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African and Non-African Populations Intermixed Well After Migration out of Africa 60,000 Years Ago, Genome Studies Show

New genome studies reveal that African and non-African populations continued to exchange genetic material well after migration out of Africa 60,000 years ago. (Credit: © Sailorr / Fotolia)

ScienceDaily (July 13, 2011) — Researchers have probed deeper into human evolution by developing an elegant new technique to analyse whole genomes from different populations. One key finding from the Wellcome Trust Sanger Institute's study is that African and non-African populations continued to exchange genetic material well after migration out-of-Africa 60,000 years ago. This shows that interbreeding between these groups continued long after the original exodus.

For the first time genomic archaeologists are able to infer population size and history using single genomes, a technique that makes fewer assumptions than existing methods, allowing for more detailed insights. It provides a fresh view of the history of humankind from 10,000 to one million years ago.

"Using this algorithm, we were able to provide new insights into our human history," says Dr Richard Durbin, joint head of Human Genetics and leader of the Genome Informatics Group at the Sanger Institute. "First, we see an apparent increase in effective human population numbers around the time that modern humans arose in Africa over 100,000 years ago.

"Second, when we look at non-African individuals from Europe and East Asia, we see a shared history of a dramatic reduction in population, or bottleneck, starting about 60,000 years ago, as others have also observed. But unlike previous studies we also see evidence for continuing genetic exchange with African populations for tens of thousands of years after the initial out-of-Africa bottleneck until 20,000 to 40,000 years ago.

"Previous methods to explore these questions using genetic data have looked at a subset of the human genome. Our new approach uses the whole sequence of single individuals, and relies on fewer assumptions. Using such techniques we will be able to capitalize on the revolution in genome sequencing and analysis from projects such as The 1000 Genomes Project, and, as more people are sequenced, build a progressively finer detail picture of human genetic history."

The team sequenced and compared four male genomes: one each from China, Europe, Korea and West Africa respectively. The researchers found that, although the African and non-African populations might have started to differentiate as early as 100,000 to 120,000 years ago, they largely remained as one population until approximately 60,000 to 80,000 years ago.

Following this the European and East Asian ancestