, Oct. 17, 2011, at 7:03 AM ET



Reinhold Niebuhr is having a renaissance

Photograph by Matt Cardy/Getty Images.

In his journal entry dated June 10, 1971, the late historian Arthur Schlesinger Jr. lamented the inattention paid to his chief intellectual influence, theologian Reinhold Niebuhr. "It is odd to me how little read Niebuhr seems these days," Schlesinger wrote. "We are inundated by new forms of the old utopianism he exposed so effectively. ... But we are bound to go back to Niebuhr, because we cannot escape the dark heart of man and because we cannot permit an awareness of this darkness to inhibit action and abolish hope."

Schlesinger died in 2007, but he lived long enough to see his beloved Niebuhr revived. Indeed, Niebuhr has somehow become the go-to thinker in the age of terrorism. He has been invoked for various purposes by the neoconservative columnist David Brooks, the liberal journalist Peter Beinart, and the isolationist professor Andrew Bacevich. Politicians have gotten in on the act too: Republican Sen. John McCain, then-New York Gov. Eliot Spitzer, and President Barack Obama have all cited Niebuhr to serve their needs in recent years. "In think tanks, on op-ed pages, and on divinity-school quadrangles, Niebuhr's ideas are more prominent at any time since his death, in 1971," the *Atlantic* reported in 2007. How did it come to pass that a man born in 1892, when Benjamin Harrison was in the White House, became the philosopher of the post-9/11 era?

Answering that question was the last scholarly task undertaken by the intellectual historian John Patrick Diggins. Diggins, the author of thoughtful studies of Ronald Reagan, Eugene O'Neill, and Max Weber,

among other subjects, died in 2009 before fully completing the manuscript of his book on Niebuhr. A former student of his finished the project and the result is *Why Niebuhr Now?*

Despite its title, Diggins never attempts to explain the reasons for Niebuhr's current resurrection. Instead he sets out to clarify Niebuhr's basic thought in separate chapters on religion, ideology, and American history. Though his thematic organization has a way of blurring the evolution of Niebuhr's ideas, and sometimes wrenching them from their context, Diggins' mission indirectly offers an answer to his question: Part of the reason Niebuhr has so many and such disparate admirers is that, mostly thanks to his intellectual growth and nuanced thinking, there was a Niebuhr for every occasion. Alternately a Wilsonian idealist, a pacifist, a socialist, a New Dealer, an anti-fascist, a Cold Warrior, and a realist in the style of his friends Hans Morgenthau and George Kennan, Niebuhr went through more incarnations than Krishna.

If there was something in Niebuhr's evolution that made him seem almost like Woody Allen's Zelig, opportunism was not the primary force at work. He was remarkably attuned to the events of his time, yet his responses were anything but reflexive or self-serving. On the contrary, he was an exceptionally complex thinker, willing to court charges of inconsistency and ever alert to unintended consequences.

All of which makes sense because Reinhold Niebuhr was first and foremost a pastor and theologian, not a policy analyst. Diggins reminds us that Niebuhr's genius was principally in recasting Christian thought to make it not only relevant but urgently useful in grappling with the problems of the 20th century. "Whether a supreme being exists was of less importance to Reinhold Niebuhr than the message Christianity holds out to humankind," Diggins writes. In Niebuhr's hands, the myth of the Fall from the Garden of Eden and the doctrine of original sin were enduring insights about the imperfectability of mankind. Unlike Marxism, liberalism, and fascism, "prophetic Christianity" contained internal checks on utopian aspirations.

And yet, Niebuhr believed that even as man was fundamentally flawed, he was "called" to seek justice—not in the hereafter, but in the temporal world. The complete justice of the kingdom of God was beyond attainment by human beings, and yet it was essential to continually strive for the best possible outcome, however qualified. In his magnum opus, *The Nature and Destiny of Man* (1941), Niebuhr wrote that the Christian is " 'both sinner and righteous' … Christ is what we ought to be and also what we cannot be." A wise man recognizes "that the power of God is in us and the power of God is against us in judgement and mercy." If this sounds paradoxical, that was the point. He had the sermonizer's appreciation of the power of contradictions to heighten moral awareness.

Niebuhr's preoccupation with sin and imperfection led him frequently to endorse the middle spot between two poles. His most lasting political book, *The Children of Light and the Children of Darkness* (1944), was written at the height of the midcentury debate over the viability of liberal democracy. At a time when many Western intellectuals were arguing that the future lay in Soviet-style socialism, Niebuhr spoke out for democracy as a bulwark against any "undue centralization of power," whether "priestly, military, economic, or political." By constraining utopian impulses emerging from all sides, he argued, democracy is able to attain a measure of peace and justice—but only a measure. Ever alert to the perils of fanaticism, as well as undue optimism or bleak pessimism, Niebuhr remained a small-d democrat who prioritized the possible over the ideal through his various political incarnations. And yet the problem with balanced thought is that it can easily be manipulated. Niebuhr's principles were so elastic and general that they can be plausibly interpreted and applied in nearly infinite ways. Any war or political act can be explained as pragmatic or humble—as a median between two extremes—depending on where the goalposts are placed. That is why Niebuhr was able to endorse events and ideas as seemingly contradictory as nuclear deterrence and Kennan-style anti-anti-communism, which abhorred nuclear weapons.

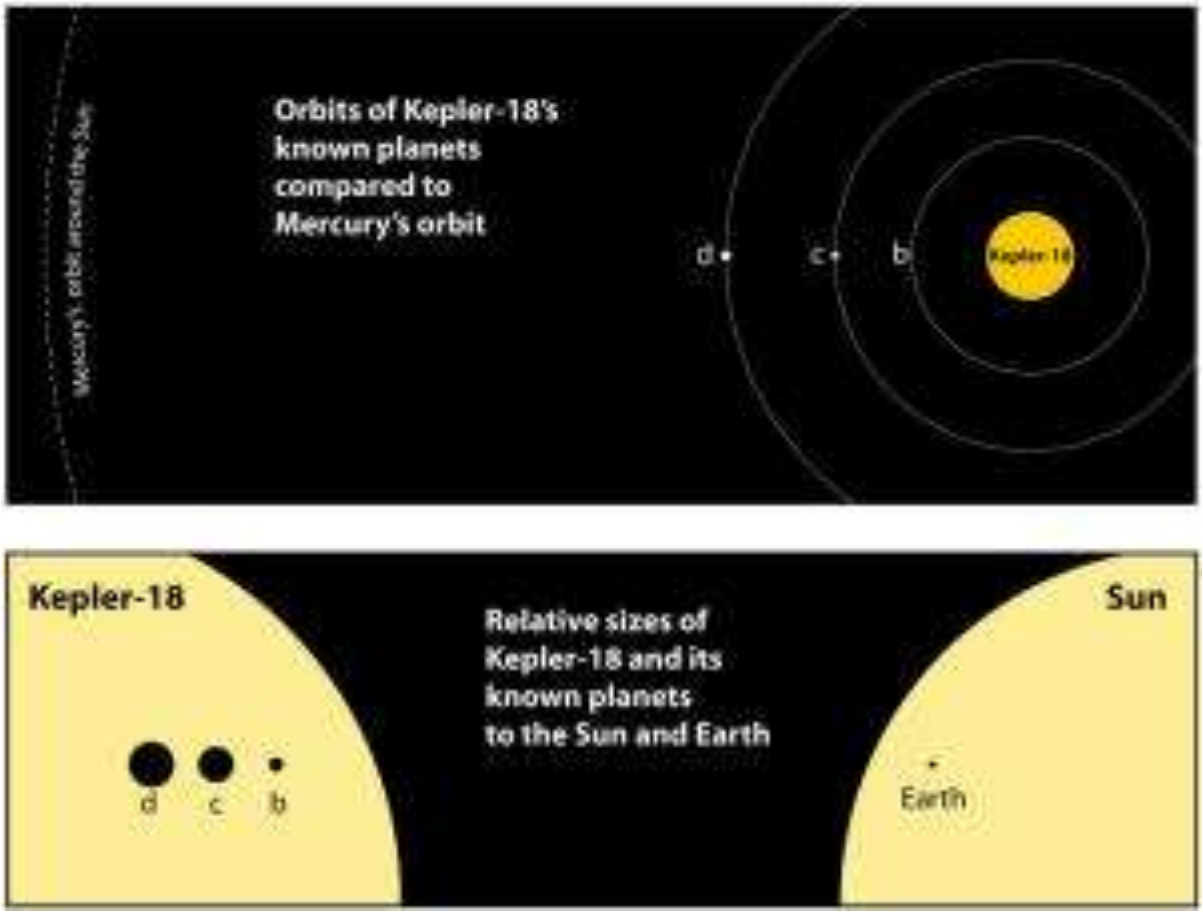
It should come as no surprise that Niebuhr's spirit has been invoked in a variety of conflicting ways in our current Libyan crisis. David Brooks of the *New York Times* cast the intervention as Niebuhrian on the grounds that it was done reluctantly, (at least originally) with the modest goal of stopping an impending massacre, and with an awareness of the moral complexities on the ground. At the same time, in the *American Prospect*, Adam Serwer made the case that it was anti-Niebuhrian. The intervention, he argued, was justified by the purity of its intentions, and President Obama invoked American exceptionalism, both ideas Niebuhr persistently opposed. Similarly, even while writing that "pressing Niebuhr into service on behalf of any and all causes will make him irrelevant," Andrew Bacevich has appropriated the pastor on behalf of anti-interventionism, calling him a "prophet" who foresaw that America would fall prey to its messianic instincts. Ultimately, though, Niebuhr's diversity and unpredictability make applying his thought with any precision to contemporary problems an impossibility. The answer to the question "What would Niebuhr say?" is: We don't know.

Even if Niebuhr cannot offer policy prescriptions of the sort his followers yearn for, he remains a uniquely valuable voice. Reading Diggins' brief treatise is a reminder of the void in American culture that Niebuhr managed to fill as a highbrow Christian thinker whose ideas were debated by the intelligentsia. Because Niebuhr's thoughts on human nature and society were only rooted in, not exclusively derived from, a biblical worldview, they spoke to non-Christians and believers alike as they wrestled with their political principles during a dark century.

Those few religious intellectuals who even attempt to speak to a secular audience, such as Jim Wallis and Michael Lerner on the left or the theoconservatives at the journal *First Things*, lack Niebuhr's intellect, mass appeal, and genuinely insightful engagement with the great problems of the day. But perhaps it is impossible for any theologian to straddle the profound divides in post-1960s American life over sexual freedom, science, and American exceptionalism. And perhaps, given this rare Christian thinker's skepticism about life after death, it is only fitting that Niebuhr has no heir.

http://www.slate.com/articles/arts/books/2011/10/john_diggins_why_niebuhr_now_reviewed_how_did_he_become_the_phil.html

Kepler Spacecraft Discovers New Multi-Planet Solar System



The top graphic shows the orbits of the three known planets orbiting Kepler-18 as compared to Mercury's orbit around the Sun. The bottom graphic shows the relative sizes of the Kepler-18 and its known planets to the Sun and Earth. (Credit: Tim Jones/McDonald Obs./UT-Austin)

ScienceDaily (Oct. 5, 2011) — A team of researchers led by Bill Cochran of The University of Texas at Austin has used NASA's Kepler spacecraft to discover an unusual multiple-planet system containing a super-Earth and two Neptune-sized planets orbiting in resonance with each other.

They are announcing the find in Nantes, France at a joint meeting of the European Planetary Science Conference and the American Astronomical Society's Division of Planetary Science. The research will be published in a special Kepler issue of *The Astrophysical Journal Supplement Series* in November.

Cochran's team is announcing three planets orbiting Kepler-18, a star similar to the Sun. Kepler 18 is just 10 percent larger than the Sun and contains 97 percent of the Sun's mass. It may host more planets than the three just announced.

The planets are designated b, c, and d. All three planets orbit much closer to Kepler-18 than Mercury does to the Sun. Orbiting closest to Kepler-18 with a 3.5-day period, planet b weighs in at about 6.9 times the mass of Earth, and twice Earth's size. Planet b is considered a "super-Earth." Planet c has a mass of about 17 Earths, is about 5.5 times Earth's size, and orbits Kepler-18 in 7.6 days. Planet d weighs in at 16 Earths, at 7 times

Earth's size, and has a 14.9-day orbit. The masses and sizes of c and d qualify them as low-density 2Neptune-class" planets.

Planet c orbits the star twice for every one orbit d makes. But the times that each of these planets transit the face of Kepler-18 "are not staying exactly on that orbital period," Cochran says. "One is slightly early when the other one is slightly late, [then] both are on time at the same time, and then vice-versa."

Scientifically speaking, c and d are orbiting in a 2:1 resonance. "It means they're interacting with each other," Cochran explains. "When they are close to each other ... they exchange energy, pull and tug on each other."

Kepler uses the "transit method" to look for planets. It monitors a star's brightness over time, looking for periodic dips that could indicate a planet passing in front of the star. A large part of the Kepler science team's work is proving that potential planets they find aren't something else that mimics the transit signature (such as a perfectly aligned background star, specifically either an eclipsing binary star or a single star orbited by a giant planet).

That follow-up work to Kepler is done by scores of scientists using ground-based telescopes the world over (including several at The University of Texas at Austin's McDonald Observatory) as well as Spitzer Space Telescope.

Kepler-18's planets c and d did astronomers a favour by proving their planet credentials up front via their orbital resonance; they had to be in the same planetary system as each other for the resonance to occur.

Confirming the planetary bona fides of planet b, the super-Earth, was much more complicated, Cochran says. His team used a technique called "validation," instead of verification. They set out to figure out the probability that it could be something other than a planet.

First, they used the Palomar 5-meter (200-inch) Hale Telescope with adaptive optics to take an extremely high-resolution look at the space around Kepler-18. They wanted to see if anything close to the star could be positively identified as a background object that would cause the transit signal they had attributed to a super-Earth.

"We successively went through every possible type of object that could be there," Cochran says. "There are limits on the sort of objects that can be there at different distances from the star." Astronomers know how many of different types of objects (various kinds of stars, background galaxies, and more) are seen on average in the sky. They didn't find anything in the Palomar image.

"There's a small possibility that [planet b] is due to a background object, but we're very confident that it's probably a planet," Cochran says. His team calculated that the likelihood the object is a planet is 700 times more likely than the likelihood that it's a background object.

The process is called "planet validation," rather than the usual "planet verification." Cochran says it's important to understand the difference -- not just for this system, but for future discoveries from Kepler and other missions.

"We're trying to prepare the astronomical community and the public for the concept of validation," he says. "The goal of Kepler is to find an Earth-sized planet in the habitable zone [where life could arise], with a one-year orbit. Proving that such an object really is a planet is very difficult [with current technology]. When we find what looks to be a habitable Earth, we'll have to use a validation process, rather than a confirmation process. We're going to have to make statistical arguments."

Kepler was selected as the tenth NASA Discovery mission. NASA Ames Research Center, Moffett Field, Calif., is the home organization of the science principal investigator, and is responsible for the ground system development, mission operations and science data analysis. Jet Propulsion Laboratory, Pasadena, Calif., managed the Kepler mission development. Ball Aerospace & Technologies Corp. of Boulder, Colo., developed the *Kepler* flight system and supports mission operations with the Laboratory for Atmospheric and Space Physics at the University of Colorado, Boulder. The Space Telescope Science Institute in Baltimore archives, hosts, and distributes the *Kepler* science data. For more information about the Kepler mission, visit: http://www.nasa.gov/kepler.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **McDonald Observatory, University of Texas at Austin**.

http://www.sciencedaily.com/releases/2011/10/111004132817.htm

The Skin I Live In
Pedro Almodóvar's new film is a math problem, not a poem.

By Dana Stevens|Posted Thursday, Oct. 13, 2011, at 10:50 PM ET

Antonio Banderas as Dr. Robert Ledgard and Elena Anaya as Vera in *The Skin I Live In*.

The Skin I Live In (Sony Pictures Classics), Pedro Almodóvar's 18th film, marks the Spanish director's first attempt to blend elements of the horror genre with the high-camp, gender-bending melodrama that's become his stock in trade. Visually lush and thematically ambitious, the movie abounds in familiar Almodovarian pleasures: Alberto Iglesias' magnificent score pulses with obscure menace, Jean-Paul Gaultier's costumes (designed in collaboration with Paco Delgado) are deliciously perverse, and Antxon Gomez's production design is pure postmodern eye candy—if Almodóvar hadn't become a filmmaker, he could've been a hell of an interior decorator. But the story of a plastic-surgeon-turned-mad-scientist unfolds with a clinical chill we're unaccustomed to feeling in this director's films. *The Skin I Live In* is a math problem, not a poem.

Still, what an elegant proof it is. The film's story (based on a French novel by Thierry Jonquet) emerges slowly from a pieced-together series of flashbacks and scenes from the present day, fragments that finally begin to converge around the halfway mark. Robert Ledgard (Antonio Banderas) is a plastic surgeon outside the town of Toledo. Rich, arrogant, and secretive, he operates on patients in a private facility at his lavish mansion. Early in the film, the doctor presents his groundbreaking work at a medical conference: He's developed an artificial skin that's resistant to both burns and insect bites, which he's now testing on laboratory mice.

Except … back at Robert's gated compound, El Cigarral, there seem to be no mice in evidence. Instead, there's a twisted domestic setup that is at first impenetrably baffling. A beautiful young woman, Vera (Elena Anaya) appears to be living as a prisoner in a locked room, supplied with everything she needs through a

dumbwaiter sent up from the kitchen. Vera wears nothing but a full-length flesh-colored bodystocking at all times, and though she appears resigned to her captivity—even practicing yoga with calm concentration—the walls of the room are covered in writing that tallies up the days since her imprisonment.

How did this woman wind up living in such strange circumstances, and why is the doctor spying on her via a giant closed-circuit screen in his bedroom? Why does the housekeeper, Marilia (longtime Almodóvar stalwart Marisa Paredes), collaborate with her boss in keeping Vera hidden away from the world? None of this will make sense until we learn about the fates of Marilia's son (Roberto Alamo), an armed robber who appears at the mansion gates one day costumed as a tiger, and Robert's daughter (Blanca Suárez), a mentally-ill teenager who's sexually attacked at a party by a drug-abusing local youth (Jan Cornet).

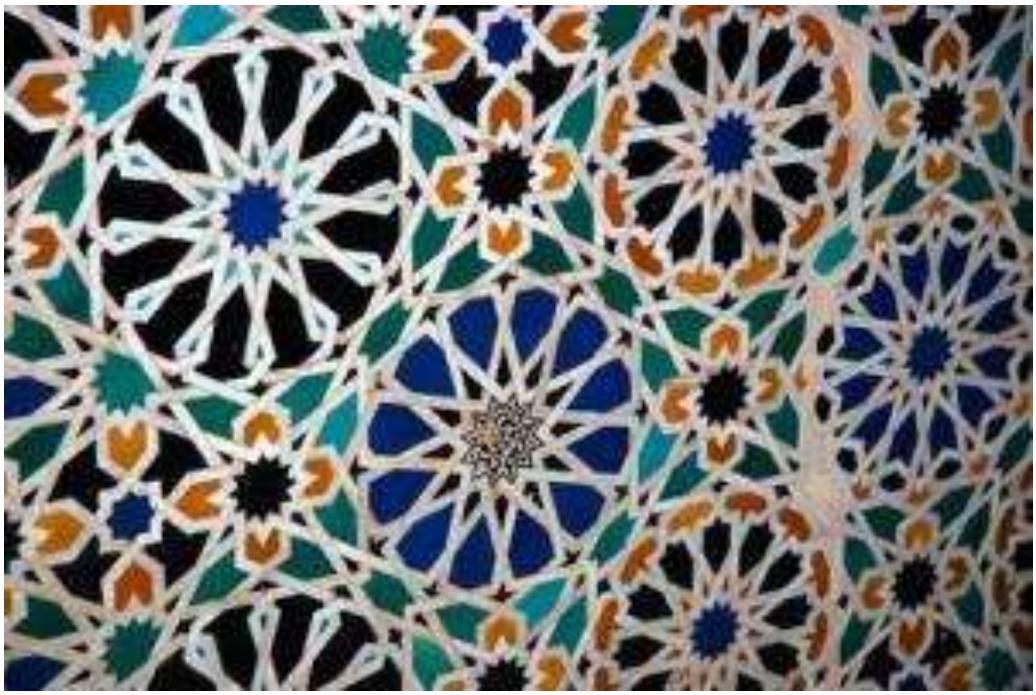
Nothing that happens after the midpoint can be revealed in a review (though June Thomas and I discuss the movie's twists at length in the Spoiler Special podcast linked above). I'll have to limit myself to describing the movie's mood, which is somber and densely allusive. (*Vertigo* is a clear antecedent, as are James Whale's *Frankenstein* and Georges Franju's *Eyes Without A Face.*) *The Skin I Live In* is a meditation on profound themes: memory, grief, violence, degradation, and survival—so why does it leave the viewer (at least this one) so curiously unmoved? Watching the parts of this multigenerational melodrama slowly fuse into a coherent (if wackily improbable) whole offers aesthetic and intellectual gratification, but little in the way of emotional punch.

This may have to do with the mid-movie shift of protagonist. When we abruptly stop focusing on Robert's story arc and turn instead to Vera's, it's hard to know what to do with the reserve of sympathy we've painstakingly built up for Banderas' twisted, sadistic, but still recognizably human character. Shifting the audience's identification in this way is a deliberate choice on Almodóvar's part—he wants to mess with our usual filmgoing expectations about good guys and bad guys, victims and perpetrators. Yet Vera's and Robert's interests are diametrically opposed; if we root for the prisoner, we must necessarily root against the jailer. It's hard to have your cake of moral ambiguity and eat your revenge narrative, too. Almodóvar's insistence on having it both ways makes for a final act that's less cathartic than simply confusing (though the film's very last scene is masterful; the credits roll just a few seconds before you're ready for them to, and you walk out of the film thinking about the moment you *didn't* get to see).

Some of *The Skin I Live In*'s failure to connect can perhaps be laid at the feet of Antonio Banderas. While he's custom-made for the brutish boy-toy roles he played in Almodóvar's films of the late '80s and early '90s, the less-than-expressive Banderas (who was coached by his director to tamp down his performance) never quite gets across the internal torment of this emotionally stunted psychopath. Even tightly wound stoics—*especially* tightly wound stoics—have inner lives, but Dr. Robert Ledgard's, though it can be surmised from his tragedy-packed backstory, remains inaccessible to us. Elena Anaya, on the other hand, invests her impossibly difficult role—without spoiling, let's just say that Vera is a far cry from your average damsel in distress—with both strength and pathos. Though the story boils over with extreme acts of passion and vengeance, Almodóvar's examination of these two damaged people's troubled coexistence remains a cold (if impressively executed) formalist exercise. *The Skin I Live In*'s beauty is only skin deep.

http://www.slate.com/articles/arts/movies/2011/10/the_skin_i_live_in_reviewed_pedro_almod_var_s_new_film_.html

'Quasicrystals' Once Thought Impossible Have Changed Understanding of Solid Matter



Aperiodic mosaics, such as those found in the medieval Islamic mosaics of the Alhambra Palace in Spain (shown above), have helped scientists understand what quasicrystals look like at the atomic level. In those mosaics, as in quasicrystals, the patterns are regular -- they follow mathematical rules -- but they never repeat themselves. (Credit: © cbomers / Fotolia)

ScienceDaily (Oct. 5, 2011) — The Royal Swedish Academy of Sciences has decided to award the Nobel Prize in Chemistry for 2011 to Daniel Shechtman of the Technion -- Israel Institute of Technology in Haifa, Israel, for the discovery of quasicrystals: non-repeating regular patterns of atoms that were once thought to be impossible.

A remarkable mosaic of atoms

In quasicrystals, we find the fascinating mosaics of the Arabic world reproduced at the level of atoms: regular patterns that never repeat themselves. However, the configuration found in quasicrystals was considered impossible, and Daniel Shechtman had to fight a fierce battle against established science. The Nobel Prize in Chemistry 2011 recognizes a breakthrough that has fundamentally altered how chemists conceive of solid matter.

On the morning of April 8, 1982, an image counter to the laws of nature appeared in Daniel Shechtman's electron microscope. In all solid matter, atoms were believed to be packed inside crystals in symmetrical patterns that were repeated periodically over and over again. For scientists, this repetition was required in order to obtain a crystal.

Shechtman's image, however, showed that the atoms in his crystal were packed in a pattern that could not be repeated. Such a pattern was considered just as impossible as creating a football using only six-cornered polygons, when a sphere needs both five- and six-cornered polygons. His discovery was extremely controversial. In the course of defending his findings, he was asked to leave his research group. However, his battle eventually forced scientists to reconsider their conception of the very nature of matter.

Aperiodic mosaics, such as those found in the medieval Islamic mosaics of the Alhambra Palace in Spain and the Darb-i Imam Shrine in Iran, have helped scientists understand what quasicrystals look like at the atomic level. In those mosaics, as in quasicrystals, the patterns are regular -- they follow mathematical rules -- but they never repeat themselves.

When scientists describe Shechtman's quasicrystals, they use a concept that comes from mathematics and art: the golden ratio. This number had already caught the interest of mathematicians in Ancient Greece, as it often appeared in geometry. In quasicrystals, for instance, the ratio of various distances between atoms is related to the golden mean.

Following Shechtman's discovery, scientists have produced other kinds of quasicrystals in the lab and discovered naturally occurring quasicrystals in mineral samples from a Russian river. A Swedish company has also found quasicrystals in a certain form of steel, where the crystals reinforce the material like armor. Scientists are currently experimenting with using quasicrystals in different products such as frying pans and diesel engines.

Daniel Shechtman, Israeli citizen. Born 1941 in Tel Aviv, Israel. Ph.D. 1972 from Technion -- Israel Institute of Technology, Haifa, Israel. Distinguished Professor, The Philip Tobias Chair, Technion -- Israel Institute of Technology, Haifa, Israel.

The Prize amount: SEK 10 million.

For further information, including backgrounders for the public and scientists and links for further reading, see: http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2011/press.html

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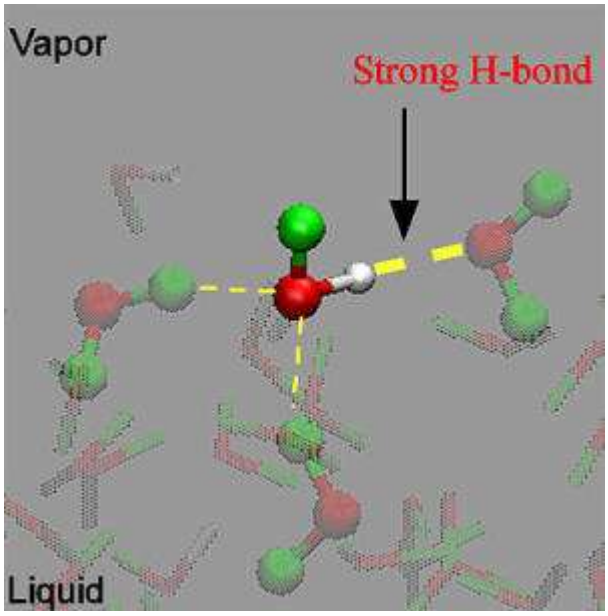
Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Nobel Foundation**.

http://www.sciencedaily.com/releases/2011/10/111005080232.htm

When Water and Air Meet: New Light Shed On Mysterious Structure of World's Most Common Liquid Interface



A snapshot in the MD simulation trajectory of the HOD / D2O mixture that shows the water pair at the surface. White, green and red represent H, D and O atoms, respectively. (Credit: Image courtesy of RIKEN)

ScienceDaily (Oct. 5, 2011) — Findings by researchers at the RIKEN Advanced Science Institute and their colleagues at Tohoku University and in the Netherlands have resolved a long-standing debate over the structure of water molecules at the water surface. Published in the *Journal of The American Chemical Society*, the research combines theoretical and experimental techniques to pinpoint, for the first time, the origin of water's unique surface properties in the interaction of water pairs at the air-water interface.

The most abundant compound on Earth's surface, water is essential to life and has shaped the course of human civilization. As perhaps the most common liquid interface, the air-water interface offers insights into the surface properties of water in everything from atmospheric and environmental chemistry, to cellular biology, to regenerative medicine. Yet despite its ubiquity, the structure of this interface has remained shrouded in mystery.

At the heart of this mystery are two broad bands in the vibrational spectrum for surface water resembling those of bulk ice and liquid water. Whether these bands are the result of hydrogen bonds themselves, of intra-molecular coupling between hydrogen bonds within a single water molecule, or of inter-molecular coupling between adjacent water molecules, is a source of heated debate. One popular but controversial hypothesis suggests one of the spectral bands corresponds to water forming an actual tetrahedral "ice-like" structure at the surface, but this interpretation raises issues of its own.

The researchers set out to resolve this debate through a comprehensive study combining theory and experiment. For their experiments, they applied a powerful spectroscopy technique developed at RIKEN to selectively pick out surface molecules and rapidly measure their spectra. To eliminate coupling effects, which are difficult to reproduce in simulations, they used water diluted with D_2O (heavy water) and HOD (water with one hydrogen atom, H, replaced by deuterium, D). Doing so eliminates coupling of OH bonds within a single molecule (since there is only one OH bond) and reduces the overall concentration of OH bonds in the solution, suppressing intermolecular coupling.

With other influences removed, the researchers at last pinpointed the source of water's unique surface structure not in an "ice-like" structure, but in the strong hydrogen bonding between water pairs at the outermost surface. The extremely good match between experimental and theoretical results confirms this conclusion, at long last bringing clarity to the debate over the structure of the water surface and setting the groundwork for fundamental advances in a range of scientific fields.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **RIKEN**.

Journal Reference:

1. Satoshi Nihonyanagi, Tatsuya Ishiyama, Touk-kwan Lee, Shoichi Yamaguchi, Mischa Bonn, Akihiro Morita, Tahei Tahara. **Unified Molecular View of the Air/Water Interface Based on Experimental and Theoretical $x^{(2)}$ Spectra of an Isotopically Diluted Water Surface**. *Journal of the American Chemical Society*, 2011; 110929124813002 DOI: 10.1021/ja2053754

http://www.sciencedaily.com/releases/2011/10/111003132208.htm

"Cartier"

By Alexandra Teague|Posted Tuesday, Oct. 18, 2011, at 7:10 AM ET

The old woman on the train tonight
tells me the Port of Oakland's lights

look like Cartier's chokers: *so beautiful.*
She gestures through the dirt-dull

glass. Pillbox hat and wool skirt
fetching and proper for Friday art,

she's come from the immaculate
exhibit of another world. *Such delicate*

work. In the darkness, new and fallen
while we were under water, the cranes

as always lower cargo toward the boats:
the boxes pendent in the sudden glow

of diamonds … Cut and blazing,
as once I saw emeralds hatching

from jeweled eggs: the minute filigree
of skaters spinning beneath the icy

pearl moon, mechanical and scarved
in rubies. Small treasure casks the Tsar

ordered in the years before his family
died—shot in a cellar, topaz in their sleeves.

The eggs were love gifts for his wife,
each gold hinge lifting to another life—

a world inside this world, bright and jeweled.
A world inside this jeweled, blinding world.

http://www.slate.com/articles/arts/poem/2011/10/_cartier_a_poem_by_alexandra_teague.html

A Voice, Still Vibrant, Reflects on Mortality

By CHARLES McGRATH

HOUSTON — Christopher Hitchens, probably the country's most famous unbeliever, received the Freethinker of the Year Award at the annual convention of the Atheist Alliance of America here on Saturday. Mr. Hitchens was flattered by the honor, he said a few days beforehand, but also a little abashed. "I think being an atheist is something you are, not something you do," he explained, adding: "I'm not sure we need to be honored. We don't need positive reinforcement. On the other hand, we do need to stick up for ourselves, especially in a place like Texas, where they have laws, I think, that if you don't believe in Jesus Christ you can't run for sheriff."

Mr. Hitchens, a prolific essayist and the author of "God Is Not Great: How Religion Poisons Everything," discovered in June 2010 that he had Stage 4 esophageal cancer. He has lately curtailed his once busy schedule of public appearances, but he made an exception for the Atheist Alliance — or "the Triple A," as he called it — partly because the occasion coincided almost to the day with his move 30 years ago from his native England to the United States. He was already in Houston, as it happened, because he had come here for treatment at the MD Anderson Cancer Center, where he has turned his 12th-floor room into a temporary library and headquarters.

Mr. Hitchens is gaunt these days, no longer barrel-chested. His voice is softer than it used to be, and for the second time since he began treatment, he has lost most of his hair. Once such an enthusiastic smoker that he would light up in the shower, he gave up cigarettes a couple of years ago. Even more inconceivable to many

of his friends, Mr. Hitchens, who used to thrive on whiskey the way a bee thrives on nectar, hasn't had a drink since July, when a feeding tube was installed in his stomach. "That's the most depressing aspect," he said. "The taste is gone. I don't even want to. It's incredible what you can get used to."

But in most other respects Mr. Hitchens is undiminished, preferring to see himself as living with cancer, not dying from it. He still holds forth in dazzlingly clever and erudite paragraphs, pausing only to catch a breath or let a punch line resonate, and though he says his legendary productivity has fallen off a little since his illness, he still writes faster than most people talk. Last week he stayed up until 1 in the morning to finish an article for Vanity Fair, working on a laptop on his bedside table.

Writing seems to come almost as naturally as speech does to Mr. Hitchens, and he consciously associates the two. "If you can talk, you can write," he said. "You have to be careful to keep your speech as immaculate as possible. That's what I'm most afraid of. I'm terrified of losing my voice." He added: "Writing is something I do for a living, all right — it's my livelihood. But it's also my life. I couldn't live without it."

Mr. Hitchens's newest book, published last month, is "Arguably," a paving-stone-sized volume consisting mostly of essays finished since his last big collection, "Love, Poverty and War," which came out in 2004. The range of subjects is typically Hitchensian. There are essays — miniature pamphlets, almost — on political subjects and especially on the danger posed to the West by Islamic terrorism and totalitarianism, a subject that has preoccupied Mr. Hitchens since 2001. But there are just as many on literary figures; there's a paean to oral sex, and there are little rants about unruly wine waiters, clichés and the misuse of "fuel" as a verb. The book's epigraph is from Henry James's novel "The Ambassadors": "Live all you can: It's a mistake not to." And in an introduction Mr. Hitchens writes: "Some of these articles were written with the full consciousness that they might be my very last. Sobering in one way and exhilarating in another, this practice can obviously never become perfected."

In his hospital room he suggested that an awareness of mortality was useful for a writer but ideally it should remain latent. "I try not to dwell on it," he said, "except that once in a while I say, O.K., I'm not going to make that joke, I'm not going to go for that chortle. Or if I have to choose between two subjects, I won't choose the boring one."

He added, talking about an essay on Philip Larkin that made it into "Arguably": "I knew the collection was going to come out even if I did not, and I was very pleased when I finished that one, because of the way it ends: 'Our almost-instinct almost true:/ What will survive of us is love.' I remember thinking, if that's the last piece I write, that will do me." After a moment he went on: "The influence of Larkin is much greater than I thought. He's perfect for people who are thinking about death. You've got that old-line Calvinist pessimism and modern, acid cynicism — a very good combo. He's not liking what he sees, and not pretending to."

His main regret at the moment, Mr. Hitchens said, was that while he was keeping up with his many deadlines — for Slate, The Atlantic and Vanity Fair — he didn't have the energy to also work on a book. He had recently come up with some new ideas about his hero, George Orwell, for example — among them that Orwell might have had Asperger's — and he said he ought to include them in a revised edition of his 2002 book, "Why Orwell Matters." He had also thought of writing a book about dying. "It could be called 'What to Expect When You're Expecting,' " he said, laughing.

Turning serious, he said, "I've had some dark nights of the soul, of course, but giving in to depression would be a sellout, a defeat." He added: "I don't know why I got so sick. Maybe it was the smokes, or maybe it's genes. My father died of the same thing. It's pointless getting into remorse."

On balance, he reflected, the past year has been a pretty good one. He won a National Magazine Award, published "Arguably," debated Tony Blair in front of a huge audience and added two states to the list of those

he has visited. “I lack only the Dakotas and Nebraska,” he said, “though I may not get there unless someone comes up with some ethanol-based cancer treatment in Omaha.”

Mr. Hitchens has an extensive support network that includes his wife, Carol Blue, and his great friends James Fenton and Martin Amis. Mr. Amis is known for being cool and acerbic, but as he kissed and embraced Mr. Hitchens last week, visiting on the way to a literary festival in Mexico, his affection for his friend was unmistakable. “Hitch’s buoyancy is amazing,” he said later. “He has this great love of life, which I rather envy, because I think I may be deficient in that respect. It’s an odd thing to say, but he’s almost like a Tibetan monk. It’s as if he’d become religious.”

http://www.nytimes.com/2011/10/10/books/christopher-hitchens-on-writing-mortality-and-cancer.html?ref=books

A Womb Without a View

Major birth defects come as a surprise for most parents, but they don't have to.

By Darshak Sanghavi|Posted Wednesday, Oct. 19, 2011, at 11:33 AM ET

Prenatal screenings including ultrasounds, while not without controversy, are improving

Photo by Photodisc/Thinkstock.

Here's something to freak out expectant parents: Over 2 percent of all American pregnancies are complicated by serious birth defects, and more than 0.5 percent of all fetuses have either a missing or an extra chromosome—a condition that leads to problems like Down or Edwards syndrome. Birth defects are a leading cause of infant mortality in the country, and most problems occur in pregnancies without any obvious risk factors. (For example, most babies with Down syndrome are born to women under 35 years of age.) There are ways to screen fetuses for birth defects like these, but due to a lack of clear guidance from caregivers or policymakers, parents may not find out about them until it's too late.

Knowing about problems before birth is important for at least two reasons. First, it allows doctors to treat the condition. Take heart problems, where a major artery may be connected incorrectly or a pumping chamber may be missing. Prenatal detection and immediate treatment at birth can prevent the sudden oxygen deprivation and shock that might occur if doctors were surprised by the defect. Some types of spina bifida can be surgically fixed before birth, preventing future paralysis.

A second benefit of prenatal screening is that it gives families a chance to decide whether they wish to continue a pregnancy at all. A huge number of women now choose abortion when faced with major birth defects. In Hawaii, which collects comprehensive information on pregnancy outcomes, more than 90 percent of women who learn they have a fetus with Down syndrome choose to terminate their pregnancies. (Other states are likely to have similar proportions.) Roughly one-half of all women whose babies have brain defects or major abdominal defects also elect abortion. To be sure, many families continue their pregnancies, and love and nurture their babies. Such families deserve support from doctors and insurers. But many families choose differently and they also deserve support.

Most of the time, however, expectant parents never realize there might be a problem. Major heart defects go unnoticed until birth an astounding 70 percent of the time. Three-quarters of all babies with missing limbs come as a surprise to both doctors and patients. More than one-half of cases of Down syndrome are overlooked. The list goes on and on.

Why are we missing so many important birth defects during pregnancy? Insurers and advisory groups don't support the necessary procedures. To diagnose the vast majority of problems—such as those related to the heart, lung, gut, and brain—one must visualize the fetus's body by ultrasound during the second trimester. But back in 1993, the *New England Journal of Medicine* reported results from the so-called RADIUS study (that's "Routine Antenatal Diagnostic Imaging with Ultrasound"). According to its findings, the blanket use of such ultrasounds "clearly indicate" no impact on a baby's outcome; parents would do just as well by letting their doctors decide whether to do the scans on a case-by-case basis. As a result, several insurance companies, such as Aetna, don't cover comprehensive fetal scans for routine pregnancies—a policy that affects roughly one-third of American women. The American Congress of Obstetricians and Gynecologists does not recommend the scan for all women, either. (When my wife was pregnant with our first child, our obstetrician actually advised us to make up a family history of birth defects, since our insurer wouldn't cover the scan in a normal pregnancy.)

Yet the RADIUS study, now almost 20 years old, shouldn't guide our approach today. First, treatments have gotten better. RADIUS actually showed that screening increased the number of major birth defects identified by a factor of more than 3—but given the therapies for heart defects and other problems that were available back then, this extra information didn't help. Second, the technology for scanning fetuses has vastly improved. At least one-half of the detections of major birth defects in the RADIUS study came too late for women to consider pregnancy termination; if we did the study over using today's technology, it's very likely that would change. Third, many parents want to know whether their unborn child has a major birth defect, even if there's nothing they can do about it. (As with many screening tests, false positives worry doctors and policymakers. However, even the RADIUS study showed no measurable harms to babies from ultrasound screening.)

At this point, almost every obstetrician in the country who manages high-risk pregnancies thinks ultrasound screenings are a good idea—so long as they they're done in a high-quality, high-volume center. (A good center is key since the doctors' and technicians' skills vary a lot. Just this month, I saw a pregnant patient who'd been assured her baby was fine, yet a week before birth our ultrasound detected clear signs of a major heart defect, missing stomach, and a malformed brain, among other problems.) Among large, developed Western nations, only the United States, the Netherlands, and Spain fail to recommend complete fetal ultrasounds for all pregnant women. (Germany and France, which have the highest detection rates for major defects, recommend a complete scan every trimester.)

Without comprehensive prenatal ultrasound, women are at the mercy of conventional "risk-based" screening, in the form of a blood test that provides information on three (and only three) potential problems: spina bifida, Down syndrome, and Edwards syndrome. By measuring the levels of estriol, alpha-fetoprotein, and several other substances in a pregnant woman, the test assigns a certain *probability* to each defect. The lab report reads like a Vegas betting line. For example, a woman of a given age might have a baseline 1-in-476 chance of having a baby with Down syndrome before she even takes the test, and then be told that her true risk, determined from her blood sample, is 1 in 51. (In 2007, ACOG added an ultrasound measurement of the fetus's neck to the standard test, but continued the practice of reporting proportions.)

That's a problem because many patients find these statistics utterly baffling. In 1999, researchers found that one-half of all patients can't make sense of them; for example, many think a 1-in-200 risk of a birth defect is more favorable than a 1-in-400. Perhaps as a result, few women with elevated risks choose to have amniocentesis, the follow-up procedure that would give a more definitive result.

Amniocentesis carries its own risks: It causes miscarriages at a rate that falls between 1 in 300 and 1 in 1,600. How should one probability be weighed against another? Many patients aren't sure. Interestingly, no regulatory authority tracks doctors' complication rates with amniocentesis, and ACOG does not set a minimum number of procedures for each doctor per year (meaning that your doctor may not do them often enough to stay sharp).

Given all these concerns, what should expectant women do? No test can catch every problem, of course. Here's the bottom line: Until sophisticated new blood tests or high-quality scans become widely available—for example, one that provides the same information as amniocentesis but without the risks of miscarriage—the best resource to help navigate prenatal testing is a genetic counselor. These professionals, typically on staff at large birth centers, help women make sense of their options for prenatal testing—and remind them that the usual blood tests cover only a few, relatively uncommon problems. (They also may guide couples of certain high-risk populations, like Ashkenazi Jews, to more specialized testing.) For now, women should also consider a comprehensive fetal ultrasound in the second trimester at a high-volume, tertiary-care center. Otherwise, they may be turning a blind eye to their baby's health.

http://www.slate.com/articles/health_and_science/medical_examiner/2011/10/prenatal_testing_birth_defects_often_come_as_a_surprise_.single.html

Long-Lost Lake Agassiz Offers Clues to Climate Change

Lowell extracts information from core samples in his University of Cincinnati laboratory. (Credit: Photo by Lisa Ventre)

ScienceDaily (Oct. 5, 2011) — What caused water levels to drop in an immense yet long-vanished lake? Research by a University of Cincinnati geologist suggests that conditions 12,000 years ago encouraged evaporation.

Not long ago, geologically speaking, a now-vanished lake covered a huge expanse of today's Canadian prairie. As big as Hudson Bay, the lake was fed by melting glaciers as they receded at the end of the last ice age. At its largest, Glacial Lake Agassiz, as it is known, covered most of the Canadian province of Manitoba, plus a good part of western Ontario. A southern arm straddled the Minnesota-North Dakota border.

Not far from the ancient shore of Lake Agassiz, University of Cincinnati Professor of Geology Thomas Lowell will present a paper about the lake to the Geological Society of America annual meeting in Minneapolis. Lowell's paper is one of 14 to be presented Oct. 10 in a session titled: "Glacial Lake Agassiz -- Its History and Influence on North America and on Global Systems: In Honor of James T. Teller."

Although Lake Agassiz is gone, questions about its origin and disappearance remain. Answers to those questions may provide clues to our future climate. One question involves Lake Agassiz' role in a thousand-year cold snap known as the Younger Dryas.

As the last ice age ended, thousands of years of warming temperatures were interrupted by an abrupt shift to cold. Tundra conditions expanded southward, to cover the land exposed as the forests retreated. This colder climate is marked in the fossil record by a flowering plant known as Dryas, which gives the period its name.

"My work focuses on abrupt or rapid climate change," Lowell said. "The Younger Dryas offers an opportunity to study such change. The climate then went from warming to cooling very rapidly, in less than 30 years or so."

Scientists noted that the Younger Dryas cold spell seemed to coincide with lower water levels in Lake Agassiz. Had the lake drained? And, if so, had the fresh water of the lake caused this climate change by disrupting ocean currents? This is the view of many scientists, Lowell said.

Lowell investigated a long-standing mystery involving Lake Agassiz -- a significant drop in water level known as the Moorhead Low. It has long been believed that the Moorehead Low when water drained from Lake Agassiz through a new drainage pathway. Could this drainage have flowed through the St. Lawrence Seaway into the North Atlantic Ocean?

"The most common hypothesis for catastrophic lowering is a change in drainage pathways," Lowell said.

The problem is, better dating of lake levels and associated organic materials do not support a rapid outflow at the right time.

"An alternative explanation is needed," he said.

Lowell's research shows that, although water levels did drop, the surface area of the lake increased more than seven-fold at the same time. His research suggests that the lower water levels were caused by increased evaporation, not outflow. While the melting glacier produced a lot of water, Lowell notes that the Moorhead Low was roughly contemporaneous with the Younger Dryas cold interval, when the atmosphere was drier and there was increased solar radiation.

"The dry air would reduce rainfall and enhance evaporation," Lowell said. "The cold would reduce meltwater production, and shortwave radiation would enhance evaporation when the lake was not frozen and sublimation when the lake was ice-covered."

Further research will attempt a clearer picture of this ancient episode, but researchers will have to incorporate various factors including humidity, yearly duration of lake ice, annual temperature, and a better understanding of how and where meltwater flowed from the receding glaciers.

Lowell's efforts to understand changes in ancient climates have taken him from Alaska to Peru, throughout northern Canada and Greenland.

In Greenland, Lowell and a team of graduate students pulled cores of sediment from lakes that are still ice-covered for most of the year. Buried in those sediments are clues to long-ago climate.

"We look at the mineralogy of the sediments," Lowell said, "and also the chironomids. They're a type of midge and they're very temperature sensitive. The exact species and the abundance of midges in our cores can help pinpoint temperature when these sediments were deposited."

Lowell's research was initially funded by the Comer Foundation. In recent years, the National Science Foundation has provided funding for this work.

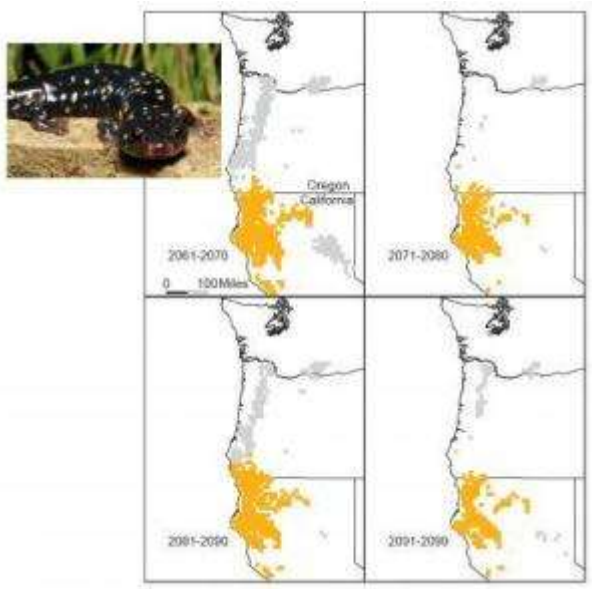
When the Geological Society of America meets this year the University of Cincinnati will be well represented, with more than two dozen papers and presentations. Topics range from ice-age climate to the health effects of corrosion in drinking water pipes.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Cincinnati**. The original article was written by Greg Hand.

http://www.sciencedaily.com/releases/2011/10/111005180513.htm

Climate Change Simulations Show Which Animals Can Take the Heat



The speckled black salamander, one of the species studied, could expand its current range (orange) into new territory (gray). Climate change, however, will put the new areas beyond the salamander's reach. (Credit: Sax Lab, Brown University)

ScienceDaily (Oct. 4, 2011) — Species' ability to overcome adversity goes beyond Darwin's survival of the fittest. Climate change has made sure of that. In a new study based on simulations examining species and their projected range, researchers at Brown University argue that whether an animal can make it to a final, climate-friendly destination isn't a simple matter of being able to travel a long way. It's the extent to which the creatures can withstand rapid fluctuations in climate along the way that will determine whether they complete the journey.

In a paper in *Ecology Letters*, Regan Early and Dov Sax examined the projected "climate paths" of 15 amphibians in the western United States to the year 2100. Using well-known climate forecasting models to extrapolate decades-long changes for specific locations, the researchers determined that more than half of the species would become extinct or endangered. The reason, they find, is that the climate undergoes swings in temperature that can trap species at different points in their travels. It's the severity or duration of those climate swings, coupled with the given creature's persistence, that determines their fate.

"Our work shows that it's not just how fast you disperse, but also your ability to tolerate unfavorable climate for decadal periods that will limit the ability of many species to shift their ranges," said Sax, assistant professor of biology in the Department of Ecology and Evolutionary Biology. "As a consequence, many species that aren't currently of conservation concern are likely to become endangered by the end of the century."

The researchers chose to study frogs, salamanders, and toads because their living areas are known and their susceptibility to temperature changes has been well studied. Based on that information, they modeled the migratory paths for each creature, estimating their travels to be about 15 miles per decade. The climate models showed fluctuations in temperatures in different decades severe enough that four creatures would become extinct, while four other species would become endangered at the least. The other seven would "fare OK," Early said, "but they all lose out a lot."

The temperature swings can cause a species to be stopped in its tracks, which means that it has to do double time when the climate becomes more favorable. "Instead of getting warmer, it can get cooler," said Early, the paper's lead author, of the climate forecasts. "That means that species can take two steps forward, but may be forced to take one step backward, because the climate may become unsuitable for them. Unfortunately, if they take a step back, they have to make up all of that ground. That's what causes the gaps in the climate path."

The study is unique also in that it considers at species' ability to weather adverse intervals. Early and Sax said unfavorable climate lasting a decade would put the species in a bind. If the interval lasted two decades or more, it was likely the species would become extinct. "We've identified one critical piece of information that no one's really thought about, and that is what's the ability of species to persist under non-optimal conditions," Sax said. "If you move to those conditions, can it hang on for a while? The answer will vary for different species."

Rapid changes to climate already being witnessed underscores the study's value. A growing number of scientists believe climate change is intensifying so quickly that the planet is hurtling toward a sixth mass extinction in history -- and the first widespread perishing of creatures since the dinosaurs' reign ended some 65 million years ago. For the first time, species are grappling not just with projected temperatures not seen for the last 2 million years but also with a human-shaped landscape that has compromised and fragmented animals' natural habitats.

Confronted with these realities, Early and Sax say wildlife managers may need to entertain the idea of relocating species, an approach that is being hotly debated in conservation circles. "This study suggests that there are a lot of species that won't be able to take care of themselves," Sax said. "Ultimately, this work suggests that habitat corridors will be ineffective for many species and that we may instead need to consider using managed relocation more frequently than has been previously considered."

Brown University, the U.S. Forest Service and the Portuguese Foundation of Science and Technology funded the research.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Brown University**.

Journal Reference:

1. Regan Early, Dov F. Sax. **Analysis of climate paths reveals potential limitations on species range shifts**. *Ecology Letters*, 2011; DOI: 10.1111/j.1461-0248.2011.01681.x

http://www.sciencedaily.com/releases/2011/09/110929074203.htm

'Mirage-Effect' Helps Researchers Hide Objects

Scientists have created a working cloaking device that not only takes advantage of one of nature's most bizarre phenomenon, but also boasts unique features; it has an 'on and off' switch and is best used underwater. (Credit: Image courtesy of Institute of Physics)

ScienceDaily (Oct. 4, 2011) — Scientists have created a working cloaking device that not only takes advantage of one of nature's most bizarre phenomenon, but also boasts unique features; it has an 'on and off' switch and is best used underwater.

The researchers, from the University of Dallas, Texas, have demonstrated the device's ability to make objects disappear in a fascinating video shown here http://www.youtube.com/watch?v=3YO4TTpYg7g

This novel design, presented on September 4, in IOP Publishing's journal Nanotechnology, makes use of sheets of carbon nanotubes (CNT) -- one-molecule-thick sheets of carbon wrapped up into cylindrical tubes.

CNTs have such unique properties, such as having the density of air but the strength of steel, that they have been extensively studied and put forward for numerous applications; however it is their exceptional ability to conduct heat and transfer it to surrounding areas that makes them an ideal material to exploit the so-called "mirage effect."

The mirage effect, frequently observed in deserts or on long roads in the summer, is an optical phenomenon in which light rays are bent to produce a displaced image of distant objects or the sky.

The most common example of a mirage is when an observer appears to see pools of water on the ground. This occurs because the air near the ground is a lot warmer than the air higher up, causing lights rays to bend upward towards the viewer's eye rather than bounce off the surface.

This results in an image of the sky appearing on the ground which the viewer perceives as water actually reflecting the sky; the brain sees this as a more likely occurrence.

Through electrical stimulation, the transparent sheet of highly aligned CNTs can be easily heated to high temperatures. They then have the ability to transfer that heat to its surrounding areas, causing a steep temperature gradient. Just like a mirage, this steep temperature gradient causes the light rays to bend away from the object concealed behind the device, making it appear invisible.

With this method, it is more practical to demonstrate cloaking underwater as all of the apparatus can be contained in a petri dish. It is the ease with which the CNTs can be heated that gives the device its unique 'on and off' feature.

Lead-author, Dr Ali Aliev, said, "Using these nanotube sheets, concealment can be realized over the entire optical range and rapidly turned on-and-off at will, using either electrical heating or a pulse of electromagnetic radiation.

"The research results also provide useful insights into the optimization of nanotube sheets as thermoacoustic projectors for loud speaker and sonar applications, where sound is produced by heating using an alternating electrical current."

An Institute of Physics spokesperson said, "It is remarkable to see this cloaking device demonstrated in real life and on a workable scale. The array of applications that could arise from this device, besides cloaking, is a testament to the excellent work of the authors."

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Institute of Physics**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Ali E Aliev, Yuri N Gartstein, Ray H Baughman. **Mirage effect from thermally modulated transparent carbon nanotube sheets**. *Nanotechnology*, 2011; 22 (43): 435704 DOI: 10.1088/0957-4484/22/43/435704

http://www.sciencedaily.com/releases/2011/10/111003195245.htm

Where Should I Start with Tomas Tranströmer?

By Colin Cheney

| Posted Thursday, Oct. 6, 2011, at 3:20 PM ET

A picture taken on March 31, 2011 shows Swedish poet Tomas Transtroemer at his home in Stockholm, Sweden.

Photo by JESSICA GOW/AFP/Getty Images

Not to be confused with the Michael Bay franchise, the 80-year-old Swedish psychologist and poet Tomas Tranströmer, just awarded the Nobel Prize in Literature, writes surreal, imagistic poems that explore his fascinations with the music of memory and nature. If you want to get to know his work, here are a few good entry points:

1. *Tomas Tranströmer: Selected Poems, 1954 – 1986*. Edited by former U.S. Poet Laureate Robert Hass, this selection of over 100 poems provides perhaps the best introduction to Tranströmer. Here, the poems are Englished by twelve different translators, including Hass; it's a good way to figure out whose translations make you feel closest to the 'real' Tranströmer.

2. *The Great Enigma: New Collected Poems*. This 2006 collection of Robin Fulton's clear-eyed and spare translations will give you the most complete picture of the arc of Tranströmer's career. It's also one of the only readily available books that shows how the poems were originally collected in Swedish. *The Great Enigma* includes everything from the astonishing teenage lyrics published in 1952 (*17 Poems*), to the haunting *Baltics*, to the late poems of *The Sad Gondola.*

3. *The Half-Finished Heaven: The Best Poems of Tomas Tranströmer*. Robert Bly has long been a champion of Tranströmer, and his translations in the 1960s had a great influence on a generation of American poets. These are perhaps the most well-known versions of Tranströmer in English, and they bear the mark of Bly's own poetic imagination, as well as his particular (and at times controversial) translation style.

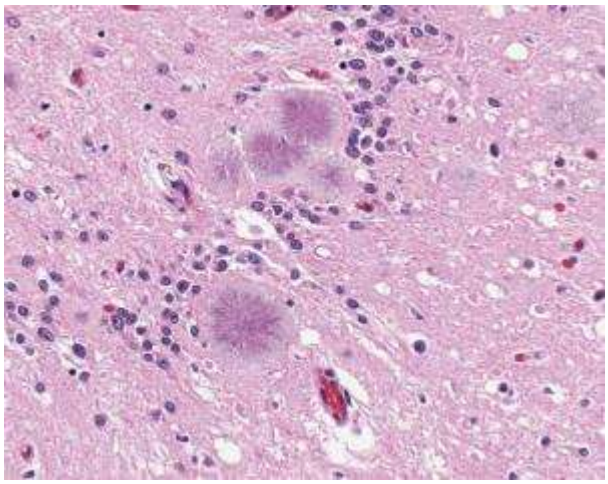
My personal favorite, I should add, is Tranströmer's slim, green chapbook, *Baltics*, which I brought with me when I moved from New York to Thailand last year. In Samuel Charters's translation of this book-length poem, Tranströmer navigates the forested archipelago of his native Sweden, stitching together fragments of memory, family histories, echoes of violence and faith. This, like so many of his other poems, enters us into a landscape that's material and immediate, but decaying slowly into dream:

> The strategic planetarium rotates. The lenses stare into the darkness.
> The night sky is full of numbers, and they're fed into
> a blinking cupboard,
> a piece of furniture,
> inside it the energy of a grasshopper swarm that devours the acres
> of Somalia in half an hour.

I found this book when I was just beginning to consider a life in poetry, and Tranströmer showed me what was possible to discover in a poem. I hold him and his little green book responsible for getting me into this whole poetry racket. I thank him for it.

http://www.slate.com/blogs/browbeat/2011/10/06/tomas_transtromer_what_should_i_read_first_.html

Alzheimer's Might Be Transmissible in Similar Way as Infectious Prion Diseases, Research Suggests



Light photomicrograph of brain tissue reveals the presence of typical amyloid plaques found in a case of variant Creutzfeldt-Jakob disease (vCJD), a prion disease. (Credit: Sherif Zaki; MD; PhD; Wun-Ju Shieh; MD; PhD; MPH / via CDC Public Health Images Library)

ScienceDaily (Oct. 4, 2011) — The brain damage that characterizes Alzheimer's disease may originate in a form similar to that of infectious prion diseases such as bovine spongiform encephalopathy (mad cow) and Creutzfeldt-Jakob, according to newly published research by The University of Texas Health Science Center at Houston (UTHealth).

"Our findings open the possibility that some of the sporadic Alzheimer's cases may arise from an infectious process, which occurs with other neurological diseases such as mad cow and its human form, Creutzfeldt-Jakob disease," said Claudio Soto, Ph.D., professor of neurology at The University of Texas Medical School at Houston, part of UTHealth. "The underlying mechanism of Alzheimer's disease is very similar to the prion diseases. It involves a normal protein that becomes misshapen and is able to spread by transforming good proteins to bad ones. The bad proteins accumulate in the brain, forming plaque deposits that are believed to kill neuron cells in Alzheimer's."

The results showing a potentially infectious spreading of Alzheimer's disease in animal models were published in the Oct. 4, 2011 online issue of *Molecular Psychiatry*, part of the Nature Publishing Group. The research was funded by The George P. and Cynthia W. Mitchell Center for Research in Alzheimer's Disease and Related Brain Disorders at UTHealth.

Alzheimer's disease is a form of progressive dementia that affects memory, thinking and behavior. Of the estimated 5.4 million cases of Alzheimer's in the United States, 90 percent are sporadic. The plaques caused by misshapen aggregates of beta amyloid protein, along with twisted fibers of the protein tau, are the two major hallmarks associated with the disease. Alzheimer's is the sixth leading cause of death in the United States, according to the Alzheimer's Association.

Researchers injected the brain tissue of a confirmed Alzheimer's patient into mice and compared the results to those from injected tissue of a control without the disease. None of the mice injected with the control showed signs of Alzheimer's, whereas all of those injected with Alzheimer's brain extracts developed plaques and other brain alterations typical of the disease.

"We took a normal mouse model that spontaneously does not develop any brain damage and injected a small amount of Alzheimer's human brain tissue into the animal's brain," said Soto, who is director of the Mitchell

Center. "The mouse developed Alzheimer's over time and it spread to other portions of the brain. We are currently working on whether disease transmission can happen in real life under more natural routes of exposure."

UTHealth co-authors of the paper are Rodrigo Morales, Ph.D, postdoctoral fellow, and Claudia Duran-Aniotz, research assistant. Other co-authors are Joaquin Castilla, Ph.D., Basque Foundation for Science, Bilbao, Spain; and Lisbell D. Estrada, Ph.D., Universidad Catolica de Chile, Santiago, Chile. Duran-Anoitz is also a doctoral student at the Universidad de los Andes in Santiago, Chile. Soto, Morales, Castilla and Estrada did a portion of the research at The University of Texas Medical Branch at Galveston.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Texas Health Science Center at Houston**.

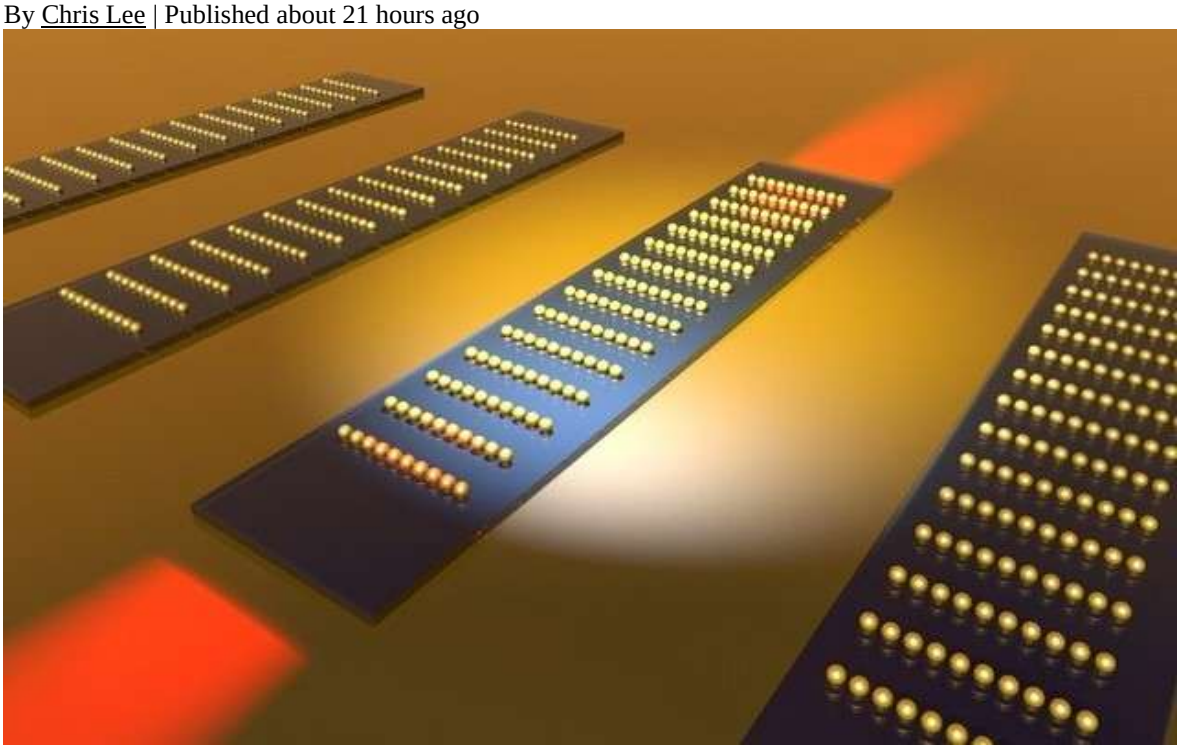
Journal Reference:

1. R Morales, C Duran-Aniotz, J Castilla, L D Estrada, C Soto. **De novo induction of amyloid-β deposition in vivo**. *Molecular Psychiatry*, 2011; DOI: 10.1038/mp.2011.120

http://www.sciencedaily.com/releases/2011/10/111004113757.htm

Plasmons on precious metals make for super-sensitive hydrogen leak detector

By Chris Lee | Published about 21 hours ago



One of the key ingredients to every scientific discipline is the ability to detect stuff. This should be an obvious statement, but it's amazing how many scientific advances have come about not because people were searching for anything in particular, but because a new instrument allowed them to see further, see smaller things, or detect smaller amounts. So I am always excited to see new sensor developments, even if they *only* have industrial applications or ultimately come to nothing.

Being an optics guy, I think the best way to detect something is optically. Combine this with the joys of plasmonics, and it becomes a little difficult to distract me. Add to that the joys of something called impedance matching, and I am in my own little version of heaven. This is exactly what a team of researchers have done, using it to create a hydrogen sensor.

Why hydrogen? It's dangerous. Hydrogen is the smallest of molecules, and it will find the tiniest of holes in any reaction chamber, making the risk of leaks a constant. To make matters worse, a hydrogen-oxygen atmosphere becomes explosive with just four percent of hydrogen present and remains explosive until you get past 77 percent hydrogen. To be safe, you need to detect hydrogen levels well below four percent.

This may sound a bit esoteric, but hydrogen is used in a lot of industrial processes. Not to mention that, to power hydrogen fuel cells—one of the proposed replacements for gasoline and diesel—you will have a tank full of a highly volatile and explosive gas in the back of your car. I think a sensitive, reliable, and inexpensive leak detector might be a valuable addition to such a vehicle, don't you?

Doing it with optics

So we know why we want to detect hydrogen. And doing it without devices that might *initiate* an explosion seems like a good idea, which is why an optical approach is appealing. However, hydrogen is quite difficult to detect optically. Most molecules can be detected through absorption measurements: if you illuminate the gas with the right color of light, some will be absorbed, and this can be detected. Sensitivities in the parts per trillion range have been demonstrated.

Unfortunately, because of the symmetry of the hydrogen molecule, this doesn't work. Quite simply, the rules of quantum mechanics preclude direct absorption measurement.

With direct detection out, the researchers turned to an indirect method: the effect of hydrogen on plasmons, light fields that propagate across the surface of a metal. However, the normal approach to plasmonics doesn't work with hydrogen. You see, for biology applications—detecting comparatively huge DNA and protein molecules—the presence of the molecules changes the refractive index of the material at a metallic surface. This change in refractive index changes the efficiency with which plasmons are generated on those surfaces, and this can be detected by looking for changes in the reflectivity of the surface (if you generate a plasmon, less light is reflected).

But hydrogen is tiny and has basically no effect on the refractive index of the material at its surface. The researchers turned, instead, to the metallic substrate in which the plasmon is generated. They noted that when hydrogen encounters palladium, it creates a chemical bond. Indeed, it becomes incorporated into the crystalline structure of the palladium, expanding the spacing between palladium atoms. Surely, these dramatic changes must effect the propagation of the plasmon?

This turns out to be a difficult question to answer, because palladium, by itself, is not very good at supporting plasmons anyway. Even when you choose everything optimally, most incident light is reflected, and only a small fraction is turned into a plasmon. In terms of a sensor, this means you are detecting small changes on top of a large background signal—not desirable.

This is where the power of looking at light propagation through the lens of circuit design really pays off. By using the concept of impedance matching (see side bar), the researchers could ensure that, under normal circumstances, light would be absorbed to generate plasmons, while in the presence of hydrogen it would not.

Impedance matching

Both optical equipment and electronics involve sending signals in the form of electromagnetic waves between different circuit elements, such as amplifiers or filters. Now, without precautions, when a wave encounters the interface between components, some of the energy will be reflected. Why? As the wave is traveling down the system, it travels with a certain speed. In the next component, however, it will travel with a different speed.

To accommodate this sharp transition between the two components, the phase of the field has to change as it crosses the boundary. But if the phase changes, the amplitude of the fields at each side of the boundary are different. This difference generates a current that radiates a field just sufficient to make the amplitudes equal, which creates a signal traveling in the opposite direction. The more dramatic the phase change, the larger the reflected signal.

Electronic engineers get around this problem using a process called impedance matching. What impedance matching does is present the electromagnetic wave with something that looks exactly like the medium it is already traveling through. As a result, there is no reflection generated at all. In practice, there are actually *two*

reflected waves, but they are exactly out of phase so that they destructively interfere. Meaning that all the power goes forward as if nothing ever happened.

Although impedance matching has been the domain of electrical engineering, it is slowly becoming an explicit tool in optics—it has always been implicitly used. In this case, the researchers placed a series of palladium wires on top of a gold substrate with a glass spacer in between. The structure and spacing of the wires make it very easy to couple light with a certain color into a surface plasmon on the wires.

The free electrons floating around in the gold feel these plasmons and start oscillating as well. These two oscillations are exactly out of phase with each other. If the two plasmons were to radiate, their fields would be out of phase—meaning destructive interference and no light—so, instead, all of that energy is dissipated as heat within the metals.

Ideally, this implies that there is no light reflected. But in physics, as in life, nothing is quite perfect, and the researchers get a minimum of between 0.5 and 0.1 percent reflectance, depending on the width and spacing of the wires (which also means that the color of light required changes as well). Once hydrogen is added, the optical properties of the palladium start to change, and the nearly perfect balance between the two plasmons is disrupted. As a result, light begins to radiate from the structure more efficiently.

The researchers showed that they could easily detect 0.5 percent hydrogen with what appears to be a lot of room to spare. Interestingly, they did not find out how low a percentage of hydrogen they could detect, which may be due to their gas control system. Nevertheless, 0.5 percent is a good start. And certainly four percent is very easy to sense with this system.

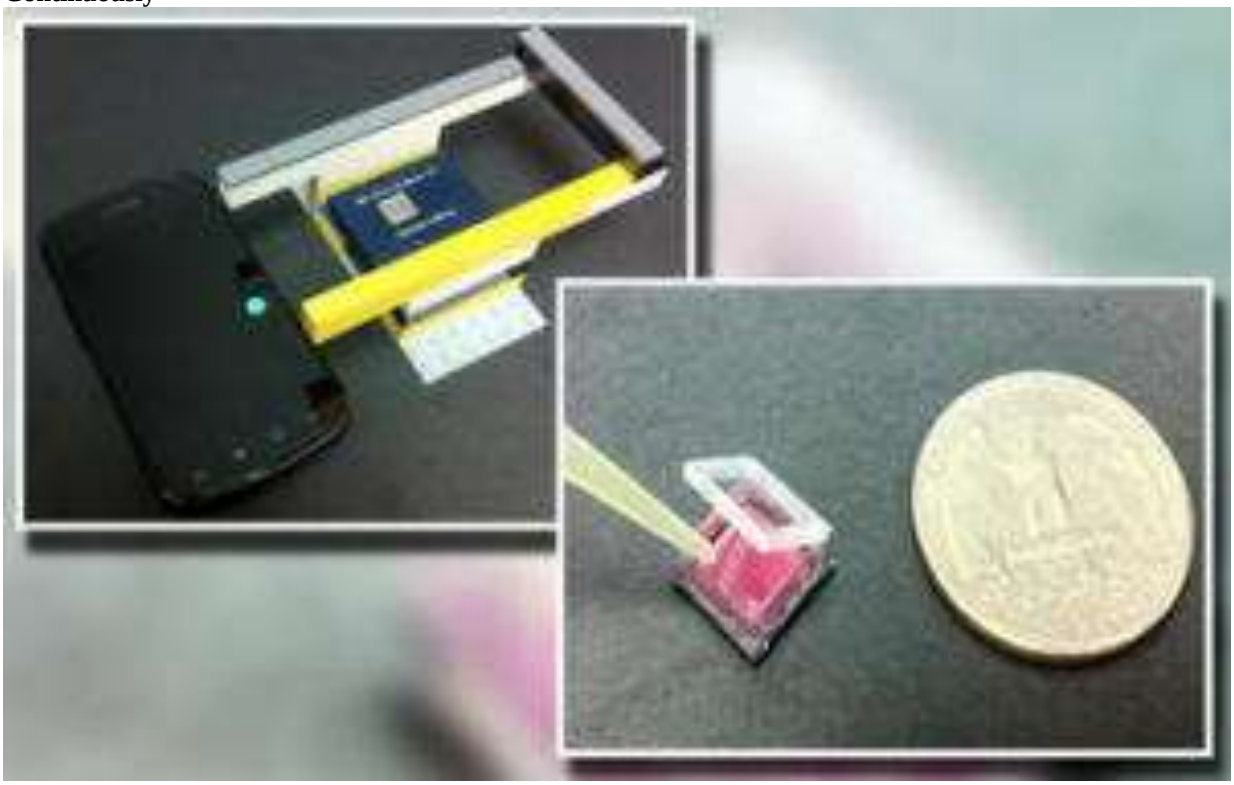
It also has the potential to be relatively cheap. It doesn't take much gold or palladium, while the light source could be as simple as a light emitting diode.

Nano Letters, 2011, DOI: 10.1021/nl202489g

Photograph by ucf.edu

http://arstechnica.com/science/news/2011/10/perfect-absorber-makes-a-great-detector.ars

Engineers Build Smart Petri Dish: Device Can Be Used for Medical Diagnostics, Imaging Cell Growth Continuously



The ePetri platform is built from Lego blocks and uses a smartphone as a light source. The imaging chip is seen in detail on the right. (Credit: Image courtesy of Guoan Zheng, California Institute of Technology)

ScienceDaily (Oct. 4, 2011) — The cameras in our cell phones have dramatically changed the way we share the special moments in our lives, making photographs instantly available to friends and family. Now, the imaging sensor chips that form the heart of these built-in cameras are helping engineers at the California Institute of Technology (Caltech) transform the way cell cultures are imaged by serving as the platform for a "smart" petri dish.

Dubbed ePetri, the device is described in a paper that appears online this week in the *Proceedings of the National Academy of Sciences* (*PNAS*).

Since the late 1800s, biologists have used petri dishes primarily to grow cells. In the medical field, they are used to identify bacterial infections, such as tuberculosis. Conventional use of a petri dish requires that the cells being cultured be placed in an incubator to grow. As the sample grows, it is removed -- often numerous times -- from the incubator to be studied under a microscope.

Not so with the ePetri, whose platform does away with the need for bulky microscopes and significantly reduces human labor time, while improving the way in which the culture growth can be recorded.

"Our ePetri dish is a compact, small, lens-free microscopy imaging platform. We can directly track the cell culture or bacteria culture within the incubator," explains Guoan Zheng, lead author of the study and a graduate student in electrical engineering at Caltech. "The data from the ePetri dish automatically transfers to a computer outside the incubator by a cable connection. Therefore, this technology can significantly streamline and improve cell culture experiments by cutting down on human labor and contamination risks."

The team built the platform prototype using a Google smart phone, a commercially available cell-phone image sensor, and Lego building blocks. The culture is placed on the image-sensor chip, while the phone's LED screen is used as a scanning light source. The device is placed in an incubator with a wire running from the chip to a laptop outside the incubator. As the image sensor takes pictures of the culture, that information is sent out to the laptop, enabling the researchers to acquire and save images of the cells as they are growing in real time. The technology is particularly adept at imaging confluent cells -- those that grow very close to one another and typically cover the entire petri dish.

"Until now, imaging of confluent cell cultures has been a highly labor-intensive process in which the traditional microscope has to serve as an expensive and suboptimal workhorse," says Changhuei Yang, senior author of the study and professor of electrical engineering and bioengineering at Caltech. "What this technology allows us to do is create a system in which you can do wide field-of-view microscopy imaging of confluent cell samples. It capitalizes on the use of readily available image-sensor technology, which is found in all cell-phone cameras."

In addition to simplifying medical diagnostic tests, the ePetri platform may be useful in various other areas, such as drug screening and the detection of toxic compounds. It has also proved to be practical for use in basic research.

Caltech biologist Michael Elowitz, a coauthor on the study, has put the ePetri system to the test, using it to observe embryonic stem cells. Stem cells in different parts of a petri dish often behave differently, changing into various types of other, more specialized cells. Using a conventional microscope with its lens's limitations, a researcher effectively wears blinders and is only able to focus on one region of the petri dish at a time, says Elowitz. But by using the ePetri platform, Elowitz was able to follow the stem-cell changes over the entire surface of the device.

"It radically reconceives the whole idea of what a light microscope is," says Elowitz, a professor of biology and bioengineering at Caltech and a Howard Hughes Medical Institute investigator. "Instead of a large, heavy instrument full of delicate lenses, Yang and his team have invented a compact lightweight microscope with no lens at all, yet one that can still produce high-resolution images of living cells. Not only that, it can do so dynamically, following events over time in live cells, and across a wide range of spatial scales from the subcellular to the macroscopic."

Elowitz says the technology can capture things that would otherwise be difficult or impossible -- even with state-of-the-art light microscopes that are both much more complicated and much more expensive.

"With ePetri, you can survey the entire field at once, but still maintain the ability to 'zoom in' to any cells of interest," he says. "In this regard, perhaps it's a bit like an episode of CSI where they zoom in on what would otherwise be unresolvable details in a photograph."

Yang and his team believe the ePetri system is likely to open up a whole range of new approaches to many other biological systems as well. Since it is a platform technology, it can be applied to other devices. For example, ePetri could provide microscopy-imaging capabilities for other portable diagnostic lab-on-a-chip tools. The team is also working to build a self-contained system that would include its own small incubator. This advance would make the system more useful as a desktop diagnostic tool that could be housed in a doctor's office, reducing the need to send bacteria samples out to a lab for testing.

Funding support was provided by the Coulter Foundation.

Story Source:

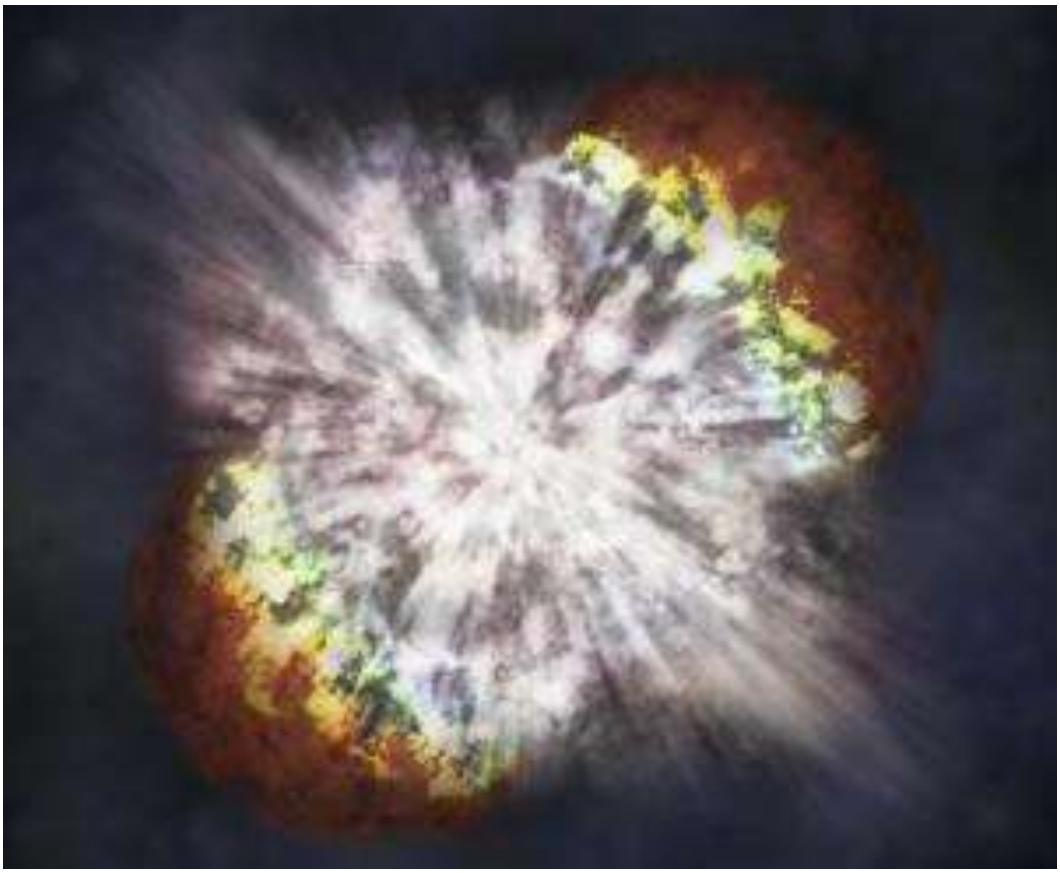
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **California Institute of Technology**. The original article was written by Katie Neith.

Journal Reference:

1. Guoan Zheng, Seung Ah Lee, Yaron Antebi, Michael B. Elowitz, and Changhuei Yang. **The ePetri dish, an on-chip cell imaging platform based on subpixel perspective sweeping microscopy**. *Proceedings of the National Academy of Sciences*, 2011; DOI: 10.1073/pnas.1110681108

http://www.sciencedaily.com/releases/2011/10/111003151834.htm

Discovery of Expanding Universe by Observing Distant Supernovae



Artist's illustration shows what a supernova might looked like if viewed at a close distance. See original for more details. (Credit: NASA/CXC/M.Weiss)

ScienceDaily (Oct. 4, 2011) — The Royal Swedish Academy of Sciences has decided to award the Nobel Prize in Physics for 2011 with one half to Saul Perlmutter, of the Supernova Cosmology Project at Lawrence Berkeley National Laboratory and the University of California, Berkeley; and the other half jointly to Brian P. Schmidt, of the High-z Supernova Search Team at Australian National University, Weston Creek, Australia, and Adam G. Riess, of the High-z Supernova Search Team at Johns Hopkins University and the Space Telescope Science Institute, Baltimore for the discovery of the accelerating expansion of the Universe through observations of distant supernovae.

Written in the stars

"Some say the world will end in fire, some say in ice," Robert Frost wrote. What will be the final destiny of the Universe? Probably it will end in ice, if we are to believe this year's Nobel Laureates in Physics. They have studied several dozen exploding stars, called supernovae, and discovered that the Universe is expanding at an ever-accelerating rate. The discovery came as a complete surprise even to the Laureates themselves.

In 1998, cosmology was shaken at its foundations as two research teams presented their findings. Headed by Saul Perlmutter, one of the teams had set to work in 1988. Brian Schmidt headed another team, launched at the end of 1994, where Adam Riess was to play a crucial role.

The research teams raced to map the Universe by locating the most distant supernovae. More sophisticated telescopes on the ground and in space, as well as more powerful computers and new digital imaging sensors (CCD, Nobel Prize in Physics in 2009), opened the possibility in the 1990s to add more pieces to the cosmological puzzle.

The teams used a particular kind of supernova, called type Ia supernova. It is an explosion of an old compact star that is as heavy as the Sun but as small as Earth. A single such supernova can emit as much light as a whole galaxy. All in all, the two research teams found over 50 distant supernovae whose light was weaker than expected -- this was a sign that the expansion of the Universe was accelerating. The potential pitfalls had been numerous, and the scientists found reassurance in the fact that both groups had reached the same astonishing conclusion.

For almost a century, the Universe has been known to be expanding as a consequence of the Big Bang about 14 billion years ago. However, the discovery that this expansion is accelerating is astounding. If the expansion will continue to speed up the Universe will end in ice.

The acceleration is thought to be driven by dark energy, but what that dark energy is remains an enigma -- perhaps the greatest in physics today. What is known is that dark energy constitutes about three quarters of the Universe. Therefore the findings of the 2011 Nobel Laureates in Physics have helped to unveil a Universe that to a large extent is unknown to science. And everything is possible again.

Saul Perlmutter, U.S. citizen. Born 1959 in Champaign-Urbana, IL, USA. Ph.D. 1986 from University of California, Berkeley, USA. Head of the Supernova Cosmology Project, Professor of Astrophysics, Lawrence Berkeley National Laboratory and University of California, Berkeley, CA, USA.

Brian P. Schmidt, U.S. and Australian citizen. Born 1967 in Missoula, MT, USA. Ph.D. 1993 from Harvard University, Cambridge, MA, USA. Head of the High-z Supernova Search Team, Distinguished Professor, Australian National University, Weston Creek, Australia.

Adam G. Riess, U.S. citizen. Born 1969 in Washington, DC, USA. Ph.D. 1996 from Harvard University, Cambridge, MA, USA. Professor of Astronomy and Physics, Johns Hopkins University and Space Telescope Science Institute, Baltimore, MD, USA.

Prize amount: SEK 10 million, with one half to Saul Perlmutter and the other half to be shared equally between Brian Schmidt and Adam Riess.

For further information, including backgrounders for the public and scientists and links for further reading, see: http://www.nobelprize.org/nobel_prizes/physics/laureates/2011/press.html

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Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Nobel Foundation**.

http://www.sciencedaily.com/releases/2011/10/111004091704.htm

Data gold mine lifts veil on world of online poker

- 03 October 2011 by **Celeste Biever**
- Magazine issue 2832.

Online poker, staked out *(Image: Karen Bleier/AFP/Getty)*

Software has provided a mass of statistics about online poker, one of the world's biggest draws, and could help pinpoint problem gamblers

When 4 million people worldwide checked into some of the world's most popular poker websites and played an estimated billion hands, software was watching.

The results reveal patterns in play that could help inform how poker is regulated and uncover a wealth of information about one of the internet's most popular pastimes. "It's a data gold mine," says economist Ingo Fiedler at the University of Hamburg in Germany. "It is interesting for regulators, academics and also for the treatment of problem gamblers."

Fiedler gathered his data on the 4 million players between September 2009 and March 2010. To do so, he turned to the poker-market spectator Pokerscout.com. Its software logged the locations of players, game outcomes, the date and time, and the commission paid to the operator by people playing on the two biggest sites worldwide at the time - Pokerstars and Full Tilt Poker (the latter has recently been shut down amid allegations of financial irregularities) - as well as smaller operators, Everest Poker, IPN Poker and Cake Poker.

Altogether, that amounted to 4.6 million different online-poker "identities" worldwide, which Fiedler reckons equates to about 3.9 million different players; some players play under different screen names on several different poker sites. As those websites accounted for about two-thirds of the market at the time, he used the data to extrapolate a figure for the total number of people playing online poker worldwide: 6 million. Click here to see the geographic spread of poker players and current legal status.

But this information, which first appeared in a book co-authored by Fiedler and released earlier this year in German called *The Market for Online Poker: Player origins and gambling habits*, also reveals patterns in play, painting a picture of a few dominant players who play a huge amount, and a majority who barely play at all. Fifty per cent of people played for less than 5 hours in a period of six months, while 6 per cent played for more than 100 hours. "Very few people account for a lot of the playing volume," says Fiedler.

Although he did not capture the amount of money exchanged between players, Fiedler can still get some idea of how much money is changing hands. He recorded the average rake - the amount of money paid to the poker site by a player - per hour (Click here to see amount paid by players to online poker sites). Generally, the higher the stakes being played for, the higher the rake.

Fiedler says the next challenge is teasing apart which of the people who play intensively are pathological gamblers as opposed to professionals - perhaps by finding ways to use the data to measure their gambling patterns. Impulsive betting, for example, is one way to tell a problem gambler from a professional.

Kahlil Philander, who studies gambling policy at the University of Nevada in Las Vegas says that this could help further our understanding of gaming behaviour. "Online poker is a relatively benign activity for 95 to 99 per cent of its users, but is very intense for a handful of professionals and potential pathological gamblers," he says. "Further distinguishing between those two groups is the next challenge for player-analytics software, to help determine which players may be at-risk gamblers."

When this article was first posted, the first sentence read: "BETWEEN September 2009 and March 2010, software watched as about 4 million people worldwide checked into some of the world's most popular poker websites and played an estimated billion hands."

Poker: a game of skill for the few and of luck for the rest

ARE online poker players playing a game of skill or chance? It's a contentious issue, as the so-called "predominance test" - a measure of whether skill or chance is more dominant - is used in many US jurisdictions, and others across the world, to settle whether poker should be treated as gambling. In many places, this is what determines its legality.

In 2009, Ingo Fiedler and his colleague Jan-Philipp Rock at the University of Hamburg, Germany, reasoned that while each individual hand has elements of both skill and luck, over time winnings or losses due to chance should cancel out, whereas those due to skill, or a lack of it, should be consistent and accumulate. He tracked how 55,000 online players' winnings and losses varied over time and calculated that a typical player, who loses overall, would have to play around 1560 hands, equivalent to about 22 hours online, before their winnings or losses were more a result of their skill - or lack of it - than luck. The pair called this point the "critical repetition frequency" (CRF).

Now new figures reveal that most people play less than 5 hours over the course of 6 months - not enough for their skill level to become the dominant factor. On the other hand, Fiedler discovered that professional players - those who regularly win - have a much higher CRF. It turns out that far more hands need to be played for skill to show through than a lack of skill. That is because skilled players win less per hand than bad players lose. Or to put it another way, it is much easier to throw your money away than to win other people's.

Professionals play so many hands, often by playing on multiple tables at once, that they easily pass their CRF (click here to see how professional and typical players differ). "They are playing a game of skill," says Fiedler.

The predominance test is misguided because of this difference between the two types of players, he says. "The legalisation of online poker should not depend on the degree of skill of the game, but the potential for addiction," he says, something he hopes the kind of data he has gathered will shed light on.

http://www.newscientist.com/article/mg21128324.500-data-gold-mine-lifts-veil-on-world-of-online-poker.html

World's first cloned human embryonic stem cells

- 18:00 05 October 2011 by **Peter Aldhous**

More than seven years after Woo Suk Hwang's South Korean team fraudulently claimed to have created the first cloned human embryonic stem cells (hESCs), finally the cells seem to have been made for real.

There's one problem: the cells contain an extra set of chromosomes, which means they could never be used to grow tissues for transplantation from a patient's own cells – the ultimate goal. But having at last shown that there is no block to making cloned human stem cells, biologists are optimistic that it should be possible to find a solution to the chromosome problem.

Dieter Egli and Scott Noggle of the New York Stem Cell Foundation Laboratory in New York City and colleagues fused skin cells with unfertilised human eggs. When they removed the eggs' own chromosomes, as is usual in cloning experiments, the resulting embryos all stopped developing at the six to 12 cell stage.

However, when the eggs' chromosomes were left in place, a fifth of the embryos developed further to form balls of cells called blastocysts. From two out of 13 of these embryos, the team isolated hESCs.

One of the cloned cell lines came from a man with type 1 diabetes, the other from a healthy man.

The next step

The search is now on to identify the factors associated with the egg chromosomes that allowed the embryos to develop to the blastocyst stage, says George Daley, a stem cell biologist at the Children's Hospital in Boston, who was not involved in the research.

Once these factors are known, it should be possible to produce cloned hESCs without retaining the extra set of chromosomes. Candidate factors include various proteins already known to act as "checkpoints" for cell division.

"I don't think this is an insurmountable biological obstacle," says Daley. "We need to figure out what the mechanism is and complement it."

Egli is also substituting other cells for the skin cells used in the initial experiments, to see if some will yield blastocyst embryos even when fused with eggs stripped of their chromosomes. "It could be as simple as trying other cell types," he says.

Researchers will be keen to find the answer, given recently discovered drawbacks of induced pluripotent stem cells, or iPSCs, which are created from adult cells by a genetic reprogramming method, and seen as an alternative to cloned hESCs. Not only do iPSCs seem to be incompletely reprogrammed, retaining a "memory" of their former existence, but they may also be seen by the immune system as foreign, even when transplanted into genetically identical animals.

No eggs for free

One important reason Egli and Noggle succeeded in their experiments is that they were able to pay women to donate their eggs for research, thanks to the State of New York's 2009 decision to allow the practice. Indeed, Egli used to work in the lab of Kevin Eggan at the Harvard Stem Cell Institute in Cambridge, Massachusetts,

who this week describes his team's abject failure to find women who were prepared to donate their eggs for free for similar experiments.

In the US, women are typically paid several thousand dollars when donating their eggs to infertile couples undergoing IVF, compensating for the time and discomfort involved. The New York team piggybacked on this process by asking women who had already decided to donate if they wanted to provide eggs for research, instead. Those who agreed were then paid the same $8000 fee given to IVF egg donors.

Approaching women who were already committed to donating their eggs "was quite creative", says Insoo Hyun, a bioethicist at Case Western Reserve University in Cleveland, Ohio. He believes the approach reduces concerns about women being lured to donate for financial reasons. But ethical objections to the research will remain, as isolating hESCs still involves destroying a blastocyst embryo.

It may also be difficult for other groups to follow the New York team's lead. Some ethical guidelines, including those adopted in 2005 by the US National Academy of Sciences, frown upon paid donations – and in California, paying for eggs for use in research is prohibited by law.

Journal reference: Cloned hESCs: *Nature*, DOI: 10.1038/nature10397, Egg donation: *Cell Stem Cell*, DOI: 10.1016/j.stem.2011.08.002

http://www.newscientist.com/article/dn21012-worlds-first-cloned-human-embryonic-stem-cells.html?full=true&print=true

Green Screen

Is it better for the environment to watch TV via satellite, cable, or the Internet?

By Brian Palmer|Posted Tuesday, Oct. 18, 2011, at 7:23 AM ET

What's the greenest way to watch television?

Photo by Sean Gallup/Getty Images.

I just moved into a new apartment, and I can't decide how to get my television fix. Would it be better for the environment if I watched via cable, satellite, or streaming over the Internet?

It's high time to examine America's favorite pastime. According to the Bureau of Labor Statistics, Americans spend 2.7 hours per day watching television. That's half of our leisure time, and it would account for nearly six weeks per year of round-the-clock television watching.

All other things held equal, size matters: Your energy use will be higher if you're watching TV on the flat-screen behemoth in your living room than it would if you were using the tiny display of your smartphone. So for the purposes of this comparison, let's assume that no matter how the programming is delivered, you're looking at it on the same type of screen.

From the consumer end of the equation, the outcome is very clear: Your set-top box, whether it's hooked up to the cable system or a satellite provider, is a major waste of energy. You should get rid of it right now and switch to an Internet-based system that uses either a low-energy box or no box at all.

Over the course of a year, a set-top high-definition cable box paired with a DVR consumes 446 kilowatt-hours, which is 31 kilowatt-hours more than an Energy Star refrigerator, according to data (PDF) compiled by the Natural Resources Defense Council and Ecos Consulting. Almost two-thirds of that consumption occurs when you're not even watching television, because the boxes use almost as much energy when not in use.

As for the differences between set-top boxes, the cable devices consume approximately 34 watts during use, which is slightly better than the satellite models. Hardware dedicated for streaming Internet content, such as the Apple TV or Roku box, tend to perform far better, using less than 7 watts during use. The Apple model consumes just 0.5 watts in sleep mode—a huge improvement over satellite and cable boxes.

An even better solution would be to video mirror downloaded programs from your laptop or other device using the appropriate adapter. The iPad, iPhone, and Android phones each use between 3 and 6 watts, far less than any of the standard set-top boxes. (A standard desktop computer isn't a good alternative. Even when idle and with the screen off, they use more than 30 watts [PDF].) Your Wi-Fi router adds another 5 watts to the equation, and your cable or DSL modem might tack on another 4—although you'd probably be running those regardless.

The other end of the equation is the energy consumed by the satellite and cable companies sending the signal to your box. Unfortunately, there are no good data on their power consumption. The Lantern huddled with some consultants in this field who feel that the satellite providers probably beat out cable, if we're looking only at television. Cable providers have to power and maintain thousands of infrastructure boxes on street corners around the country. They have to lay underground cable from house to house. And there's a lot of embedded energy in those cables, such as the copper mining. Solar-powered satellites don't share those problems.

On the other hand, most households receive broadband Internet, which shares a lot of the same infrastructure as cable. Some satellite providers even deliver video on demand through the Internet.

This lack of clarity isn't particularly significant, however, because household energy consumption is what really matters. There are more than 112 million households in the United States, with an average of 2.24 televisions per home. Approximately 116 million of those 250 million televisions have set-top boxes, which means a collective, continuous energy consumption of approximately 4 billion watts. If they all switched to a video-mirrored tablet, it could save the energy grid as much as 2.6 billion watts. By comparison, the Internet giant Google shocked the world in September when the company revealed that, worldwide, its data centers continuously draw 260 million watts. Their total consumption is an order of magnitude less than the energy that could be saved nationwide if everyone turned off their set-top boxes.

That doesn't mean the cable and satellite companies are off the hook. They could make a lot of changes to decrease energy consumption. First, they could choose less-energy-hungry set-top boxes, since consumers have no real choice in the matter. (European boxes, according to the NRDC report, are smarter with energy management.)

The home DVR model is also terribly inefficient. Most people record many times more programming than they ever intend to watch. And the recording system that allows you to rewind live television runs all the time, whether or not the TV is on. That means the DVR's hard drive is spinning round-the-clock, eating through kilowatts.

It would be far more efficient to convert DVR to a video-on-demand-type system, with the television providers hosting the data remotely. That way many people could share the same copy of a show. Unfortunately, legal complexities have gotten in the way of this relatively obvious solution. Content providers say that arrangement would be more like pay-per-view than home DVRs, so they should get another payment

each time a household watches their shows. Until the big boys can settle this, your electricity meter is going to keep spinning out of control.

The Lantern thanks Gregg Hardy of Ecos Consulting and Noah Horowitz of the NRDC.

http://www.slate.com/articles/health_and_science/the_green_lantern/2011/10/cable_satellite_or_the_internet_which_is_better_for_the_environm.html

The Year of Reading Differently
What happened when I abandoned print for pixels.

By Edward Stourton|Posted Saturday, Oct. 8, 2011,

Photo by Hemera.

Towards the end of last year it became apparent that the Stourton household was heading for a book crisis. My wife and I both brought substantial collections into our marriage. I get a steady stream of review copies and manuscripts from friends and acquaintances hoping for endorsements. She makes factual television programmers and is often sent books by aspiring producers and presenters. I am incontinent when the urge to buy a new hardback novel comes upon me, and she reads incredibly quickly. All these factors had conspired to fill our shelves. The books had become Triffid-like, taking over our home and lives. Something had to be done.

So, almost a year ago, in this paper, I took these vows: "My resolution is that for 12 months I shall buy no new books and shall limit my leisure reading to books already in my library. There are bound to be professional reasons for bending the rule from time to time. But if I devote myself to our existing collection I might learn something about myself and my family ... I shall catch up with some of the friends' books which have been neglected, and I shall attack the many review copies that still have a marker stuck somewhere in the first couple of chapters ... "

I also—partly at the instigation of the editors at the FT, and very much through gritted teeth—promised to try an e-reader. It might, we thought, be one solution to the overstuffed shelves. And I said I would report back on my reading habits, both paper-based and electronic.

Eleven months on, abstinence from new book buying has proved one of the hardest challenges I have ever undertaken—far tougher than giving up alcohol (which I have had to do on reporting trips to Saudi Arabia) or any Lenten effort I have made to deny myself some pleasurable form of food. It means avoiding what in Catholic teaching are known as "occasions of sin". Bookshop windows become bright bordellos of temptation, and a walk down Piccadilly (Hatchards and a huge Waterstone's within yards of one another) is like some Homeric trial of will.

I also realized that I had to stop myself reading the review sections of the weekend papers. On Saturdays and Sundays, I find that my eyes naturally slide away from the heavyweight political commentaries I ought to be reading for work purposes and on to the books pages, and giving into that temptation is one of my great weekend pleasures—not, in normal circumstances, a very grave sin. But a glowing review of a new book by one of your favorite authors is simple torture when you cannot buy it.

I did, I confess, find some inventive "professional reasons for bending the rule".

The most pleasurable was a serendipitously timed invitation to chair the judges of the Desmond Elliott Prize for a first novel. I had to finish 10 books over a period of six weeks or so—enough to satisfy my new book lust for a while and, of course, the books were sent to me for free, so I could add them to our crowded shelves without feeling guilty about breaking my vow. On the other hand, they were extremely good (I recommend Anjali Joseph's *Saraswati Park*, the winner, and, the other two finalists, *Boxer, Beetle* by Ned Beauman, and *Pigeon English* by Stephen Kelman), so the experience also made me feel antsy about all the other new writing I was denying myself.

The other excuse I found to break my vows was associated with a Pyrenean trek. This summer I took part in a four-day commemorative hike in the footsteps of second world war escapers and evaders (I am making a BBC Radio 4 series on the subject). The experience opened a door on to such a fascinating chapter of history that it is growing from a radio series into a book project and I have begun to read some of the memoirs written by those who made the journey "for real" during the dark days of the Nazi occupation of France.

These tales were popular in the 1940s and 1950s, when memories of the war were still vivid, and some of them—such as George Millar's *Maquis* and *Horned Pigeon*—are still classics. Others are out of print and, rootling around on Amazon and AbeBooks, I discovered that you can buy first editions and early reprints for really not very much money. So I have been buying like crazy.

It is almost impossible for people of my age or younger to manage the imaginative leap required to get inside the minds of those who made that journey some seven decades ago. But reading what they did in a book printed close to the time of their exploits helps. There is a period feel to these early editions that takes you closer to those who wrote them.

All of this has restricted the reading time I have been able to devote to our existing collection of books—the only one of my vows I was really looking forward to. I began by revisiting Evelyn Waugh and Graham Greene, and honesty compels me to admit that I have got no further. Indeed, I find that I am in no great hurry to get further. Waugh's *Sword of Honour* trilogy has restored to me the youthful pleasure of laughing loudly at a book in public places, while Greene's *The Quiet American*, my current bedside companion, leaves me as awestruck as I was when I first read it as a teenager. How can anyone do so much with so few words?

Here is a cheerful conclusion: on the basis of the experiment to date I am persuaded that, if I have to, I can go on re-reading my existing library without ever getting bored—I estimate I have enough good literature in the house to last me for the rest of my life.

So why bother with an e-reader? Well, a promise is a promise. I bought my Kindle in April. It was a purchase made without pleasure and for weeks it lay unopened in its Amazon box—a sullen presence sulking on my desk. Only when the BBC sent me on assignment to investigate corruption in the nations of the former Soviet Union was I galvanized into powering it up.

It was one of those reporting trips that really test your physical stamina. There were several days of frantic scurrying around Moscow collecting interviews, followed by an overnight sleeper to Kazan, the capital of Tartarstan. The drunken Russian oil engineer who shared my compartment thought he spoke English but he

was mistaken; the unbroken miles of birches that flashed passed as we rattled through that night seemed never-ending as he fired out words that never quite added up to a coherent sentence. Then there was a complicated sequence of flights to Ukraine, more journeys in cramped taxis, and finally a long flight home. I spent quite a lot of time hanging around in the antechambers of the rich and the powerful waiting for interviews. Easy access to reading material is essential to staying sane on such a trip.

The Kindle passed this test with flying colors; indeed, it proved itself the ideal reporter's companion. It is light and a convenient size—you can just about stuff it into a jacket pocket. Downloading a book takes seconds (if you have an Amazon account, you pay almost without noticing the transaction, which can be dangerous). It never ran low on power, flashing cheerfully into life whenever I needed a distraction.

By the time I reached Kiev I had discovered that I could buy newspapers wirelessly, and I used the Kindle to read them over breakfast in a floating hotel on the Dnieper river. Even my producer, a battered paperback man, was impressed. My conversion—and I sense this is a common experience among those who have taken the plunge—was swift but far from complete.

The first book I read on the Kindle was *The Book Lover's Tale*, a psychological drama about a bibliomaniac gone to the bad. A failed writer, he makes his living by putting together libraries for rich men; his revenge for disappointment is to seduce the clients' wives. The novel is, in part, a hymn to the seductive power of the book as a physical object. The (anti) hero loses his virginity in the basement of a second-hand bookshop in Soho, where "the smell of dust on old pages filled my lungs and my nose, mixing with the smell of her cheap lipstick, and the taste of chewing gum and cigarettes on her breath."

I might have chosen *The Book Lover's Tale* to begin my e-book life out of a sense of irony—in fact, I did so because the book is my eldest son Ivo's second novel. Its publication coincided with my purchase of the Kindle and I have, of course, bought several hardback copies as well as the e-book. My bibliomania is still at the benign stage; I love having books about me so I can look at them, revisit them and (sometimes) share them. The way Ivo writes about books has hurried me to a conclusion I would have anyway reached before long; if I buy and like a book on Kindle, I shall almost certainly buy a hardback copy too. So I shall end up spending more money, not less, as a result of the e-book revolution.

It is just possible, however, that the e-reader will kill the paperback; I have done my Waugh and Greene reading with old paperbacks and, handsome as those Penguin covers are, there is no denying that they are, at best, fragile. The Kindle is remarkably resilient. During our summer holiday in France, our dog leapt out of the lake and thwacked mine—it was lying on the picnic rug—with a wet paw; he inflicted no damage at all. So if I need to buy a new copy of *The Quiet American* before I finish rereading it (quite possible, given the signs of strain on the spine of my venerable copy), I can imagine downloading it rather than buying a new paperback.But Kindle's recent advertising carries one of the silliest boasts I have ever read: it can store 3,500 books. Assuming I live for another 25 years (which would take me to my late seventies), I would need to read 2.6 books a week to reach that total. More to the point, what possible sense would it make to substitute a thin grey slate-like object that I might forget on the Tube for the groaning shelves of the beautiful and instructive artifacts that adorn my house?

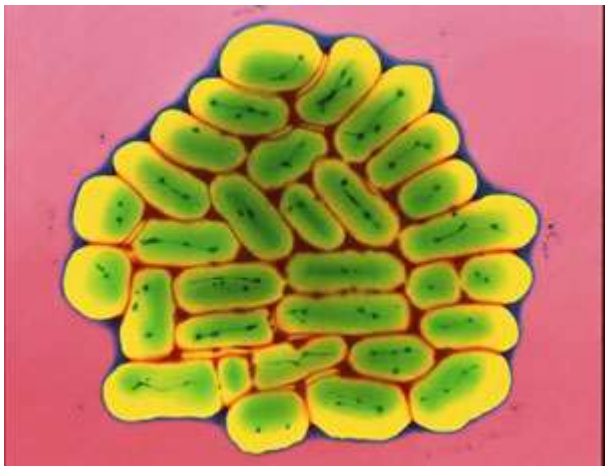
I am keeping my Kindle but I am giving up my vows of abstinence. I have started reading the reviews again and have already drawn up a list of hardbacks I would like to buy. I am off to the shops for a bender.

We shall just have to find more room somewhere.

http://www.slate.com/articles/arts/ft/2011/10/the_kindle_fire_the_ipad_e_readers_what_happened_when_i_abandone.single.html

Cheatobiotics: Send in the subversive superbugs

- 07 October 2011 by **Clare Wilson**
- Magazine issue 2832



Take the rest of the day off *(Image: Dr Kari Lounatmaa/Science Photo Library/ Getty)*

Breeding strains of bacteria too lazy to attack us could help the fight against deadly bugs like MRSA

Gallery: Top ten superbug super-villains

IT IS a superbug with quite a few tricks up its sleeve. Found pretty much everywhere, from soil and water to your skin and lungs, it thrives with oxygen and without. It can dine on diesel and tar. It is naturally resistant to many antibiotics and can rapidly evolve resistance to all the rest. And for its party piece, it can stand upright and walk. Step forward *Pseudomonas aeruginosa*.

What makes *Pseudomonas* and many other kinds of bacteria so deadly, though, is their ability to work together. Millions of them can join forces to form powerful armies that overwhelm our defences.

It is not surprising, then, that if you are ever unlucky enough to end up in intensive care, there is a chance *Pseudomonas* will kill you. In fact, the real mystery has been why it doesn't kill more of us. Even though the bacterium infects just about everyone who remains on a ventilator for a long period, only 15 per cent ever get pneumonia.

Now we may have discovered why. It turns out that the armies of *Pseudomonas* are often greatly weakened by indiscipline in the ranks. They come to be dominated by cheaters and layabouts, who feast on the spoils of victory but ignore all orders to attack. These selfish bacteria multiply faster than the obedient ones, resulting in a less aggressive infection.

This discovery opens up the possibility of a radical new way to tackle superbug infections: deliberately encouraging the growth of cheater strains, perhaps by injecting them into people. Some think it is a crazy and dangerous idea. For others it is a bold approach that is sorely needed as antibiotic resistance grows.

Long seen as simple, solitary creatures, in the past few decades we have come to understand that bacteria are actually highly social. Large groups of bacteria can cooperate closely - and it is this ability to work together that makes some species so dangerous to us.

Many disease-causing bacteria have dual personalities. In small numbers they live independently and peaceably within us, staying beneath the immune system's radar. On reaching a critical mass, however, they turn nasty or virulent, and start to behave like an army. Sometimes these armies build fortifications, cementing their bodies together to form tough biofilms. Or they may march together in vast swarms and launch an all-out attack. Now they get noticed, but their sheer force of numbers can overwhelm the immune system.

Don't cooperate

These discoveries made researchers realise that it might not be necessary to kill bacteria to prevent them harming us. Instead, we could just stop them ganging up on us.

The most obvious way to do this is to stop them talking to each other. Bacteria gauge their population size through a system called quorum sensing. They continuously pump out a chemical signal; if only a few individuals are around, its level remains low, but in a crowd the chemical gets more concentrated. When the bacteria detect that numbers are on their side, they turn virulent.

Several groups have been trying to develop drugs that block these signals. Unfortunately, progress on such "quorum quenchers" has been slow, with compounds that work well in the Petri dish failing in tests on animals. Having other ways of subverting bacterial cooperation wouldn't hurt.

That's where the cheater bacteria come in. Their significance was discovered not by microbiologists but by sociobiologists, who study the evolution of societies and of traits such as altruism and spite. In the animal kingdom, whenever some individuals cooperate for the greater good, others evolve to take advantage. In other words, some animals benefit from the community's hard work without doing anything themselves, which can sometimes lead to the community's downfall.

Sociobiologists suspected the same must be true of bacteria - and they were right. The first cheaters were spotted in populations of a soil-dwelling microbe called *Myxococcus xanthus*. When food runs low, thousands of individuals behave as if they are a multicellular organism, clustering together to form tiny towers, called fruiting bodies, that release spores.

Only a few bacteria actually get to form spores, though - around nine out of 10 sacrifice themselves in the process of producing the fruiting body. In 2000, it was shown that some mutant strains cheat by always trying to form spores rather than sacrificing themselves (*Nature*, vol 404, p 598). When these cheaters take over a population, they can destroy its ability to form fruiting bodies, sometimes even leading to extinction.

Does the pattern hold for disease-causing bacteria? When they attack en masse, bacteria start pumping out toxins and other chemicals. These "virulence factors" take a lot of energy to manufacture so cheaters would reap the benefits of these compounds without paying the price of making them.

The first evidence of this in *Pseudomonas* related to iron scavenging. Bacterial growth is often limited by a lack of iron, so when *Pseudomonas* turn virulent, they usually release a virulence factor called pyoverdin, which scavenges iron from human proteins. Some mutants had been discovered, however, that don't produce pyoverdin. Looking at it from an evolutionary perspective, sociobiologists realised that these mutants thrived because they were cheaters: why go to the trouble of making a costly molecule like pyoverdin if you can hang around and steal iron freed by the pyoverdin made by others?

Other strains are even bigger cheaters - they have mutations in a master switch that controls production of many virulence factors, and so can coast along doing very little work. In 2007, two groups published work around the same time showing that if these strains are introduced into a colony of normal *Pseudomonas* bacteria growing in a test tube, the mutants take over.

"These mutants had been found naturally and nobody really knew why," says Steve Diggle, a microbiologist at the University of Nottingham in the UK, who led one of the groups. His team's work proved that not spending precious energy making virulence factors gives the cheaters a big competitive advantage (*Nature*, vol 450, p 411). "That raises the question of, can you use this?"

Yes, says Christian van Delden, an infectious disease specialist at Geneva University Hospitals in Switzerland. Van Delden has long battled *Pseudomonas* in his intensive care units. The bacteria colonise the breathing tube of anyone who has one in place for long enough, and some people develop pneumonia as a result.

The infection is hard to fight as resistance develops to whatever antibiotics are used, and the patients are too sick to cope with the drugs' side effects. "The first time you can treat with not too many problems, the second episode will be more difficult and the third will be a nightmare," says van Delden.

What has long baffled doctors is why *Pseudomonas* infection causes pneumonia in only 10 to 15 per cent of people on ventilators. "There are no risk factors that clinicians could identify on the patient's side," says van Delden. "This suggests the bacteria are different."

As more and more papers were published on bacterial cheating, van Delden began to suspect that this could be the explanation. Perhaps people who didn't develop pneumonia had *Pseudomonas* infections weakened by cheaters.

The chance to test this idea arose when van Delden was involved in a trial of an existing antibiotic called azithromycin. Though poor at killing *Pseudomonas* in the Petri dish, van Delden's team had found the drug somehow blocks its quorum-sensing systems. A Swiss biotech firm called Ambix applied for a new patent on the antibiotic based on its quorum-quenching activity, and asked van Delden to test it on people on ventilators. To show the drug was working through quorum quenching, repeated sputum samples were taken and the bacteria analysed to see if they had responded to quorum-sensing signals and turned virulent.

The trial ended abruptly when Ambix's US patent application was rejected, but van Delden realised he could still make use of the data. He teamed up with Angus Buckling, an evolutionary biologist at the University of Oxford who had done some of the early work on *Pseudomonas* cheating. "It was a fantastic opportunity," says Buckling.

Sure enough, their team found that more than half of people infected with non-cheater bacteria got pneumonia, compared with less than a tenth of those infected with cheater strains (*Thorax*, vol 65, p 703).

If other studies confirm these results, it could change the treatment of people in intensive care. Because *Pseudomonas* evolves resistance so easily, at the moment doctors wait until people show signs of pneumonia before giving them antibiotics. But if they could identify the 15 per cent of people likely to get pneumonia, they could treat them earlier, potentially saving lives.

A more radical approach would be to inoculate the vulnerable 15 per cent with a dose of cheater bacteria. In theory they would outcompete the virulent bacteria and stop the infection progressing. But it would be risky. "Who is going to sanction introducing a pathogen?" says Buckling. "All it's going to take is one case going wrong."

Instead van Delden's group is exploring ways to encourage the spontaneous evolution of cheating. One way to do this is to stop cheaters being punished.

When *Pseudomonas* turn virulent, among the toxins they produce may be pyocins that kill other bacteria. At the same time, they start producing pyocin-blocking compounds to avoid shooting themselves in the foot. Cheaters that ignore the signal to turn virulent, however, do not ready their defences, and thus are killed along with unrelated bacteria. So if we could find drugs that block pyocins, they should help cheating mutants to survive and take over populations, rendering the infection harmless.

Diggle's group in Nottingham, meanwhile, is exploring the radical approach. In 2009 his team deliberately infected the wounds of mice with various strains of *Pseudomonas*. They found that those infected with cheater strains were twice as likely to survive as those infected with normal bacteria. Mice dosed with a 50-50 mix of cheaters and normal bacteria were also twice as likely to survive, which suggests giving cheaters to people already infected with normal strains might help save lives (*Current Biology*, vol 19, p 341).

Diggle hopes to try out this daring strategy in people with burns with severe *Pseudomonas* infections. He is in talks with regulators to work out how the first cautious tests could be done. "I don't think it's as crazy as it seems," he says. "It's early days and there are huge regulatory hurdles to overcome, but there's potential for it to work."

Subversive superbugs

If it fulfils its promise, the approach could help treat many kinds of infections. In 2008, Richard Novick, a microbiologist at New York University, showed that cheats that ignore quorum-sensing signals exist among *Staphylococcus aureus*, another common cause of wound infections and pneumonia, especially in hospital patients (*Microbiology*, vol 154, p 2265). That's big news because the spread of *S. aureus* resistant to the antibiotic methicillin, better known as MRSA, is a huge problem. In a study that has not yet been published, Novick's colleague Bo Shopsin found that in people with pneumonia caused by *S. aureus*, the presence of cheaters made them more likely to survive.

Whether any of the strategies to exploit bacterial cheating will bear fruit remains to be seen. But these discoveries are changing the way researchers think. At first, mainstream microbiologists were doubtful about applying theories about social evolution to bacteria. "They are interested in the 'how' questions, we are interested in the 'why'," says Diggle. "It was received with a bit of scepticism."

Combining these approaches is leading to a wealth of new insights. For instance, Sarah Reece, a parasitologist at the University of Edinburgh, UK, has found that the organism that causes malaria alters its reproductive strategy depending on how many of its fellows are present in the same human and how closely related they are (*Nature*, vol 453, p 609). "This could be a new opportunity to control these creatures," says Reece.

It is even relevant to industry. Cheating among *Lactococcus lactis* has been found to explain why some batches of cheese fail to ferment properly.

It's one thing to inject bacteria into a Stilton, quite another to stick them into a person. Yet it is no exaggeration to say that the rise of antibiotic resistance is one of the biggest threats to our health. If a time comes when people are dying because conventional antibiotics are no longer any use, injecting them with "cheatobiotics" instead might look a lot less crazy.

***Clare Wilson** is medical features editor at New Scientist*

http://www.newscientist.com/article/mg21128321.700-cheatobiotics-send-in-the-subversive-superbugs.html

The Five Best Ways to Fight AIDS

What happened when we asked economists to identify the most effective responses to the epidemic.

By Bjørn Lomborg|Posted Friday, Oct. 14, 2011, at 1:24 PM ET

AIDS in Africa

Photograph by Abdelhak Senna/AFP/Getty Images.

It is dangerous to believe that the end of AIDS is in sight. About 30 million people around the world live with HIV, and another 30 million are likely to become infected in the next decade if current trends persist. Funding from developed governments is dropping—a trend that must be reversed. But we also need to acknowledge that billions of dollars have been spent on well-meaning attempts to save lives, and there has been an alarming lack of high-quality evaluation of how these investments have performed.

This is true not only of abstinence campaigns, for which there is no evidence of effectiveness, but also for many other mainstays of the AIDS response. On a systemic level, we do not know what works, where, and why—or how to replicate our successes.

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In the project RethinkHIV, the Copenhagen Consensus Center and the Rush Foundation asked 30 of the world's top HIV economists, supported by epidemiologists, demographers, and medical professionals to analyze the most promising responses to the epidemic in the world's worst-hit region, sub-Saharan Africa. They were asked to examine what could be achieved with extra investments in six key areas: prevention of

sexual transmission, reduction of nonsexual transmission, treatment of those who have the disease, initiatives to use social policy and health-system strengthening to fight HIV/AIDS, and vaccine research.

The resulting research papers offer the first-ever comprehensive attempt at cost-benefit analysis of AIDS priorities. Economics can offer a fresh perspective by showing us the overall value to society of competing spending options. Among worthwhile investments, some are very costly and achieve little good; others are remarkably cheap and incredibly effective. Whether on AIDS or other problems, additional funds should be spent first where we can achieve the highest return for our money.

To spark a dialogue about HIV/AIDS priorities based on the RethinkHIV research, the Copenhagen Consensus Center and the Rush Foundation asked five world-class economists—including three Nobel laureates—to form their own conclusions about how best to spend additional funding. The panel zeroed in on five investments that they believe should be at the top of policymakers' lists.

Most important, they identified an urgent need for increased investment in developing an HIV vaccine. This is clearly a longer-term response to the epidemic: Research by Dean Jamison and Robert Hecht (PDF) for RethinkHIV suggests that we are about 20 years away from large-scale vaccination, and that increasing current funding by around 10 percent, or $100 million a year, would meaningfully shorten that projection. This would save millions of lives and potentially end the epidemic in the long run, while dramatically improving scientific understanding of the disease in the near term. For every dollar spent, it is likely that the benefits would run into the tens of dollars.

As a shorter-term response to the epidemic, the Nobel laureates were convinced by research by the economist Lori Bollinger (PDF) that we could practically wipe out mother-to-child transmission of HIV by 2015 with additional expenditures of just $140 million a year. About 350,000 infants became HIV positive in 2008, through pregnancy, labor, delivery, or breast-feeding, accounting for approximately 20 percent of all new infections. Since we have such cost-effective programs to halt this tragedy, the Nobel laureates concluded, this is a compelling investment.

So, too, is spending more to make blood transfusions safer. Bollinger calculates that annual investment of $2 million over five years would achieve 100 percent safe blood transfusions by 2015 and avert more than 131,000 HIV infections, while alleviating fears of infection for the almost half-billion people who would otherwise receive blood that was not comprehensively screened.

The Nobel laureates also found that male circumcision is an excellent use of funds. They focused particularly on the longer-term benefits of infant-male circumcision, arguing that there is massive untapped potential to introduce this very cheap practice across Africa. We know that adult-male circumcision reduces the odds of transmission from a woman to a man by up to 60 percent. Research by Jere Behrman and Hans-Peter Kohler (PDF) of the University of Pennsylvania makes clear that the real focus needs to be on working out the best ways to broaden adult circumcision efforts across the region, and to convince men that getting circumcised is a good idea. We also need to introduce counseling to ensure that men do not treat circumcision as a vaccine, and engage in riskier behavior as a result.

Finally, the panel of Nobel laureates concluded based on research by Mead Over and Geoffrey Garnett (PDF) that additional resources for treatment should go first to patients who are the sickest and most infectious. Because treatment is very expensive, coverage rates remain woefully inadequate. But treatment is not only an ethical imperative; it also is important in preventing and reducing sexual transmission.

The expert panel did not just identify the top-priority uses for additional funds. It also highlighted promising areas where more research is needed. As Anna Vassall, Michelle Remme, and Charlotte Watts of the London School of Hygiene and Tropical Medicine point out (PDF), gender inequalities and domestic violence are both associated with a significant increase in risk of HIV infection. So, if gender training programs were to

piggyback on current income-boosting microfinance and agricultural-support programs, we could undermine norms about gender roles that entrench women's dependence on men or condone domestic violence. It's a proposal that deserves further investigation, as is the proposition from William McGreevey of Georgetown University (PDF) to increase efforts to focus treatment of HIV-positive patients to reduce opportunistic infections of cryptococcal meningitis.

We need to arrest the recent drop in AIDS funding and secure additional resources in order to make further headway against the disease. By highlighting sound investments—including some that are not currently at the top of policymakers' to-do lists—RethinkHIV makes the case in economic terms for doing just that.

This article comes from Project Syndicate.

http://www.slate.com/articles/health_and_science/project_syndicate/2011/10/how_to_fight_aids_five_of_the_most_effective_responses_.html

Before Hitler, Who Was the Stand-In for Pure Evil?

The Egyptian Pharaoh, of course.

By Brian Palmer|Posted Tuesday, Oct. 4, 2011

Adolf Hitler

Photograph by AFP/Getty Images.

ESPN dropped singer Hank Williams Jr. from its *Monday Night Football* telecast after he publicly compared President Obama to Adolf Hitler on Monday. Today, the Führer is universally recognized as the embodiment of evil and the most convenient example of a truly terrible human being. Before World War II, who was the rhetorical worst person in history?

The Pharoah. In the 18th, 19th, and early 20th centuries, many Americans and Europeans had a firmer grasp of the bible than of the history of genocidal dictators. Orators in search of a universal symbol for evil typically turned to figures like Judas Iscariot, Pontius Pilate, or, most frequently, the Pharaoh of Exodus, who chose to endure 10 plagues rather than let the Hebrew people go. In Common Sense, Thomas Paine wrote: "No man was a warmer wisher for reconciliation than myself, before the fatal nineteenth of April, 1775 [the date of the Lexington massacre], but the moment the event of that day was made known, I rejected the hardened, sullen tempered Pharaoh of England for ever." In the run-up to the Civil War, abolitionists regularly referred to slaveholders as modern-day Pharaohs. Even after VE Day, Pharaoh continued to pop up in the speeches of social reformers like Martin Luther King Jr.

Generally speaking, hatred was more local and short-lived before World War II. Nineteenth-century polemicists occasionally used Napoleon Bonaparte as shorthand for an evil ruler—they sometimes referred to "the little tyrant" rather than name the diminutive conqueror—but those references were rare. There is little record of oratorical comparisons of political leaders to Genghis Khan, Attila the Hun, or Ivan the Terrible.

Even Adolf Hitler himself once commented on history's tendency to forget the sins of bloody dictators. In 1939, the Führer asked rhetorically, "Who still talks nowadays of the extermination of the Armenians?" (The authenticity of this quote is disputed.)

In the absence of a universal boogeyman, different regions latched on to a particular person as the personification of evil at different historical moments. Yet genocide and murder were less likely to earn a man universal revilement than treason or other forms of disloyalty. During the Civil War, for example, some Southerners spoke of Abraham Lincoln in vaguely Hitler-like terms. Upon Lincoln's assassination, for example, the editor of the Texas Republican wrote, "the world is happily rid of a monster that disgraced the form of humanity." (Some Confederates called Lincoln a "modern Pharaoh.") Part of this scorn was based on their view of Lincoln as a traitor—both of his parents were Virginians, and Lincoln was born on slaveholding soil. Northerners, for their part, focused their ire on the traitorous assassin John Wilkes Booth. In fact, 52 years after Lincoln's assassination, some Americans compared Woodrow Wilson to Booth, because he betrayed his country by leading the United States into war.

King George III was also a major whipping boy for American rhetoricians for decades after the Revolution. A good example is Walt Whitman's "A Boston Ballad," in which he argued that the Fugitive Slave Act, which required Northern States to return escaped slaves to their owners, represented a return of the ghost of King George.

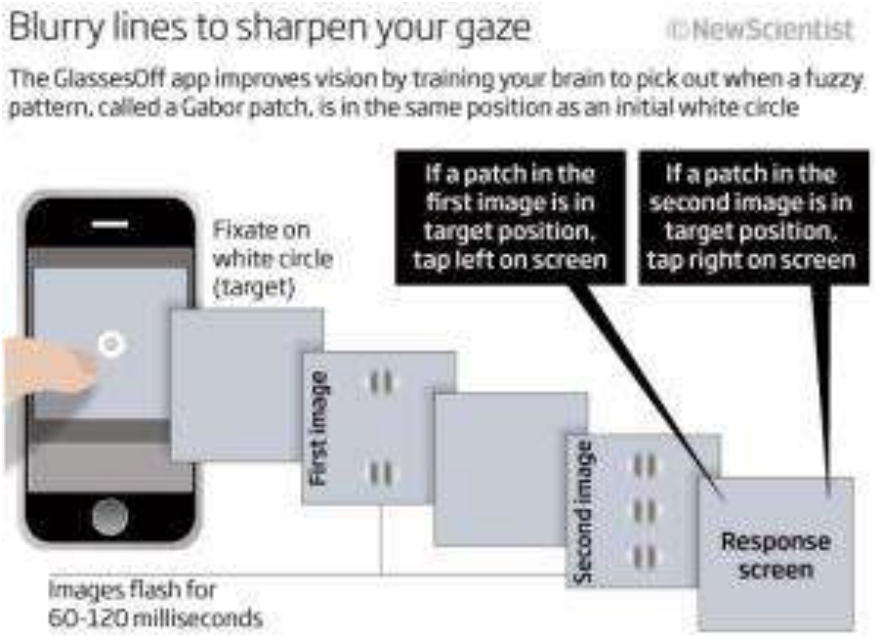
Got a question about today's news? Ask the Explainer.

Explainer thanks David Blight and Jay Winter of Yale University; Brandon Inabinet of Furman University; Stephen Kantrowitz of the University of Wisconsin-Madison; Michele Kennerly of Northeastern University; Ned O'Gorman of the University of Illinois, Urbana-Champaign; Christopher Swift of Texas A&M University; Dave Tell of the University of Kansas; and Michael Turner of Appalachian State University.

http://www.slate.com/articles/briefing/explainer/2011/10/hank_williams_jr_firing_who_was_the_rhetorical_worst_person_in_h.html

Improve your vision with an app

- 08 October 2011 by **Peter Aldhous**
- Magazine issue 2832.



Blurry lines to sharpen your gaze

A system that trains your brain to overcome degrading vision as you age will soon be available as an iPhone app

WE HAVE gotten used to the idea that smartphone apps can substitute for devices like GPS navigation systems or portable music players. But the latest item on the list may come as a surprise: reading glasses.

Early next year, a company called Ucansi will launch GlassesOff, an iPhone app that could help older people shed their reading glasses for at least part of the time - and may allow others to carry on reading without optical aids for years longer than would otherwise be possible.

The app helps people compensate for deterioration in their eyes' ability to focus on nearby objects by training the brain to process the resulting blurred images. "We're using the brain as glasses," says Uri Polat of Tel Aviv University in Israel, and co-founder of Ucansi.

As we get older, the lenses in our eyes become less elastic, and so can't readily be adjusted to focus on nearby objects. Known as presbyopia, the condition is almost ubiquitous among people in their early fifties and older. In addition to the obvious reading problems, symptoms include tired eyes and headaches.

Polat's software trains users to detect patterns called Gabor patches - blurry lines created by varying a grey background. In a typical training session, the user fixates on a white circle, which then gives way to a rapid succession of images. Some are blank, but others show Gabor patches at different places on the screen, one of which will appear where the circle was (see diagram).

Users must determine when in the sequence the pattern appeared at the target position. As they become better at the task, the software adapts to alter the orientation of the patterns, place them closer to the target, or speed up the sequence.

At last week's meeting of the Entertainment Software and Cognitive Neurotherapeutics Society in San Francisco, Polat's team described tests of the software that Dennis Levi ran in his lab at the University of California, Berkeley. After 40 training sessions, volunteers averaging 51 years of age showed impressive gains in contrast sensitivity, measured by similar tests with Gabor patches.

This translated into real-world improvements in vision. After training, the volunteers were able to read more than two lines further down an optical chart held 40 centimetres from their eyes - corresponding to a reduction in "eye age" from 50.5 to 41.9 years. Reading speed increased by about 4 seconds per sentence, which would cut the time to read a page of *The New York Times* without glasses by an average of 5.3 minutes from the pre-training performance of more than 12 minutes.

As expected, there were no differences in the eyes' ability to focus after the training. "Every single change is in the brain," says Polat.

Although Levi's experiments were run using a PC, the first product will be an iPhone app because of the convenience of the device and its high-quality screen. The cost of the app is expected to be around $95, covering an initial training period of about three months during which users will train for 15 minutes, three times a week. After that there will be a small monthly fee for less-intensive "maintenance" training.

Given that our eyes eventually lose their ability to focus on close objects, the app is unlikely to be a panacea for presbyopia. But Lee Duffner, an opthalmologist in Hollywood, Florida, who serves as a clinical expert for the American Academy of Opthalmology, suggests that it might delay the need to adopt reading glasses. "I think they're probably on to something," he says.

http://www.newscientist.com/article/mg21128324.400-improve-your-vision-with-an-app.html?full=true&print=true

Speaking in Tongues
Where pop meets Modernism.

By Robert Pinsky|Posted Tuesday, Oct. 4, 2011

Edgar A. Guest

Courtesy NBC Publicity

The most famous poet in American history sold a million copies of his book, back in the days when a million was a lot. He had his own weekly radio show and even, for a while, his own television show. His poetry was syndicated and appeared in hundreds of newspapers. For many years he published a new poem every day—and he did not miss deadlines. And yet, as fame goes, few people today know the name of Edgar Guest (1881-1959).

More interesting than the brevity of fame is the fact that Edgar Guest wrote his poems in dialect, with deliberate misspellings and apostrophes replacing the G in words ending with "ing." The grammar, like the spelling, impersonates an unschooled, rustic speaker. Guest's lyric style is calculated to imply that uneducated country people have special access to wisdom and a special grasp of what's most important. His immense appeal for generations of readers was rooted in that populist idea, that true feeling and insight come from plain, unschooled country people. People in towns or cities who read Guest's work in the newspaper may have associated his poems with their farmer parents or grandparents.

Along with nostalgia for that old rural life, the poems have an element of gentle condescension: an implicit, chuckling superiority along with the reverence. Guest's readers could admire his country speakers while also

smiling at their dialect. If the stylized country language is clearly exaggerated beyond reality, that may have made it feel all the more amusing and reassuring.

Speculation about the nature of Guest's popular appeal is illuminated by the delicious fact that, far from any origins in rural America, this poet was born—a Brit! A native of Birmingham, England, he was 10 years old when he moved with his family to Detroit. Within a few years, he was a teenager working for the *Detroit Free Press*. From Birmingham (which of course had its own, Andy Capp dialect and traditions, which may have been a model) to Detroit: Edgar Guest was even less Appalachian than Bob Dylan.

This example from poetry gives a fresh way to think about things so familiar we barely notice them: political candidates who drop their G's, or popular singers from American (or British) cities who perform in the dialect of rural Tennessee or the Mississippi Delta. Even the exaggerated, defiant spellings of hip-hop may share something with the calculated, artful misspellings of Edgar Guest.

What does it mean that, in a process accelerated long ago with the marriage of R & B with country, nearly all American popular music seems to be written in dialect? To my inexpert ear, some older stars, like Bruce Springsteen and Mos Def, still perform in language similar to how the performers actually speak. Springsteen's working-class characters are moving partly because he does not exaggerate their speech. In contrast, many white British singers of the blues sound far more black and American than Junior Wells or Buddy Guy. Across a range of genres, in the arcane subdivisions and niche variations of "hip-hop nouveau" and "retro country," dialect seems to rule. In great-grandpa's day, Ella Fitzgerald and Frank Sinatra sang so much the way they spoke that you can hear New Jersey in his singing, and maybe a touch of Yonkers in hers.

Dialect has a long, honorable literary history, including Robert Burns and the humorist Artemis Ward, said to be Abraham Lincoln's favorite writer. Lincoln, before he read the Emancipation Proclamation to his cabinet, tried to ease tension in the meeting by reading aloud—weeping with laughter as he did—Ward's comic piece "Outrage in Utica." Here is the opening of the piece that cracked up Abraham Lincoln: "*In the Faul of 1856, I showed my show in Utiky, a trooly grate sitty in the State of New York*." This example from that time and place may illustrate the limited shelf life of dialect, or of comedy itself. It also suggests that the unreal, inconsistent, made-up quality of the spellings ("sitty" but "New York"?) may be part of the point.

The dialect of Guest's work is synthetic, well-calculated and skillful, though with the passage of time he has become (for the likes of me, anyway) close to unreadable. Here is his best-known poem:

"Home"

It takes a heap o' livin' in a house t' make it home,
A heap o' sun an' shadder, an' ye sometimes have t' roam
Afore ye really 'preciate the things ye lef' behind,
An' hunger fer 'em somehow, with 'em allus on yer mind.
It don't make any differunce how rich ye get t' be,
How much yer chairs an' tables cost, how great yer luxury;
It ain't home t' ye, though it be the palace of a king,
Until somehow yer soul is sort o' wrapped round everything.

Home ain't a place that gold can buy or get up in a minute;
Afore it's home there's got t' be a heap o' livin' in it;
Within the walls there's got t' be some babies born, and then
Right there ye've got t' bring 'em up t' women good, an' men;
And gradjerly as time goes on, ye find ye wouldn't part
With anything they ever used — they've grown into yer heart:

The old high chairs, the playthings, too, the little shoes they wore
Ye hoard; an' if ye could ye'd keep the thumb-marks on the door.

Ye've got t' weep t' make it home, ye've got t' sit an' sigh
An' watch beside a loved one's bed, an' know that Death is nigh;
An' in the stillness o' the night t' see Death's angel come,
An' close the eyes o' her that smiled, an' leave her sweet voice dumb.
Fer these are scenes that grip the heart, an' when yer tears are dried,
Ye find the home is dearer than it was, an' sanctified;
An' tuggin' at ye always are the pleasant memories
o' her that was an' is no more—ye can't escape from these.

Ye've got t' sing an' dance fer years, ye've got t' romp an' play,
An' learn t' love the things ye have by usin' 'em each day;
Even the roses 'round the porch must blossom year by year
Afore they 'come a part o' ye, suggestin' someone dear
Who used t' love 'em long ago, an' trained 'em jes t' run
The way they do, so's they would get the early mornin' sun;
Ye've got t' love each brick an' stone from cellar up t' dome:
It takes a heap o' livin' in a house t' make it home.

*Click the arrow on the audio player below to hear Robert Pinsky read Edgar Guest's "Home."You can also download the recording or subscribe to **Slate**'s Poetry Podcast on iTunes.*

The “thumb-marks on the door,” the death's angel, the roses in the last stanza: These are effective details, even though the opening exposition about “yer chairs an' tables” may be a bit repetitious and heavy. Guest is more willing to risk tedium than obscurity. In the concluding rhyme, “dome” may be lunged-for, and in language like “these are scenes that grip the heart,” Guest the literary man may be too visible behind his bucolic mask. But “Home” is far from incompetent: The poem is an expert performance, and its onetime popularity is understandable.

On the other hand, there is no element of surprise in Guest's poem, and nothing is left to the imagination. What the poem has to say about the idea of home is clear from the first line, and the rest is elaboration, in a certain manner. Here is another, quite different American poem about an idea of home. This one is by an American poet only six years younger than Guest, though they seem to inhabit different centuries:

“Silence”

My father used to say,
“Superior people never make long visits,
have to be shown Longfellow's grave
or the glass flowers at Harvard.
Self-reliant like the cat—
that takes its prey to privacy,
the mouse's limp tail hanging like a shoelace from its mouth—
they sometimes enjoy solitude,
and can be robbed of speech
by speech which has delighted them.
The deepest feeling always shows itself in silence;
not in silence, but restraint.”
Nor was he insincere in saying, “Make my house your inn.”
Inns are not residences.

*Click the arrow on the audio player below to hear Robert Pinsky read Marianne Moore's "Silence." You can also download the recording or subscribe to **Slate**'s Poetry Podcast on iTunes.*

Marianne Moore is a Modernist, and her poem is built on imagination and surprise, in how it moves and what it says. The old rose vines and little shoes of Guest's poem do their work efficiently and clearly: The reader understands them comfortably and completely. You can read the images, feel them, and forget them. Utterly different from that, the mouse's tail in Moore's poem dangles in the mind, with a meaning that while clear includes an indelible mystery. As an evocation of psychic privacy, the inaccessible interior peculiar to each of us guests and hosts, the image is inexhaustible. Moore's language, in a certain way, is more plain than Guest's elaborate countrification. On the other hand, the social class of "superior people," Longfellow and Harvard is unabashed—in relation to our American evasions and confusions about class, you might call it shameless.

In another contrast, Guest elaborates, repeats and re-emphasizes; Moore amends, departs, contradicts, and revises herself: "in silence;/ not in silence, but restraint." Even her repetitions involve movement, reversal or change of perspective: "and can be robbed of speech/ by speech which has delighted them."

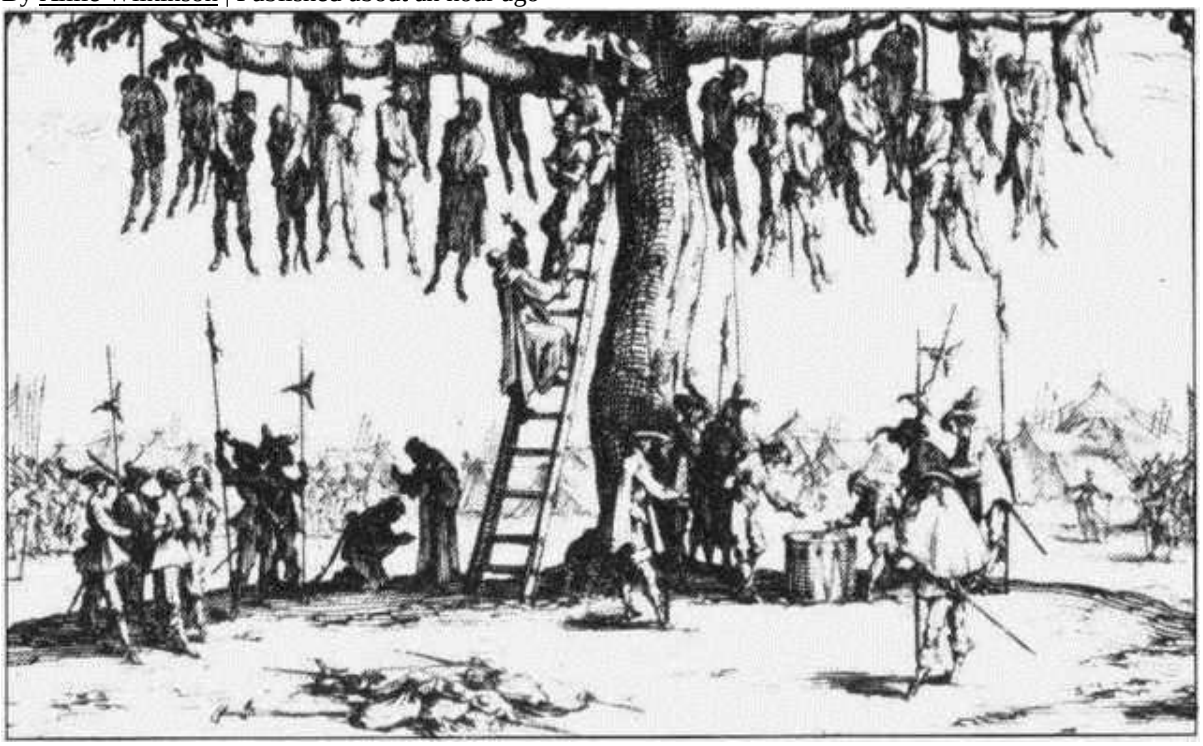
In the realm of poetry, the Modernist approach of Marianne Moore long ago replaced the reactionary, nostalgic, populist mode of Edgar Guest. But in ways easier to intuit vaguely than to describe precisely, the two contrasting modes, with their cultural and political forms and implications, are still with us.

***Slate** Poetry Editor Robert Pinsky will be joining in discussion of Edgar Guest's "Home" and Marianne Moore's "Silence" this week. Post your questions and comments on the work, and he'll respond and participate. You can also browse "Fray" discussions of previous classic poems. For **Slate**'s poetry submission guidelines, click here. Click here to visit Robert Pinsky's Favorite Poem Project site.*

http://www.slate.com/articles/arts/poem/2011/10/edgar_guest_s_home_and_marianne_moore_s_silence_where_pop_music_.single.html

European wars, famine, and plagues driven by changing climate

By Alllie Wilkinson | Published about an hour ago



The Thirty Years War was especially deadly.

Economic chaos, famine, disease, and war may all be attributed to climate change, according to a recent study. Through advances in paleoclimatology, researchers used temperature data and climate-driven economic variables to simulate the climate that prevailed during golden and dark ages in Europe and the Northern Hemisphere from 1500-1800 AD. In doing so, they discovered a set of casual linkages between climate change and human crisis. They noted that social disturbance, societal collapse and population collapse often coincided with significant climate change in America, the Middle East, China, and many other countries in preindustrial times, suggesting that climate change was the ultimate cause of human crisis in many preindustrial societies.

The General Crisis of the 17th Century in Europe was marked by widespread economic distress, social unrest, and population decline. A significant cause of mankind's woes during these times was the climate-induced shrinkage of agricultural production. Bioproductivity, agricultural production, and food supply per capita all showed immediate responses to changes in temperature. In the five to 30 years following these changes, there were also responses in terms of social disturbance, war, migration, nutritional status, epidemics, and famine.

Cooling during the Cold Phase (1560-1660 AD) reduced crop yields by shortening the growing season and shrinking the cultivated land area. Although agricultural production decreased or became stagnant in a cold climate, population size still grew, leading to an increase in grain price and an increased demand on food supplies. Inflating grain prices led to hardships for many, and triggered social problems and conflicts such as rebellions, revolutions, and political reforms.

Many of these disturbances led to armed conflicts, and the number of wars increased 41 percent during the Cold Phase. During the latter portion of the Cold Phase, the number of wars decreased, but the wars lasted

longer and were far more lethal—most notable was the Thirty Years War (1618-1648), where fatalities were more than 12 times of the conflicts between 1500-1619.

Famine became more frequent too. Nutrition deteriorated, and the average height of Europeans shrunk 2cm by the late 16th century. As temperatures began to rise again after 1650, so did the average height.

The economic chaos, famine, and war led people to emigrate, and Europe saw peak migration overlapping the time of peak social disturbance. This widespread migration, in conjunction with declining health caused by poor nutrition, facilitated the spread of epidemics, and the number of plagues peaked during 1550-1670, reaching the highest level during the study period. As a result of war fatalities and famine, the annual population growth rate dropped dramatically, eventually leading to population collapse.

In the 18th century, the mild climate improved matters considerably, leading to the speedy recovery of both Europe's economy and population.

The alternation between periods of harmony and crisis, golden ages and dark ages, closely followed variations in the food supply per capita. Consequently, grain price could be used as an indicator of crisis in preindustrial Europe. Although grain price is dictated by agricultural production and population size, analysis by the researchers shows that temperature change was the real cause behind the grain price, since agricultural production was climate-dependent at the time.

The history of golden and dark ages in Europe is often attributed to sociopolitical factors, which fails to explain the co-occurrence of long-term crises in different countries, at different stages of development, and across different climate zones. Instead, the authors make a compelling case that climate change is the culprit, thanks to a climate-driven economic downturn due to a decreasing food supply. Where there is a shrinking food supply, chaos and misery follow.

PNAS, 2011, DOI: 10.1073/pnas.1104268108

http://arstechnica.com/science/news/2011/10/european-wars-famine-and-plagues-driven-by-climate.ars

Ice-age nettles may survive in dark Chinese caves

- 10:56 05 October 2011 by **Kat Austen**

Nettle's-eye view *(Image: Alex Monro, The Natural History Museum)*

Walk into a cave in south-west China and you could be stepping back 30,000 years in time.

So says Alex Monro, a researcher in tropical plant diversity at the Natural History Museum, London, who thinks the caves could be a time capsule preserving rare nettles from the time of the last ice age.

Working with researchers from the Chinese Academy of Sciences, Monro has identified seven species of nettle that grow in isolated, dark corners of the karst landscapes of Guangxi and Yunnan provinces. Some species can survive in conditions in which just 0.02 per cent of sunlight penetrates the cave – that's less than reaches 100 metres deep into the oceans. "They grow at the backs of the main caverns in near-dark conditions," says Monro.

"Some of the specimens came from areas with very low light levels indeed, and one can easily interpret the site as being under full cave conditions," says Frank Howarth of the Hawaii Biological Survey in Honolulu, a speleologist who specialises in karst caves and their ecologies.

"There must be something quite special about their photosynthesis," says Monro, although the team has not yet investigated the photosynthetic mechanism. "They probably activate the photosynthetic process very

quickly, which enables them to take advantage of very short bursts of light, and they might go for slightly different wavelengths," he says.

The nettle species seem to be unique to the remote caves and gorges, growing in isolated groups. One species, *Elatostema retrorstrigulosum*, is limited to only 10 adult plants, some growing in a grotto, hidden among stalagmites. The team have identified two of the species as "critically endangered" under the criteria of the International Union for Conservation of Nature; the rest are either "endangered" or "vulnerable".

Cold blast from the past

Nettles like these are not found in the surrounding tropical forest. To explain the discovery of these pockets of rare plants in an environment that is too tropical to support them, Monro suggests that the rare species could be "relicts of a vegetation from a previous cooler climate that resembled that of the caves".

Another suggestion is that the nettles could have evolved inside the caves. Monro intends to check this with DNA sequencing: if correct, this would be rapid evolution, according to Rogier de Kok, a botanist at the Royal Botanical Gardens in London, who has visited the caves. "These caves are not very old – less then a million years – which is usually seen as very quick in the evolution of a series of species."

Journal reference: *Phytotaxa*, vol 29, p 1

http://www.newscientist.com/article/dn21009-iceage-nettles-may-survive-in-dark-chinese-caves.html?full=true&print=true

American Horror Story
Freaky sex, sadistic violence, and fun for the whole family?

By Troy Patterson|Posted Tuesday, Oct. 4, 2011

Alexandra Breckenridge in *American Horror Story*

Photo courtesy FX © 2011.

While being lightly pummeled by the freaky sex and sadistic violence of ***American Horror Story*** (FX, Wednesdays at 10 p.m. ET), you may start wondering if the Bernard Herrmann Estate is preparing legal action against parties including, but not limited to, series creators Ryan Murphy and Brad Falchuk, music editor David Klotz, and media conglomerate News Corp. At every plausible moment—and a few implausible ones—its soundtrack rips with violins heavily indebted to Herrmann's score for the scene where Norman Bates surprises Marion Crane in the shower.* With its grindhouse canted angles, *giallo* gore, and a trickle of piano recalling *The Exorcist*'s "Tubular Bells," *American Horror Story* has openly thieved from every horror-flick trick in the book. Considering the show's slasher-film streak, its kitsch-kink bent, and its loony riffs on madness, this hypothetical book would be a hybrid of Leonard Maltin's *Movie Guide* and the DSM-IV.

You could call it *The Joy of Overcooking*. The producers are the guys behind the karaoke fantasia of *Glee* and the garish nastiness of *Nip/Tuck*. No strangers to camp, they are trying a deliberately heavy hand at a psychosexual thriller. Let's put it this way: Jessica Lange, playing the battily malicious neighbor of a troubled California family, is wiggier than she ever has been. Remember that this is a woman who's been Blanche Dubois, Big Edie, and Frances Farmer.

Dylan McDermott plays a shrink named Ben Harmon, which, according to the rules of the genre, means that his work is driving him crazy and that his life is inharmonious.* Ben and his family have moved out of

Boston not to escape Red Sox fans but rather because he was cheating on his wife, and they are attempting a fresh start in Los Angeles. The city looks more grim than golden, and things are more "Hell-ay" than usual. As one of Ben's patients tells him, "Dude, you're on the murder-house tour." Psycho killers have done some psycho-killing in the Harmon's creepy old new house.

It follows that Ben is tense and nervous, and he can't relax. Sometimes McDermott underacts (as when Ben embraces his wife and we see what she can't: the more dubious of this two-faced guy's two faces). Sometimes McDermott overacts (as when, during a jog, he pantingly pounds his feet, trying to outrun the twisted visions that the show keeps hurtling at his mind's eye). But then sometimes, every now and then, he just *acts* (as the excesses of bloody dream sequences and shuddering sexual tension allow).

Noting that the actress Connie Britton plays Ben's Vivien, who is pregnant again after a stillbirth, you realize that the guy really *must* be crazy as no one in his right mind would cheat on Connie Britton. Hasn't he seen *Friday Night Lights*? As *FNL*'s Tami Taylor, Britton inspired a rare sort of lustful reverence, and it is hard to tell how good her performance as Vivien is, so distracting is her aura.

Taissa Farmiga plays the Harmons' daughter, Violet. She's quite convincing as the sort of ambitious teenager who, unlike the myriad high-school girls content to be passive-aggressive with their parents, doggedly aspires to aggressive-aggression.

I hesitate to say that *American Horror Story* is a slick machine engineered to deliver cheap shocks of sensation. No, its shocks of sensation come at a higher price point, what with the show's midmarket marital conflict and especially its extravagant perviness. This show's got more sexy-uniform costumes than the stockroom at Ricky's. A killer who came to the house in the late '60s had a naughty-nurse problem, and Ben, either hallucinating or tuning into paranormal vibes, always looks at a dowdy old maid and sees a frisky young chickadee in her place. All the while, Lange oozes around as a whack job of a wacky neighbor. You're waiting for her to kill someone with poisonous false perkiness.

So far, *American Horror Story* isn't the great American horror story but rather a pretty good fright night. The title carries more weight than its content can bear. I am reminded of Joyce Carol Oates' review of Curtis Sittenfeld's *American Wife*: "Is there a distinctly American experience? *The American*, by Henry James; *An American Tragedy*, by Theodore Dreiser; *The Quiet American*, by Graham Greene; *The Ugly American*, by William Lederer and Eugene Burdick; Philip Roth's *American Pastoral*; and Bret Easton Ellis' *American Psycho*—each suggests, in its very title, a mythic dimension in which fictitious characters are intended to represent national types or predilections.... 'American' is an identity fraught with ambiguity, as in those allegorical parables by Hawthorne in which 'good' and 'evil' are mysteriously conjoined."

Don't trouble yourself too much with all that. This gourmet junk food gives you some pure evil, and it takes some axes to some evildoers, and the American type represented has a predilection for French maids. *Bon appetit.*

http://www.slate.com/articles/arts/television/2011/10/american_horror_story_reviewed_freaky_sex_sadistic_violence_fun_.html

Climatequake: Will global warming rock the planet?

- 05 October 2011 by **Caroline Williams**
- Magazine issue 2832

The San Andreas fault may feel the pressure *(Image: Proehl Studios/Corbis)*

The Earth's crust will heave as ice melts and the sea rises – and that could unleash earthquakes, volcanoes and tsunamis

FEW things are more likely to prompt instant ridicule from climate sceptics than the idea that there might be a link between global warming and geological disasters such as earthquakes, volcanic eruptions and tsunamis. "Earthquakes are caused by tectonic plate movements - they are not caused by Bubba driving his SUV down the highway," is typical of the responses found in the denialist blogosphere.

Yes, the Earth moves all by itself, but it is becoming increasingly clear that climate plays a role in when and how often. What happens on the surface can suppress quakes and eruptions - and trigger them. There are already signs of such effects in the world's northern regions, which are warming fastest.

So seriously is the issue being taken that an upcoming special report on extreme events and disasters related to climate change, commissioned by the Intergovernmental Panel on Climate Change, will include a section on it. So what exactly is going on and what can we expect during the next century and beyond?

The idea that climate change can affect events such as earthquakes is not as outlandish as it might first seem. While the power of earthquakes comes from the movements of tectonic plates deep beneath the surface, even these stupendously massive structures can be influenced by what is happening at the surface. The rapid erosion of huge quantities of material by the monsoon rains in India, for instance, has affected the motion of the Indian plate over the past few million years.

On a more immediate timescale, there is already plenty of evidence that human activity can trigger earthquakes. The building of vast dams has often been linked to seismic activity, for instance. Some blame the Great Quake of Sichuan in 2008, which killed 80,000 people, on the recently constructed Zipingpu dam just 5 kilometres away from the epicentre.

Mining and drilling activities can also trigger small earthquakes, and at least one geothermal project has been cancelled because of fears of further quakes. And if small geothermal projects can trigger quakes, it is not so surprising that altering the climate of the entire planet will have an effect too.

The crux of the problem is simple: anything that increases or decreases the load on the Earth's crust causes stresses and strains. When this happens slap bang on top of one of the world's many volcanoes or geological faults, where the crust is already under strain, it can make the area more or less likely to erupt or slip. And there is a very heavy substance whose movements depend largely on the weather and the climate: water.

During past ice ages, vast ice sheets several kilometres thick built up over northern Eurasia and north America. The weight of the ice pinned down faults and suppressed the flow of magma. When the ice melted, there was a flurry of earthquakes and volcanic eruptions as faults began to move again.

These ice sheets were so massive that sea level rose by 120 metres after they melted. However, even far smaller changes in the distribution of water are enough to trigger earthquakes and volcanic eruptions. A recent study of earthquakes on the Easter microplate in the Pacific, for example, found that a dip in local sea levels of only 20 centimetres due to changes in trade winds before an El Niño event raised the average number of monthly earthquakes from two to eight. When El Niño arrived, raising the local sea level by 50 centimetres, fewer earthquakes occurred (*Philosophical Transactions of the Royal Society A*, vol 368, p 2481).

And Mount Pavlof, an active volcano on the Alaska peninsula, erupts more often in the winter. This may be a result of sea levels rising by 30 centimetres in the winter due to local storms, says Steve McNutt of the Alaska Volcano Observatory in Fairbanks. This would squeeze magma upwards as the weight of the water on the seabed either side of the peninsula increases.

Melting glaciers

While these two examples are seasonal and linked to the weather, in Alaska there are signs of climate-driven changes. "I think of Alaska as the 'canary in the cage' because it is very tectonically active, there are a lot of active faults, a lot of volcanoes and it's very high latitude and that is where the temperatures are rising most rapidly," says Bill McGuire, a volcanologist who heads the Benfield Hazard Centre at University College London.

In the south of Alaska, large glaciers sit over a major fault where the Pacific-Yukatat plate dips under the continent. During the past century, the glaciers that have pinned down and stabilised the fault have thinned by hundreds of metres, and the crust beneath has rebounded by up to 20 millimetres per year.

Ice loss was particularly fast during a warm spell between 2002 and 2006. The frequency of small earthquakes in the area increased during this time, according to Jeanne Sauber of NASA's Goddard Space Center in Maryland and Natalia Ruppert of the University of Alaska, Fairbanks. Sauber and Ruppert also think that the magnitude 7.2 St Elias earthquake in this region in 1979 occurred earlier than it might otherwise have done, due to the loss of ice (*Geophysical Monograph Series*, vol 179, p 369). The quake was in a unpopulated area and no one died.

Even if climate change is indeed to blame these are relatively minor events. On a global level, there has been no significant increase in either volcanic eruptions or earthquakes as a result of the warming over the past

century. Certainly, no researcher is claiming there is any connection between climate change and major disasters such as the Japanese megaquake earlier this year.

There is, however, evidence that warming has triggered major landslides (see "Slip-sliding away"). And there has been very little warming so far compared with what is to come: McGuire thinks we will we see a clear effect on volcanoes and earthquakes when climate change really gets going. "Earthquakes and volcanic eruptions over a hundred years would cluster. You need a certain amount of strain to accumulate and climate change may bring forward the time that takes," he suggests. This will mean more earthquakes and eruptions in a given period, rather than more in total, he says.

The main reason is melting ice. There is far less ice now, of course, than at the end of the last ice age. But the planet is warming much faster, so sea level may rise as fast as it ever did before. While sea level rose just 0.17 metres over the 20th century, most glaciologists expect sea level to rise around a metre by the end of the 21st century. This would add an extra tonne per cubic metre to undersea and coastal faults.

The good news is that it will probably weigh down and stabilise faults beneath the sea floor. The bad news is that it will create extra stress at the coast. Here there will be a kind of see-saw effect as the seabed is pushed down. That could add enough stress to trigger a quake on faults that straddle the coast, or run parallel to them, such as the San Andreas fault in California, the North Anatolian fault in northern Turkey, and the Alpine fault in New Zealand.

The next hundred years of sea-level rise is only likely to trigger an earthquake on a fault system that is already very close to failure, says Karen Luttrell of the US Geological Survey in Menlo, California. Still, that could mean people suffering an earthquake that otherwise would not have happened in their lifetime.

Apart from this coastal effect, the areas most likely to be affected are sparsely populated and are already hotspots for geological activity, such as Iceland. Its largest icecap, Vatnajökyll (pictured left), sits on top of two active volcanoes. The icecap has lost 10 per cent of its mass since 1890, which is having two effects. The crust is rebounding, potentially bringing the magma chambers beneath closer to collapsing and triggering earthquakes. It also causes more magma to be produced at depth, as lower pressure can lead to rocks melting. This second effect is peculiar to Iceland, where hot magma is already close to the surface because it lies along the mid-Atlantic ridge.

Carolina Pagli of the University of Leeds, UK, and Freysteinn Sigmundsson of the University of Iceland in Reykjavik recently calculated that the thinning of the icecap is increasing magma production each year by 10 per cent (*Geophysical Research Letters*, vol 35, p L09304). To put it in perspective, the extra 1.4 cubic kilometres produced in each century is similar to the 2 cubic km per century already produced under the Bardabunda volcano. So almost a volcano's worth of extra magma is being produced due entirely to the melting of the ice.

Adding more magma to an existing chamber is likely to mean more frequent eruptions as the chamber fills and empties more quickly. "It is likely to cause an increase but it is not possible to tell when," Pagli is quick to point out. "We don't know how quickly the magma that is being produced moves to the surface," she says.

While Iceland is a special case, in that it sits over a major spreading ridge, Pagli points out that wherever ice caps or glaciers above volcanoes melt, they will cause the crust above the magma chambers to flex, which might make them more likely to fail. "Volcanoes in Antarctica may be subject to this," she suggests. There are also chains of volcanoes covered by large glaciers in the Aleutian Islands in Alaska and parts of Patagonia.

In Greenland and Antarctica, extensive melting of the ice caps could even rewaken long-dormant faults. This would result in earthquakes that would not have occurred otherwise, and some of them could be major ones.

Both polar regions are seismically quiet at the moment, but according to Andrea Hampel, a geologist at Hannover University in Germany, that is probably because of the vast amount of ice that is weighing them down. While few people live near these areas, coastal earthquakes in remote places could still cause major disasters by triggering tsunamis that speed across oceans and hit densely populated areas. Around 8000 years ago, after the end of the last ice age, there was a massive underwater landslide, called the Storegga slide, off the coast of Norway. An estimated 3200 cubic km of seabed slid down the edge of the continental shelf, generating a huge tsunami with waves up to 25 metres high, which engulfed parts of Scotland, Norway and Iceland.

Tsunami risk

The slide is thought to have been triggered by earthquakes, which in turn were caused by the rebounding of the crust in northern Europe after the ice melted. Studies of the sea floor show that the Storegga slide was one of a series of megaslides in this area over the past 500,000 years, most of which occurred in the aftermath of ice ages.

Underwater slides could occur off many coastlines around the world. A 1998 tsunami that killed 2000 people in Papua New Guinea, for instance, was caused by an undersea slide triggered by an earthquake. So if rising sea level triggers more earthquakes in coastal areas, in theory, it will also increase the odds of underwater slides and thus of tsunamis.

Overall, then, the evidence does point to a small but real increase in the likelihood of earthquakes, volcanic eruptions, landslides and tsunamis over the next century or so as a result of climate change. The effect is likely to be greatest in areas where few people live, minimising the threat to lives. Even those who live far from any volcanoes or quake zones, however, could feel the economic and practical consequences.

The eruption of the Eyjafjallajökull volcano in Iceland in April 2010 grounded flights across Europe for nearly a week, while an eruption at Chile's Puyehue-Cordon Caulle volcano in June this year had a similar effect across the Pacific in southern Australia. Neither eruption had anything to do with climate change, but it is the type of problem that we - or our children - are likely to see more of if McGuire's predictions about more frequent eruptions are borne out.

In a world that is going to suffer from ever more catastrophic floods and storms, killer heatwaves and devastating droughts, the risk of a few more earthquakes and volcanic eruptions, mostly in remote areas, might seem to be a relatively minor issue. That may well be true, but it is yet another item to add to the already long list of adverse consequences predicted or beginning to occur as a result of climate change. Events such as earthquakes also strike with little if any warning, so they can kill far more people than, say, hurricanes and floods.

What's more, geological events such as earthquakes, volcanoes and tsunamis have always been seen as completely beyond our control. Now it appears this is no longer entirely true - we have the power to prevent at least a few of them if we choose to.

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Slip-sliding away

High-altitude mountain areas are warming fast, melting the permafrost that holds many slopes together. In areas such as Alaska, New Zealand, the Russian Caucasus and the Alps in Europe, the result has been an increase in rock and ice landslides over the past few decades.

"Gradual warming causes long-term thaw of permafrost that generally reduces rock strength, while high-temperature events act in much less time, days to weeks, and can be considered as landslide triggers," says Christian Huggel, a glaciologist who studies glacial hazards at the University of Zurich in Switzerland. And if temperatures quickly fall again, meltwater freezes and expands, destabilising the slope yet further.

Huggel and his team have linked several rock-ice avalanches across the world's mountains to this kind of rapid warming. The worst yet - and the largest rock avalanche on record - was in the Russian Caucasus in 2002. Part of the Dzhimarai-Khokh mountain (pictured left) collapsed, smashed into the Kolka glacier below, picked up 100 million cubic metres of rock and ice and raced down the mountainside at 80 metres per second, killing 100 people. Temperature recordings from sensors embedded in the rock suggest the permafrost gave way at the bottom of the section that slipped (*EOS Transactions*, vol 89, p 469).

A similar story played out on Mount Steller, Alaska, three times - once in 2005 and twice in 2008 - and also on Mount Cook, New Zealand, in 1991, and on Mount Rosa in the Swiss Alps in 2005 and 2007 - all after warm spells lasting up to 10 days and in some cases followed by a refreeze immediately before the landslide. On these occasions, no one was killed, although the Mount Cook avalanche narrowly missed an occupied Alpine hut, and both Mount Rosa avalanches hit what was a glacial lake until it drained in 2003. Had the lake still been full, the community of Macugnaga below would have been hit by a devastating outburst flood.

Huggel predicts that brief warm spells in the highly populated Alps will become 1.5 to 4 times more common in the next few decades compared with the past 50 years.

If that is the case it is only a matter of time before lives are lost again. "A similar event [to the Russian landslide] in the Alps could cause the death of thousands of people and damage of the order of billions of dollars," says Huggel.

But it might be possible to save lives. "Often, but not always, there are precursory signs of instabilities that should not go unnoticed in densely developed mountain regions," he says. Any advance warning would buy time for people to make their escape.

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http://www.newscientist.com/article/mg21128321.600-climatequake-will-global-warming-rock-the-planet.html

Man-Cave Masculinity

A man's quest for his soul starts with a walk downstairs.

By Bryan Curtis|Posted Monday, Oct. 3, 2011

Illustration by Robert Neubecker.

Students of anthropology, by now you've heard of "man caves": the basements and above-the-garage spaces where men gather to watch the Red Zone Channel. What requires further study is the culture that has arisen there. It is man-cave masculinity—a new male code. Study man-cave utterances ("This is everything and more of what I've ever wanted in a basement") and you begin to see fear. You see confusion. You see men galloping into adulthood like Leon Lett running toward the end zone in Super Bowl XXVII. That this unsteady manliness would be celebrated with big-screens and kegerators and *Golden Tee* machines is part of what makes it so touching.

To see how far men have come—or maybe how far they've retreated—we need to start at midcentury, at a proto-man cave: Toots Shor's eponymous saloon in New York City. The décor at 51 West 51st Street was manly in extremis. "[I]t is as devoid of subtlety and fussy trimmings as a boxing ring," John Bainbridge wrote in his three-part *New Yorker profile*. Fleshy and obscene, Shor pulled in manly types—Frank Sinatra and Jackie Gleason; sports stars like Joe DiMaggio; sportswriters like Jimmy Cannon; even Chief Justice Earl Warren—to join his nocturnal party. As Shor liked to say, "A bum who ain't drunk by midnight ain't tryin'."

Shor also enforced a male tribal code. To be one of his "crumb bums," you had to make frequent and tender declarations of friendship. You were expected to smother your ego. (Charlie Chaplin, enduring a 20-minute wait for a table, was told by Shor, "Have a drink and be funny for the people.") And although he was happily married, Shor did not make his inner sanctum particularly woman-friendly. Bainbridge: "[A] member is not forbidden to bring a female companion into the restricted area, but it is understood that he will not do it too often." Switch up a few particulars, and this is man caving today.

What changed is that middle-aged male "palship"—Shor's excellent phrase—is now practiced on sofas. The saloon came home. There are two big reasons for this. First, there was the women's movement, which made it verboten for married men to be at bars until all hours. Men (or this was the idea, anyway) took on a bigger role in rearing children, cooking dinner, and maintaining the house.

The second reason is that the sports bar became redundant. These days, every giant, glowing LED TV is its own sports bar. We have the NFL Sunday Ticket—the NFL "package," as it is gonadally known—and niche channels like the Longhorn Network. Jimmy Cannon, the most famous sportswriter of his day, snooped for material at Shor's bar; Bill Simmons, the most famous sportswriter of his day, snoops for it on his satellite. "What a man cave night," Simmons tweeted in April. "3 NBA games, Bs-Habs, Hawks-Canucks, Sox going for .500 + 6 of my League of Dorks starters pitching. TV smorgasbord!"

Staying home and declaring, "I'm totally OK with that!" produces its own peculiar macho code. At its simplest level, a man cave, like a saloon, represents an escape hatch. "I feel like when I shut the door, I'm isolated from all the frustrations of being a dad and a husband," one man caver told the Nashville *Tennessean*. Another told the *Calgary Herald*, "It's almost like you walk down the steep stairs and everything else is forgotten." James B. Twitchell, author of the book *Where Men Hide*, compared this downstairs walk with ones that lead to other illicit male redoubts—strip clubs, opium dens—where there are no windows, where the outside world can't see in.

Yet man caves full of framed sports jerseys aren't illicit escapes. They're the male equivalent of slipping into a bubble bath. (Cal Ripken, take me away!) Many man caves are stripped of sex altogether. "It couldn't be anything cheesecake," one man told the *Tennessean* of his décor. "No *Maxim* magazine." Likewise, when a man constructs an elaborate bar in his basement, what he is really constructing is a pretend bar: one without pool table brawls, chance encounters, and drunken flirting. A Pittsburgh Steelers fan and man caver told the *Sacramento Bee*, "It's my space. … My wife knows where to find me." In the yawning void between those two sentences, you see the fantasy a man caver is creating for himself.

So man-cave masculinity is about tip-toeing 10 feet and hiding in plain sight. It's also regaining control of a life's narrative. See, for example, the DIY Network TV show *Man Caves*. Jason Cameron, a contractor, and Tony Siragusa, a former NFL nose tackle, grant the wishes of sad, cave-less men who write into the show's website. (It's the reverse of the 1950s, when a strung-out housewife would go on TV to weep for new appliances.) Cameron and Siragusa build these men dream worlds. "There are certain things we always put in a man cave," Cameron tells me by phone. "One is the bar. We haven't done a man cave without a bar and a kegerator. And a comfortable chair. And a big-screen TV."

About the walls: "Earth tones, steel, and wood," Cameron says. Manly materials, the kind that would have made Tim Taylor grunt in ecstasy. (*Man Caves* bans throw pillows, scented candles, and fuchsia.) As Cameron explains it, presiding over a man cave is a trade off. The men on *Man Caves* have no say (or interest) in decorating the rest of the house. But they throw themselves into decorating the man cave within an inch of its life. It is a plank of man-cave masculinity that you will give away the world—drapery, patio furniture, kids' names—for a small zone of autonomy. "It's just that I'm comfortable down here," one man told the *Muskegon Chronicle*, "and it's kinda mine."

Let's enter the man cave. Here are some typical decorations, culled from news stories: seats from the old Boston Garden. Game-worn cleats from Tommie Frazier. A Lance Parrish Tigers jersey. The board game Axis & Allies. "Ironic movie and video game posters." A saddle. An Egyptian tomb. The man cave isn't just the new sports bar—it's the new parents' basement, the college dorm room. It is the place where a permanent childhood is left uninterrupted.

Man caves become ego caves. They are shrines to their owners. "Most people are amazed when they walk into my room," a man caver named Ken remarked to the *Sacramento Bee*. "They are just shocked that one

guy could have as much as I do." (Ken has a signed photo of Derek Jeter.) In the suburban hinterlands, the man cave—along with the garage workshop, the in-home theater, and the humidor—is a muscle-flex of wealth, of having a McMansion with more square footage than your neighbor's.

On the credit side, this physical space—this five-yard halo—can also provide some mental space. "Building a space of your own is a way to establish your identity," says Sam Martin, author of the book *Manspace: A Primal Guide to Marking Your Territory*. One man Martin chronicled made his man cave into an elaborate replica of a 16th-century Japanese tea house. Another man refurbished a 75-foot tugboat. DIY's *Man Caves* crew designed the radio studio for former *SportsCenter* host Dan Patrick: a cave of exposed brick walls and a pinball machine and athlete cardboard cutouts and a basketball hoop. According to Jason Cameron, when Patrick saw the room, he wept.

Cameron himself lives with his wife in a 1,000-square-foot condo—too small for a man cave. But he's dreaming of a future hideout. "I'm a cigar guy," Cameron tells me. "It's going to be a cigar-slash-wine room." I tell him that sounds awfully upscale. He pauses. "Yeah, I'm shocked I just said that." Man cave masculinity holds that—contra the sports bar—self-realization comes when a man is alone. If he's ever alone.

The hedge is appropriate, because at bottom a man cave is a compromise, a punt. It is an admission that unbridled guydom will be balanced with family life. That self-realization with be mixed with self-abnegation. As Bill Simmons noted in another tweet, his vacated man cave had been taken over by his young son, who was watching *Scooby-Doo* on the big screen. We guys haven't "turned in our man cards," to use the most horrific phrase known to, er, man. But we have accepted that we can only use them in a dank basement, in view of Tommie Frazier's cleats, for a few hours on Sunday.

We? You bet! I get married in a week. My current "man space" amounts to half of the second bedroom in our Brooklyn apartment. It could support an ethnography of man cave masculinity. Papers strewn all over the floor (stubborn messiness). Fitted caps I buy but never wear (longing for lost childhood). The complete novels of Michael Crichton (ditto). A cactus (still under booth review). And finally, a photo of me, around age 13, in a suit and clip-on tie interviewing a baseball player (a cocktail of childhood longing, sports fetishization, and escape from reality that even Dr. Freud would have trouble choking down). As this article goes to press, I'm temporarily surrendering my cave to my in-laws, who will be sleeping in it for a night. How do I feel about the intrusion? You know, man to man, I think I'm going to be totally OK with it.

(Disclosure: I write for Bill Simmons at *Grantland*. James Twitchell, cited above, has admitted to plagiarism in his published works; if his insights about man cavery rightly belong to someone else, I'll credit them instead.)

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Pay as you go solar power makes energy cheaper

- Updated 14:29 07 October 2011 by **Jacob Aron**

Turn that sunshine into electricity *(Image: Tanja Giessler/Getty)*

Pay as you go is a common way of paying for calls on your cellphone. Now the idea could help make solar power a more realistic option for families in Kenya and other African countries.

The system, called IndiGo, consists of a low-cost flexible plastic 2.5W solar panel that charges a battery. This is connected to a USB mobile phone charger and an LED lamp that provides around 5 hours of light from one day's charge.

Developed by solar energy firm Eight19, based in Cambridge, UK, IndiGo costs $1 a week to run, though the unit itself must be leased for an initial $10 fee. Users add credit by buying a scratchcard that they validate by sending a text message from their phone.

IndiGo is being trialled in Kenya and will be tested in other countries in the next few months. Eight19 hopes the device will go on sale early next year. The company also plans to offer higher-power systems as demand for solar energy increases, such as a 50W system that could power a small TV.

No more kerosene

Many rural areas of countries such as Kenya are not connected to the electricity grid, so people light their homes using kerosene lamps. As well as being relatively expensive, these create smoke pollution and carbon emissions. Simon Bransfield-Garth, CEO of Eight19, says the high cost of fuel locks people into a cycle of poverty. "They're paying disproportionately large amounts for their energy," he says – typically $3 or £2 a week.

Bransfield-Garth says the benefits of his firm's solar power system aren't just economic - it will improve access to power too. People in rural Kenya currently pay around $0.20 to charge their phone, and many also have to travel to a charger. One man in the trial used to make a 2-hour round-trip each week and wait another 2 hours to actually charge his phone. He can now do it at home.

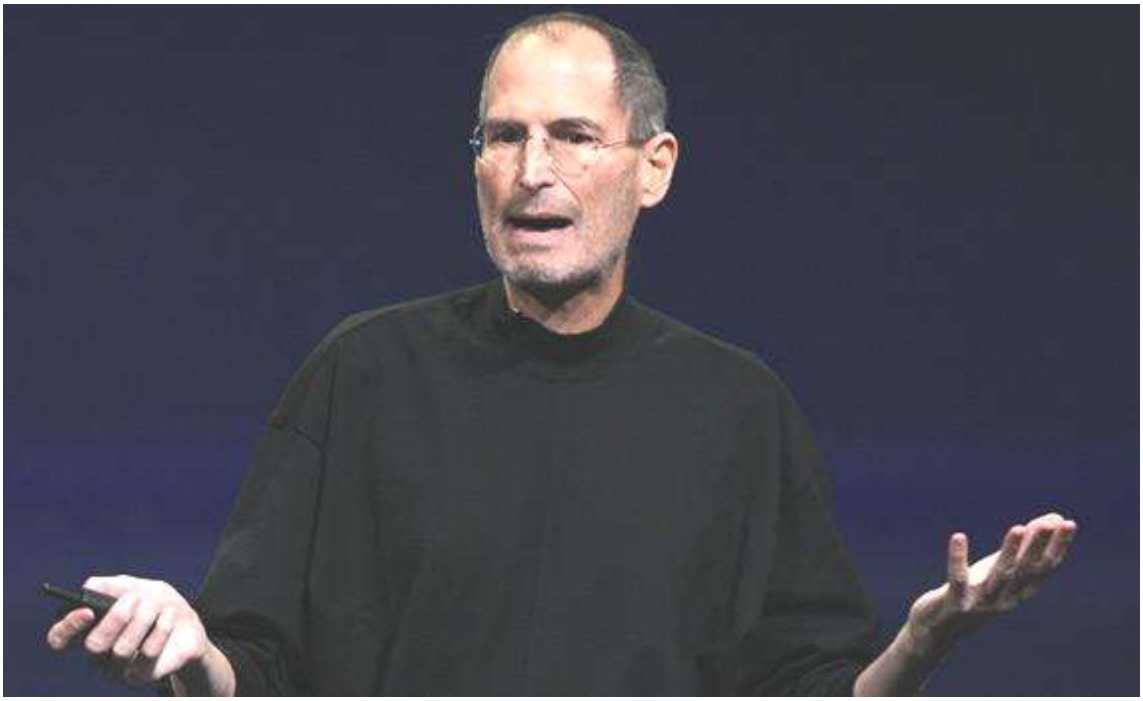
"There's no doubt it's a great development," says Sabah Abdullah , who researches sustainable energy development in developing countries at the University of Bath, UK. But she warns that the system could be hard for people with low literacy levels to use and that relying on a mobile phone for payment could marginalise those who can't afford such devices. "These are the people who really need a step up in terms of electrification."

http://www.newscientist.com/article/dn20991-pay-as-you-go-solar-power-makes-energy-cheaper.html

Help the Next Steve Jobs

If you want to honor Steve Jobs, do what somebody did for him: Donate your organs.

By William Saletan|Posted Thursday, Oct. 6, 2011



Apple CEO Steve Jobs worked to enact a law to encourage organ donation in California

Photograph by Justin Sullivan/Getty Images.

Steve Jobs made machines. They're machines you can type on, or talk on, or listen to music on. He didn't just tinker with gadgets. He changed what they did. He made machines do what machines had never done before.

But there was one machine he couldn't fix: his body.

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Jobs died yesterday at 56 because of a glitch in his programming. The glitch was cancer. A lot of smart people are trying to fix this glitch in future releases of the human body. But that's going to take a while. In the meantime, there's something you can do to help people such as Jobs. You can supply replacement parts for the machines that keep them alive. You can sign up as an organ donor.

Two years ago, Jobs got a liver transplant to prolong his life. Apparently his cancer, which began in his pancreas, had damaged his liver. To get the liver, Jobs went to Tennessee, because the waiting list in Northern California was too long. There weren't enough livers to go around. Lots of other people in Northern California needed livers but couldn't get them, because they didn't have the kind of money or savvy Jobs did. They couldn't afford to fly around the country, go through extensive evaluations at multiple transplant centers, and guarantee their availability within an hour for the next liver that became available.

Go to the data page of the Organ Procurement and Transplantation Network and look at the numbers. More than 100,000 people are on waiting lists for organs. Sixteen thousand are waiting for livers. Ninety thousand are waiting for kidneys. Three thousand are waiting for hearts. In the past decade and a half, more than 100,000 people—on average, more than 6,000 per year—were removed from the lists not because they got organs, but because they died. Another 30,000 were removed because they became too ill. Right now, more than 3,000 people are waiting for livers in California. Most of them have been waiting more than two years.

Earlier this year, when Jobs took a leave from Apple because of deteriorating health, I asked whether he should have received his transplant in the first place. As bioethicist Arthur Caplan has noted, almost none of the 1,500 people who received liver transplants in the U.S. when Jobs did, in the first quarter of 2009, had cancer. That's because there's no evidence that transplants stop metastatic cancer. The much more likely scenario is that the cancer continues to spread and soon kills the patient, destroying a liver that could have kept someone else alive for many years. Among liver recipients, cancer patients have the worst survival rate. While more than 70 percent of liver recipients in Jobs' age bracket are still alive and functioning five years later, Jobs lasted only half that long.

Video: Steve Wozniak Remembers Steve Jobs

Spending that liver on Jobs seems unfair, given the scarcity of organs. But why should we accept scarcity? Jobs didn't. He used his influence to prod California to enact a new law that requires applicants for a driver's license to be asked whether they'd like to be organ donors. He recognized that the wait for organs doesn't have to be a zero-sum game. If more organs become available, people like Jobs can get transplants, possibly prolonging their lives, without sentencing others on the waiting list to death.

In the hours since the world learned of Jobs' death, I've seen lots of people posting tributes to him online. They say he was one of a kind. They say he did things nobody else could do. But medically, he was one of thousands. And the thing he needed most was something any of us can do. He needed an organ donor. There are 100,000 people behind him—people who didn't have his wealth or connections—still waiting.

If you want to honor Jobs and his donor, don't just recycle your computer. Recycle your body. Register as an organ donor, and spread the word. You can help the next Steve Jobs reboot the machine that matters most.

http://www.slate.com/articles/health_and_science/human_nature/2011/10/steve_jobs_liver_transplant_organ_donation_is_the_best_way_to_ho.html

Forget the new iPhone, let's talk Siri

19:55 4 October 2011

Jacob Aron, technology reporter

For those hoping for an iPhone 5, Apple's "Let's Talk iPhone" event today might have been a disappointment. But the consumer electronics firm did grace the world with the new iPhone 4S, an overhaul from the iPhone 4 that also came with some breakthrough software in the form of the personal assistant program, Siri.

On stage at the event senior vice president of iPhone software Scott Forstall asked his phone: "What's the weather like today?" And Siri responded with the forecast.

That was just the beginning. Over the next few minutes, Forstall asked Siri to find him some Greek restaurants and arrange them by their ratings. He showed that Siri could set up business meetings, or search Wikipedia or search engine Wolfram Alpha - all by speaking to a phone in plain English, just as you would ask any human the same questions.

Such an apparent breakthrough in natural language processing promises to change the way we interact with our phones - say "find me a table at an Italian restaurant near my office for 7 pm" and Siri will get it done, even make you a reservation. Gizmodo likened this spooky level of personal service to the USS Enterprise's computer in *Star Trek*.

A rehearsed demo is all well and good, of course. But will it work as well as advertised in the real world? Google's Android supports voice commands such as sending a text message by speaking, but its performance is spotty at best.

But this is not Apple's first go-round with voice commands, or even Siri - the company released an early version of the software assistant in February last year. Now, powered by the iPhone 4S's faster A5 processor and integration with Apple's iCloud service, which processes voice commands on a remote server, the new and improved Siri does indeed look poised to raise the bar significantly. No word on whether Siri will also be available for the iPad 2 - which also sports an A5 processor - or Mac laptop and desktop systems.

Siri's roots can actually be traced back to 2003, when DARPA funded a research program called "Cognitive Assistant that Learns and Organizes" or CALO. The intention was to create an automated assistant that could learn from the user and handle a variety of tasks. The project was lead by SRI International, a California based research institute - when it came to an end a number of people working on the CALO project founded Siri, and the company was snapped up by Apple.

Siri will come with support for English, French, and German at the start, with other languages to follow throughout the service's beta phase (not clear how it will handle strong accents, though). The assistant's voice recognition component is powered by software from Nuance, the company which also produces Dragon Naturally Speaking voice recognition software for Windows PCs. Their software supports other languages, but voice is just one component. Siri relies on other online services such as Rotten Tomatoes for movies or OpenTable for making restaurant reservations, and many of these offer a limited or no experience outside of the US.

http://www.newscientist.com/blogs/onepercent/2011/10/forget-the-new-iphone-lets-tal.html

Ahmadinejad's Nightmare

Does homosexuality exist in every human society?

By Jesse Bering|Posted Wednesday, Oct. 5, 2011

Mahmoud Ahmadinejad recently reiterated his belief that there are no homosexuals in Iran. Are there any societies without gays?

Photo by Brent Stirton/Getty Images.

At a press event two weeks ago, CNN's Wolf Blitzer asked Iranian President Mahmoud Ahmadinejad to elaborate on his notorious assertion from 2007 that there were no homosexuals in Iran. "My position hasn't changed," replied the defiant Ahmadinejad. He then acknowledged to Blitzer, begrudgingly, the *tiny sliver* of a possibility that there could be such monsters living amongst even the Sharia-centric Iranians. "Perhaps there are those who engage in [homosexual] activities … but these are not known elements within Iranian society. Rest assured, this is one of the ugliest behaviors in our society … but as the government, I cannot go out in the street and ask [my people] about their specific orientation."

I'd take considerable pleasure in using this column to expound on Ahmadinejad's intellectual deficiencies. (Let's be honest, any leader who believes in a supernatural entity that finds gay people icky isn't exactly the deepest thinker.) Yet this arrogant theocrat unwittingly raises a more interesting issue for us to consider: *Does homosexuality exist in every human society?*

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For anyone with even a modest scientific background, the answer seems obvious —hence the widespread disbelief of Ahmadinejad's initial claim of a gay-free Iran. Although LGBT Iranians live under constant threat

of severe legal and social sanctions, we do know that there is no shortage of them. Still, that doesn't mean that homosexuality can be found in every other corner in the world. A husband-and-wife team of anthropologists at Washington State University named Barry and Bonnie Hewlett believe that they've found a society without gay sex—and that there other societies, too, in which some presumably universal behaviors, such as homosexuality and masturbation, are nonexistent at all levels of analysis.

The Hewletts work amid a group of peaceful net-hunting foragers in central Africa known as the Aka, who live in migratory camps of about 25 to 35 individuals. Other ethnographic details, such as the Aka's sociopolitical organization (minimal-control chiefdoms) and gender relations (men and women are relatively equal) certainly aren't irrelevant to their sex lives, but in a report published last year in *African Study Monographs*, the researchers focused on the Aka's bedroom behaviors. It was the Aka's apparent hypersexuality that inspired the Hewletts' research. "We decided to systematically study sexual behavior," they explain, "after several campfire discussions with married middle-aged Aka men who mentioned in passing that they had sex three or four times during the night. At first we thought it was just men telling their stories, but we talked to women and they verified the men's assertions." That's right—three or four times *per night*.

But campfire talk is one thing, actual behaviors quite another. So the anthropologists conducted a more rigorous series of interviews in the Aka's native language (Diaka) using a local interpreter. They also interviewed nearby farmer-villagers known collectively as the Ngandu. To get at the patterns of sexuality in these two groups, the Hewletts interviewed 56 people, ages 18 to 70, who'd been married at least once. Given the sensitive subject matter, the husbands were interviewed by the male anthropologist, Barry Hewlett, while Bonnie Hewlett spoke with the wives. "The Aka and Ngandu were very open and willing to talk to us about sexual behavior," note the authors, "but this was in part due to our long-term relationships in these communities." (At the time of their interviews, 35 years for Barry and a decade for Bonnie.)

Now, before we get to the nitty-gritty, there a few important things to first point out about the Aka and Ngandu—and indeed, about the anthropologists' motives in examining these people's sexuality in the first place. Over the past half-century or so, a lot of impressive work has been done on cross-cultural differences in sexuality. But for a host of reasons—ethical, practical, personal and professional—it's still a subject area at the outermost margins of mainstream anthropology. Anthropologists who choose to study sexuality, writes Carole Vance of Columbia University, are often cornered into the world of sexology, itself "an intellectual ghetto of disciplinary refugees." As a result, enormous gaps in our knowledge remain, particularly with regard to sex in small foraging societies like the Aka. That we know so very little about sex in other cultures, however, hasn't stopped many scientists from claiming that there are indisputable sexual universals on the basis of data collected from large Euro-American samples, such as the famous Kinsey findings.

"One of our fears in writing this paper," emphasize the Hewletts, "was that the Aka and Ngandu might be viewed as 'others' with unusual and exotic sexual practices … [but] overall, the Euro-American patterns are relatively unusual by cross-cultural standards." In other words, although widespread Westernization creates the impression of a species-wide sexual homogeneity, when one takes the sheer number of living and extinct cultures into perspective, it's *us*—not them—who are weird.

The other important thing to note with the Aka and Ngandu is that, by Western standards, they are extremely open with respect to sexuality. Children mimic intercourse publicly and without being reproached by their parents, the lyrics to a popular Aka children's song are the orgasmic vocalizations of two people having sex, and adults discuss sexual matters freely in camp. Furthermore, the Aka are known for their extremely flexible gender roles and near absent gender stereotypes. The women are just as likely to hunt as are the men, and men are heavily involved in childrearing. (In fact, the *Guardian* dubbed Aka men "best fathers in the world" a few years ago.) This is hardly an oppressive environment, which is why the apparent absence of homosexuality and masturbation in these societies came as a surprise to the Hewletts. "[These behaviors] are rare or

nonexistent," observe the authors, "not because they are frowned upon or punished, but because they are not part of the cultural models of sexuality in either group."

But we're getting ahead of ourselves. Let's have a closer look at what the Aka and Ngandu are (and are not) doing with their genitals. To begin with, they're having *a lot* of married sex. On average—and remember, this isn't just newlywed teenagers, but also middle-aged couples we're talking about—the Aka reported having sex three times per night, and the Ngandu twice per night. According to the Hewletts, these groups consider sex as being more like work than recreational activity. Given the importance placed on having many children—coupled with a high infant mortality rate—the Aka and Ngandu view sex as an exercise in gathering offspring, a form of nocturnal labor that is just as important as their subsistence activities during daylight. "The work of the penis is the work to find a child," said one Aka informant. "I am now doing it five times a night to search for a child," said another. "If I do not do it five times my wife will not be happy because she wants children quickly." It's not that sex isn't pleasurable to these people, the Hewletts emphasize. Rather, pleasure just isn't their primary motive.

As evidence of this secondary role of pleasure, there's not a lot of foreplay in Aka sexuality. For example, one woman remarked that a man never puts the clitoris in his mouth; "if he does he will vomit." That's not necessarily a sign of prudery. Given their general attitude toward the subject of sex, it's more likely an indication that such nonreproductive behaviors just aren't part of their script. This is relevant to current debates in our own culture about sexual libertarianism, such as those dealing with the "naturalness" of monogamy. "The Western cultural emphasis on recreational sex," the investigators observe, "has led some researchers to suggest that human sexuality is similar to bonobo apes because they have frequent non-reproductive sex, engage in sex throughout the female cycle, and use sex to reduce social tensions. The bonobo view may apply to Euro-Americans, but from the Aka and Ngandu viewpoint sex is linked to reproduction and building a family."

Another reason the Aka, especially, are having so much sex is because they're convinced that semen is a nutritive substance that enhances fetal development and leads to healthy babies. This helps to explain why Aka women report that they do not have orgasms with each bout of intercourse overnight, but Aka men are ejaculating into them every few hours. The concept of "seminal nurture"—that semen is a kind of milk for developing embryos—is found in many other cultures across the world as well, most notably in South America. Still, that's a lot of semen being churned out by your average set of middle-aged testes. (Couples take a few nights off during the week, presumably for men to replenish their seed.) Fortunately, the Aka do have access to some natural, and seemingly potent Viagra in the form of a chewable tree bark they call *bolumba*, which goes down best while drinking palm wine. Ngandu men also say that simple enemas are effective sexual stimulants.

But while they may be comfortable enough infusing liquid into their anuses to "give force to the penis," it's apparently never occurred to them to insert an actual penis into that particular orifice. The tribespeople, like Ahmadinejad, claimed there was no homosexuality of any kind in their culture. "The Aka, in particular, had a difficult time understanding the concept and mechanics of same-sex relationships," the Hewletts write. "No word existed and it was necessary to repeatedly describe the sexual act … we thought that maybe they were shy or embarrassed, but this would have been uncharacteristic of the Aka that we had known for so long." Apparently, the Aka aren't alone in their homo-naivete. In 1976, another team of anthropologists sifted through the Standard Cross-Cultural Sample data for attitudes toward homosexuality and found that people in five of 42 cultures listed had no concept of same-sex desire or behaviors. It's not that these cultures penalized or disapproved of homosexuality. Rather, they didn't even know what it was.

The absence of homosexuality in the Aka and Ngandu is hard enough to fathom, yet consider their unfamiliarity with another "natural" sexual behavior, masturbation. "Like homosexuality," explain the Hewletts, "it was difficult to explain self-stimulation to the Aka. They found it unusual and said it may happen far away in Congo, but they did not know it." People from other ethnic groups, too, are deeply

confused about this mysterious principle of self-induced orgasm. The anthropologists mention a colleague of theirs who was tracking fertility among the Lese people in the Ituri forest of central Africa, and found it extremely difficult to instruct men how to collect their own semen samples by masturbating. Even with rather explicit instructions, nearly all of the samples that were brought back to him were mixed with vaginal secretions! The only reasonable assumption to make here is that such frequent copulation, at least among married Aka adults, has obviated the need for self-gratification. Still, one would think that masturbation would occur in adolescents and that, like riding a bike, adults would remember the general motor pattern. But alas, no luck.

In any event, the point is not to suggest that homosexuality and masturbation are unnatural and therefore wrong, but that "deviance" is a relative term. Let's not forget there are certainly cultures for which homosexual behavior is the norm rather than the exception. In the 1980s, anthropologist Gilbert Herdt stunned the Western world with his reports on the "semen ingestion ritual" of the Sambia of Papua New Guinea. In that society, boys are separated from their families from the ages of 7 to 10 and forced to fellate older adolescent boys and ingest their semen. Ironically, the Sambia haven't really a concept of "homosexuality," either. Rather, they believe that only by swallowing prodigious amounts of semen can boys become fierce warriors. Not until they've completed several years of semen-swallowing and then another four or five years of being fellated by boys themselves can Sambia males become fully adult and enter into exclusively heterosexual marriages. And in certain parts of Lesotho, South Africa, a related, albeit semen-free pattern of sex between adolescent females and younger girls has been reported as the norm.

The examples above should remind us that there are as many sexual differences between cultures as there are similarities. It may astonish Westerners to realize that societies with these practices exist elsewhere in the world, but just imagine all of the other variations in human sexuality that must have been lost through the ages. Even today, there really are societies in which homosexuality does not exist; Iran's just not one of them. Still, I'm sure there are more than a few Iranians who wouldn't mind dropping Ahmadinejad into the jungles of the Central African Republic, so he might live out his days in the perfect, gay-free world of his dreams. But how cruel that would be to those peaceful Aka.

http://www.slate.com/articles/health_and_science/science/2011/10/ahmadinejad_s_assertion_about_gays_in_iran_isn_t_that_crazy_afte.single.html

App could help you control your home appliances

- 05 October 2011 by **Vijaysree Venkatraman**

Domicile domination in the palm of your hand *(Image: Mark Hunt/Huntstock/Corbis)*

IT'S a couch potato's dream come true. Teletouch, a program that runs on a smartphone, can dim the lights, turn off an alarm, or even double as a television remote.

To use this universal remote, a user points their smartphone's camera at an appliance that has been fitted with a Wi-Fi node. Vision software on the phone recognises what it is looking at and the phone then looks up the IP address of the appliance. The user classifies it as something that can be switched off and on, say, or turned up or down. The system remembers the setting, and then users are free to operate the object simply by pressing buttons on a virtual control panel. Teletouch can also control objects that are within Wi-Fi range but out of view.

Teletouch's developer, Pranav Mistry of the Massachusetts Institute of Technology, says "what you see is what you get" has long been the principle behind graphical user interfaces. He wanted to take that further. "With Teletouch what you see on the screen is what you can touch and control" in the real world, he says.

Mistry will demonstrate Teletouch at the NASSCOM India Leadership Forum in Mumbai in February 2012.

http://www.newscientist.com/article/mg21128324.800-app-could-help-you-control-your-home-appliances.html?full=true&print=true

The 40-Year Itch

Would-be space explorers, scientists, and a couple of crackpots gather at DARPA's 100-Year Starship Symposium to try to get interstellar travel unstuck.

By Konstantin Kakaes |Posted Wednesday, Oct. 5, 2011

*This article arises from Future Tense, a collaboration among Arizona State University, the New America Foundation, and **Slate**. Future Tense explores the ways emerging technologies affect society, policy, and culture. To read more, visit the Future Tense blog and the Future Tense home page. You can also follow us on Twitter.*

Will humans ever reach the Andromeda Galaxy?

Image by Comstock/Thinkstock.

The fastest a person has ever traveled is just 24,791 miles per hour. The three men of Apollo 10 went that fast on their way back from the moon in 1969.

The fastest a man-made object has ever traveled out of the solar system is 39,000 miles per hour—the speed with which Voyager 1, a space probe launched in 1977.*

David Neyland wants to beat these dusty, decades-old records. Neyland is a tall man, with the bushy beard of a frontier prophet and the measured tones of a midranking bureaucrat. He is both of these things. The head of the tactical-technology office at the military research agency DARPA, he convened a group of more than

1,000 at the Orlando Hilton last weekend to strategize about the next great era in space travel. The mission of the 100-Year Starship Public Symposium: to set about organizing a century-long effort to send a spaceship to another star. Neyland opened the conference to the public, drawing sci-fi fans and space geeks along with professional scientists. Ph.D. or not, all were frustrated with the lack of progress in space. As one wag in the audience would say, we should be having this meeting at the lunar Hilton. There was a sense that, for the just over 40 years since Neil Armstrong set foot on the moon, nothing new has been done.

The symposium was far-reaching, with presentations including "Modular Aneutronic Fusion Engine for an Alpha Centauri Mission" and "To Humbly Go ... Breaking Previous Patterns of Colonization." The meat of the conference was hard science: the physics and engineering of propulsion. The dessert, which drew in the public, came in the form of sessions on space and religion ("Did Jesus die for Klingons, too?") and panels with sci-fi writers.

But many came for the dessert and strayed to the meat. One of the hard-core tracks ("Time-Distance Solutions: Exotic Physics") was so popular it had to be moved to the symposium's biggest room. The session's moderator, John Cramer, a physics professor from the University of Washington in a plaid shirt and sport coat, said, "In times to come I predict this will be looked back on as the Woodstock of star travel." He compared the exotic physicists to "the punk bands, the guys that break the rules in order to get laid faster."*

There are many complications to interstellar travel, but the fundamental problem is that we need to go faster. Burning things—what almost every spacecraft so far has relied on for propulsion—would require trips that last tens of thousands of years. Nuclear rockets of various types—fission, fusion—would be faster but have their own drawbacks. Fission rockets are, in principle, technically feasible today, but launching them would be politically impossible because of the risk of radioactive contamination, if the rocket were to blow up on lift-off. The next option is solar sails, which aren't so different from regular sails, except instead of wind, they rely on the pressure of light bouncing off them. They have the big advantage of not having to carry propellant (which nuclear rockets, like regular rockets, would have to do). A variant on solar sails, the simplest of which rely on sunlight, would instead bounce off a beam—laser or microwave—sent from earth, which has the advantage that it could be tightly focused.

After years of being all talk, a Japanese probe launched last year became the first to use solar sails for propulsion, making it to Venus in just over six months. James Benford, an entrepreneur who founded the company Microwave Sciences, gave one of the most focused talks of the conference, addressing the economics of microwave-driven sails. Because microwave ovens are cheap, he said, we could assemble an array of thousands of microwave ovens into an array to push sails. This was a great example of the reverse spin-off argument: It's more likely that Earth-bound developments will make things in space feasible than that astronaut ice cream will take over the nation's stomachs.

These two most obvious paths—solar sails and nuclear rockets—are methods that, if we spent a lot of money and time on developing them, would definitely work moderately well. But neither will ever be that good. The stars are just too far. What we really need is something radically different, a game-changer. For that, I turned to Kramer's exotic physics session.

Usually musical festivals build up to the big names. But the exotic physics session opened with a rock star in the world of space geeks: Marc Millis.* Millis was famous for having persuaded NASA to run a short-lived "breakthrough propulsion physics" project from 1996 to 2002. During my subsequent interview with him, we were interrupted three times by attendees eager for Millis' autograph. He now runs his own outfit, the Tau Zero Foundation, which scrapes by on donations. He also literally wrote the book on the subject: *Frontiers of Propulsion Science*, which has whole sections on how to dissuade crackpots.

While careful not to overpromise, Millis is trying to think of ways that a spacecraft could be propelled without fuel. "You have to pick something completely different," he says. "Why don't we go back to the fundamental

physics and try and find solutions around that?" One of his ideas is to try to push against the universe. "You move one way and the universe moves the other way. If you start thinking about this, your head starts spinning. What," he asks, "are you pushing the universe relative to?"

Throughout the weekend, there was some disconnect between the space-curious members of the public, eager for visions of *Star Trek* futures, and the scientists engrossed in the nitty-gritty. Millis was followed by Harold "Sonny" White, from NASA's Johnson Space Center. While talking about the field equations of general relativity, he had the excitement of someone describing a running back juke around a defender. When he segued into the Chung-Freese metric, the woman next to me, a matronly type with dyed red hair, turned to her companion and asked, "Do you understand this?" He had a bushy mustache and sneakers, and if nerdish looks were any guide, looked like he should. He wrote his answer on a piece of paper, a scrawled "No." It's good to get the public excited, but the best way to do this is to actually do exciting things, not to have a deliberate strategy of public engagement that leaves lay audience members baffled in Orlando conference rooms.

White is currently designing an experiment to test whether he can demonstrate a small gravity-distorting effect in the lab. "This is highly speculative physics. It may not have any basis in physical reality," he cautioned. "Nobody get excited. It's still very, very hard." That was the line between the serious types and the crackpots—the serious types had crazy ideas, too; they just didn't forget that their ideas were probably wrong. "You want to tackle the challenges that make your peers feel uneasy," Millis says.

Millis, White, and their colleagues are trying hard to strike a balance; they know they must be both audacious and methodical. Others at the conference weren't trying as hard.

On Sunday morning, the guys from Sol Seed ("Bringing Life Even Unto the Galaxy") passed out fliers stating four rather ambitious, and divergent, goals. The first is to build an "eco-village community in Portland," while the fourth is "contributing to the destiny of life: spreading beyond Earth to take root amongst the stars!" Surprisingly, though, only one guy ranted about UFOs. ("I'm not talking about the crazy people. I'm talking about solid military evidence, CIA, DIA.") He left the room quietly when the panelists refused to engage him.

Then there were those who weren't crazy, but weren't helpful, either. One presenter vaguely said that it would be good to be able to communicate faster than light. He was riveted by his own slides, which said, "This problem appears insoluble." Toward the end, he mentioned the potential military application of his non-existent technology: It would work underwater. This is a bit like saying that if you were immortal, not having to worry about a long wait for a table at Applebee's would be one of the important benefits.

Tufts University's Ken Olum had the biggest beard I saw at the conference, which is saying a lot. His beard goes around a big U along the whole of his head, giving him a sort of upside-down halo. He looks like I imagine an alchemist might. But he wouldn't like that comparison. "We should not be alchemists," he told the conference. "They wanted a goal and that's what they thought about. After a while they were doing nothing useful. They were replaced by chemists who had the desire to learn about the world as it is, and not the desire to do some particular thing."

Speaking of misguided desires, a subsequent panel of science-fiction writers engaged in a long and pointless argument about the sociology of space colonies: It had all the substance and weight of a nuanced public policy debate, except that the dilemmas they were talking about were fictional. Michael Waltemathe, a young German academic with a pink tie, talked about religion and space colonization. *Apollo 14*, he told the audience, had taken 100 microfiche Bibles to the surface of the moon and back. This made him wonder how many bishops a space colony would have to take along to uphold apostolic succession. "Since I'm a Protestant," he said, "I would take all of them." That was the problem with a conference that deliberately tried to cultivate dreamers: They started planning the wedding before they'd even asked the girl out.

As the symposium drew to a close, James Benford sounded a note of optimism with a hint of longing: "We've been asking how to build starships. If we can't, the rest of the questions are moot. The answer, I think, is that we can." No one expects more money from DARPA, or from NASA, but they really are convinced that change is coming. Outside the main session, I stood talking with Millis. He took out a recent article he wrote for the *Journal of the British Interplanetary Society*. There was a triptych of rockets: a NASA rocket, Virgin Galactic's SpaceShip One, and SpaceX's Falcon rocket. "Fail!" he exclaimed when he pointed to the NASA rocket. "We are at the threshold of a sociological change," he said: Space is about to be opened up to private industry in a fundamentally new way. If industry lives up to the hopes of those assembled in Orlando, maybe the fastest human beings in history will soon be traveling toward something instead of back to Earth, like the Apollo 10 crew.

http://www.slate.com/articles/health_and_science/future_tense/2011/10/darpa_s_100_year_starship_symposium_alien_religion_solar_propuls.html

Star exploded? Just another day in Arp 220

- 17:30 07 October 2011 by **David Shiga**

Supernovae in the mist *(Image: NASA, ESA, the Hubble Heritage (STScI/AURA)-ESA/Hubble Collaboration, and A. Evans (University of Virginia, Charlottesville/NRAO/Stony Brook University))*

Object type: Ultra-luminous infrared galaxy
Luminosity: Bright as 1 trillion suns
Distance: 250 million light years

If our galaxy was a couple of kids with sparklers, Arp 220 would be the most eye-popping fireworks display you've ever seen. While we Milky Way dwellers get a miserly ration of supernovae – just two a century on average – Arp 220 is treated to 400 magnificent stellar explosions in the same time span. It is the highest supernova rate of any known galaxy.

This furious volley of detonations occurs because Arp 220 is actually two galaxies in the process of merging. That violence funnels gas to Arp 220's core, where it fuels prolific star formation. Many of these are massive, short-lived stars that soon explode.

That Arp 220 is a hotbed of explosive activity is not news. But only now has a team led by Fabien Batejat of Onsala Space Observatory in Sweden made measurements confirming that it is indeed full of supernovae. "We are very lucky to have Arp 220 close enough to see inside," says Batejat. "It's a very exciting galaxy that has a lot to teach us."

Arp 220's ongoing merger makes it a unique window into the past and future of galaxies like our own. In a few billion years, our galaxy is expected to merge with the Andromeda galaxy, for example. Meanwhile, smaller events in which the Milky Way swallowed dwarf galaxies may have given it its spiral arms.

Dim smudge

Despite being the most explosive galaxy known, Arp 220 isn't much to look at – at least if you, like most humans, can see only in the visible spectrum. When first noted in a 1966 galaxy catalogue, its visible-light image showed it as an unimpressive dim smudge.

But don't be fooled. Almost 20 years later, the Infrared Astronomical Satellite (IRAS) revealed that Arp 220 blazes like a beacon in infrared light, emitting more radiation in total than any other galaxy within 300 million light years of Earth.

This led to the suspicion that ultra-luminous infrared galaxies such as Arp 220 are, contrary to appearances, powerful sources of visible light – but it is obscured by thick shrouds of dust. The dust absorbs the light, heating it to make it glow strongly in infrared.

It was not immediately clear, however, whether the source of all that light would be vigorous star formation or a supermassive black hole gorging on gas, which would also blaze in visible wavelengths.

Tidal tail

Since then, further observations have backed star formation. The deal was sealed in 2002 when a Hubble Space Telescope image showed 200 massive young star clusters in Arp 220's core. The galaxy seems to be birthing more than 100 stars a year, far more than the paltry handful that spark into life each year in the galaxy we call home.

Those observations also suggested that many ultra-luminous infrared galaxies, including Arp 220, are in fact pairs of galaxies that we are seeing in the process of merging. Stray wisps of light around Arp 220 are signs of a tidal tail – a splash of stars and gas hurled outward by the violent merger process.

If Arp 220 really is two galaxies merging, a vast number of supernovae is just what you would you expect. A merger funnels gas into the resulting galaxy's core, fuelling star birth. Whenever that happens, supernovae are bound to follow: newborn stars come in all sizes, and the heaviest burn through their nuclear fuel in just a few million years before exploding as supernovae.

It seemed likely that Arp 220 was a prolific supernova factory, but hard evidence of these exploding stars remained elusive. Although Arp 220 is the closest ultra-luminous infrared galaxy to us, it is still distant enough to make detailed observation difficult.

Supernova signatures

Batejat's new study, which combines observations from more than a dozen radio telescopes around the world, firms up the evidence considerably. Over several years, his team monitored more than 40 radio sources in Arp 220 that were already suspected to be clouds of debris expanding from the sites of supernovae. The sizes and changing radio spectra of seven of these sources are just what would be expected of supernovae that exploded no more than 60 years before the radio waves were emitted. The spectra and sizes of many of the others suggest they are older supernova remnants. The result confirms that

Arp 220 has the highest measured rate of supernovae for any galaxy – on average one every three months.

Don't hold out for the light show, however, unless you are expecting to live for an awfully long time: Arp 220's will remain hidden from view behind its dust shrouds. And although the Milky Way may turn into a supernova factory when it collides with Andromeda, forming "Milkomeda", that smash-up isn't due for another 5 billion years.

Journal reference: *Astrophysical Journal*, DOI: 10.1088/0004-637x/740/2/95

http://www.newscientist.com/article/dn21024-astrophile-star-exploded-just-another-day-in-arp-220.html?full=true&print=true

How Do You Turn Off a Particle Accelerator?
First press one button. Then press another.

By J. Bryan Lowder|Posted Friday, Sept. 30, 2011

The Fermi National Accelerator Laboratory in Batavia, Ill.

Photo courtesy Fermi National Accelerator Laboratory.

After 28 years of operation, the Fermi National Accelerator Laboratory's Tevatron—a 4-mile-long ring of superconducting magnets and vacuum tubes buried in the suburban soil just outside Chicago—will be turned off Friday afternoon. Until the construction of the Large Hadron Collider at CERN in 2009, the Tevatron was the most powerful particle collider in the world, generating subatomic bits of matter not seen since the Big Bang. How would you turn off such a device—is it as easy as pulling the plug?

Sort of. Engineers shut down the Tevatron via a two-step process that involves little more than entering a couple of commands into a computer terminal in the main control room. The first clears the accelerator tunnel of high-energy particles, after new protons and anti-protons have stopped being injected into the machine. By typing a few instructions (including "KILL_BEAM") into a device called a sequencer, a set of magnets are activated so as to kick the particle beam into an auxiliary tunnel and toward a thick metal target where it will be absorbed. The second command orders the magnets to "ramp down," dumping their 5,000-amp current into resistors and gradually lowering the energy of the system to nothing. It's not a particularly unusual or dramatic process—engineers do it on a regular basis for machine maintenance.

The control room of Tevatron

Photo courtesy Fermi National Accelerator Laboratory.

For the purposes of the closing ceremony on Friday, the engineers have created two special buttons to execute the commands, a red one labeled "BEAM" and a blue one labeled "RAMP." Once the buttons have been pressed, there's not much left to do but some housekeeping. Over the coming week, engineers will gradually bring the magnets up to room temperature from their operating state a few degrees north of absolute zero, and break the vacuum seal on the tunnel. Finally, the cooling gases and fluids will be drained.

Fermilab officials expect to open a section of the Tevatron to visitors sometime next year.

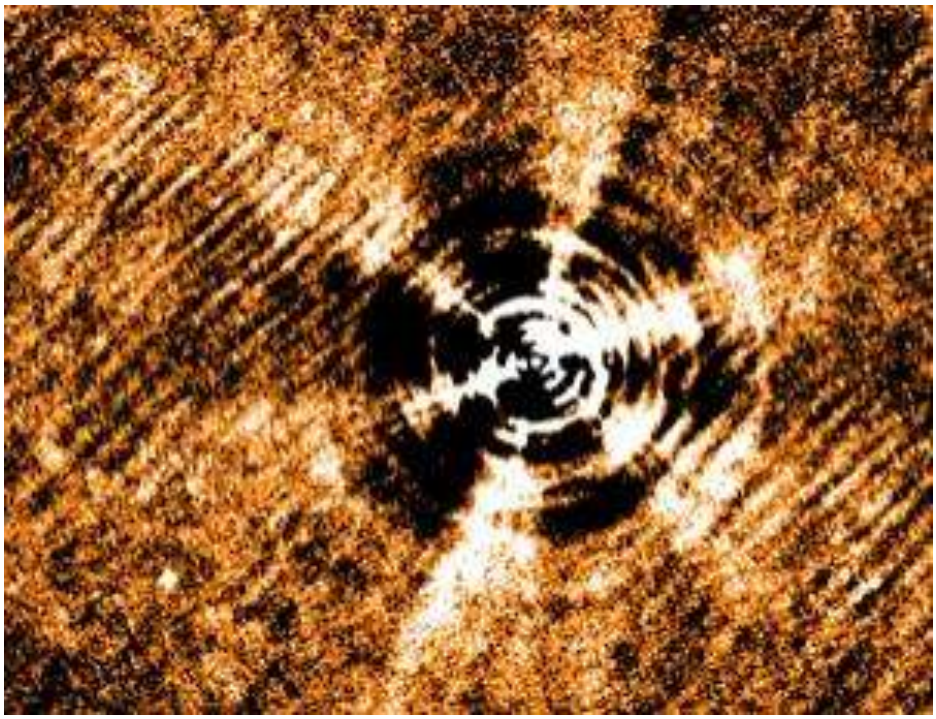
Got a question about today's news? Ask the Explainer.

Explainer thanks Roger Dixon and Duane Newhart of the Fermi National Accelerator Laboratory.

http://www.slate.com/articles/health_and_science/explainer/2011/09/tevatron_shutdown_how_do_you_turn_off_a_particle_accelerator_.html

Giant star comes with ancient tree rings

- 11:42 03 October 2011 by **Maggie McKee**



Millennia in the making *(Image: ESA/PACS/MESS Consortia)*

Astrophile *is our weekly column covering curious cosmic objects, from within the solar system to the furthest reaches of the multiverse*

Object type: Red giant star
Distance: 490 light years
Mass: 2 suns, but losing it at a rate of 0.002 per cent per year

The sun, bless its life-giving heart, is boring. Sure, it has the occasional outburst – hurling charged particles into space that sometimes land on Earth with troublesome consequences – but for the most part it goes about the workaday business of burning nuclear fuel without incident.

But our star may not always be so staid. One day, it could start throwing off clumps of stardust that would act like cosmic tree rings. The clues to this arboreal future come from a more evolved star called CW Leo, which is already doing just that.

Astronomers knew that "sun-like" stars – those with a mass up to about eight times that of the sun – puff up towards the end of their lives into red giants. Pressure from the stars' light pushes dust outwards, but until recently it was assumed that this happened at a constant rate, creating a smoothly expanding envelope of dust and gas.

Observations of CW Leo over the past decade show that there is another way. At 490 light years away, the star is the closest red giant to Earth. "That's why everyone looks at it," says Patrick Huggins of New York University in New York City. "It's the nearest one that is puffing off a lot of material."

Peanut dust

About a decade ago, Huggins and Nicolas Mauron of Montpellier University 2 in France noticed that the dust immediately surrounding CW Leo formed a peanut shape, with concentric arcs of dust – partial spherical shells – expanding out beyond the peanut to distances of 25,000 times the Earth-sun distance.

Given the rate at which the dust is expanding, that corresponds to reading the past 8000 years of the star's history.

Now Leen Decin of the Catholic University of Leuven in Belgium and colleagues have used the Herschel Space Observatory to find the most distant – and therefore oldest – shells yet seen, revealing dust shed by the star 16,000 years ago.

Herschel is sensitive to very long wavelength infrared light, allowing the telescope to pick up the faint thermal glow of dust just 25 °C above absolute zero.

Creation processes

It has revealed that at least a dozen dusty arcs surround CW Leo, and their thickness, location relative to the star and distance from their neighbouring shells all vary. "These giant stars are not losing mass at a constant rate – there are fluctuations," Decin says, adding that sometimes the stars lose mass from around their poles and sometimes from their equators.

Similar to the way a tree ring is a clue to the prevailing weather in the year when it formed, the dust shells hint at the processes that might have created them.

The spacing between them suggests they were ejected between 500 and 1700 years apart. What could be causing the star to puff out dust in fits and starts? Decin says that temperature variations across its surface might allow dust to condense in cooler regions and be puffed outwards.

Earth swallowed

Decin says other red giant stars probably puff out dust in shells too, but are too far away for other telescopes to have detected the shells. The recently launched Herschel telescope, however, may see them.

Will the sun produce rings too? Decin thinks so. "It will go through some spectacular phases later on," she says, adding that the sun will begin to expand into a red giant in the next 5 billion years.

Sadly, we will probably not be around to count and examine the rings. In swelling up into a red giant, "the sun will be so huge the Earth will be swallowed", she says.

Journal reference: *Astronomy & Astrophysics*, DOI: 10.1051/0004-6361/201117360

http://www.newscientist.com/article/dn20994-astrophile-giant-star-comes-with-ancient-tree-rings.html?full=true&print=true

Single Moms Are Crazy!
Does everyone secretly think this?

By Katie Roiphe|Posted Wednesday, Oct. 5, 2011

Are single mothers biting off more than they can chew?

Photograph by iStockphoto.

When I was pregnant with my second child, I was aware that there were ways in which I was not prepared to take care of a baby on my own, but that awareness didn't unduly influence or affect me. What I thought to myself was, "The universe will rearrange itself for this baby."

I often hear people refer to other single mothers I know as "crazy," and I assume that they refer to me that way, too. I have thought about this word, especially in relation to one single mother in particular who seems to me more sublimely functional and sane than anyone else I know. I began to realize that the quality people are referring to as crazy is actually what I would call "romantic." They mean that she is not influenced by the practical news on the ground, is listening instead to another story that is in her head. She is drawn to things that are, according to the dictionary definition of romantic, "impractical in conception or plan" and is in thrall to the "heroic, adventurous, remote, mysterious, or idealized."

This is a common thread in the single mothers I know: They go for vividness over contentment, intensity over security. One was embedded with the Army in Afghanistan when she was six months pregnant, another somehow floats with her toddler between Los Angeles, Paris, and wherever her French rail pass will take her. Others with more pedestrian professional lives simply decided to have a baby while their romantic lives remained complicated or turbulent or a work in progress. I can see why this is "crazy" in relation to conventional, settled life, but is it crazy? And, more importantly, is the term *crazy* one of our few acceptable ways of passing judgment on something different or unusual or uncommon in a culture that is technically not supposed to be passing those judgments?

To be clear, I am writing here about myself and the handful of other single mothers I know, specifically women who conceived children in some sort of relationship that they are no longer in and had the baby: a tiny, arguably privileged subset of single mothers. (It's worth noting, though, that nearly four in 10 babies in this country are currently born to single mothers, and a rapidly growing percentage of those mothers are adults.)

A few months ago I came across a Pew Poll showing that a large majority of Americans still view single motherhood as unacceptable and, in the colorful words of the poll, "bad for society."* Which somehow doesn't surprise me. Caitlin Flanagan wrote in *Time*, "Few things hamper a child as much as not having a father in the home," which is perhaps a little unsubtle for progressive New Yorkers, and yet many of them think and recycle polite, modified versions of this same idea.

Someone who was trying to persuade me not have the baby said that I should wait and have a "regular baby." His exact words were, "You should wait and have a regular baby!" What he meant, of course, was that I

should wait and have a baby in more regular circumstances. But I had already seen the feet of the baby on a sonogram, and while he was pacing through my living room making his point, I was thinking: This is a regular baby. His comment stayed with me, though. It evoked the word *bastard*: "something that is spurious, irregular, inferior or of questionable origin."

Someone said, similarly, to a single friend of mine who was pregnant that she should wait and have a "real baby." As if her baby were unreal, a figment of her imagination, as if she could wish him away.

Such small word choices, you might say. How could they possibly matter to any halfway healthy person? But it is in these choices, these casual remarks, these throwaway comments, these accidental bursts of honesty and flashes of discomfort that we create a cultural climate; it's in the offhand that the judgments persist and reproduce themselves. It is here that one feels the resistance, the static, the pent up, irrational, residual, pervasive conservatism that we do not generally own up to. Hawthorne called it "the alchemy of quiet malice by which [we] concoct a subtle poison from ordinary trifles."

A novelist I know is sitting on the bench in the park with his wife and two sons. He peers into the stroller at my 5-pound newborn, Leo, and says, "How did *that* happen?" He smiles radiantly: It's a joke! But my 6-year-old, Violet, is standing next to me, and I feel her stiffen because she senses something in his tone, something not quite nice. I say, "The usual way," but I have a feeling that if I were married, he would have said something more along the lines of "congratulations."

It's around this time that I begin to see that ***The Scarlet Letter*** is in fact a fresh, modern commentary. One might be under the impression that tolerant liberal New York bears no resemblance to Nathaniel Hawthorne's windy Puritan New England town, but one would be wrong. Our judgments are more polite, more subtle, more psychologically nuanced; latter-day critics of the state are thinking, of course, of what is best for the child, what is the healthiest environment; they are not opposed to extramarital philandering *per se*, but there is still underlying everything the same unimaginative approach to family, the same impulse to judge, the same sexual conservatism, and herd mentality. The single mother traipsing down the subway steps in heels with her Maclaren in New York (as opposed to, say, Paris or Berlin) is not as many worlds away as you'd think from Hester Prynne.

One day one of my colleagues, noticing that I was pregnant with my second child, ducked into my office and said, "You really do whatever you want." He meant it as some variety of compliment, and I took it as such, but I was beginning to get the sense that other people were looking at me and thinking the same thing; it seemed to some as if I were getting away with something, as if I were not paying the usual price, and if the usual price was take-out Thai food and a video with your husband on a Saturday night, then I was not, in fact, paying that price. James Baldwin once wrote, "He can face in your life only what he can face in his own." And I imagine if you are feeling restless or thwarted in your marriage, if you have created an orderly warm home for your child at a certain slight cost to your own freedom or momentum, you might look at me or someone else like me and think that I am not making the usual sacrifices. (I may be making *other* sacrifices, but that is not part of this sort of calculation or judgment.)

Before I have the baby, one of my friends politely suggests that it may be "hubris" to think that I can make up for the fact that the baby's father would not be in the house, and not even in the city most of the time. He tells me that I am too confident in my own powers. This worries me, sometimes late at night, because I wonder if it's not true, and there are times during the baby's first year when I wish the earth would stop spinning so that I can get off for a moment and rest. But maybe this is the good and useful kind of hubris.

The submerged premise here is that there is something greedy, selfish, narcissistic, or anti-social about having a baby on your own. But is there? It seems to me that if anything a baby born in these conditions is extra-wanted. The fact that having that baby is not necessarily the obvious or predictable or easy thing to do at this particular juncture in life makes it all the more of a deep and consuming commitment.

At lunch I mention to an editor that I am thinking of writing about single mothers and the subtle and not so subtle forms our moralism toward them takes. He says: "That's a good idea. And I say that as a guy who looks at single women and thinks, 'What's wrong with her? How did she screw up?' "

In spite of our exquisite tolerance for and fascination with all kinds of alternative lifestyles, we have a wildly outdated but strangely pervasive idea that single motherhood is worse for children, somehow a compromise, a flawed venture, a grave psychological blow to be overcome, our enlightened modern version of shame. It malingers, this idea; it affects us still.

The power of this view is that it very easily gets inside your head, it resonates with every children's book you have ever read about little bear families, with all the archaic visions of family that cohere in the furthest reaches of your imagination: It's hard to free yourself.

I notice the tendency in myself is toward jokes, toward a kind of protective mockery. I find that I am very deliberately not apologizing for the baby by embracing the most ridiculous, tabloidy words for him like *love child*. I hear myself spinning a caricature of my semi-bohemian household when I run into someone at a party I haven't seen in a while: "Yeah, two babies, two different dads. I somehow ended up with the family structure Pat Moynihan was complaining about."

In fact, by now I have spent so long outside of conventional family life that sometimes when I spend an afternoon with married friends and their children, their way of life seems exotic. The best way I can describe this is the feeling of being in a foreign country where you notice the bread is good and the coffee excellent but you are not exactly thinking of giving it all up and living there.

The baby refers to his sister's father, Harry, as "My Harry" as in, "My Harry is coming!" It seems to me the exuberant, unorthodox use of preposition kind of gets at the conjuring, the act of creation, the interesting magic trick at the center of the whole venture: His family will be what he makes it. He is 2, but he chooses his own people. He picks fatherish figures, including his own father. I notice people often find little ways of telling me that *it's not the same thing*. And of course it's not, but it seems a bit narrow minded or old fashioned or overly literal to think that love has to come from two parents, like water from hot and cold faucets.

But is it more stable or secure to grow up in a house with two parents? There is arguably an absence of what people like to call borders in my house. For instance the baby seems to have caught my insomnia. Before going to bed he howls like a wolf, then says, "I am a wolf," then says: "Where is my bottle? Where is my mango? Where is my ketchup?" then very deliberately climbs out of his bed and walks through the halls saying, "I am lost, Mama, I am lost." It occurs to me that in this unfiltered, unmediated environment I am passing everything along to him. In any event, that's exactly how I feel at 2 in the morning—somewhere in the middle of "I am lost" and "Where is my mango? Where is my ketchup?"

I am prepared to believe that in a household with two adults, there is often a little more balance, a healthy dilution of affection, a diffused focus that makes everyone feel comfortable. One morning I overhear Violet saying to the baby: "You can't marry anyone. You are going to live with me." When I first separated from her father five years ago, she said, "Mommy, it's like you and *I* are married." And this would pretty accurately reflect the atmospherics of our house: a little too much love, you might tactfully say.

Quentin Bell once wrote about growing up with his single-ish mother, the painter Vanessa Bell: "We had to balance the comforts of being so well loved against the pain of being so fearfully adored." And that seems like a fair assessment of what goes on in my house. (The grown son of one of the single mothers I know refers to this same thing as "the unparalleled intimacy.") But if I am being honest I like the fearful adoration, the too-muchness of it, the intensity, the fierceness. I don't actually believe "healthy" is better.

I also can't help noticing that the people talking about a "healthy" environment are often the same people talking about "working" on their relationships. They are often the denizens of couples therapy and date nights in restaurants with hand-cured pancetta and organic local fennel. I have no doubt that they do create a healthy, balanced environment, but I like to think there are some rogue advantages to the unbalanced and unhealthy environment: to the other way of doing things.

Here someone is bound to say, "Studies have shown …" But as far as I am concerned the studies can continue to show whatever they feel like showing. There are things that can't be measured and quantified in studies, and I imagine the multitudinous varieties of family peace are among them. Not to mention what these stern studies fail to measure: which is what happens when there is anger or conflict in the home, or unhappy or airless marriages, relationships wilting or faltering, subterranean tensions, what happens when everyone is bored.

One day at dinner, Violet is playing a game where she is listing impossible things. Like it's impossible to talk when you are dead, when she suddenly comes out with, "It's impossible to be normal." The family member in attendance shoots me a look that eloquently points out that Violet might not think it was so impossible to be normal if instead of piles of books on the floor I had a little financial security, if I had a man around the house. If I stopped running around like I do, in other words.

It's near dawn when I finish the *Scarlet Letter* and I had forgotten the ending. Hawthorne is careful to tell us that Pearl, wild, radiant, spritelike Pearl, grows up and leaves for Europe, where she flourishes; the suggestion is that she is perhaps a bit happier than the children of the drab Puritan town she has left behind.

It's getting dark and I am stepping into a taxi, the parlor window is lit, the children at home in their pajamas, smelling of Johnson & Johnson, domestic peace descending, and I go off in the taxi to meet a man at a hotel bar. This will seem to many people like the wrong structure; they will tell me how unhealthy it is, how unsustainable, how unstable, and they may be right, but there I am speeding nonetheless over the bridge. There are other possible ways I could conduct my life, other forms and structures. But I remember hearing somewhere: "You have one life, if that." And one sometimes feels like mentioning that to some of the more blinkered, respectable couples, to those purveyors of wholesome and healthy environments, to those who truly believe the child of a single mother is not whole or happy in his room playing with his dinosaurs: You have one life, if that.

http://www.slate.com/articles/double_x/doublex/2011/10/shaming_the_single_mom_do_we_all_secretly_think_single_moms_are_.html

Ancient cave paintings threatened by tourist plans

- 19:00 06 October 2011 by **Charles Harvey**

Tourists – run! *(Image: Panoramic Images/Getty)*

Prehistoric paintings in northern Spain could be irreparably damaged if plans to reopen the Altamira cave to tourists go ahead. Local officials want to reopen the cave to boost the local economy, but visitors could heat the caves and introduce microbes that destroy pigments.

The Altamira cave paintings were discovered in 1879 and are thought to be at least 14,000 years old. The paintings have attracted huge numbers of visitors – 175,000 in 1973, the busiest year on record. But the cave was closed to the public in 2002 after photosynthetic bacteria and fungi were found to be consuming pigments at alarming rates.

Plans to reopen the caves could restart the damaging processes. A team from the Spanish National Research Council in Madrid have modelled the effect of visitors over a number of years and say that tourists would increase the temperature, humidity and carbon-dioxide levels in the cave, creating conditions in which microbes would thrive.

In addition, visitors would bring with them organic matter in the form of skin flakes, clothing fibres and dust, which microbes can consume. Air turbulence created by moving people would spread bacterial and fungal spores to other, previously unaffected spaces.

Another Lascaux?

Although reopening the caves might boost the economy in the short term, says lead researcher Cesáreo Sáiz Jiménez, the damage would outweigh the benefit. "The paintings are a legacy from the past and their importance exceeds local culture."

The researchers say they want to prevent the scale of damage that occurred at the Lascaux cave in France, where mismanagement led to successive waves of pathogens attacking wall paintings there. For example, pesticides intended to destroy microorganisms became a source of nutrients for them instead.

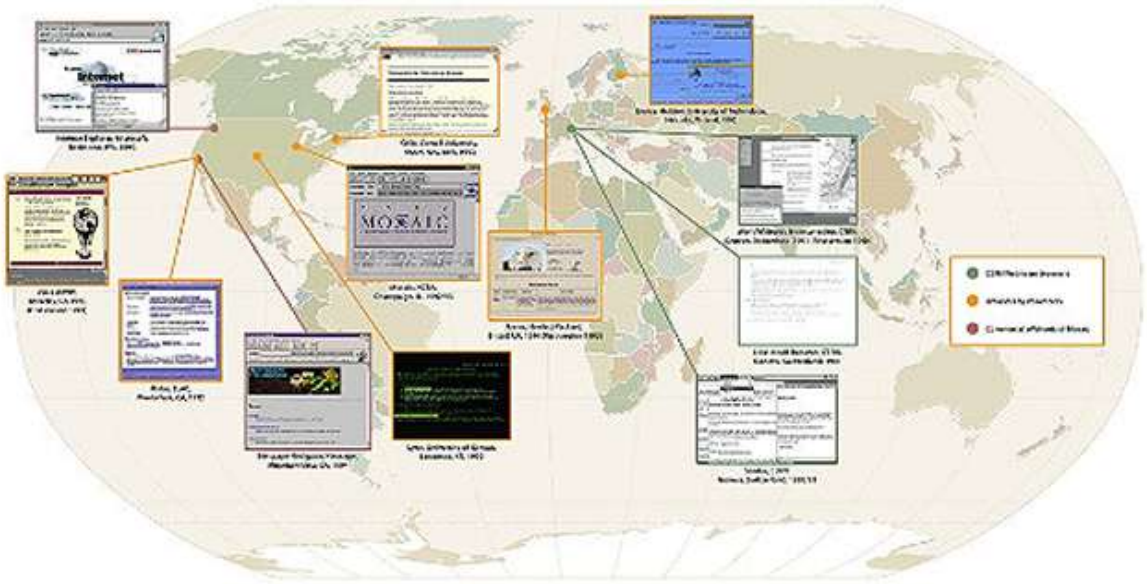
Sáiz Jiménez and his colleagues conclude that only isolation from the outside world can prevent the same kind of damage at Altamira.

Journal reference: *Science*, DOI: 10.1126/science.1206788

http://www.newscientist.com/article/dn21020-ancient-cave-paintings-threatened-by-tourist-plans.html?full=true&print=true

Before Netscape: the forgotten Web browsers of the early 1990s

By Matthew Lasar | Published a day ago



When Tim Berners-Lee arrived at CERN, Geneva's celebrated European Particle Physics Laboratory in 1980, the enterprise had hired him to upgrade the control systems for several of the lab's particle accelerators. But almost immediately, the inventor of the modern webpage noticed a problem: thousands of people were floating in and out of the famous research institute, many of them temporary hires.

"The big challenge for contract programmers was to try to understand the systems, both human and computer, that ran this fantastic playground," Berners-Lee later wrote. "Much of the crucial information existed only in people's heads."

So in his spare time, he wrote up some software to address this shortfall: a little program he named Enquire. It allowed users to create "nodes"—information-packed index card-style pages that linked to other pages. Unfortunately, the PASCAL application ran on CERN's proprietary operating system. "The few people who saw it thought it was a nice idea, but no one used it. Eventually, the disk was lost, and with it, the original Enquire."

Some years later Berners-Lee returned to CERN. This time he relaunched his "World Wide Web" project in a way that would more likely secure its success. On August 6, 1991, he published an explanation of WWW on the alt.hypertext usegroup. He also released a code library, libWWW, which he wrote with his assistant Jean-François Groff. The library allowed participants to create their own Web browsers.

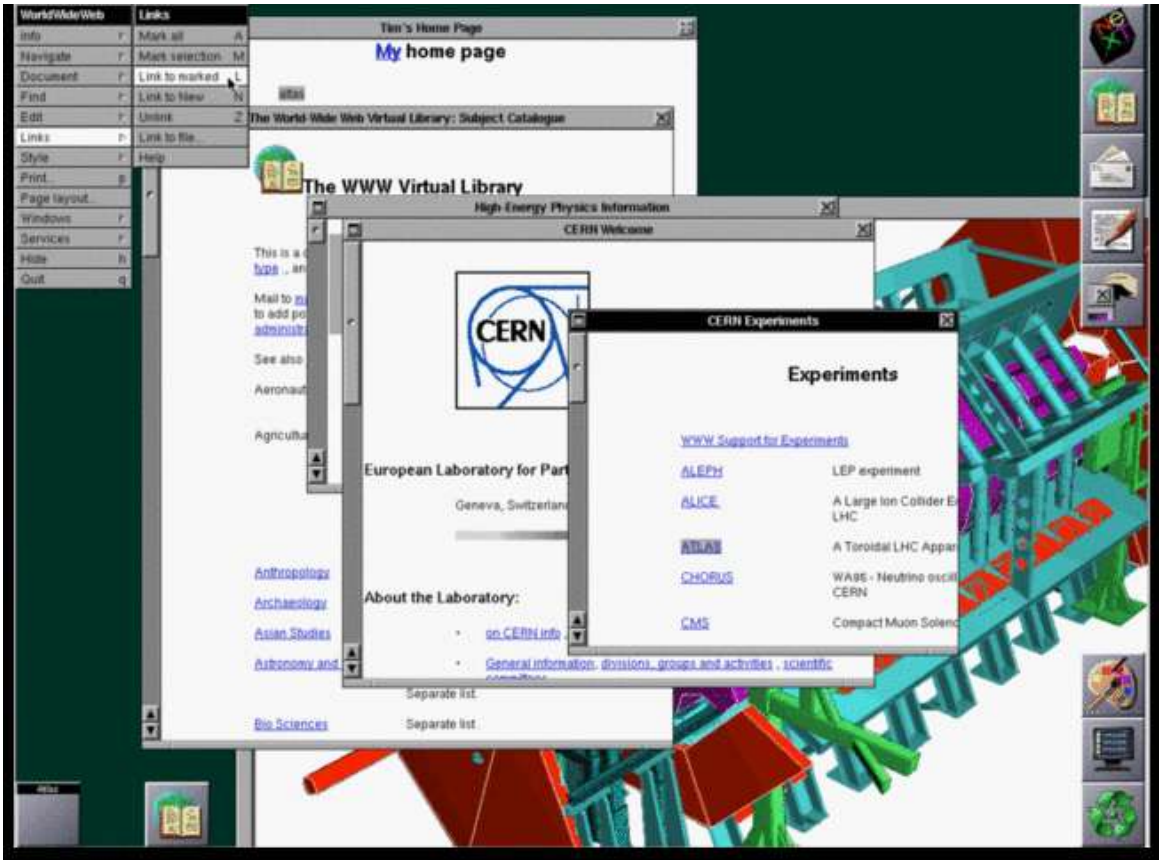
"Their efforts—over half a dozen browsers within 18 months—saved the poorly funded Web project and kicked off the Web development community," notes a commemoration of this project by the Computer History Museum in Mountain View, California. The best known early browser was Mosaic, produced by Marc Andreesen and Eric Bina at the National Center for Supercomputing Applications (NCSA).

Mosaic was soon spun into Netscape, but it was not the first browser. A map assembled by the Museum offers a sense of the global scope of the early project. What's striking about these early applications is that they had

already worked out many of the features we associate with later browsers. Here is a tour of World Wide Web viewing applications, before they became famous.

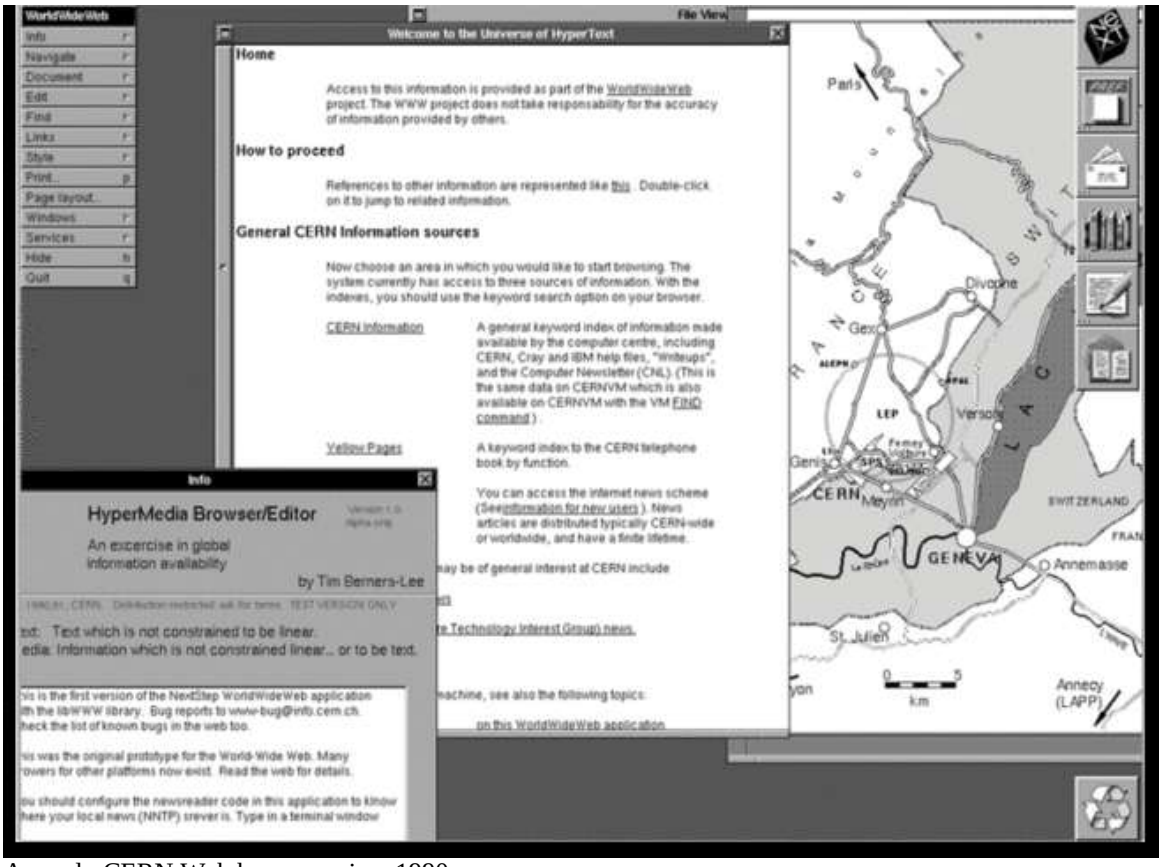
The CERN browsers

Tim Berners-Lee's original 1990 WorldWideWeb browser was both a browser and an editor. That was the direction he hoped future browser projects would go. CERN has put together a reproduction of its formative content. As you can see in the screenshot below, by 1993 it offered many of the characteristics of modern browsers.



Tim Berners-Lee's original WorldWideWeb browser running on a NeXT computer in 1993
Cern

The software's biggest limitation was that it ran on the NeXTStep operating system. But shortly after WorldWideWeb, CERN mathematics intern Nicola Pellow wrote a line mode browser that could function elsewhere, including on UNIX and MS-DOS networks. Thus "anyone could access the web," explains Internet historian Bill Stewart, "at that point consisting primarily of the CERN phone book."



An early CERN Web browser, circa 1990
info.cern.ch

Erwise

Erwise came next. It was written by four Finnish college students in 1991 and released in 1992. Erwise is credited as the first browser that offered a graphical interface. It could also search for words on pages.

Berners-Lee wrote a review of Erwise in 1992. He noted its ability to handle various fonts, underline hyperlinks, let users double-click them to jump to other pages, and to host multiple windows.

"Erwise looks very smart," he declared, albeit puzzling over a "strange box which is around one word in the document, a little like a selection box or a button. It is neither of these—perhaps a handle for something to come."

So why didn't the application take off? In a later interview, one of Erwise's creators noted that Finland was mired in a deep recession at the time. The country was devoid of angel investors.

"We could not have created a business around Erwise in Finland then," he explained. "The only way we could have made money would have been to continue our developing it so that Netscape might have finally bought us. Still, the big thing is, we could have reached the initial Mosaic level with relatively small extra work. We should have just finalized Erwise and published it on several platforms."

The Erwise browser
OS News

ViolaWWW

ViolaWWW was released in April of 1992. Developer Pei-Yuan Wei wrote it at the University of California at Berkeley via his UNIX-based Viola programming/scripting language. No, Pei Wei didn't play the viola, "it just happened to make a snappy abbreviation" of Visually Interactive Object-oriented Language and Application, write James Gillies and Robert Cailliau in their history of the World Wide Web.

Wei appears to have gotten his inspiration from the early Mac program HyperCard, which allowed users to build matrices of formatted hyper-linked documents. "HyperCard was very compelling back then, you know graphically, this hyperlink thing," he later recalled. But the program was "not very global and it only worked on Mac. And I didn't even have a Mac."

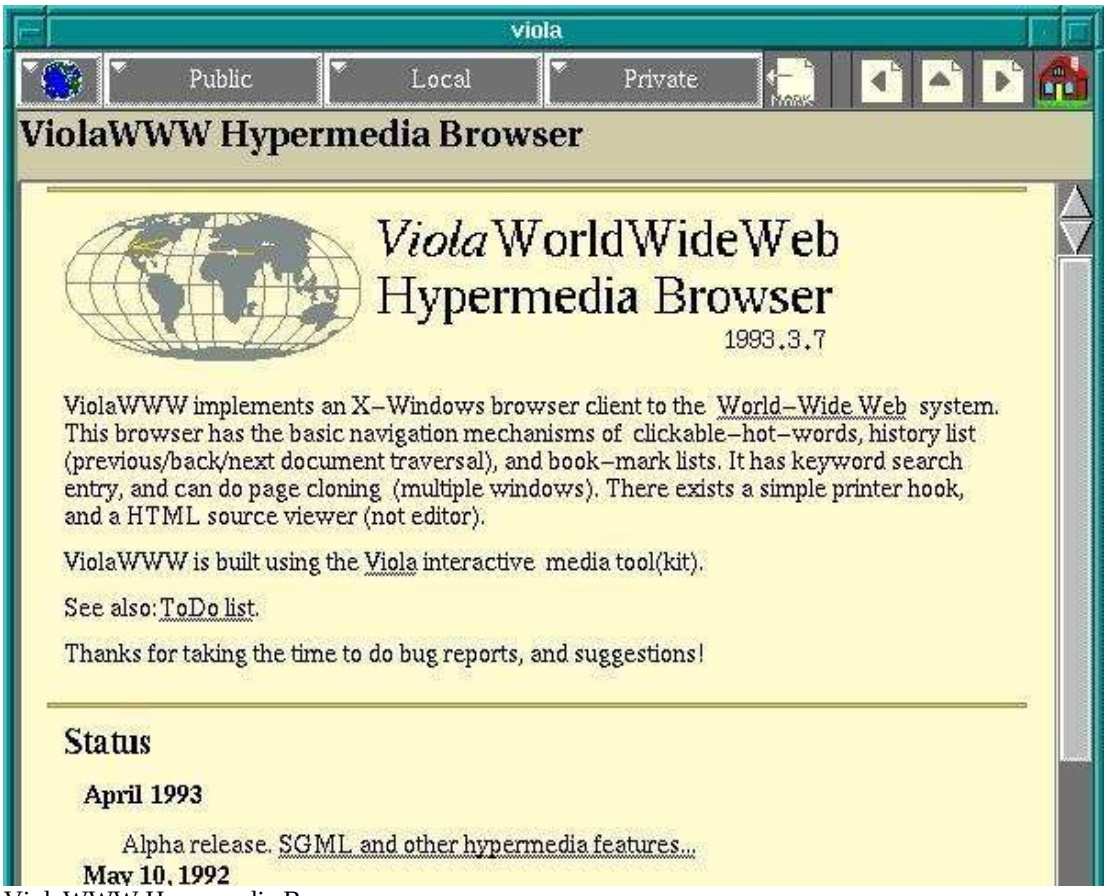
But he did have access to UNIX X-terminals at UC Berkeley's Experimental Computing Facility. "I got a HyperCard manual and looked at it and just basically took the concepts and implemented them in X-windows." Except, most impressively, he created them via his Viola language.

One of the most significant and innovative features of ViolaWWW was that it allowed a developer to embed scripts and "applets" in the browser page. This anticipated the huge wave of Java-based applet features that appeared on websites in the later 1990s.

In his documentation, Wei also noted various "misfeatures" of ViolaWWW, most notably its inaccessibility to PCs.

- Not ported to PC platform.
- HTML Printing is not supported.
- HTTP is not interruptable, and not multi-threaded.
- Proxy is still not supported.
- Language interpreter is not multi-threaded.

"The author is working on these problems... etc," Wei acknowledged at the time. Still, "a very neat browser useable by anyone: very intuitive and straightforward," Berners-Lee concluded in his review of ViolaWWW. "The extra features are probably more than 90% of 'real' users will actually use, but just the things which an experienced user will want."



ViolaWWW Hypermedia Browser
viola.org

Midas and Samba

In September of 1991, Stanford Linear Accelerator physicist Paul Kunz visited CERN. He returned with the code necessary to set up the first North American Web server at SLAC. "I've just been to CERN," Kunz told SLAC's head librarian Louise Addis, "and I found this wonderful thing that a guy named Tim Berners-Lee is developing. It's just the ticket for what you guys need for your database."

Addis agreed. The site's head librarian put the research center's key database over the Web. Fermilab physicists set up a server shortly after.

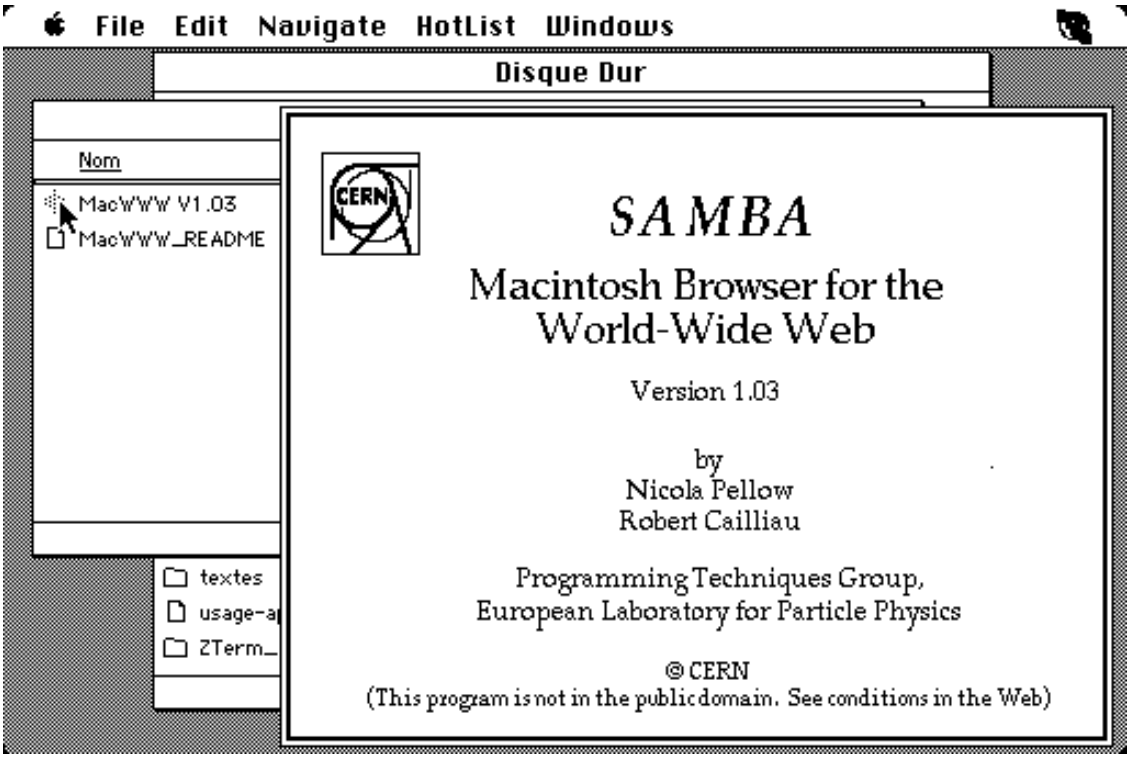
Then over the summer of 1992 SLAC physicist Tony Johnson wrote Midas, a graphical browser for the Stanford physics community. The big draw for Midas users was that it could display postscript documents, favored by physicists because of their ability to accurately reproduce paper-scribbled scientific formulas.

"With these key advances, Web use surged in the high energy physics community," concluded a 2001 Department of Energy assessment of SLAC's progress.

Meanwhile, CERN associates Pellow and Robert Cailliau released the first Web browser for the Macintosh computer. Gillies and Cailliau narrate Samba's development.

For Pellow, progress in getting Samba up and running was slow, because after every few links it would crash and nobody could work out why. "The Mac browser was still in a buggy form,' lamented Tim [Berners-Lee] in a September '92 newsletter. 'A W3 T-shirt to the first one to bring it up and running!" he announced. The T shirt duly went to Fermilab's John Streets, who tracked down the bug, allowing Nicola Pellow to get on with producing a usable version of Samba.

Samba "was an attempt to port the design of the original WWW browser, which I wrote on the NeXT machine, onto the Mac platform," Berners-Lee adds, "but was not ready before NCSA [National Center for Supercomputing Applications] brought out the Mac version of Mosaic, which eclipsed it."



Samba!
Loz's Nicole Project

Mosaic

Mosaic was "the spark that lit the Web's explosive growth in 1993," historians Gillies and Cailliau explain. But it could not have been developed without forerunners and the NCSA's University of Illinois offices, which were equipped with the best UNIX machines. NCSA also had Dr. Ping Fu, a PhD computer graphics wizard who had worked on morphing effects for *Terminator 2*. She had recently hired an assistant named Marc Andreesen.

"How about you write a graphical interface for a browser?" Fu suggested to her new helper. "What's a browser?" Andreesen asked. But several days later NCSA staff member Dave Thompson gave a demonstration of Nicola Pellow's early line browser and Pei Wei's ViolaWWW. And just before this demo, Tony Johnson posted the first public release of Midas.

The latter software set Andreesen back on his heels. "Superb! Fantastic! Stunning! Impressive as hell!" he wrote to Johnson. Then Andreesen got NCSA Unix expert Eric Bina to help him write their own X-browser.

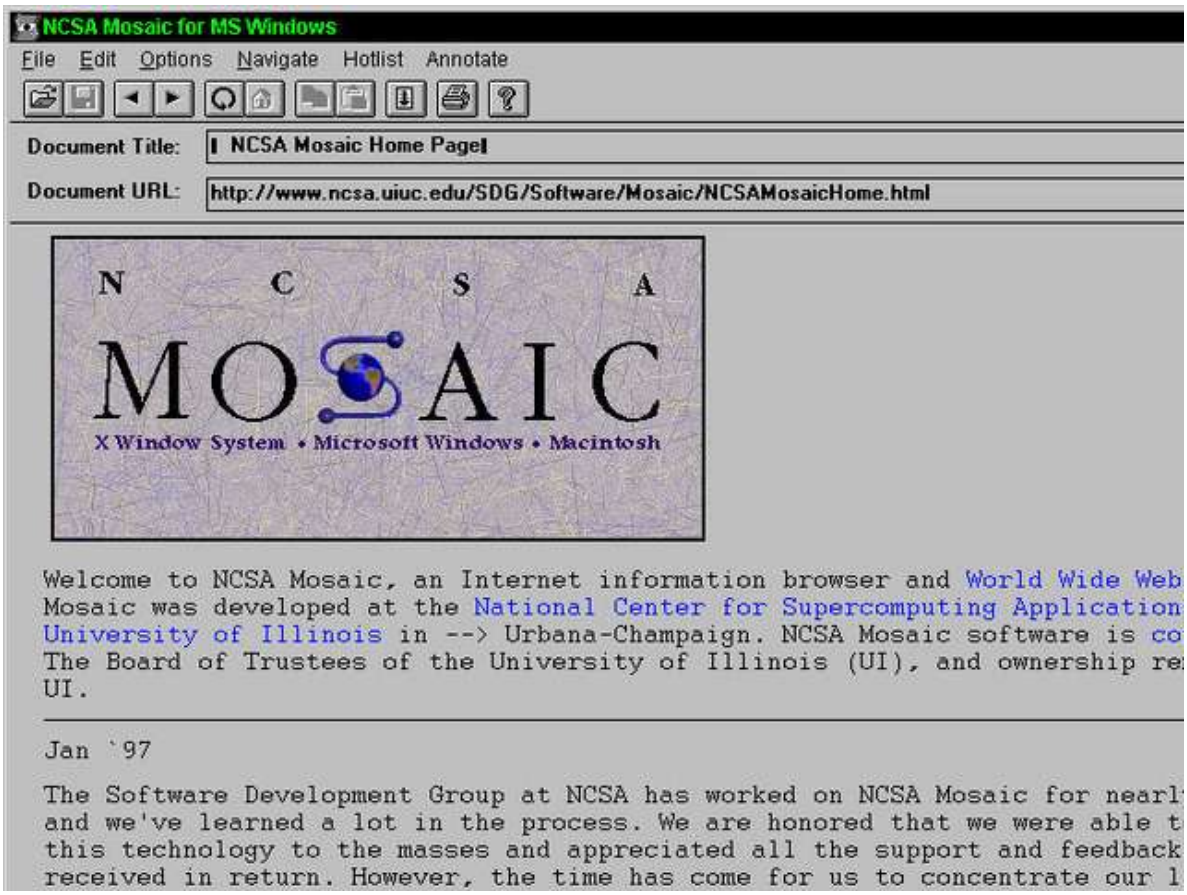
Mosaic offered many new web features, including support for video clips, sound, forms, bookmarks, and history files. "The striking thing about it was that unlike all the earlier X-browsers, it was all contained in a single file," Gillies and Cailliau explain:

Installing it was as simple as pulling it across the network and running it. Later on Mosaic would rise to fame because of the <IMG> tag that allowed you to put images inline for the first time, rather than having them pop up in a different window like Tim's original NeXT browser did. That made it easier for people to make Web pages look more like the familiar print media they were use to; not everyone's idea of a brave new world, but it certainly got Mosaic noticed.

"What I think Marc did really well," Tim Berners-Lee later wrote, "is make it very easy to install, and he supported it by fixing bugs via e-mail any time night or day. You'd send him a bug report and then two hours later he'd mail you a fix."

Perhaps Mosaic's biggest breakthrough, in retrospect, was that it was a cross-platform browser. "By the power vested in me by nobody in particular, X-Mosaic is hereby released," Andreeson proudly declared on the www-talk group on January 23, 1993. Aleks Totic unveiled his Mac version a few months later. A PC version came from the hands of Chris Wilson and Jon Mittelhauser.

The Mosaic browser was based on Viola and Midas, the Computer History museum's exhibit notes. And it used the CERN code library. "But unlike others, it was reliable, could be installed by amateurs, and soon added colorful graphics within Web pages instead of as separate windows."

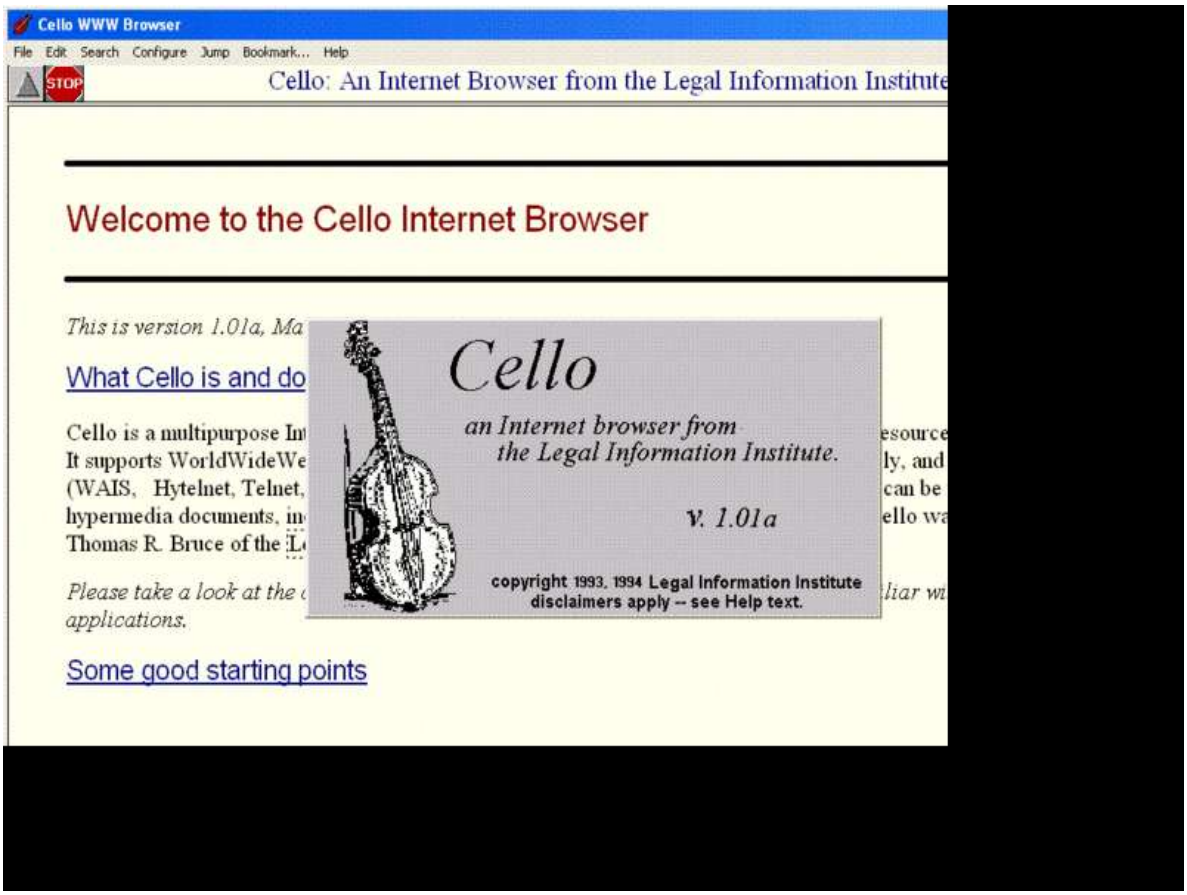


The Mosaic browser was available for X Windows, the Mac, and Microsoft Windows
http://www.nsf.gov/od/lpa/news/03/images/mosaic.6beta.jpg

A guy from Japan

But Mosaic wasn't the only innovation to show up on the scene around that same time. University of Kansas student Lou Montulli adapted a campus information hypertext browser for the Internet and Web. It launched in March, 1993. "Lynx quickly became the preferred web browser for character mode terminals without graphics, and remains in use today," historian Stewart explains.

And at Cornell University's Law School, Tom Bruce was writing a Web application for PCs, "since those were the computers that lawyers tended to use," Gillies and Cailliau observe. Bruce unveiled his browser Cello on June 8, 1993, "which was soon being downloaded at a rate of 500 copies a day."



Cello!

Six months later, Andreesen was in Mountain View, California, his team poised to release Mosaic Netscape on October 13, 1994. He, Totic, and Mittelhauser nervously put the application up on an FTP server. The latter developer later recalled the moment. "And it was five minutes and we're sitting there. Nothing has happened. And all of a sudden the first download happened. It was a guy from Japan. We swore we'd send him a T shirt!" But what this complex story reminds is that is that no innovation is created by one person. The Web browser was propelled into our lives by visionaries around the world, people who often didn't quite understand what they were doing, but were motivated by curiosity, practical concerns, or even playfulness. Their separate sparks of genius kept the process going. So did Tim Berners-Lee's insistence that the project stay collaborative and, most importantly, open. "The early days of the web were very hand-to-mouth," he writes. "So many things to do, such a delicate flame to keep alive."

Further reading

- Tim Berners-Lee, *Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web*
- James Gillies and R. Cailliau, *How the web was born*
- Bill Stewart, *Living Internet* (www.livinginternet.com)

Photograph by Computer History Museum
http://arstechnica.com/web/news/2011/10/before-netscape-forgotten-web-browsers-of-the-early-1990s.ars

The giant, prehistoric squid that ate common sense

By Brian Switeck, wired.com |

Shonisaurus vertebrae from Berlin-Ichthyosaur State Park.

We have a serious problem with science journalism. A big one, in fact, and today that problem takes the form of a giant, prehistoric squid with tentacles so formidable that it has sucked the brains right out of staff writers' heads.

While making the rounds among a few California museums late last month, I kept hearing rumors of a bombastic, super-hyped presentation due to be presented at this year's Geological Society of America meeting in Minneapolis. The scuttlebutt was that someone was going to give a talk about a super-intelligent, predatory squid which fed on huge ichthyosaurs during the Triassic. Fascinating, if true, but the reason that all the paleontologists I met were chuckling was because there was not a shred of actual evidence to back up the claims. Apparently, whoever was set to give the talk had apparently stayed up late watching *It Came From Beneath the Sea* too many times.

Now the talk has officially been given and the scant details of the proposition have been oozed out into the newswires by way of a press release. Let me be clear—there is no paper yet or anything specific for those not in attendance at GSA to look at. This fact will be key to the media nonsense which has been swirling around the web today.

You can find the skinny through ScienceDaily and the official GSA abstract, but the basic story is as follows. In central Nevada—among the roughly 215 million-year-old, Late Triassic rocks of what has come to be known as Berlin-Ichthyosaur State Park—paleontologists have previously found the remains of numerous marine reptiles called *Shonisaurus popularis*. These were some of the largest ichthyosaurs to have ever swum the ancient seas, and this particular site has been of interest to paleontologists because multiple individuals have been found together at some localities. Why these individuals were found together in a mass death assemblage is unknown—explanations have ranged from stranding to poisoning by a prehistoric red tide — but now Mark McMenamin and wife Dianna Schulte-McMenamin of Mount Holyoke College have suggested that the graveyard is actually a cache of bones collected and arranged by a squid the likes of which has never been seen.

There is no direct evidence for the existence of the animal the McMenamins call "the kraken." No exceptionally preserved body, no fossilized tentacle hooks, no beak—***nothing***. The McMenamins' entire case is based on peculiar inferences about the site. It is a case of reading the scattered bones as if they were tea leaves able to tell someone's fortune. Rather than being distributed through the bonebed by natural processes related to decay and preservation, the McMenamins argue that the *Shonisaurus* bones were intentionally arrayed in a "midden" by a huge cephalopod nearly 100 feet long (how the length of the imaginary animal was estimated is anyone's guess). But that's not all—the McMenamins speculate that his "kraken" played with its food:

The proposed Triassic kraken, which could have been the most intelligent invertebrate ever, arranged the vertebral discs in biserial patterns, with individual pieces nesting in a fitted fashion as if they were part of a puzzle. The arranged vertebrae resemble the pattern of sucker discs on a cephalopod tentacle, with each amphicoelous vertebra strongly resembling a coleoid sucker. Thus the tessellated vertebral disc pavement may represent the earliest known self-portrait.

I guess a giant, ichthyosaur-eating "kraken" wasn't enough. A squid with a stroke of artistic genius was *clearly* the simplest explanation for the formation of the bonebeds. ***facepalm***

Of course, the McMenamins were not the first people to ponder how the ichthyosaurs came to rest at the site. Paleontologist David Bottjer wrote a summary of the bonebed—largely based on the work of colleague Jennifer Hogler—for the book *Exceptional Fossil Preservation*. As a whole, the fossil deposits indicate that different *Shonisaurus* specimens died and became preserved in different ways. Some skeletons were scattered by currents and scavengers, and other, more-complete individuals—such as those at the Fossil House Quarry—were well preserved and found in multi-individual groups. In this latter case, a lack of encrusting invertebrates would seem to indicate that the skeletons came to be preserved in deep water environments with low levels of dissolved oxygen. The initial cause of death for the marine reptiles is unknown, but there is no good evidence that the exceptional sites were, to borrow from Ringo Starr, giant killer octopus gardens.

Extraordinary claims require extraordinary evidence. Esteemed scientist and science communicator Carl Sagan reminded us of that throughout his career, but the message didn't sink in at some news desks. All you have to do is track the news of the "kraken" to see that recycling press releases often counts for "science news" right now. Jeanna Bryner of LiveScience swallowed the big squid story whole and had her version regurgitated at FOX and CBS News. Dean Praetorius of the Huffington Post, *Houston Chronicle's* "Sci Guy" Eric Berger, and TG Daily's Kate Taylor also took the bait. Who could resist a sensational, super-sized squid? Only Cyriaque Lamar of io9 sounded a minor note of skepticism—"But the possibility of finding that which is essentially a gargantuan mollusk's macaroni illustration?", Lamar wrote, "That's the kind of glorious crazy you hope is reality." Leave it to science bloggers like PZ Myers to point out how ridiculous this media feeding frenzy is.

But what really kills me about this story is the fact that no reporter went to get a second opinion. Each and every story appears to be based directly off the press release and uses quotes directly from that document. No

outside expert was contacted for another opinion in any of the stories—standard practice in science journalism—and, frankly, all the stories reek of churnalism. What does it say about the general quality of science reporting when major news sources are content to repackage sensationalist, evidence-lite speculations and print them without further thought or comment? Whether you think the "kraken" story should have been reported or ignored due to lack of evidence, the fact remains that journalists should have actually done their jobs rather than act as facilitators of hype. You don't have to be a paleontologist to realize that there's something fishy about claims that there was a giant, ichthyosaur-crunching squid when there is no body to be seen.

Further reading:

- I wrote an article for *Smithsonian* a few months back about how the giant squid—or kraken, if you like—was transformed from a mythical creature to a scientific reality. Check it out here: *The Giant Squid: Dragon of the Deep*
- Bottjer, D. "Berlin-Ichthyosaur: Preserving Some of the Earth's Largest Marine Vertebrates" in Bottjer, D.; Etter, W.; Hagadorn, J.; and Tang, C. 2002. *Exceptional Fossil Preservation: A Unique View on the Evolution of Marine Life*. Columbia University Press: New York.
- Hogler, J. 1992. Taphonomy and paleoecology of Shonisaurus popularis (Reptilia: Ichthyosauria). *PALAIOS*, Vol. 7 (1): 108-117

Photograph by GSA

http://arstechnica.com/science/news/2011/10/the-giant-prehistoric-squid-that-ate-common-sense.ars

Will the E-Book Kill the Footnote?

By ALEXANDRA HOROWITZ

When my dog, Pumpernickel, first found a stray grape on my kitchen floor, she licked at it, tumbled it around in her mouth and spat it out. She accepted a lot of food from my plate not traditionally thought of as interesting to dogs: carrots, broccoli, bagels. But she would not eat grapes, nor was she fond of raisins.

More than a decade later, I included this anecdote in my book about dog cognition, to open a chapter on domestication. I had subsequently learned that raisins — and grapes — "are now suspected of being toxic to some dogs, even in small amounts (though the mechanism of toxicity is unknown) — leading me to wonder whether Pump was instinctively averse to raisins," as I added in a footnote.

A footnote. I did not include the facts about the toxicity of grapes in the anecdote itself, because, well, it's not part of the anecdote. I did not include it in the main body of the chapter because, well, it has nothing to do with domestication. But I thought it was note-worthy and maybe even important, so I assigned it to the small type at the bottom of the page.

Since typing that small type, I have received dozens of angry and concerned queries about the anecdote. Why had I fed her grapes? Did I not know they were toxic? After some back-and-forth, I was surprised to discover that these incredulous comments often came from readers of the electronic version of my book, where the footnotes are shunted off to the end of the text, relegated to being mere endnotes. If footnotes are at risk of going unread, endnotes are even more so.

All this is discouraging for a champion of footnotes like myself. The footnotes are among the first things I look at when I pull a book from a store shelf. My editor gamely tolerated my inclusion of many in my own book (though we removed more than we left in). I would be proud to be a footnote in someone else's work.

Of course, scholarly books are still full of footnotes. The prototypic footnote is the source note, providing a citation for each proclamation in the text (early annotations were sometimes called "proofs"). These footnotes range from useful to pedantic, sometimes lending an air of authority, sometimes providing a map of the writer's path. Legal writing in particular is rife with these footnotes, perhaps an acknowledgment that law is built on laws-past.

But I champion another species of footnote: the wandering footnote. These digressive notes, seeing a sentence that some might consider complete, determine to hijack it with a new set of ever more tangential facts. In the wayward note, the bumps and curves of the author's mind seem to be laid plain on the paper. I came of intellectual age hearing the author's sotto voce asides in the philosophy essays I loved. I still recall footnotes that begin, enticingly, "Imagine that . . . "; "Consider . . . "; or even, in one of J. L. Austin's famous thought experiments, "You have a donkey. . . . " I had the feeling of being taken into confidence by a wise fellow during an erudite lecture, and being told something even more clever and lucid.

In fiction, I was spoiled by Nicholson Baker, whose novel "The Mezzanine" is largely footnotes — including a four-pager that starts: "And escalators *are* safe. . . . " (A door has popped up unexpectedly and opened! I'm going in!) Smitten with the small type, I sought out the broader history of the footnote, covered to within a millimeter of its life in Anthony Grafton's study "The Footnote: A Curious History" and Chuck Zerby's "Devil's Details: A History of Footnotes" (both are heavily footnoted). Grafton led me to such rollicking footnoters as Edward Gibbon, whose judgmental, conversational and explicatory notes in "The History of the Decline and Fall of the Roman Empire" lighten a weighty read. Such digressions and asides were so enthusiastically used in the 18th century that one satirist wrote a mock dissertation consisting entirely of footnotes. Pierre Bayle's best seller "Historical and Critical Dictionary," first published in the 1690s, charmingly used footnotes to point out the errors in the scholarship of others. I'll take Grafton and Zerby's

word for it that John Hodgson's mighty "History of Northumberland," published a century and a half later, is at least worth flipping through for its footnotes on footnotes on footnotes, including one traversing 165 pages.

I have since found that attitudes on footnotes tend toward the hyperbolic. One scholarly writing handbook celebrates the "cartwheel" of the footnote, while Grafton compares the drone of the historian's footnote to "the high whine of the dentist's drill," a sign that we are in the presence of professionals. Legal footnotes — the subject of particularly contentious debate — are "a mother lode, a vein of purest gold," one judge gushed, while another legal writer called them "lead feet below the line." Footnotes are "a rhapsodic grace note" in a master's hands, a journalist wrote. More often, however, footnotes are slandered as "forbidding," "unsightly," "like a fungus"; and even, as one footnote-weary professor put it, a "subversive breed of mice." I have come across more than one author who chose "excrescence" to describe footnotes. Noël Coward reputedly said that "having to read a footnote resembles having to go downstairs to answer the door while in the midst of making love."

The footnote jousting could soon be moot, as the e-book may inadvertently be driving footnotes to extinction. The e-book hasn't killed the book; instead, it's killing the "page." Today's e-readers scroll text continuously, eliminating the single preformed page, along with any text defined by being on its bottom. A spokesman for the Kindle assured me that it is at the discretion of the publisher how to treat footnotes. Most are demoted to hyperlinked endnotes or, worst of all, unlinked endnotes that require scrolling through the e-reader to access. Few of these will be read, to be sure.

I admit to being somewhat mystified that technological innovation is imperiling footnotes. Computers would seem to solve what I see as the main problem they pose — to wit, edging in the superscript numbers on a typewritten page and measuring just the right amount of space to leave at the bottom. Footnotes really presage hyperlinks, the ultimate interrupter of a stream of thought. (But footnotes are far superior: while hyperlinks can be highly useful, one never finds oneself looking at an error message at the bottom of the page where a footnote used to be.) Even the audio book has solved the problem of how to convey footnotes. Listen to David Foster Wallace reading his essay collection "Consider the Lobster," with its ubiquitous show-stealing asides: at a certain point, his voice is unnaturally distant, the result of a production trick intended to represent the small type of a footnote. Wallace's e-book was not immune to de-footnoting, though; all these crucial asides now appear at the end of the book in the Kindle and iPad versions. Even the Kindle edition of Zerby's history of the footnote is now full of endnotes instead.

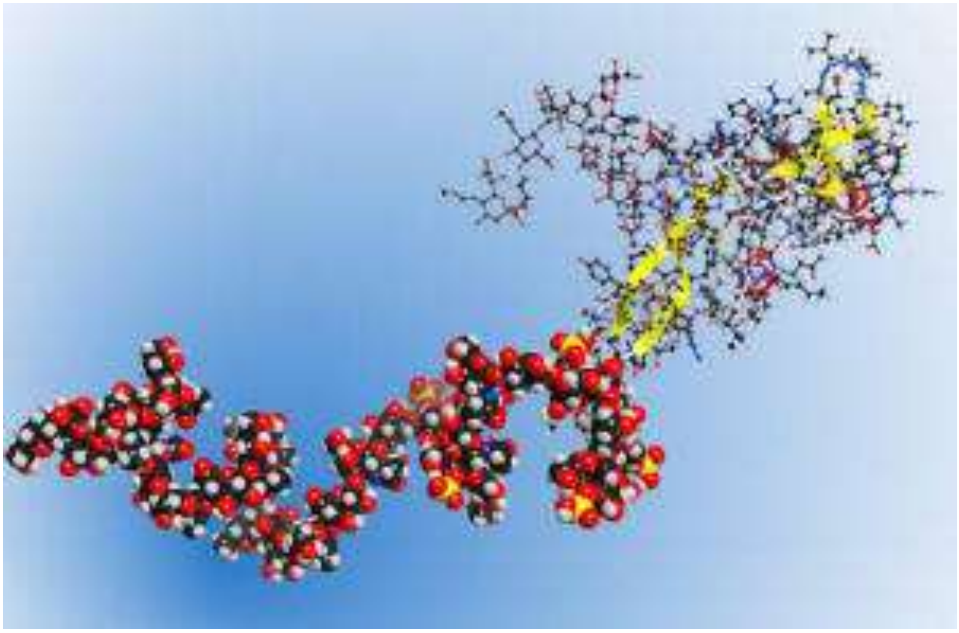
Should footnotes fully disappear, I would grieve their loss. I do not find it disagreeable to bend my nose south and find further information where it lands. Surely the purpose of a book is not to present a methodically linear narrative, never wavering from its course, with no superfluous commentary set off by commas. In my mind, footnotes are simply another punctuative style: a subspecies of parenthesis that tells the reader: "I've got something else here you might like! (Read it later.)" What better thing? You get to follow the slipstreams in the author's thinking at your own leisure.

A footnote: I've kept this essay annotation-free. But every sentence could have had a footnote, providing a source, further reading, a tangent, an explanation. Is the essay really better without them?

Alexandra Horowitz is the author of "Inside of a Dog: What Dogs See, Smell and Know."

http://www.nytimes.com/2011/10/09/books/review/will-the-e-book-kill-the-footnote.html?_r=1

Uncharted Territory: Scientists Sequence the First Carbohydrate Biopolymer



Structure of the bikunin: The portion on the left corresponds to the sugar part of the molecule, the sequence of which was determined in the current study. The portion on the right corresponds to the protein part of bikunin. (Credit: Rensselaer Polytechnic Institute)

ScienceDaily (Oct. 15, 2011) — DNA and protein sequencing have forever transformed science, medicine, and society. Understanding the structure of these complex biomolecules has revolutionized drug development, medical diagnostics, forensic science, and our understanding of evolution and development. But, one major molecule in the biological triumvirate has remained largely uncharted: carbohydrate biopolymers.

Today, for the first time ever, a team of researchers led by Robert Linhardt of Rensselaer Polytechnic Institute has announced in the October 9 Advanced Online Publication edition of the journal *Nature Chemical Biology* the sequence of a complete complex carbohydrate biopolymer. The surprising discovery provides the scientific and medical communities with an important and fundamental new view of these vital biomolecules, which play a role in everything from cell structure and development to disease pathology and blood clotting.

The paper is titled "The proteoglycan bikunin has a defined sequence."

"Carbohydrate biopolymers, known as glycosaminoglycans, appear to be really important in how cells interact in higher organisms and could explain evolutionary differences and how development is driven. We also know that carbohydrate chains respond to disease, injury, and changes in the environment," said Linhardt, who is the Ann and John H. Broadbent Jr. '59 Senior Constellation Professor of Biocatalysis and Metabolic Engineering at Rensselaer. "In order to understand how and why this all happens, we first need to know their structure. And today, at least for the simplest glycosaminoglycan structure, we can now do this."

The first glycosaminoglycan sequenced was obtained from bikunin. Bikunin is a proteoglycan, a protein to which a single glycosaminoglycan chain is attached. Unlike less sophisticated carbohydrate biopolymers, such as starch and cellulose, the proteoglycans are decorated with structurally complex carbohydrates that enable them to perform more sophisticated and defined roles in the body. Bikunin, for example, is a natural anti-inflammatory that is used as a drug for the treatment of acute pancreatitis in Japan. It has the simplest

chemical structure of any proteoglycan. Linhardt views the discovery of the structure of bikuin as the first step on the ladder to the discovery of the structure of more complex proteoglycans.

"The first genome sequences of DNA were on the simplest organisms such as bacteria. Once the technology was developed it ultimately led to the sequencing of the human genome," he said. "In our efforts to sequence carbohydrate biopolymers we don't yet know if the defined structure we observe for this simple protoglycan will hold for much more complex proteoglycans."

But, looking for structure in more complex proteoglycans will be among the next steps in the research for Linhardt and his team. The search for structure could help put to rest a long-running debate in the scientific community as to whether complex carbohydrate biopolymers require a defined structure to function.

"Despite all that is known about glycan formation, our understanding has not yet been deep enough to infer sequence or even determine if sequence occurs," Linhardt said. "These findings represent a new way of looking at these complex biomolecules as ordered structures."

Linhardt's research into carbohydrate sequencing began 30 years ago. In his previous work, he determined that some order existed in at least a portion of some carbohydrate biopolymers, but it did not represent the entire finished puzzle.

"Previously, we could see a pattern, but we could not see if all the chains were playing the same music. The tools did not yet exist. Now we can recognize it as a symphony."

To uncover the entire structure, Linhardt and his team, which was led by his doctoral student Mellisa Ly, borrowed a technique from the field of protein research called the proteomics top-down approach. As opposed to the bottom-up approach that first breaks apart a complex biopolymer into pieces and then rebuilds it piece by piece like a jigsaw puzzle, the top-down approach used by Linhardt and colleagues allows the researcher to picture the whole intact puzzle. This can only be accomplished with some of the most sophisticated technology available to the scientific community today, including very high-powered mass spectrometers.

Linhardt used a mass spectrometer located in the Rensselaer Center for Biotechnology and Interdisciplinary Studies (CBIS) to make his initial discoveries, and had these results independently confirmed on a separate and higher-level spectrometer at the University of Georgia. Mass spectrometers break down a molecule into separate charged particles or ions. These ions can then be categorized and analyzed based on their mass-to-charge ratio. These ratios then allow for sequencing of the entire molecule.

"This was truly the convergence of really sophisticated spectroscopy and its application to biology," Linhardt said. "We were fortunate to have a lot of time to play with the instrument at CBIS to understand its capabilities."

Beyond the technology it also took faith and determination. According to Linhardt, "It takes a student that is willing to try something even when the odds are pretty low. If it doesn't work, you make incremental progress. If it does work, you can make a great discovery. But, from the beginning you need to be a believer that it is worth taking the chance because it takes a lot of hard work in the lab."

And the odds weren't in Linhardt's favor. Despite being the most simple of proteoglycans, there were still 290 billion different possible sequences for the molecule.

"The first sample we looked at, we got the structure," Linhardt said. "In the end we did 15 chains and they all came back playing the same exact symphony."

The research is funded by the National Institutes of Health.

Linhardt and Ly were joined in the research by Tatiana Laremore of Rensselaer; Franklin Leach and Jonathan Amster of the University of Georgia; and Toshihiko Toida of Chiba University in Japan.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Rensselaer Polytechnic Institute**.

Journal Reference:

1. Mellisa Ly, Franklin E Leach, Tatiana N Laremore, Toshihiko Toida, I Jonathan Amster, Robert J Linhardt. **The proteoglycan bikunin has a defined sequence**. *Nature Chemical Biology*, 2011; DOI: 10.1038/nchembio.673

http://www.sciencedaily.com/releases/2011/10/111011112757.htm

Artificial crystals get their own textbook laws

- 15:21 14 October 2011 by **Charles Harvey**

Now available in nanoparticles and DNA *(Image: Captain Tucker ISS/NASA)*

An alternative chemistry of DNA-bonded nanoparticles, rather than chemically bonded atoms, just got a boost. We now have rules for building crystals like this, which means they can be created on demand.

In nature, the atoms of different elements arrange themselves in very different ways to form crystals. How many partners each atom is bonded to, and the length of the bonds, depend on the sizes and properties of the atoms in question. So sodium chloride forms a "face-centred cubic" structure, in which each sodium atom is surrounded by six chlorines and vice versa; whereas in gallium arsenide, say, the atoms arrange themselves differently and each has only four nearest neighbours.

Chad Mirkin of Northwestern University in Evanston, Illinois, and colleagues wondered if they could wrest control from nature and create crystals where the bond lengths and number of bonds don't depend on the size or composition of the component particles.

To do this the researchers coated their atom analogues – gold nanoparticles with multiple DNA molecules. The DNA contained exposed, single-stranded sections that formed "sticky" regions on each particle which could bond to complementary sections on strands coating other gold particles.

It's not the first time that researchers have used these building blocks to create artificial structures. In the past few years, structures have been build that resembled natural crystals, with the nanoparticles as "atoms" and the DNA linkers standing in for chemical bonds. A current limitation is that the identities of the particles being assembled often determine the structures that can be synthesised – so certain structures can only be built using certain nanoparticles and vice versa.

Now Mirkin and colleagues have worked out how to dictate the number of nanoparticles and the length of bonds for a system of particles of a given size and composition – and summarised their findings in six rules. For instance, the total size of the nanoparticle, including its DNA coating, determined what sort of crystal developed – and this size could be tailored either by using different lengths of DNA or different-sized nanoparticles.

Against nature

These rules could be used to design artificial crystals with totally novel properties, says Mirkin. This is "one of the most fundamental demonstrations of man over nature", he adds.

For instance, he suggests using the rules to design materials that can absorb light of low energy and release it in the form of high-energy photons. This might drastically improve the efficiency of solar cells.

"There are extremely few successful examples of crystals with nanoparticles, and these were obtained after extremely difficult procedures and with little control over the final structure," says Alex Travesset of Iowa State University in Ames. "This paper shows how DNA-programmed self-assembly provides a relatively simple route to solve this very fundamental technological problem."

Journal reference: *Science*, DOI: 10.1126/science.1210493

http://www.newscientist.com/article/dn21050-artificial-crystals-get-their-own-textbook-laws.html

Oldest Fossil Rodents in South America Discovered; Find Is 10 Million Years Older and Confirms Animals from Africa

Teeth of one of the new fossil rodents. (Credit: Laurent Marivaux)

ScienceDaily (Oct. 13, 2011) — In a literal walk through time along the Ucayali River near Contamana, Peru, a team of researchers found rodent fossils at least 41 million years old -- by far the oldest on the South American continent.

The remains -- teeth -- showed these mouse- and rat-size animals are most closely related to African rodents, confirming the hypothesis that early rodents of South America had origins in Africa, said Darin Croft, an anatomy professor at the Case Western Reserve University School of Medicine and member of the research team.

This discovery supports the contention that rodents landed in the north and spread south. The rodents are from the suborder Caviomorpha, the group that includes living rodents such as guinea pigs, chinchillas, and New World porcupines. The oldest fossils from this group are only about 32 million years old in central Chile and about 30 million years old in Patagonia, Argentina,. Taken all together, the pattern contradicts the theory of a northward expansion deduced from the fossil record 20 years ago.

The findings, which describe three new species, are published online in *Proceedings of the Royal Society B.*

"This really pushes back the date of the first South American rodents," said Croft, a paleontologist who specializes in mammalian evolution.

Pierre-Olivier Antoine, a professor of paleontology in the Institute of Evolutionary Sciences at Montpellier University in southern France, asked Croft to join the team of scientists from France, Germany, Peru and Panama. Members first flew into the region in 2008, after reading Harvard Geology Professor Bernhard Kummel's 1948 description of the area.

Kummel mentions fossils along the Ucayali, a major tributary of the Amazon, but the team found no evidence that anyone had investigated them.

During three trips from 2008 to 2010, Antoine's group found the fossils in a portion of the riverbank exposed when the water level is low.

The geology along the river showed that layers of rock, including the fossil layer, had been pushed up in a rainbow-shaped fold, called an anticline. The layers that had once been above or below the fossils turned from

horizontal to nearly vertical. Instead of digging down to the past, the scientists walked downstream from the fossil layer to go back in time, upstream to go forward in time.

Ash found among silt particles 47 meters forward in time was dated at 41 million years ago using argon-argon radioactive dating, providing the minimum age of the fossils.

The date is supported by genetic studies of living African and South American rodents that show the animals are of common origin and estimate the animals arrived in South America during the Mid-Eocene Climatic Optimum, or about 40 million years ago.

At that time, other scientists estimate, an African rodent on a raft of vegetation could have reached Northeast Brazil in one to two weeks.

The characteristics of the teeth found reinforce the connection between the continents: the morphologies are closest to those of African rodents.

The dental features indicate the rodents probably ate soft seeds and plant parts as many small rodents do today.

Pollen extracted from the fossilized mud that contained the teeth suggests these rodents lived in a rain forest, much like the rain forest there today.

The new species, however, are smaller than nearly all caviomorph rodents today. This group includes the largest living rodent, the capybara, which can reach 150 pounds.

Cachiyacuy contamanensis, named for the Contamana region, appeared to be the size of a small rat.

Canaanimys maquiensis, named for the specific locality the fossils were found, and *Cachiyacuy kummeli*, named for Kummel, were about the size of a field mouse.

Remains of two more rodents found at the site appear to be the same as those described, but not dated, in a 2004 study from Santa Rosa, Peru, in the Amazon basin southeast of this site. The authors of the new paper identified them by their genus only: *Eobranisamys* and *Eospina*.

Remains of other mammals such as marsupials, an armadillo, and several types of hoofed mammals were also found at the site, but most are too fragmentary to identify precisely. They appear to be closely related to species from 45 to 35 million-year-old fossil sites elsewhere in South America, further supporting the age of the Peruvian site.

"This study shows that where we're looking for fossils has a major effect on what we think we know about mammal evolution," Croft said. While Patagonia in the extreme south of the continent has been well researched, comparatively few fossil beds have been found in much of the rest of South America, especially in more tropical areas.

"There are still a lot of great fossils to be discovered," Croft said. He doubts, however, that much older caviomorph fossils will be found. "Odds are pretty low that we would push back the date for these rodents by more than a million years or two."

The fossils are permanently stored at the Museum of Natural History in Lima.

The research was funded by the Centre National de la Recherche Scientifique.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Case Western Reserve University**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. P.-O. Antoine, L. Marivaux, D. A. Croft, G. Billet, M. Ganerod, C. Jaramillo, T. Martin, M. J. Orliac, J. Tejada, A. J. Altamirano, F. Duranthon, G. Fanjat, S. Rousse, R. S. Gismondi. **Middle Eocene rodents from Peruvian Amazonia reveal the pattern and timing of caviomorph origins and biogeography**. *Proceedings of the Royal Society B: Biological Sciences*, 2011; DOI: 10.1098/rspb.2011.1732

http://www.sciencedaily.com/releases/2011/10/111011192420.htm

Glow around black holes could light up dark energy

- 12 October 2011 by **Lisa Grossman**
- Magazine issue 2834.

Who needs supernovae? *(Image: X-ray: NASA/CXC/CFA/R. Kraft and colleagues; radio: NSF/VLA/University of Hertfordshire/M. Hardcastle; optical: ESO/WFI/M. Rejkuba and colleagues)*

There's a new way to measure the accelerating expansion of the primordial universe – and it may just reveal what dark energy is

DISCOVERING that the universe's expansion is speeding up garnered three cosmologists a Nobel prize last week, even though the force apparently responsible - dark energy - remains deeply mysterious. Now there's a way to measure this cosmic acceleration that should be able to probe a much earlier period in the universe's history. This primordial era may be key to revealing what dark energy is.

Cosmologists probe the early universe by looking at distant objects. Light speed is constant, so the further away something is, the further back in time a viewed event actually happened. The advantage of the new method, which uses glowing discs around black holes, is that it should work at larger distances than any other.

"We can fill in the puzzle in regions where no other method can see," says Kelly Denney of the Dark Cosmology Centre at the University of Copenhagen in Denmark, one of the researchers proposing the method.

In principle, measuring cosmic distances should be simple: objects look dimmer when farther away so comparing a star's apparent brightness with how bright it actually is should tell you its distance. The trouble is that there's no way to tell the intrinsic brightness of most stars and galaxies, and so no way to know their true distance. That's why astronomers use "standard candles", bodies of known brightness, to figure out how far away other objects are.

The Nobel laureates used exploding stars called type Ia supernovae, which seem to all have the same intrinsic brightness (see interview with Adam Riess). By comparing supernovae of different apparent brightnesses - and therefore at different distances - they worked out that the universe's expansion has been faster in more recent times than it was in the distant past.

This was a surprise, as it had been assumed that over time gravity would slow the expansion. Theorists' answer is dark energy, a repulsive force driving space-time apart. But is this energy constant or has it been changing with time? The answer could be key to working out its true nature, but has remained elusive - partly because supernovae are rare, unpredictable and fade quickly. So far, they have only allowed astronomers to look back to about 9.6 billion years ago - seven-tenths of the age of the universe.

A team led by Darach Watson at the University of Copenhagen offers an alternative that will let astronomers look further back than any other technique: bright beacons generated by supermassive black holes at the hearts of distant galaxies.

Some black holes that live in galactic cores gather huge discs of gas around them, which glow white-hot as they are slowly devoured. Called active galactic nuclei, they can send energy out into the galaxy which ionises clouds of gas that orbit the discs. The brighter the AGN, the greater its reach, so the more distant the ionised clouds can be. Denney and her colleagues realised that if they could measure the distance between the AGN and the ionised gas, they could calculate the nucleus's absolute brightness. Then they could measure its apparent brightness to find its distance from Earth. "This measurement of the ionised cloud tells us how bright the object is intrinsically," says Watson. "That gives you your standard candle."

The galaxies are too far away to measure the distance between the AGNs and the ionised gas clouds directly, but the team reasoned that as the light from a given cloud originally came from the AGN that is ionising it, it should take longer to reach Earth than the light coming directly from the AGN. So by measuring this time delay, the researchers could determine the distances from the AGNs to their respective clouds.

They used this method to figure out the distances from Earth to 38 AGNs, some of which had already been measured by other means. Comparing their results with the known values showed the technique worked pretty well, though measuring distances with supernovae is still three times as accurate, on average (*The Astrophysical Journal Letters*, DOI: 10.1088/2041-8205/740/2/L49).

AGNs have a number of advantages over supernovae, though, that suggest they might one day provide much more precise measurements of distance: they're bright, they're persistent, they're everywhere and we understand how they ionise their surroundings better than we do how supernovae explode. As measurements tend to get less accurate the further away supernovae are, the new approach could allow more distant times to be probed. The researchers estimate that AGNs could reveal the rate of the universe's acceleration as far back as 11.6 billion years ago, further than any other technique.

"I'm quite impressed. I think this is a very promising method," says Krzysztof Stanek of Ohio State University in Columbus, who was not involved in the study. "There are good physical reasons why this should work."

Peering back to epochs when the universe was much younger can help determine whether or not dark energy has changed with time, which could give us more of a handle on what it actually is.

One theory has it that the amount of repulsive energy in every unit volume of space stays the same over time. As the universe expands, more space exists, which accelerates the expansion. This fits with Einstein's cosmological constant hypothesis and with the supernova measurements.

However, an alternative model suggests that the repulsive force is a varying field called quintessence: in some versions of quintessence, the field can become dormant and so behaves like the cosmological constant, but merely over the recent past. Yet another theory says that dark energy is not an entirely different force but just gravity behaving weirdly over very large scales. Studying dark energy over long distances would test these ideas.

Looking back in time might, alternatively, reveal some surprises, says cosmologist Paul Steinhardt of Princeton University. Perhaps dark energy isn't driving the accelerating universe after all, and something even stranger is going on.

Accelerating expansion, in juicy detail

A technique based on glowing discs around black holes could allow us to measure the effects of dark energy - the enigmatic entity accelerating the expansion of space-time - at earlier points in the universe's history than ever before. But some physicists say that the juiciest insights into dark energy will come from studying its more recent past more accurately.

Astronomer Alexey Vikhlinin at Harvard University says the "best bang for the buck" will come from looking at the last 7 billion years with much more precision. While dark energy was there all along, it wasn't until about 5 billion years ago that the universe's expansion meant matter and radiation were diffuse enough for dark energy to dominate over gravity.

Here are some ways to probe this more recent period in greater detail:

Galaxy clusters Dark energy acts against the clumping force of gravity, so studying the mass of galaxy clusters at various times after the big bang can reveal the strength of dark energy back to 7.7 billion years ago.

Deep Hum Sound waves filled the universe with a deep hum in the aftermath of the big bang, squeezing matter and causing more galaxies to form in the regions compressed by the waves. The apparent distance between these clumps in different epochs reveals the changing rate of cosmic expansion - and dark energy's strength.

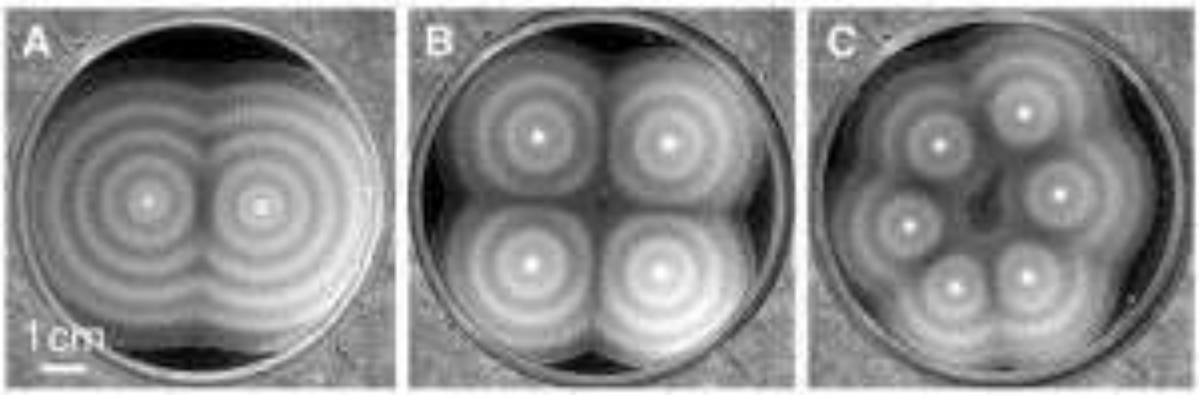
Currently, this method can look back 6 billion years but the European Space Agency's Euclid probe, planned to launch in 2019, will look back 10 billion years.

Constant constants A less well-known idea is to constrain the possibilities for dark energy via other physical constants. Paul Steinhardt at Princeton University says that if dark energy changes with time, so must they, according to most models.

But so far, observations show that the constants associated with gravity and electromagnetism are constant to very high accuracy, placing constraints on dark energy that are 1000 times as tight as those derived from supernovae. **Maggie McKee**

http://www.newscientist.com/article/mg21228344.300-glow-around-black-holes-could-light-up-dark-energy.html

How the Zebra Gets Its Stripes: A Simple Genetic Circuit



With multiple starting points, bacteria guided by a simple genetic circuit can create intricate patterns. (Credit: Image courtesy of University of California - San Diego)

ScienceDaily (Oct. 14, 2011) — Many living things have stripes, but the developmental processes that create these and other patterns are complex and difficult to untangle.

Now a team of scientists has designed a simple genetic circuit that creates a striped pattern that they can control by tweaking a single gene.

"The essential components can be buried in a complex physiological context," said Terence Hwa, a professor of physics at the University of California, San Diego, and one of the leaders of the study published October 14 in *Science*. "Natural systems make all kinds of wonderful patterns, but the problem is you never know what's really controlling it."

With genes taken from one species of bacterium and inserted into another, Hwa and colleagues from the University of Hong Kong assembled a genetic loop from two linked modules that senses how crowded a group of cells has become and responds by controlling their movements.

One of the modules secretes a chemical signal called acyl-homoserine lactone (AHL). As the bacterial colony grows, AHL floods the accumulating cells, causing them to tumble in place rather than swim. Stuck in the agar of their dish, they pile up.

Because AHL doesn't diffuse very far, a few cells escape and swim away to begin the process again.

Left to grow overnight, the cells create a target-like pattern of concentric rings of crowded and dispersed bacterial cells. By tweaking just one gene that limits how fast and far cells can swim, the researchers were able to control the number of rings the bacteria made. They can also manipulate the pattern by modifying how long AHL lasts before it degrades.

Although individual bacteria are single cells, as colonies they can act like a multicellular organism, sending and receiving signals to coordinate the growth and other functions of the colony. That means fundamental rules that govern the development of these patterns could well apply to critical steps in the development of other organisms.

To uncover these fundamental rules, Hwa and colleagues characterized the performance of their synthetic genetic circuit in two ways.

First, they precisely measured both the activity of individual genes in the circuit throughout the tumble-and-swim cycle. Then they derived a mathematical equation that describes the probability of cells flipping between swim and tumble motions.

Additional equations describe other aspects of the system, such as the dynamics of the synthesis, diffusion and deactivation of one of the cell-to-cell chemical signal AHL.

This three-pronged approach of "wet-lab" experiments, precise measurements of the results, and mathematical modeling of the system, characterize the emerging discipline of quantitative biology, Hwa said. "This is a prototype, a model of the kind of biology we want to do."

Co-authors include Jian-Dong Huang, associate professor of biochemistry at the University of Hong Kong additional researchers at Hong Kong Baptist University, the University of Marburg, and the University of Hong Kong including members of the 2008 iGEM team, which Hwa co-advised as a Distinguished Visiting Professor at UHK.

Hwa is a senior scientist with UC San Diego's Center for Theoretical Biological Physics.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of California - San Diego**.

Journal Reference:

1. C. Liu, X. Fu, L. Liu, X. Ren, C. K. L. Chau, S. Li, L. Xiang, H. Zeng, G. Chen, L.-H. Tang, P. Lenz, X. Cui, W. Huang, T. Hwa, J.-D. Huang. **Sequential Establishment of Stripe Patterns in an Expanding Cell Population**. *Science*, 2011; 334 (6053): 238 DOI: 10.1126/science.1209042

http://www.sciencedaily.com/releases/2011/10/111013141820.htm

The rebel star that broke the medieval sky

- 18:06 14 October 2011 by **David Shiga**

A 13-light-year tail *(Image: Caltech/GALEX/NASA)*

Object type: Pulsating variable star
Distance: 300 light years
Size: 300 to 400 times the sun's diameter

In 1617, David Fabricius lay on a church floor at the age of 53, murdered by a man wielding a shovel, who Fabricius had just accused of stealing a goose. It was a sorry end for the person who was first to spot one of the most important objects in the history of astronomy – a flashing star called Mira.

Not only did Mira go on to shatter cherished notions of a constant universe – to the dismay of Catholic theologians – it has recently gained another distinction: it is the first and only star with a comet-like tail that we know of. And this eternal hellraiser refuses to go quietly. The latest news is that Mira has been spotted enveloped by a mysterious spiral structure.

To fully understand the effect Mira had when it was first discovered, rewind to 20 years before Fabricius's death. The Dutch minister had been using a star to chart the position of what he thought was the planet Mercury (but later turned out to be Jupiter), so he noticed when it dimmed out of sight over a few months. Ten years later, the faithful amateur astronomer was rewarded by the star's unexpected return.

The star was then largely forgotten until, long after Fabricius's death, Polish astronomer Johannes Hevelius discovered in the mid-1600s that it continued to appear and disappear. He gave it the name Mira, meaning "wonderful" or "astonishing" in Latin.

Cultural earthquake

Word of Hevelius's observations reached the French astronomer Ismail Bouillaud, who carefully charted Mira's brightness variations and found they were highly regular, with a period of 333 days.

What ensued was a cultural earthquake. These variations challenged the idea that the realm of the stars was eternal and unchanging – the received wisdom of the time, underwritten by

Aristotle, says historian Robert Hatch of the University of Florida in Gainesville. The Catholic church itself, which only recently had banned Galileo's heretical theories, endorsed the Aristotelian view.

And unlike two supernovae that appeared and shone for about a year each in 1572 and 1604, Mira returned again and again, almost tauntingly. "Mira kept showing up and saying, 'Hey, here I am, you've got to explain me,'" says Hatch. "It's the worst nightmare for the Aristotelians."

What's more, several other stars were discovered during the 1600s to be variable. "The variable stars are not as dramatic, but they're more important in some ways than the two supernovae," Hatch says.

Dark side of a star?

In addition to adding to mounting evidence for a mutable celestial realm, the regularity of the variable stars' changes suggested that the universe could be understood and predicted in a rational way.

Bouillaud suggested that Mira had one side much brighter than the other. As it rotated, the bright side would come in and out of view, explaining why it seemed to regularly dim and disappear, then reappear and brighten again.

It wasn't until the early 20th century that the real reason for Mira's changes was discovered. It is a giant star whose atmosphere is expanding and contracting – making it bigger and brighter at some times and smaller and dimmer at others. The pulsations happen because radiation gets periodically trapped in the star's atmosphere, exerting an outward force that causes the atmosphere to bloat.

Spiral mystery

Variable stars have become immensely important in astronomy. One class, called Cepheid variables, is useful for measuring distances and was crucial in revealing how truly enormous the universe is.

Mira itself is still surprising us. In 2007, observations by the GALEX space telescope revealed an extraordinary comet-like tail behind Mira – the first ever spotted behind a star. As Mira travels through the galaxy, the gas it is shedding slams into ambient gas, causing a glow at ultraviolet wavelengths that we see as a tail.

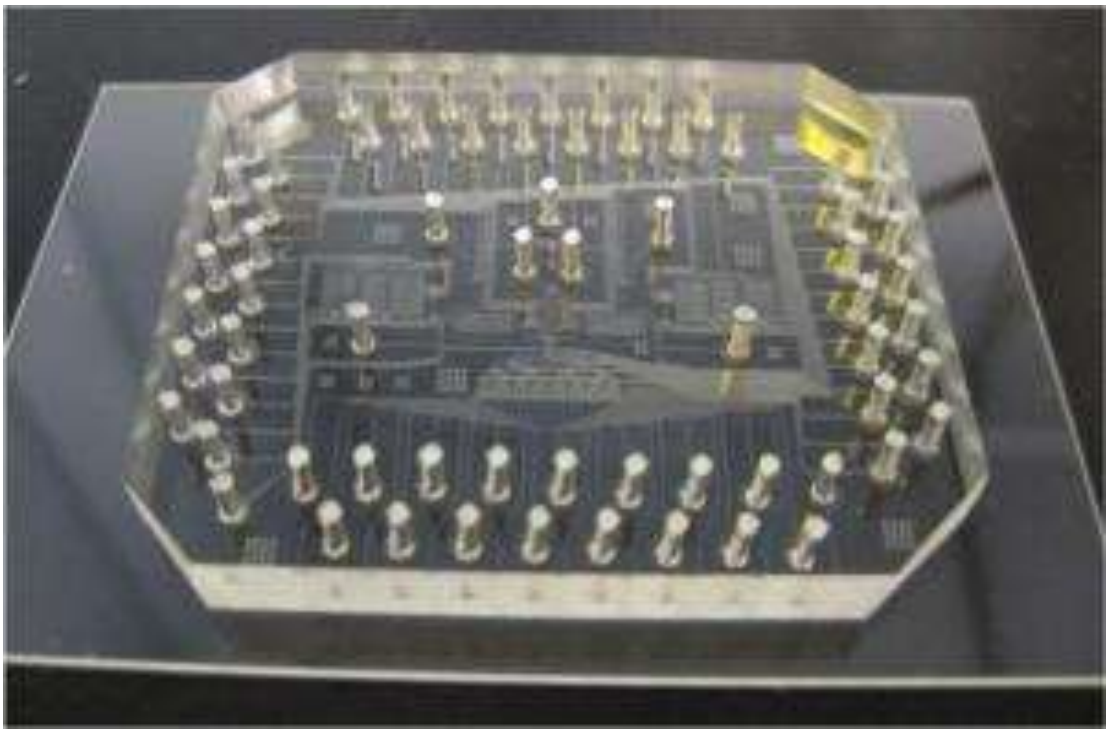
More recent observations by the Herschel space telescope have revealed another curious detail – what appears to be a spiral structure in the head of the comet-like cloud that contains Mira itself and a companion star. The spiral may result from the way the companion disturbs the gas shed by Mira as it moves around in its orbit.

If only Fabricius could have known. The star that puzzled the poor man turns out to have changed the world.

Journal reference: *Astronomy & Astrophysics*, DOI: 10.1051/0004-6361/201117203

http://www.newscientist.com/article/dn21052-astrophile-the-rebel-star-that-broke-the-medieval-sky.html

'Robot Biologist' Solves Complex Problem from Scratch



One of the microformulators that the Wikswo lab has developed that will give ABE the ability to perform experiments without human intervention. (Credit: Courtesy of Wikswo Lab)

ScienceDaily (Oct. 14, 2011) — First it was chess. Then it was Jeopardy. Now computers are at it again, but this time they are trying to automate the scientific process itself.

An interdisciplinary team of scientists at Vanderbilt University, Cornell University and CFD Research Corporation, Inc., has taken a major step toward this goal by demonstrating that a computer can analyze raw experimental data from a biological system and derive the basic mathematical equations that describe the way the system operates. According to the researchers, it is one of the most complex scientific modeling problems that a computer has solved completely from scratch.

The paper that describes this accomplishment is published in the October issue of the journal *Physical Biology* and is currently available online.

The work was a collaboration between John P. Wikswo, the Gordon A. Cain University Professor at Vanderbilt, Michael Schmidt and Hod Lipson at the Creative Machines Lab at Cornell University and Jerry Jenkins and Ravishankar Vallabhajosyula at CFDRC in Huntsville, Ala.

The "brains" of the system, which Wikswo has christened the Automated Biology Explorer (ABE), is a unique piece of software called Eureqa developed at Cornell and released in 2009. Schmidt and Lipson originally created Eureqa to design robots without going through the normal trial and error stage that is both slow and expensive. After it succeeded, they realized it could also be applied to solving science problems.

One of Eureqa's initial achievements was identifying the basic laws of motion by analyzing the motion of a double pendulum. What took Sir Isaac Newton years to discover, Eureqa did in a few hours when running on a personal computer.

In 2006, Wikswo heard Lipson lecture about his research. "I had a 'eureka moment' of my own when I realized the system Hod had developed could be used to solve biological problems and even control them," Wikswo said. So he started talking to Lipson immediately after the lecture and they began a collaboration to adapt Eureqa to analyze biological problems.

"Biology is the area where the gap between theory and data is growing the most rapidly," said Lipson. "So it is the area in greatest need of automation."

Software passes test

The biological system that the researchers used to test ABE is glycolysis, the primary process that produces energy in a living cell. Specifically, they focused on the manner in which yeast cells control fluctuations in the chemical compounds produced by the process.

The researchers chose this specific system, called glycolytic oscillations, to perform a virtual test of the software because it is one of the most extensively studied biological control systems. Jenkins and Vallabhajosyula used one of the process' detailed mathematical models to generate a data set corresponding to the measurements a scientist would make under various conditions. To increase the realism of the test, the researchers salted the data with a 10 percent random error. When they fed the data into Eureqa, it derived a series of equations that were nearly identical to the known equations.

"What's really amazing is that it produced these equations a priori," said Vallabhajosyula. "The only thing the software knew in advance was addition, subtraction, multiplication and division."

Beyond Adam

The ability to generate mathematical equations from scratch is what sets ABE apart from Adam, the robot scientist developed by Ross King and his colleagues at the University of Wales at Aberystwyth. Adam runs yeast genetics experiments and made international headlines two years ago by making a novel scientific discovery without direct human input. King fed Adam with a model of yeast metabolism and a database of genes and proteins involved in metabolism in other species. He also linked the computer to a remote-controlled genetics laboratory. This allowed the computer to generate hypotheses, then design and conduct actual experiments to test them.

"It's a classic paper," Wikswo said.

In order to give ABE the ability to run experiments like Adam, Wikswo's group is currently developing "laboratory-on-a-chip" technology that can be controlled by Eureqa. This will allow ABE to design and perform a wide variety of basic biology experiments. Their initial effort is focused on developing a microfluidics device that can test cell metabolism.

"Generally, the way that scientists design experiments is to vary one factor at a time while keeping the other factors constant, but, in many cases, the most effective way to test a biological system may be to tweak a large number of different factors at the same time and see what happens. ABE will let us do that," Wikswo said.

The project was funded by grants from the National Science Foundation, National Institute on Drug Abuse, the Defense Threat Reduction Agency and the National Academies Keck Futures Initiative.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Vanderbilt University**.

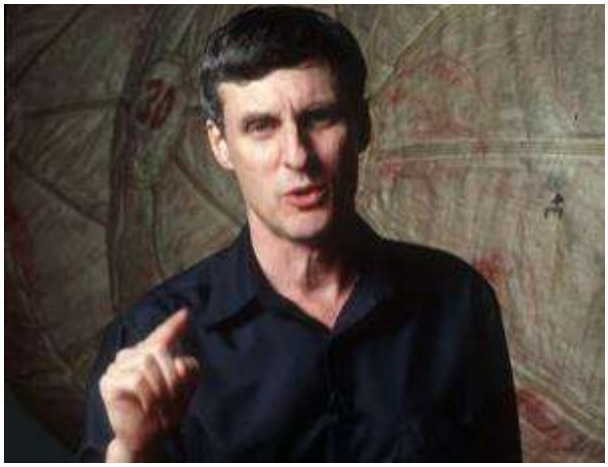
Journal Reference:

1. Michael D Schmidt, Ravishankar R Vallabhajosyula, Jerry W Jenkins, Jonathan E Hood, Abhishek S Soni, John P Wikswo, Hod Lipson. **Automated refinement and inference of analytical models for metabolic networks**. *Physical Biology*, 2011; 8 (5): 055011 DOI: 10.1088/1478-3975/8/5/055011

http://www.sciencedaily.com/releases/2011/10/111013162937.htm

Rover scientist: Why I'm spending 13 days underwater

- 22:19 14 October 2011 by **Maggie McKee**
- Magazine issue 2822.



Robot scientist, human explorer (Image: NASA)

***Steve Squyres**, lead scientist for NASA's Mars rovers Spirit and Opportunity, will become an "aquanaut" to help pave the way for a future human mission to an asteroid*

Next week you will be travelling underwater off the coast of Florida as part of NASA's NEEMO undersea exploration mission. Why?

In 2025 NASA wants to send humans to explore asteroids a kilometre in size or smaller. These are effectively microgravity environments. Nobody knows how to do field geology in microgravity – the best way to simulate it is underwater.

This is quite a change from your usual job, managing NASA's Mars rovers.

I have been saying publicly for years that I am a big supporter of human space flight. This is the chance for me to stop talking about it and actually do something towards it.

How big is the underwater laboratory you will be working in?

It's about the size of a school bus, and it sits on the seabed at a depth of 19 metres. There will be six of us there – four NASA crew members and two folks from the National Undersea Research Center.

Have you spent much time underwater before?

I did some research diving in Antarctica back in the 1980s. We were interested in understanding what the sediments deposited in lakes on Mars might look like; Martian lakes would probably be covered with ice too.

What will a typical day be like in the underwater laboratory?

It's going to be very intense. We have a very full mission timeline. Two crew members will go outdoors performing extravehicular activities – there's one EVA in the morning and one in the afternoon, three hours apiece. We are not using scuba equipment, but instead have helmets to provide air and continuous voice communication.

We'll be simulating the process of doing basic field geology tasks on the surface of an asteroid, like deploying instruments and collecting samples. We will be trying lots of ways to do it, using ropes and small one-person subs to move crew members around.

What are the benefits of sending humans to an asteroid, rather than just robots?

In Antarctica, we had a remotely operated vehicle exploring the lake bottom. We could look around and answer first-order questions with it, but I found I didn't really understand things until I got suited up and went down in that environment myself, where I could touch the surface and interact with it.

The human-robot argument is a silly argument to have. The key is to find the right mix of both. I think humans are going to be much more effective geological explorers than a robotic system would be, but robots are less expensive, and you want to find the right balance.

Are you hoping to be on board NASA's asteroid mission in 2025?

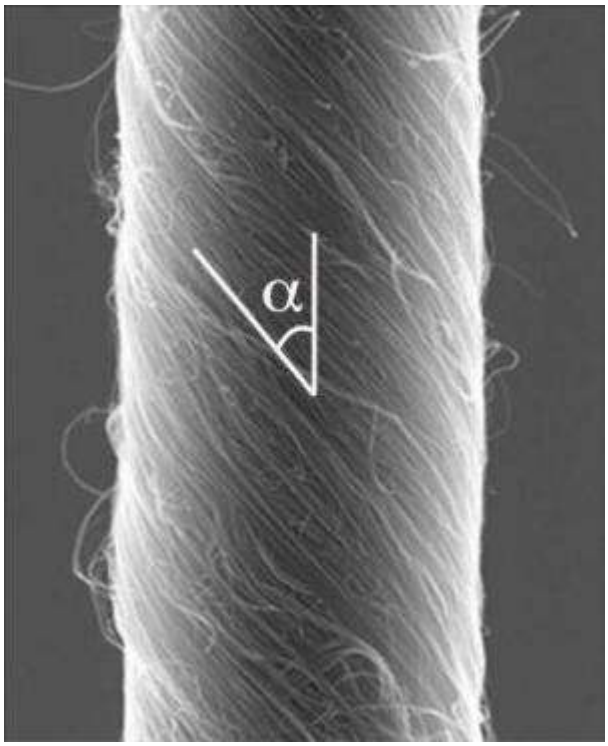
I'm 55 years old. I'm 10 years older than anybody on the NEEMO crew. I think this is going to be the closest to an asteroid I'm ever going to get. I'll be watching the asteroid mission on TV from my rocking chair.

Profile

Steve Squyres is a planetary scientist at Cornell University in Ithaca, New York. He is the lead scientist for NASA's Mars rovers Spirit and Opportunity

http://www.newscientist.com/article/dn21053-rover-scientist-why-im-spending-13-days-underwater.html

Carbon Nanotube Muscles Generate Giant Twist for Novel Motors



This is a scanning electron micrograph image of a 3.8-micron diameter carbon nanotube yarn that functions as a torsional muscle when filled with an ionically conducting liquid and electrochemically charged. The angle ± indicates the deviation between nanotube orientation and yarn direction for this helical yarn. (Credit: Image courtesy of the University of Texas at Dallas)

ScienceDaily (Oct. 14, 2011) — New artificial muscles that twist like the trunk of an elephant, but provide a thousand times higher rotation per length, have been developed by a team of researchers from The University of Texas at Dallas, The University of Wollongong in Australia, The University of British Columbia in Canada, and Hanyang University in Korea.

The research appears in the journal *Science*.

These muscles, based on carbon nanotubes yarns, accelerate a 2000 times heavier paddle up to 590 revolutions per minute in 1.2 seconds, and then reverse this rotation when the applied voltage is changed. The demonstrated rotation of 250 per millimeter of muscle length is over a thousand times that of previous artificial muscles, which are based on ferroelectrics, shape memory alloys, or conducting organic polymers. The output power per yarn weight is comparable to that for large electric motors, and the weight-normalized performance of these conventional electric motors severely degrades when they are downsized to millimeter scale.

These muscles exploit strong, tough, highly flexible yarns of carbon nanotubes, which consist of nanoscale cylinders of carbon that are ten thousand times smaller in diameter than a human hair. Important for success, these nanotubes are spun into helical yarns, which means that they have left and right handed versions (like our hands), depending upon the direction of rotation during twisting the nanotubes to make yarn. Rotation is torsional, meaning that twist occurs in one direction until a limiting rotation results, and then rotation can be

reversed by changing the applied voltage. Left and right hand yarns rotate in opposite directions when electrically charged, but in both cases the effect of charging is to partially untwist the yarn.

Unlike conventional motors, whose complexity makes them difficult to miniaturize, the torsional carbon nanotube muscles are simple to inexpensively construct in either very long or millimeter lengths. The nanotube torsional motors consist of a yarn electrode and a counter-electrode, which are immersed in an ionically conducting liquid. A low voltage battery can serve as the power source, which enables electrochemical charge and discharge of the yarn to provide torsional rotation in opposite directions. In the simplest case, the researchers attach a paddle to the nanotube yarn, which enables torsional rotation to do useful work -- like mixing liquids on "micro-fluidic chips" used for chemical analysis and sensing.

The mechanism of torsional rotation is remarkable. Charging the nanotube yarns is like charging a supercapacitor -- ions migrate into the yarns to electrostatically balance the electronic charge electrically injected onto the nanotubes. Although the yarns are porous, this influx of ions causes the yarn to increase volume, shrink in length by up to a percent, and torsionally rotate. This surprising shrinkage in yarn length as its volume increases is explained by the yarn's helical structure, which is similar in structure to finger cuff toys that trap a child's fingers when elongated, but frees them when shortened.

Nature has used torsional rotation based on helically wound muscles for hundreds of millions of years, and exploits this action for such tasks as twisting the trunks of elephants and octopus limbs. In these natural appendages, helically wound muscle fibers cause rotation by contracting against an essentially incompressible, bone-less core. On the other hand, the helically wound carbon nanotubes in the nanotube yarns are undergoing little change in length, but are instead causing the volume of liquid electrolyte within the porous yarn to increase during electrochemical charging, so that torsional rotation occurs.

The combination of mechanical simplicity, giant torsional rotations, high rotation rates, and micron-size yarn diameters are attractive for applications, such as microfluidic pumps, valve drives, and mixers. In a fluidic mixer demonstrated by the researchers, a 15 micron diameter yarn rotated a 200 times larger radius and 80 times heavier paddle in flowing liquids at up to one rotation per second.

"The discovery, characterization, and understanding of these high performance torsional motors shows the power of international collaborations," said Ray H. Baughman, a corresponding author of the author of the Science article and Robert A. Welch Professor of Chemistry and director of The University of Texas at Dallas Alan G. MacDiarmid NanoTech Institute. "Researchers from four universities in three different continents that were born in eight different countries made critically important contributions."

Other co-authors of this article are Javad Foroughi (first author and research fellow), Geoffrey M. Spinks (a corresponding author and professor), and Gordon G. Wallace (professor) of the University of Wollongong in Australia; Jiyoung Oh (postdoctoral fellow), Mikhail E. Kozlov (research professor), and Shaoli Fang (research professor) at The University of Texas at Dallas; Tissaphern Mirfakhrai (postdoctoral fellow) and John D. W. Madden (professor) at The University of British Columbia; and Min Kyoon Shin (postdoctoral fellow) and Seon Jeong Kim (professor) at Hanyang University.

Funding for this research was provided by grants from the Air Force Office of Scientific Research, the Air Force AOARD program, the Office of Naval Research MURI program, and the Robert A. Welch Foundation in the United States; the Creative Research Initiative Center for Bio-Artificial Muscle in Korea; the Natural Sciences and Engineering Research Council of Canada; and the Australian Research Council.

Story Source:

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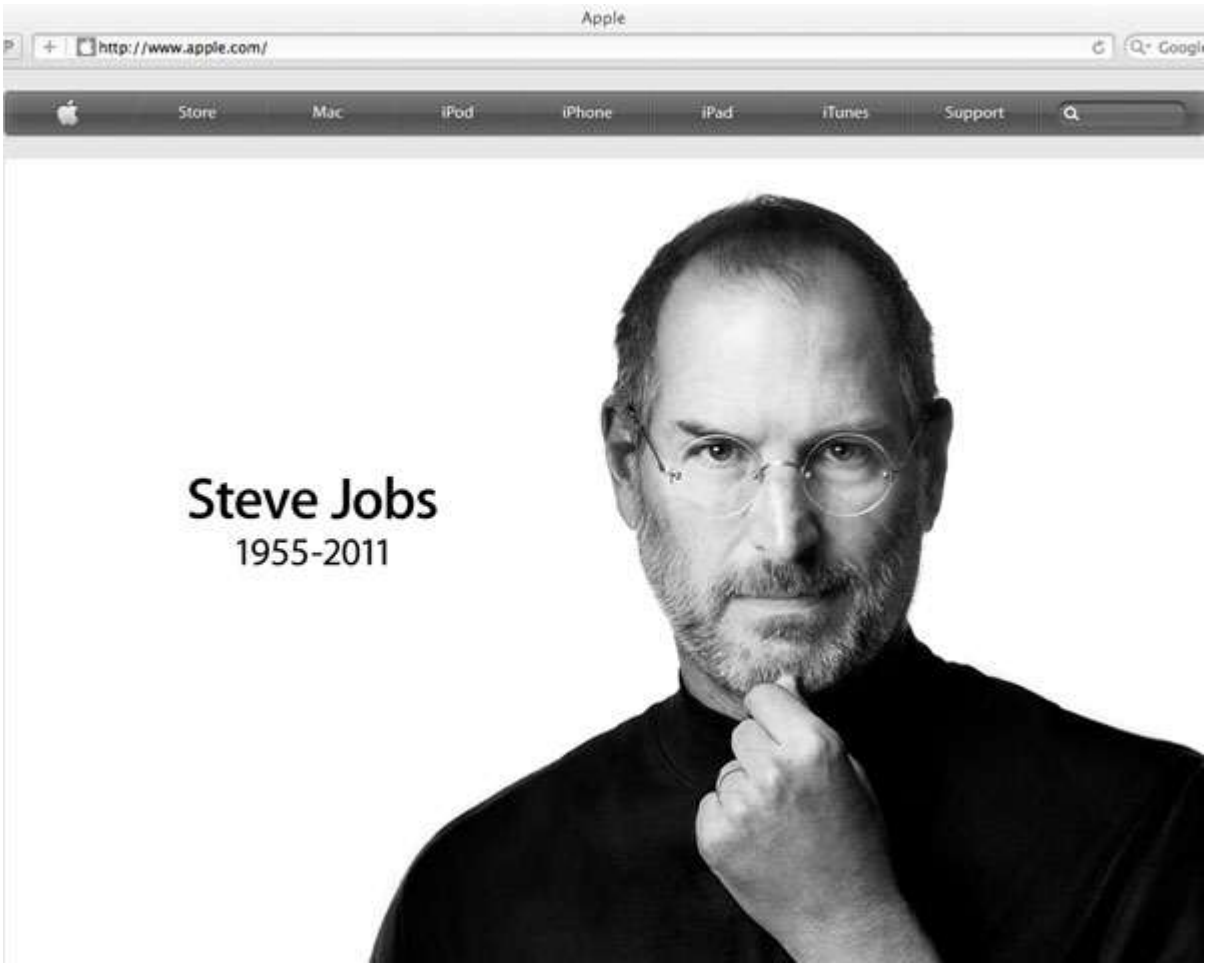
Journal Reference:

1. Javad Foroughi, Geoffrey M. Spinks, Gordon G. Wallace, Jiyoung Oh, Mikhail E. Kozlov, Shaoli Fang, Tissaphern Mirfakhrai, John D. W. Madden, Min Kyoon Shin, Seon Jeong Kim, Ray H. Baughman. **Torsional Carbon Nanotube Artificial Muscles**. *Science*, 2011; DOI: 10.1126/science.1211220

http://www.sciencedaily.com/releases/2011/10/111013141809.htm

Tributes for Steve Jobs, the man who tamed technology

12:14 6 October 2011



(Image: Equinox/Rex Features)

Paul Marks, senior technology correspondent

Editorial: "The magical legacy of Steve Jobs"

The death yesterday of the technologist and inventor Steve Jobs, co-founder of Apple, has roused a torrent of tributes from friends, colleagues, politicians and even his firm's regular adversaries in the patent courts.

Jobs was an unstinting promoter of technology that is both easy and compelling to use, and famously intolerant of any product ideas that got in the way of that basic tenet. From the Macintosh computer to the iPod, iPhone and iPad, his insistence on usability at all costs has made Apple the watchword for friendly tech: as his Apple co-founder **Steve Wozniak** told the BBC.

"He knew what made sense in a product," said Wozniak.

The White House concurs.

"By making computers personal and putting the internet in our pockets, he made the information revolution not only accessible but intuitive and fun," US president **Barack Obama** said today.

Microsoft cofounder **Bill Gates**, Jobs's 1980s rival who later invested in Apple when it hit trouble, described working with him as "an insanely great honour". "The world rarely sees someone who made such a profound impact."

At movie studio Pixar, chief creative officer **John Lasseter** said: "Steve took a chance on us and believed in our crazy dream of computer-animated films; the one thing he always said was to simply, 'Make it great'... He will forever be part of Pixar's DNA."

Another firm Jobs founded, Next Computer, released a powerful, multimedia-enabled UNIX workstation in 1990 - and it was the machine on which **Tim Berners-Lee** wrote the software behind the world wide web. In a web posting, Berners-Lee reveals just what a user-friendly machine the Next machine was. "A big thing Steve Jobs did for the world was to insist that computers could be usable rather than totally infuriating," he says.

Tributes to Jobs continue to pour in - including one from **Samsung**, a firm with which Apple is currently embroiled in a bitter patent lawsuit.

Diagnosed with pancreatic cancer in 2004, Jobs had a liver transplant in 2009 - and in gratitude to the young donor, who had been killed in a motorbike accident, he afterwards urged that everyone should consider joining organ donor programmes.

http://www.newscientist.com/blogs/shortsharpscience/2011/10/the-death-yesterday-of-the.html

New Technologies Challenge Old Ideas About Early Hominid Diets

Skull of Paranthropus boisei. (Credit: University of Colorado)

ScienceDaily (Oct. 14, 2011) — New assessments by researchers using the latest high-tech tools to study the diets of early hominids are challenging long-held assumptions about what our ancestors ate, says a study by the University of Colorado Boulder and the University of Arkansas.

By analyzing microscopic pits and scratches on hominid teeth, as well as stable isotopes of carbon found in teeth, researchers are getting a very different picture of the diet habitats of early hominids than that painted by the physical structure of the skull, jawbones and teeth. While some early hominids sported powerful jaws and large molars -- including *Paranthropus boisei*, dubbed "Nutcracker Man" -- they may have cracked nuts rarely if at all, said CU-Boulder anthropology Professor Matt Sponheimer, study co-author.

Such findings are forcing anthropologists to rethink long-held assumptions about early hominids, aided by technological tools that were unknown just a few years ago. A paper on the subject by Sponheimer and co-author Peter Ungar, a distinguished professor at the University of Arkansas, was published in the Oct. 14 issue of *Science*.

Earlier this year, Sponheimer and his colleagues showed *Paranthropus boisei* was essentially feeding on grasses and sedges rather than soft fruits preferred by chimpanzees. "We can now be sure that *Paranthropus boisei* ate foods that no self-respecting chimpanzee would stomach in quantity," said Sponheimer. "It is also clear that our previous notions of this group's diet were grossly oversimplified at best, and absolutely backward at worst."

"The morphology tells you what a hominid may have eaten," said Ungar. But it does not necessarily reveal what the animal was actually dining on, he said.

While Ungar studies dental micro-wear -- the microscopic pits and scratches that telltale food leaves behind on teeth -- Sponheimer studies stable isotopes of carbon in teeth. By analyzing stable carbon isotopes obtained from tiny portions of animal teeth, researchers can determine whether the animals were eating foods that use different photosynthetic pathways that convert sunlight to energy.

The results for teeth from *Paranthropus boisei*, published earlier this year, indicated they were eating foods from the so-called C4 photosynthetic pathway, which points to consumption of grasses and sedges. The

analysis stands in contrast to our closest human relatives like chimpanzees and gorillas that eat foods from the so-called C3 synthetic pathway pointing to a diet that included trees, shrubs and bushes.

Dental micro-wear and stable isotope studies also point to potentially large differences in diet between southern and eastern African hominids, said Sponheimer, a finding that was not anticipated given their strong anatomical similarities. "Frankly, I don't believe anyone would have predicted such strong regional differences," said Sponheimer. "But this is one of the things that is fun about science -- nature frequently reminds us that there is much that we don't yet understand.

"The bottom line is that our old answers about hominid diets are no longer sufficient, and we really need to start looking in directions that would have been considered crazy even a decade ago," Sponheimer said. "We also see much more evidence of dietary variability among our hominid kin than was previously appreciated. Consequently, the whole notion of hominid diet is really problematic, as different species may have consumed fundamentally different things."

While the new techniques have prompted new findings in the field of biological anthropology, they are not limited to use in human ancestors, according to the researchers. Current animals under study using the new tooth-testing techniques range from rodents and ancient marsupials to dinosaurs, said Sponheimer.

Much of Sponheimer's research on ancient hominids has been funded by the National Science Foundation.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Colorado at Boulder**.

Journal Reference:

1. Peter S. Ungar, Matt Sponheimer. **The Diets of Early Hominins**. *Science*, 2011; 334 (6053): 190-193 DOI: 10.1126/science.1207701

http://www.sciencedaily.com/releases/2011/10/111013141849.htm

Hypersonic X-37 spaceplanes 'could carry astronauts'

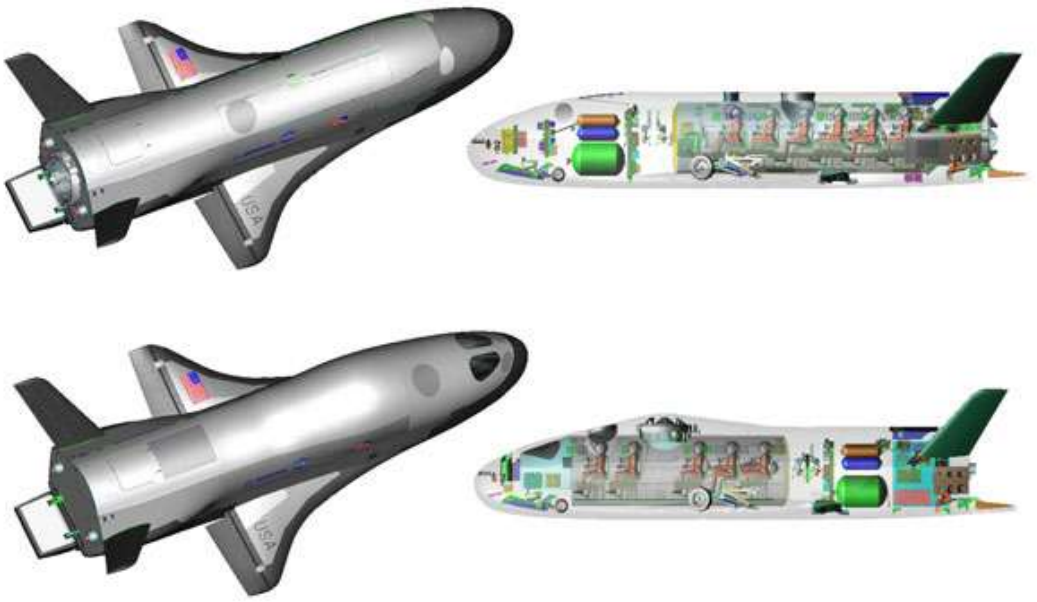
17:35 10 October 2011
Aerospace
Military
Technology

Paul Marks, senior technology correspondent

(Image: US Air Force/Boeing)

The Boeing X-37B, the mysterious uncrewed spaceplane developed for the US Air Force, could be scaled up and modified to carry astronauts. That's the tantalising possibility posited by a Boeing chief at Space 2011, an American Institute of Aeronautics and Astronautics conference in Long Beach, California, last week.

In a paper entitled "X-37B Orbital Test Vehicle and Derivatives", Boeing's X-37B project chief Art Grantz revealed that at least two more versions of the 9-metre long spaceplane are under investigation - one of which involves adding a crew to a much-enlarged version of the space drone. If built, the bigger brother would give the US back its ability to shuttle people to the International Space Station.



(Image: Boeing)

The X-37B is launched on an Atlas V rocket and has small thrusters that allow it to change its orbit at the whim of ground controllers. But, like the space shuttle, it glides in for an unpowered landing. So far, one X-37B has completed one eight-month spaceflight, while a second, launched in March, is still in orbit. Its missions are secret - but spaceflight enthusiasts have done their best to track them.

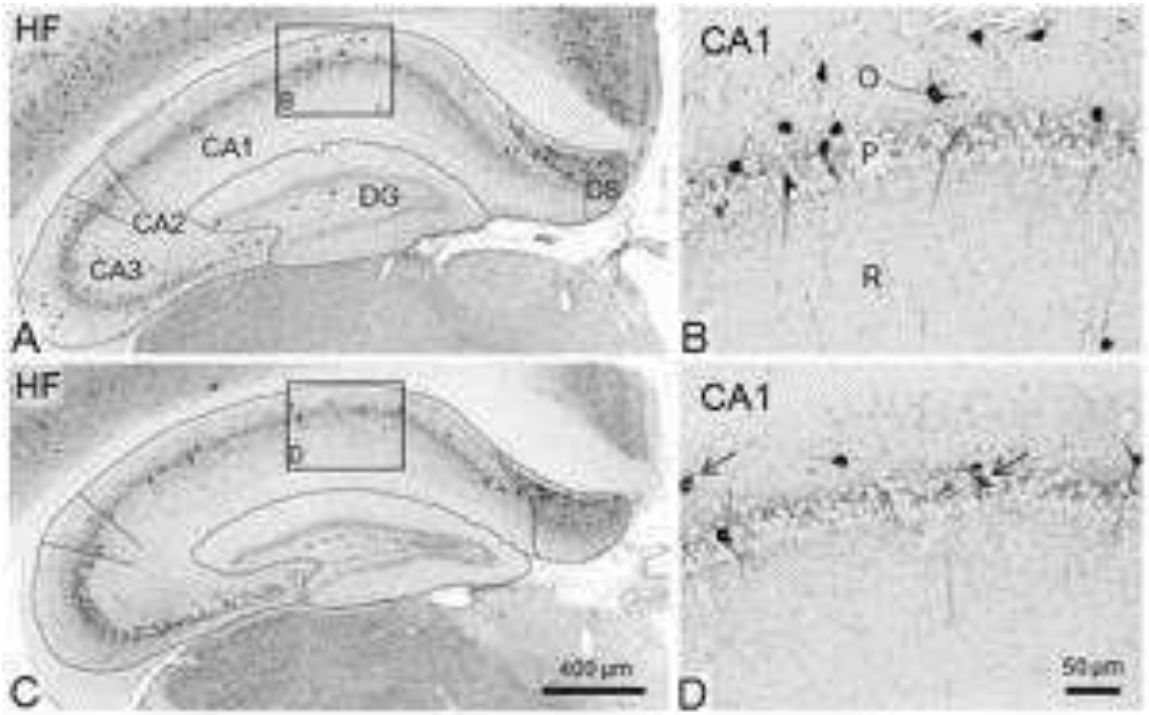
According to *Aviation Week*, Grantz told delegates that the next evolutionary step for the spacecraft is to have it deliver cargo - small stuff like gyros and pumps - to the ISS using the capacity of its current payload bay. Next, he says, the machine will be scaled up from its 9-metre length to 14.3 metres, allowing even bigger payloads to be delivered to the station.

Success at this level would then pave the way for "a human-carrying derivative" capable of carrying "five to seven astronauts", Grantz says. Space.com has pictures from Grantz's paper showing what an "X-37C" derivative with a 6-person pressurised crew compartment could look like. Smaller numbers of astronauts could allow for more cargo, says the website.

How serious is Boeing? It is hard to say. The US aerospace sector is sore to its core over the loss of the space shuttle and it could be clutching at straws. Engineering and certifying a pressurised crew compartment and life support system would incur eye-watering expense at a time when commercial providers like Space X are supposed to be taking over the reins.That said, Boeing knows its stuff on crew rating - its spaceflight pedigree stretches back to the Apollo moonshot capsules. The firm is also currently developing a commercial crew-rated capsule that will fly on an Atlas V called the CST-100, and has mooted plans to fly it to expandable space stations made by Bigelow Aerospace as well as the ISS.

http://www.newscientist.com/blogs/onepercent/2011/10/hypersonic-x-37-spaceplane-cou.html

Schizophrenia Genetics Linked to Disruption in How Brain Processes Sound



Staining performed by Konrad Talbot, PhD, targeting a marker for nerve cells involved in inhibition are shown in cross sections of the hippocampus, which is a part of the brain known to be affected in schizophrenia and involved in memory and cognition. In normal mice (top; A and B) a number of inhibitory cells are found. This staining is reduced in mice with reduced dysbindin (bottom; C and D). The finding is identical to that found in tissue from schizophrenia patients and supports the functional finding of the paper that fast inhibitory processes are disrupted in schizophrenia, leading to symptoms of the disease. (Credit: Konrad Talbot, PhD, Perelman School of Medicine, University of Pennsylvania, Neuron)

ScienceDaily (Oct. 14, 2011) — Recent studies have identified many genes that may put people with schizophrenia at risk for the disease. But, what links genetic differences to changes in altered brain activity in schizophrenia is not clear. Now, three labs at the Perelman School of Medicine at the University of Pennsylvania have come together using electrophysiological, anatomical, and immunohistochemical approaches -- along with a unique high-speed imaging technique -- to understand how schizophrenia works at the cellular level, especially in identifying how changes in the interaction between different types of nerve cells leads to symptoms of the disease.

The findings are reported this week in the *Proceedings of the National Academy of Sciences*.

"Our work provides a model linking genetic risk factors for schizophrenia to a functional disruption in how the brain responds to sound, by identifying reduced activity in special nerve cells that are designed to make other cells in the brain work together at a very fast pace" explains lead author Gregory Carlson, PhD, assistant professor of Neuroscience in Psychiatry. "We know that in schizophrenia this ability is reduced, and now, knowing more about why this happens may help explain how loss of a protein called dysbindin leads to some symptoms of schizophrenia."

Previous genetic studies had found that some forms of the gene for dysbindin were found in people with schizophrenia. Most importantly, a prior finding at Penn showed that the dysbindin protein is reduced in a majority of schizophrenia patients, suggesting it is involved in a common cause of the disease.

For the current *PNAS* study, Carlson, Steven J. Siegel, MD, PhD, associate professor of Psychiatry, director of the Translational Neuroscience Program; and Steven E. Arnold, MD, director of the Penn Memory Center, used a mouse with a mutated dysbindin gene to understand how reduced dysbindin protein may cause symptoms of schizophrenia.

The team demonstrated a number of sound-processing deficits in the brains of mice with the mutated gene. They discovered how a specific set of nerve cells that control fast brain activity lose their effectiveness when dysbindin protein levels are reduced. These specific nerve cells inhibit activity, but do so in an extremely fast pace, essentially turning large numbers of cells on and off very quickly in a way that is necessary to normally process the large amount of information travelling into and around the brain.

Other previous work at Penn in the lab of Michael Kahana, PhD has shown that in humans the fast brain activity that is disrupted in mice with the dysbindin mutation is also important for short-term memory. This type of brain activity is reduced in people with schizophrenia and resistant to current therapy. Taken as a whole, this work may suggest new avenues of treatment for currently untreatable symptoms of schizophrenia, says Carlson.

Additional co-authors are: Konrad Talbot, Tobias B. Halene, Michael J. Gandal, Hala A. Kazi, Laura Schlosser, Quan H. Phung, and Raquel E. Gur, all from the Department of Psychiatry at Penn.

This work was funded in part by the National Institutes of Mental Health.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Pennsylvania School of Medicine**.

Journal Reference:

1. G. C. Carlson, K. Talbot, T. B. Halene, M. J. Gandal, H. A. Kazi, L. Schlosser, Q. H. Phung, R. E. Gur, S. E. Arnold, S. J. Siegel. **PNAS Plus: Dysbindin-1 mutant mice implicate reduced fast-phasic inhibition as a final common disease mechanism in schizophrenia**. *Proceedings of the National Academy of Sciences*, 2011; DOI: 10.1073/pnas.1109625108

http://www.sciencedaily.com/releases/2011/10/111013153945.htm

Electric cars to get universal charger

15:35 14 October 2011

Jacob Aron, technology reporter

(Image: Car Culture Collection/Getty)

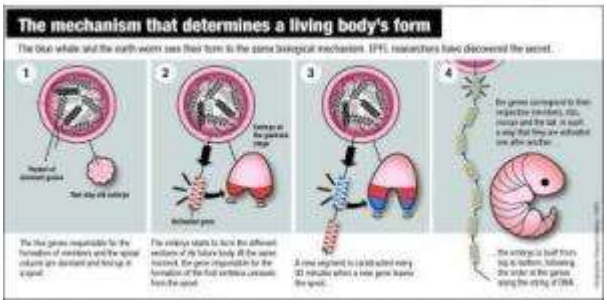
Worried about finding a compatible recharging point for your electric car? Fear not - seven vehicle manufacturers have agreed to adopt a standardised charging system in Europe and the US. Audi, BMW, Daimler, Ford, General Motors, Porsche and Volkswagen have all signed up to the scheme.

It is a move that should make it easier to build up an electric charging infrastructure and reduce manufacturing costs. It is also good for consumers who won't have to deal with multiple charging adaptors - a situation that has frustrated cellphone owners for years but will finally be remedied next year with the adoption of a standard connection for all cellphones. Existing electric car owners won't be left out either, as the new standard is backwards-compatible with older vehicles.

The seven manufacturers have also agreed to use a universal protocol, HomePlug Green Phy, to communicate between the car and charging station. This will make it possible to integrate electric vehicles with smart grids in the future, allowing drivers to connect with their cars through smartphone apps and energy companies to store excess electricity in your car battery.

http://www.newscientist.com/blogs/onepercent/2011/10/green-machine-electric-vehicle.html

From Blue Whales to Earthworms, a Common Mechanism Gives Shape to Living Beings



This is a diagram of the mechanism for form. The blue whale and the earth worm owe their form to the same biological mechanism. EPFL researchers have discovered the secret. (Credit: Infographic courtesy of Pascal Coderay, EPFL)

ScienceDaily (Oct. 14, 2011) — Why don't our arms grow from the middle of our bodies? The question isn't as trivial as it appears. Vertebrae, limbs, ribs, tailbone ... in only two days, all these elements take their place in the embryo, in the right spot and with the precision of a Swiss watch. Intrigued by the extraordinary reliability of this mechanism, biologists have long wondered how it works. Now, researchers at EPFL (Ecole Polytechnique Fédérale de Lausanne) and the University of Geneva (Unige) have solved the mystery.

Their discovery will be published October 13, 2011 in the journal *Science*.

The embryo is built one layer at a time

During the development of an embryo, everything happens at a specific moment. In about 48 hours, it will grow from the top to the bottom, one slice at a time -- scientists call this the embryo's segmentation. "We're made up of thirty-odd horizontal slices," explains Denis Duboule, a professor at EPFL and Unige. "These slices correspond more or less to the number of vertebrae we have."

Every hour and a half, a new segment is built. The genes corresponding to the cervical vertebrae, the thoracic vertebrae, the lumbar vertebrae and the tailbone become activated at exactly the right moment one after another. "If the timing is not followed to the letter, you'll end up with ribs coming off your lumbar vertebrae," jokes Duboule. How do the genes know how to launch themselves into action in such a perfectly synchronized manner? "We assumed that the DNA played the role of a kind of clock. But we didn't understand how."

When DNA acts like a mechanical clock

Very specific genes, known as "Hox," are involved in this process. Responsible for the formation of limbs and the spinal column, they have a remarkable characteristic. "Hox genes are situated one exactly after the other on the DNA strand, in four groups. First the neck, then the thorax, then the lumbar, and so on," explains Duboule. "This unique arrangement inevitably had to play a role."

The process is astonishingly simple. In the embryo's first moments, the Hox genes are dormant, packaged like a spool of wound yarn on the DNA. When the time is right, the strand begins to unwind. When the embryo begins to form the upper levels, the genes encoding the formation of cervical vertebrae come off the spool and become activated. Then it is the thoracic vertebrae's turn, and so on down to the tailbone. The DNA strand acts a bit like an old-fashioned computer punchcard, delivering specific instructions as it progressively goes through the machine.

"A new gene comes out of the spool every ninety minutes, which corresponds to the time needed for a new layer of the embryo to be built," explains Duboule. "It takes two days for the strand to completely unwind; this is the same time that's needed for all the layers of the embryo to be completed."

This system is the first "mechanical" clock ever discovered in genetics. And it explains why the system is so remarkably precise.

This discovery is the result of many years of work. Under the direction of Duboule and Daniël Noordermeer, the team analyzed thousands of Hox gene spools. With assistance from the Swiss Institute for Bioinformatics, the scientists were able to compile huge quantities of data and model the structure of the spool and how it unwinds over time.

The snake: a veritable vertebral assembly line

The process discovered at EPFL is shared by numerous living beings, from humans to some kinds of worms, from blue whales to insects. The structure of all these animals -- the distribution of their vertebrae, limbs and other appendices along their bodies -- is programmed like a sheet of player-piano music by the sequence of Hox genes along the DNA strand.

The sinuous body of the snake is a perfect illustration. A few years ago, Duboule discovered in these animals a defect in the Hox gene that normally stops the vertebrae-making process.

"Now we know what's happening. The process doesn't stop, and the snake embryo just keeps on making vertebrae, all identical, until the process just runs out of steam."

The Hox clock is a demonstration of the extraordinary complexity of evolution. One notable property of the mechanism is its extreme stability, explains Duboule. "Circadian or menstrual clocks involve complex chemistry. They can thus adapt to changing contexts, but in a general sense are fairly imprecise. The mechanism that we have discovered must be infinitely more stable and precise. Even the smallest change would end up leading to the emergence of a new species."

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Ecole Polytechnique Fédérale de Lausanne**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. D. Noordermeer, M. Leleu, E. Splinter, J. Rougemont, W. De Laat, D. Duboule. **The Dynamic Architecture of Hox Gene Clusters**. *Science*, 2011; 334 (6053): 222 DOI: 10.1126/science.1207194

http://www.sciencedaily.com/releases/2011/10/111013153943.htm

Paper patterns and smartphones foil forgers

- 11 October 2011 by **Jacob Aron**
- Magazine issue 2833.

Are you for real? *(Image: Prakash Singh/AFP/Getty)*

FORGERY is a huge source of corruption, and it can be hard to detect in developing countries due to the need for expensive equipment. A method for authenticating sheets of paper using just a smartphone and a microscope could help solve that problem.

"Authentication is a really big deal in developing countries," says Lakshminarayanan Subramanian from New York University, who worked on the technique.

The system, called PaperSpeckle, is based on the microscopic patterns of light and shadow that appear when light shines on paper. Subramanian and his colleagues encoded these patterns with an equation known as a Gabor transform, which is also used in iris and fingerprint recognition. This creates a unique "fingerprint" that allows the software to distinguish between 10^{30} different sheets of paper.

The software runs on an Android smartphone, ownership of which is on the rise in India, connected to a USB microscope. The components can be bought for around $100 each, making it accessible to small organisations and some individuals.

Subramanian claims his method is cheaper and easier to use than other paper-authentication techniques, which require laser scanners or specially prepared paper.

As well as analysing the unique speckle pattern, the software can generate a QR code - a type of matrix barcode - that corresponds to it. If this is on the document, users can authenticate it even if they do not have access to an online database. While someone could easily copy the QR code to another sheet of paper, the speckles would no longer match.

The PaperSpeckle system depends on authenticating the same region of a document each time, and the team's solution is to mark a small section of the paper with a pen. They will present the system at the Computer and Communication Security conference in Chicago later this month.

Andrew Gilbert of Ingenia Technology, a London-based firm that provides conventional laser scanning authentication, says such a small mark may be hard for users to scan each time. "Their technique relies on very precise alignment." He also says that if you don't already own a smartphone, PaperSpeckle is not much cheaper than laser scanning methods.

http://www.newscientist.com/article/mg21128334.700-paper-patterns-and-smartphones-foil-forgers.html

Cars have evolved to go faster – but humans haven't

- 14:52 11 October 2011 by **Frank McKenna**

Faster, safer modern cars may make higher speed limits appealing, but the human body is still stuck in the slow lane

Whenever a speed limit change is proposed there is a good deal of public debate. The British government's recent call to allow drivers to do 80 miles per hour (129 kilometres per hour) on some of the country's fastest roads, instead of the current 70mph (113kph), is no different.

Should we raise the speed limit to take advantage of the greater capabilities of modern vehicles? Would this increase casualties? How should limits be enforced? These are just a few of the questions that provoke endless debate. Speed is not the only factor in crashes – no one would argue otherwise. However, its importance for public health is that it is easily experimented on. Contrast that with driving while tired, which is less easy to measure and change.

There is no doubt that over the past 30 years vehicles have evolved to go faster with consummate ease. Before taking full advantage of this we might consider whether we, the drivers, have evolved much over the same period. Unfortunately our reaction times are not any faster, nor are our bodies any better at withstanding the forces involved in a crash.

A human who tries really hard can sprint at about 30kph. To reach even that speed, we have to put lots of energy into the system, our heart is pumping, we have the wind in our face and massive experience of movement – in other words, we have overwhelming biological feedback to tell us just how fast we are going.

Velocity blindness

When we drive a car, however, the energy input is the small movement of a large toe. The output, in contrast, is that we can easily travel at more than four times the maximum speed for which we have been designed – and with almost no experience of movement. The feedback to the brain from the legs, heart and lungs when we are driving is effectively that of no movement. Add to that the fact that prolonged exposure to speed reduces perceived velocity and that speed cues such as engine noise are systematically eliminated in modern vehicles, and it is no wonder there are some challenges in obeying limits.

We have the speedometer, of course, but this hardly provides visceral feedback – and, bizarrely, about half of the dial is devoted to illegal speeds. It is rare for any other product to broadcast its illegal capabilities like this.

For years, the general message from governments has been that, for safety reasons, a reduction in speed is good because it reduces casualties. But this has been difficult to get across. Messages such as "at 35mph you are twice as likely to kill someone as at 30mph" may be hard to appreciate if you assume that energy increases linearly with speed – in fact, it rises with the square of the velocity.

The transfer of that energy to the human body is the problem. The evidence on the relationship between speed and casualties is unambiguous whichever way it is examined. For example, raising the 55mph (89kph) speed limit to 65mph (105kph) in the US was estimated to have increased fatalities by 15 per cent (*American Journal of Public Health*, vol 79, p 1392). So what criteria should we use to define a limit? Two present themselves: functionality and survivability.

Survival speeds

Different types of road have different functions: access roads, which border residential and shopping areas; distribution roads, which need more entry and exit points; and through roads such as freeways and motorways which are for uninterrupted movement, with limited entry and exit.

Survivability refers to the body's capacity to tolerate the energy transfer in accidents. Evidence shows that on access roads, where crashes involving pedestrians are likely, a 20mph (30kph) limit is appropriate. On distribution roads, where side impacts are likely – when a car might ram into the side of another that is pulling out of a side road, for instance – the limit should be 30mph (50kph). In situations without pedestrians and where side impacts and head-on collisions are improbable – motorways and freeways – the limit should be 60 to 70mph (100 to 110kph).

Getting drivers to stick to limits, be they new or old ones, is another thing. Deterrence is an obvious route. Deterrence theory, derived from the work of the 18th-century judicial theorist Cesare Beccaria and the 19th-century philosopher and social reformer Jeremy Bentham, emphasises the certainty, severity and imminence of punishment. The certainty of punishment has the clearest deterrent effect, which is problematic for speed enforcement because it relies on an uncertain police presence.

This can be solved by speed cameras, which have themselves stimulated a good deal of media debate. Controversy has focused on whether their goal is safety or revenue generation. Policy-makers can tackle this by emphasising casualty reduction: for instance, they can place cameras at accident locations, allocate fines to road safety, advertise the accident location by highly visible cameras and prior warning signs, and offer education for first-time offenders.

It may be important for politicians to distinguish between media debate and public concern on this issue. For example, Damian Poulter – a colleague at the University of Reading, UK – and I examined the UK government's British Crime Survey to determine what people are concerned about in their local communities. In comparison with a range of antisocial behaviours such as race attack, drugs, intimidation and noisy neighbours, speeding was the top concern (*Accident Analysis and Prevention*, DOI: 10.1016/j.aap.2006.08.015).

So the challenge for governments who wish to change limits is complex. This is particularly so for those wishing to raise them, which is a less familiar path. What is clear, given the historical evidence and our biology, is that if they choose to permit faster driving, they must accept their part in the increased casualties that will follow.

Frank McKenna *is a psychologist at the University of Reading, UK, and director of Perception and Performance, which provides consultancy on road safety to companies and government departments*

http://www.newscientist.com/article/dn21034-cars-have-evolved-to-go-faster--but-humans-havent.html

Clearing the 'Cosmic Fog' of the Early Universe: Massive Stars May Be Responsible

This is a three-color image of the dwarf starburst galaxy NGC 5253. Green corresponds to star light. The yellow shows the gas that is being lit up by the starburst at the galaxy's core. The red shows where ultraviolet light from massive stars is evaporating gas, exposing the central starburst along a narrow cone. (Credit: Jordan Zastrow)

ScienceDaily (Oct. 13, 2011) — The space between the galaxies wasn't always transparent. In the earliest times, it was an opaque, dense fog. How it cleared is an important question in astronomy. New observational evidence from the University of Michigan shows how high energy light from massive stars could have been responsible.

Astronomers believed that early star-forming galaxies could have provided enough of the right kind of radiation to evaporate the fog, or turn the neutral hydrogen intergalactic medium into the charged hydrogen plasma that remains today. But they couldn't figure out how that radiation could escape a galaxy. Until now.

Jordan Zastrow, a doctoral astronomy student, and Sally Oey, a U-M astronomy professor, observed and imaged the relatively nearby NGC 5253, a dwarf starburst galaxy in the southern constellation Centaurus. Starburst galaxies, as their name implies, are undergoing a burst of intense star formation. While rare today, scientists believe they were very common in the early universe.

The researchers used special filters to see where and how the galaxy's extreme ultraviolet radiation, or UV light, was interacting with nearby gas. They found that the UV light is, indeed, evaporating gas in the interstellar medium. And it is doing so along a narrow cone emanating from the galaxy.

A paper on their work is published Oct. 12 in *Astrophysical Journal Letters*.

"We are not directly seeing the ultraviolet light. We are seeing its signature in the gas around the galaxy," Zastrow said.

In starburst galaxies, a superwind from these massive stars can clear a passageway through the gas in the galaxy, allowing the radiation to escape, the researchers said.

The shape of the cone they observed could help explain why similar processes in other galaxies have been difficult to detect.

"This feature is relatively narrow. The opening that is letting the UV light out is small, which makes this light challenging to detect. We can think of it as a lighthouse. If the lamp is pointed toward you, you can see the light. If it's pointed away from you, you can't see it," Zastrow said. "We believe the orientation of the galaxy is important as to whether we can detect escaping UV radiation."

The findings could help astronomers understand how the earliest galaxies affected the universe around them.

Also contributing were researchers from the University of Maryland, MIT's Kavli Institute for Astrophysics and Space Research, and the University of California, Berkeley. The research is funded by the National Science Foundation. Observations were conducted with the Magellan Telescopes at Las Campanas Observatory in Chile.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Michigan**.

Journal Reference:

1. Jordan Zastrow, M. S. Oey, Sylvain Veilleux, Michael McDonald, Crystal L. Martin. **An ionization cone in the dwarf starburst galaxy NGC 5253**. *The Astrophysical Journal*, 2011; 741 (1): L17 DOI: 10.1088/2041-8205/741/1/L17

http://www.sciencedaily.com/releases/2011/10/111012113756.htm

Smart sensors stop flickering wind turbines

- 14 October 2011 by **Paul Marks**
- Magazine issue 2834.

Wind turbines equipped with smart sensors could put an end to shadow flicker *(Image: Peter MacKinven/View Pictures/Rex Features)*

COMPLAINTS about wind turbines are nothing new - the noise of the machines and their impact on picturesque landscapes are common irritants. But there is another hated side effect: shadow flicker.

"Shadow flicker drives people mad, even if they keep their curtains shut or their blinds down," says Angela Kelly, head of Country Guardian, a British anti-wind-turbine pressure group.

As each turbine blade sweeps around, repetitive, strobing shadows can be cast on houses when the sun is low in the sky. Outdoors, it is distracting, but inside it is even worse - some people who experience flicker liken it to having the lights continually switching on and off (see video at bit.ly/qAX6kD).

A possible solution is at hand. Vestas Wind Systems, a turbine maker in Randers, Denmark, has developed a predictive system that works out when shadow flicker is about to happen and stops the turbine rotating until the sun moves the shadows onto uninhabited land.

The measure is designed to head off an oft-cited objection in local authority wind farm planning enquiries, says Bruno Lund Mathiasen, a Vestas engineer.

Called the Vestas Shadow Detection System, the technology is based on software that computes four risk factors: the angle and position of the sun, the distance of the wind turbine to any potentially affected properties, the radius of the rotor blades and the height of the turbine hub from the ground.

Light levels are assessed using two light meters placed on the east and west-facing sides of a wind turbine's support tower. If one is reading very high light levels while the other is low, it means the weather is set for very strong shadow production shortly after sunrise or before sunset, says Vestas spokesman Michael Holm.

Once the risk of shadow flicker has been calculated, the software decides whether the turbine should be temporarily shut down.

"The turbine will be put in idle mode, which means we twist the blades so the rotor turns very slowly. This stops any shadow flickering," says Mathiasen. "Based on its calculation of the shadow effect, the system will decide by itself whether to put the turbine in idle mode or not."

The system has been shown to be effective in tests at 50 Vestas sites around the world, Holm claims.

Mathiasen will not say how much Vestas will charge the firms that operate turbines for the technology, but Kelly thinks any price would be too much. "If Vestas is serious about this they ought to contact anyone with wind turbines causing flicker problems and offer them this technology for free," she says.

http://www.newscientist.com/article/mg21228346.300-smart-sensors-stop-flickering-wind-turbines.html

Tiny Fossil Fragment Reveals Giant-But-Ugly Truth: Part of Biggest-Ever Toothed Pterosaur from Dinosaur Era

Artist's rendering of a giant pterosaur, Coloborhynchus. (Credit: Mark Witton, University of Portsmouth, www.markwitton.com)

ScienceDaily (Oct. 14, 2011) — New research from the Universities of Portsmouth and Leicester has identified a small fossil fragment at the Natural History Museum, London as being part of a giant pterosaur -- setting a new upper limit for the size of winged and toothed animals.

Dr David Martill from the University of Portsmouth and Dr David Unwin from the University of Leicester examined the fossil -- which consisted of the tip of a pterosaur snout that had been in the Museum collections since 1884.

Their identification of the fossil as being part of the world's largest toothed pterosaur has been published in *Cretaceous Research.*

Dr Unwin, from the School of Museum Studies at the University of Leicester, said: "Our study showed that the fossil represented a huge individual with a wingspan that might have reached 7 metres. This is far larger than, for example, any modern bird, although some extinct birds may have reached 6 metres in wingspan.

"What this research shows is that some toothed pterosaurs reached truly spectacular sizes and, for now, it allows us to put a likely upper limit on that size -- around 7 metres in wingspan."

Dr Martill, from the University of Portsmouth, added: "It's an ugly looking specimen, but with a bit of skill you can work out just exactly what it was. All we have is the tip of the upper jaws -- bones called the premaxillae, and a broken tooth preserved in one socket.

"Although the crown of the tooth has broken off, its diameter is 13mm. This is huge for a pterosaur. Once you do the calculations you realise that the scrap in your hand is a very exciting discovery.

"The specimen was placed in the collections of London's Natural History Museum by Sir Richard Owen, perhaps the world's greatest vertebrate palaeontologist. In his day, Owen reconstructed a giant New Zealand Moa from a single bone. We might never achieve Owen's calibre, but it is nice to think that we are following in his footsteps."

Pterosaurs are flying reptiles, famously seen in Jurassic Park, that lived in the Mesozoic Era alongside dinosaurs between 210 and 65 million years ago.

There are six or seven major groups of toothed pterosaurs, but in this study the researchers focused on just one: the ornithocheirids. Unlike other toothed groups, all of which were of relatively modest size (wingspans at most of 2 or 3 metres), they are known to have achieved very large and possibly even giant sizes with wingspans of 6 meters or more. Ornithocheirids were specialised fish-feeding pterosaurs that used a fiercesome set of teeth in the tips of the jaws, to grab their prey as they flew low and slow over the surface of the water.

Dr Unwin said: "We found that, generally speaking, large ornithocheirids reached wingspans of 5 or 6 metres which was consistent with previous ideas about this group. However, we also came across one fossil, collected in the mid-19th century from a deposit in Cambridgeshire called the Cambridge Greensand that seemed to be unusually large.

"This fossil, now in the collections of the Natural History Museum, London, consisted of the tip of a pterosaur snout. The shape of the snout and the broken-off tooth that it contained allowed us to identify the new find as belonging to *Coloborhynchus capito*, a very rare ornithocheirid represented only by a few fossil fragments from the Cambridge Greensand. Calculating the original size of the animal based on just a fragment is difficult, but we were able to take advantage of some recent finds in Brazil of almost complete skeletons of ornithocheirids that are closely related to the Cambridge Greensand jaw fragment."

"Our study showed that the fossil did indeed represent a very large individual with a wingspan that might have reached 7 metres."

Significantly, though, this is still far short of the giant size achieved by some toothless pterosaurs. Several species of a group called azhdarchids achieved wingspans of around 10 metres.

The challenge for the researchers now is to try to understand why some groups, such as azhdarchids, reached these giant sizes, while toothed forms, such as the ornithocheirids, did not. Teeth are heavy, so part of the explanation may lie in weight reduction by losing these.

Dr Unwin said: "This research is important because it helps us to better understand patterns of evolution over millions of years, and in groups that are now extinct. At a more general level, it feeds into TV documentaries such as the current series 'Dinosaur Planet' on BBC1, ensuring that they have the 'ring of authenticity' that ensures successful reception, by experts and the lay public alike. Indeed, these programs are enormously popular, as viewing figures show, allowing us to comfort ourselves with the thought that the research we carry out is helping to satisfy the interests of a not insignificant portion of the viewing public.

"For Dave Martill and I, this was to some extent the 'bread and butter' stuff that we do everyday. But it's this slow piling up of data and, critically, its connection into our general understanding, that leads to the really big discoveries. Dave likes to refer to the fossil as the ugliest fossil he ever studied, and I can see his point, but as I did my PhD on Cambridge Greensand pterosaurs they have a special place in my affections and, no matter how ugly, I still love them."

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Leicester**.

Journal Reference:

1. David M. Martill, David M. Unwin. **The world's largest toothed pterosaur, NHMUK R481, an incomplete rostrum of Coloborhynchus capito (Seeley 1870) from the Cambridge Greensand of England**. *Cretaceous Research*, 2011; DOI: 10.1016/j.cretres.2011.09.003

http://www.sciencedaily.com/releases/2011/10/111013085107.htm

Clean air fixes cold poles in model of ancient climate

- 15:23 14 October 2011 by **Michael Marshall**

Boosted by pollution *(Image: Ben Gunsberger/Workbook Stock/Getty)*

Good news for climate modellers. After 25 years of trying, they have succeeded in simulating the hot climates of Earth's prehistory. So why has it taken so long? Not because of the models themselves, but because the modellers made a false assumption: that aerosol pollution in the distant past was as bad as it is today.

At various times in Earth's history, the planet was much hotter than it is now. Rocks and fossils laid down in these hothouse stretches show that the temperature difference between the poles and the equator was much smaller than it is today.

Climate models have long failed to simulate these warm times, says modeller Paul Valdes of the University of Bristol, UK. Specifically, they don't heat the poles enough, often falling as much as 15 °C short. The models can get the poles right if modellers inject more greenhouse gases into the simulated atmosphere, but then the tropics overheat.

Trying to fix this cold-pole problem, Jeff Kiehl of the National Center for Atmospheric Research in Boulder, Colorado, simulated the climate of 55 million years ago. At that time Earth briefly experienced the hottest

climate it has seen since the time of the dinosaurs, an event called the Palaeocene-Eocene thermal maximum. The average global temperature then was 35 °C – the average today is just 15 °C.

Clouds busted

Kiehl wondered whether the cold-pole problem came from the assumptions used to run the models. Most of these are derived from studying the modern atmosphere, which is heavily polluted with aerosols such as airborne soot. Water droplets condense around aerosols, so their presence affects the ways clouds form and behave – with significant consequences for the climate as a whole.

But there were no humans 55 million years ago, so the atmosphere was probably a lot cleaner. To find out how clean, Kiehl went back to a 2001 study that counted atmospheric water droplets in different regions of Earth. Polluted areas had up to 400 droplets per cubic centimetre, while less polluted ones had as few as 50.

Kiehl ran his model of the ancient climate with clean skies, and found that the cold-pole problem largely disappeared. With clouds forming in unpolluted air, the poles warmed up much more than the tropics, giving a climate within a few degrees of the one that actually existed.

The resulting model is a very good match for the Palaeocene-Eocene thermal maximum, says Paul Pearson of Cardiff University in the UK, who uses fossil animals to study past climates. Pearson says Kiehl's model is the first to reproduce the temperature distribution revealed by the fossils.

"It's reassuring," Kiehl says. "If this is the explanation, there isn't anything drastically wrong with our climate models."

Kiehl presented his work on Tuesday at a Royal Society meeting on warm climates of the past in London.

http://www.newscientist.com/article/dn21051-clean-air-fixes-cold-poles-in-model-of-ancient-climate.html

Subtly Shaded Map of Moon Reveals Titanium Treasure Troves

Full resolution WAC three colour composite (566 nm filter image in red, 360 nm in green, and 321 nm in blue) highlighting region with varying mare compositions and enigmatic small volcanic structures known as "domes". (Credit: NASA/GSFC/Arizona State University)

ScienceDaily (Oct. 7, 2011) — A map of the Moon combining observations in visible and ultraviolet wavelengths shows a treasure trove of areas rich in Titanium ores. Not only is titanium a valuable element, it is key to helping scientists unravel the mysteries of the Moon's interior.

Mark Robinson and Brett Denevi is presenting the results from the Lunar Reconnaissance Orbiter mission at the joint meeting of the European Planetary Science Congress and the American Astronomical Society's Division for Planetary Sciences.

"Looking up at the Moon, its surface appears painted with shades of grey -- at least to the human eye. But with the right instruments, the Moon can appear colourful," said Robinson, of Arizona State University. "The maria appear reddish in some places and blue in others. Although subtle, these colour variations tell us important things about the chemistry and evolution of the lunar surface. They indicate the titanium and iron abundance, as well as the maturity of a lunar soil."

The Lunar Reconnaissance Orbiter Camera (LROC) Wide Angle Camera (WAC) is imaging the surface in seven different wavelengths at a resolution of between 100 and 400 metres per pixel. Specific minerals reflect or absorb strongly certain parts of the electromagnetic spectrum, so the wavelengths detected by LROC WAC help scientists better understand the chemical composition of the lunar surface.

Robinson and his team previously developed a technique using Hubble Space Telescope images to map titanium abundances around a small area centred on the Apollo 17 landing site. Samples around the site spanned a broad range of titanium levels. By comparing the Apollo data from the ground with the Hubble images, the team found that the titanium levels corresponded to the ratio of ultraviolet to visible light reflected by the lunar soils.

"Our challenge was to find out whether the technique would work across broad areas, or whether there was something special about the Apollo 17 area," said Robinson.

Robinson's team constructed a mosaic from around 4000 LROC WAC images collected over one month. Using the technique they had developed with the Hubble imagery, they used the WAC ratio of the brightness in the ultraviolet to visible light to deduce titanium abundance, backed up by surface samples gathered by Apollo and Luna missions.

The highest titanium abundances in similar kinds of rocks on Earth are around one percent or less. The new map shows that in the mare, titanium abundances range from about one percent to a little more than ten percent. In the highlands, everywhere titanium is less than one percent. The new titanium values match those measured in the ground samples to about one percent.

"We still don't really understand why we find much higher abundances of titanium on the Moon compared to similar types of rocks on Earth. What the lunar titanium-richness does tell us is something about the conditions inside the Moon shortly after it formed, knowledge that geochemists value for understanding the evolution of the Moon," said Robinson.

Lunar titanium is mostly found in the mineral ilmenite, a compound containing iron, titanium and oxygen. Future miners living and working on the Moon could break down ilmenite to liberate these elements. In addition, Apollo data shows that titanium-rich minerals are more efficient at retaining particles from the solar wind, such as helium and hydrogen. These gases would also provide a vital resource for future human inhabitants of lunar colonies.

"The new map is a valuable tool for lunar exploration planning. Astronauts will want to visit places with both high scientific value and a high potential for resources that can be used to support exploration activities. Areas with high titanium provide both -- a pathway to understanding the interior of the Moon and potential mining resources," said Robinson.

The new maps also shed light on how space weather changes the lunar surface. Over time, the lunar surface materials are altered by the impact of charged particles from the solar wind and high-velocity micrometeorite impacts. Together these processes work to pulverize rock into a fine powder and alter the surface's chemical composition and hence its colour. Recently exposed rocks, such as the rays that are thrown out around impact craters, appear bluer and have higher reflectance than more mature soil. Over time this 'young' material darkens and reddens, disappearing into the background after about 500 million years.

"One of the exciting discoveries we've made is that the effects of weathering show up much more quickly in ultraviolet than in visible or infrared wavelengths. In the LROC ultraviolet mosaics, even craters that we thought were very young appear relatively mature. Only small, very recently formed craters show up as fresh regolith exposed on the surface," said Denevi, of Johns Hopkins University Applied Physics Laboratory.

The mosaics have also given important clues to why lunar swirls -- sinuous features associated with magnetic fields in the lunar crust -- are highly reflective. The new data suggest that when a magnetic field is present, it deflects the charged solar wind, slowing the maturation process and resulting in the bright swirl. The rest of the Moon's surface, which does not benefit from the protective shield of a magnetic field, is more rapidly

weathered by the solar wind. This result may suggest that bombardment by charged particles may be more important than micrometeorites in weathering the Moon's surface.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Europlanet Media Centre**, via AlphaGalileo.

http://www.sciencedaily.com/releases/2011/10/111007102109.htm

When will the 7 billionth human be born?

- 14 October 2011 by **Fred Pearce**
- Magazine issue 2834.

Room for a small one, but for how much longer?*(Image: Keystone/ZUMA/Rex Features)*

ON 31 October, a newborn baby somewhere in the world will become the 7 billionth member of the human race. Or so says the UN - alternatively, this date could be at least a year too early.

Behind the UN's patina of certainty may lie outdated and unreliable census data. The suspicion is that millions of births and deaths have not been counted and there is huge uncertainty about the rate at which women are giving birth.

The precise "day of 7 billion" may not matter much. But the inaccuracies make it harder to answer a more important question: is human population set to peak within the next few decades or will it carry on growing beyond that?

Wolfgang Lutz of the Vienna Institute of Demography says the UN is "under political pressure to disregard uncertainty and name a date" for 7 billion. But he and colleague Sergei Scherbov estimate that the world probably won't reach 7 billion until early in 2013, though it could be as late as 2020.

The director of the UN population division Hania Zlotnik defends her data but agrees that "an interval of a few months or even a year would be a reasonable range of uncertainty".

One problem for demographers is undercounting. Even developed countries reckon their censuses miss up to 3 per cent of people. Up-to-date figures have to adjust for both this and the changes since the last census, which could be decades in the case of some African countries. So adjusting for extra people is routine.

The big danger, Scherbov says, may be overadjusting. The world has seen a dramatic decline in fertility in recent years, with the average woman now having only 2.5 children, half as many as her grandmother 50 years ago. So there may be far fewer new arrivals than demographers assume.

Take China, the world's largest country. Raw census data suggest that the average woman has 1.2 children, but this hides a multitude of problems. State demographers believe people are hiding tens of millions of babies to evade the one-child policy, and so estimate that the rate is 1.8. But Zhongwei Zhao of the Australian National University in Canberra says other figures in the 2010 census suggest the raw data may be nearer the truth. The UN currently plumps for 1.5 children per woman.

Discrepancies in estimating populations are amplified in long-term projections. Zhao says China's recent overadjusting of its fertility rate will turn into an overestimation of as much as 100 million by 2030.

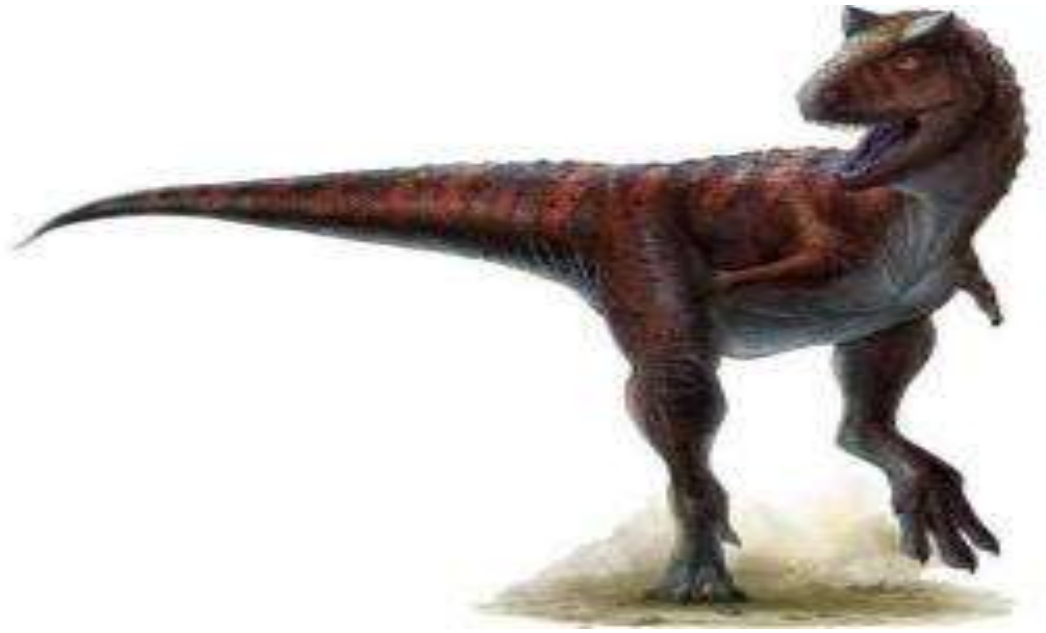
India's demographic future is even more uncertain. The UN estimates that the country's population will grow from 1.2 billion to 1.7 billion by 2050, making it substantially bigger than China. But Scherbov and Lutz predict 1.4 billion, with a possible range from 1.1 to 1.7 billion.

All this is of huge importance for the planet. Earlier this year, the UN unexpectedly raised its estimates of future population, suggesting that the world would have more than 10 billion people by 2100. But Scherbov says there is no demographic evidence to justify this gloomier prediction. It arose from "a new set of assumptions about future fertility". For instance, following what Zlotnik calls "a major change in methodology", the UN upped its estimate of the number of children Nigerian women will be having in 2050 from 2.41 to 3.41.

The UN says world population will still be rising in 2100. Scherbov says there is an 85-per-cent chance it will have peaked by then. But nobody knows for sure.

http://www.newscientist.com/article/mg21228344.500-when-will-the-7-billionth-human-be-born.html

Super-Sized Muscle Made Twin-Horned Dinosaur a Speedster



Carnotaurus, a seven-metre-long eating machine, had a huge tail muscle that U of A paleontology graduate student Scott Persons says made it one of the fastest running hunters of its time. (Credit: Image courtesy of University of Alberta)

ScienceDaily (Oct. 14, 2011) — A meat-eating dinosaur that terrorized its plant-eating neighbours in South America was a lot deadlier than first thought, a University of Alberta researcher has found. *Carnotaurus* was a seven-metre-long predator with a huge tail muscle that U of A paleontology graduate student Scott Persons says made it one of the fastest running hunters of its time.

A close examination of the tail bones of *Carnotaurus* showed its caudofemoralis muscle had a tendon that attached to its upper leg bones. Flexing this muscle pulled the legs backwards and gave *Carnotaurus* more power and speed in every step.

In earlier research, Persons found a similar tail-muscle and leg-power combination in the iconic predator *Tyrannosaurus rex*. Up until Persons published that paper, many dinosaur researchers thought *T. rex*'s huge tail might have simply served as a teeter-totter-like counterweight to its huge, heavy head.

Persons' examination of the tail of *Carnotaurus* showed that along its length were pairs of tall rib-like bones that interlocked with the next pair in line. Using 3-D computer models, Persons recreated the tail muscles of *Carnotaurus*. He found that the unusual tail ribs supported a huge caudofemoralis muscle. The interlocked bone structure along the dinosaur's tail did present one drawback: the tail was rigid, making it difficult for the hunter to make quick, fluid turns. Persons says that what *Carnotaurus* gave up in maneuverability, it made up for in straight ahead speed. For its size, *Carnotaurus* had the largest caudofemoralis muscle of any known animal, living or extinct.

Persons published these findings in *PLoS ONE* on Oct.14, with supervisor Philip Currie, a paleontology professor at the U of A.

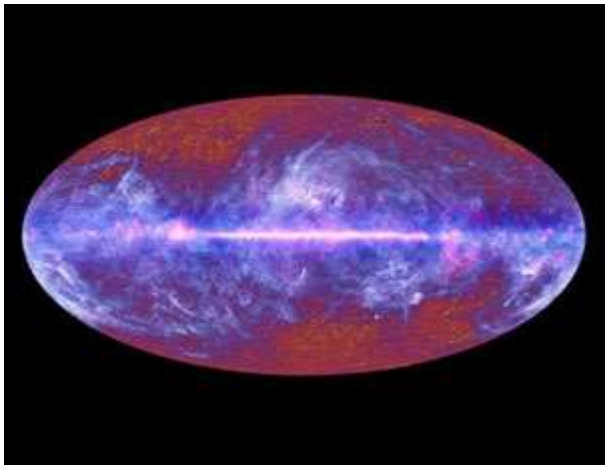
Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Alberta**.

http://www.sciencedaily.com/releases/2011/10/111014212405.htm

About time: Finding the age of everything

- 12 October 2011 by **Richard Webb**
- Magazine issue 2833



Never ask a galaxy its age *(Image: ESA/LFI & HFI Consortia)*

TIME might be mysterious, but there is one thing we can say with safety: there is an awful lot of it about. Modern cosmology dates the origin of the universe to some 13.75 billion years ago – that's a lifetime of 4.3×10^{17} seconds, give or take a few million billion.

How do we know this? Figuring out the age of the universe involves a complex series of assumptions about its geometry, expansion rate and composition. Yet it is only fairly recently that we have had an estimate to be happy with. Until a few years ago, cosmological models suggested the universe was younger than its oldest stars.

Now though, says Søren Meibom of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, estimates and observations have largely come together. NASA researchers have used the Wilkinson Microwave Anisotropy Probe to study the cosmic background radiation – considered to be the big bang's afterglow – to produce the most accurate measures yet of various cosmological parameters used to date the universe. This gave them the figure of 13.75 billion years (arxiv.org/abs/1001.4744).

Meanwhile, methods for estimating stars' ages have improved – although it is still a notoriously tricky business. Stellar dating involves measuring properties such as mass, chemical composition and temperature, and comparing them with models of how those properties should change over time for a particular type of star. One problem is that many of these models are calibrated by reference to the one star whose age and characteristics we can measure independently – our sun. "That can make you a little uneasy," says Meibom.

Closer to Earth, we can feel more confident in our dating skills. We think we know roughly how old our sun and its surrounds are from tracking radioactive decays in lumps of the solar system's original material that rain down from the sky: meteorites. The ratio of lead isotopes in the Allende meteorite, which fell in Mexico in 1969, gives it an age of 4.57 billion years – and, by extension, the solar system is not much older (*Science*, vol 297, p 1678).

Such radiometric dating stands us in good stead for dating objects from Earth's beginnings almost to the present day. In a large collection of radioactive atoms, a set number will have decayed by a set time; by measuring how much of a particular atom is sealed into a rock compared with the products of its decay, we get an idea of how long ago a rock or artefact formed.

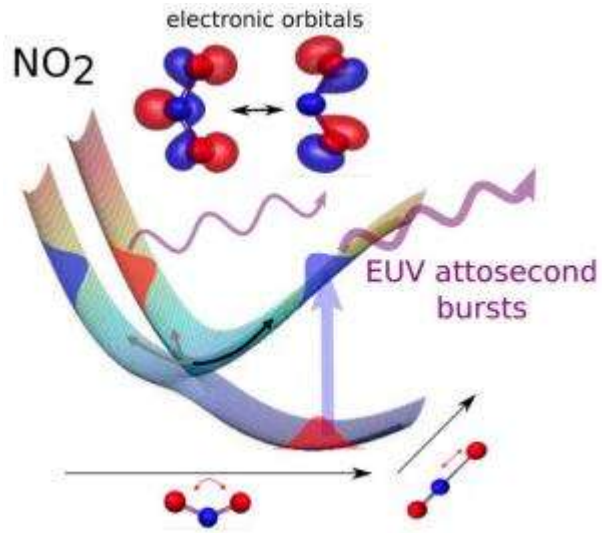
For most rocks, the favoured method is uranium-lead dating. Zircons are silicate minerals found in igneous rocks, and they often incorporate small impurities of uranium into their crystal structures. Two isotopes – uranium-238, with a half-life of some 4.5 billion years, and uranium-235 with a half-life of 704 million years – decay through two independent pathways, but both end on a stable isotope of lead. This produces a high level of accuracy. "It is widely regarded as the gold standard of dating," says Alan Dickin, a geologist at McMaster University in Hamilton, Ontario, Canada.

For younger rocks and prehistoric human artefacts, other isotopes provide more accurate results. The decay of potassium into argon has been used to date the first appearance of human tools in the Olduvai gorge in Tanzania to around 2 million years ago. The more substantial parts of human history since about 60,000 years ago, meanwhile, are written largely in the language of carbon isotopes. While the standard carbon-12 isotope is stable, a mutant form with two extra neutrons, carbon-14, has a half-life of 5730 years. Plants incorporate both forms through photosynthesis, and from there the isotopes proceed up the food chain. When an organism dies, the carbon-14 slowly decays away. It's useful for dating everything from desiccated plant seeds to ice-bound mammoths.

It's reassuring to know that, once we're six feet under, our bodies will keep the passage of time ticking.

http://www.newscientist.com/article/mg21128331.100-about-time-finding-the-age-of-everything.html?full=true&print=true

Watching Motion of Electrons in Molecules During Chemical Reactions



The picture shows the conical intersection and the two possible electronic states of the NO2 molecule before it dissociates. (Credit: Wörner /ETH Zürich)

ScienceDaily (Oct. 14, 2011) — A research group led by ETH Zurich has now, for the first time, visualized the motion of electrons during a chemical reaction. The new findings in the experiment are of fundamental importance for photochemistry and could also assist the design of more efficient solar cells.

In 1999, Ahmed Zewail was awarded the nobel prize in chemistry for his studies of chemical reactions using ultrashort laser pulses. Zewail was able to watch the motion of atoms and thus visualize transition states on the molecular level. Watching the dynamics of single electrons was still considered a dream at that time. Thanks to the latest developments in laser technology and intense research in the field of attosecond spectroscopy (1 attosecond = 10-18 s) the research has developed fast. For the first time, Prof. Hans Jakob Wörner from the Laboratory of Physical Chemistry at ETH Zurich, together with colleagues from Canada and France, was able to record electronic motion during a complete chemical reaction. The experiment is described in the latest issue of *Science*.

The research team irradiated nitrogen dioxide molecules (NO_2) with a very short ultraviolet pulse. Subsequently, the molecule takes up the energy from the pulse which sets the electrons in motion. The electrons start rearranging themselves, which causes the electron cloud to oscillate between two different shapes for a very short time, before the molecule starts to vibrate and eventually decomposes into nitric oxide and an oxygen atom.

Conical intersections

Nitrogen dioxide has model character with respect to understanding electronic motion. In the NO_2 molecule, two states of the electrons can have the same energy for a particular geometry -- commonly described as conical intersection. The conical intersection is very important for photochemistry and frequently occurs in natural chemical processes induced by light. The conical intersection works like a dip-switch. For example, if the retina of a human eye is irradiated by light, the electrons start moving, and the molecules of the retina (retinal) change their shape, which finally converts the information of light to electrical information for the human brain. The special aspect about conical intersections is that the motion of electrons is transferred to a motion of the atoms very efficiently.

Snapshot of an electron

In an earlier article, Hans Jakob Wörner has already published how attosecond spectroscopy can be used for watching the motion of electrons. The first weak ultraviolet pulse sets the electrons in motion. The second strong infrared pulse then removes an electron from the molecule, accelerates it and drives it back to the molecule. As a result, an attosecond light pulse is emitted, which carries a snapshot of the electron distribution in the molecule. Wörner illustrates the principle of attosecond spectroscopy: "The experiment can be compared to photographs, which, for example, image a bullet shot through an apple. The bullet would be too fast for the shutter of a camera, resulting in a blurred image. Therefore, the shutter is left open and the picture is illuminated with light flashes, which are faster than the bullet. That's how we get our snap-shot."

From the experiment to solar cells

When the electron returns to the molecule, it releases energy in the form of light. In the experiment, Wörner and his colleagues measured the light of the electrons and were therefore able to deduce detailed information on the electron distribution and its evolution with time. This information reveals details of chemical reaction mechanisms that were not accessible to most of previous experimental techniques. The experiment on NO_2 helps understanding fundamental processes in molecules and is an ideal extension of computer simulations of photochemical processes: "What makes our experiment so important is that it verifies theoretical models," says Wörner. The immense interest in photochemical processes is not surprising, as this area of research aims at improving solar cells and making artificial photosynthesis possible.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **ETH Zürich**.

Journal Reference:

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http://www.sciencedaily.com/releases/2011/10/111014080023.htm

Three-way race to reach lost Antarctic lakes

- 12:11 11 October 2011 by **Michael Marshall**

Three kilometres above Lake Ellsworth *(Image: British Antarctic Survey)*

Antarctic researchers are set to make first contact with long-lost lakes deep beneath the continent's ice – closely followed by second and third contact. Three expeditions will attempt to enter the hidden lakes over the next two years, in search of unknown kinds of life that have evolved in isolation. The projects could also determine if or when the west Antarctic ice sheet will collapse – one of the worst-case scenarios in future climate change.

Over the next few months a team from the British Antarctic Survey, based in Cambridge, UK, and other institutions will set up drilling equipment on the ice above Lake Ellsworth. They will return late next year to drill into the lake.

Ellsworth is buried under 3 kilometres of ice, in what was once a fjord. The team will break in by firing a jet of hot water into the ice. "We can get through those 3000 metres of ice in about three days," says lead scientist Martin Siegert of the University of Edinburgh, UK. The hot-water drill should also minimise contamination of the lake, as the melted pristine ice from the bottom of the borehole is cleaned and then used in the jet.

The hole will stay open for only 24 hours. During that time the team will lower in a probe to retrieve samples of water and sediment. A second probe will drill into the sediment on the lake floor and retrieve a core. Afterwards the hole will naturally close up. "It will be as if we were never there," Siegert says.

"We're confident we'll find life in the sediments," says Martyn Tranter of the University of Bristol, UK, but life in the nutrient-poor water is less likely. Tranter says any living things will be bacteria, perhaps feeding on sulphides from ground-up rock in the sediments.

Race to the finish

The Ellsworth team are not the first to seek life in an Antarctic lake. Last year a Russian expedition drilled to within 29 metres of the surface of Lake Vostok, which lies 3750 metres below the ice of east Antarctica. They were forced to stop when winter closed in, but will resume drilling in January.

When they break into the lake early next year, its water should rise up the hole and refreeze. They will return late next year to get samples from this fresh ice – a sampling technique that is designed to minimise the human contamination.

Antarctica's plumbing

The third project, WISSARD, will drill into west Antarctica's Lake Whillans. Unlike Vostok and Ellsworth, which have been isolated for tens of thousands of years, Lake Whillans is part of an extensive network of lakes and channels running under the ice, and is much more active.

"We know it fills with water and discharges," says Ross Powell of Northern Illinois University in DeKalb. It is "part of the plumbing" that collects water from streams under the ice and releases it into the sea.

The WISSARD team will spend two Antarctic summers setting up and testing their equipment before drilling into Lake Whillans in 2013 and 2014 using the same hot-water method as the Ellsworth team. Powell plans to observe the lake filling and discharging, and monitor how that affects the ice sheet above. The team will also send down a robot to explore the lake.

Collapsing ice sheet

The Ellsworth and Whillans projects will both help to answer the critical questions about whether, or when, rising global temperatures will cause the west Antarctic ice sheet to collapse.

Glaciers in the ice sheet have been disappearing for years. If the sheet collapses, sea levels will rise at least 3 metres, and possibly as much as 5 metres, swamping low-lying areas worldwide.

The sediment core from Lake Ellsworth should tell us when the ice sheet last collapsed, says Dominic Hodgson of the British Antarctic Survey. The sediment deposited while the ice sheet has been present will have been ground-up rock, but when it was absent, marine sediment will have been deposited instead. "That provides a marker," Hodgson says, which can then be matched to temperature records obtained from ice cores.

Hodgson suspects the last collapse was 110,000 to 120,000 years ago. At the time temperatures in Antarctica were 6 °C warmer than today, and seas were 6.6 metres higher.

Alternatively the last collapse may have occurred 400,000 years ago – the warmest period of the past 500,000 years. "That would indicate that the west Antarctic ice sheet is more resilient," Hodgson says.

"What we'd really like is a continual record going back 2.5 million years," Siegert says. "That would tell us it's really robust." Hodgson thinks this is unlikely, however, because Antarctic ice loss is the only explanation we have for the rise in sea levels 120,000 years ago.

http://www.newscientist.com/article/dn21032-threeway-race-to-reach-lost-antarctic-lakes.html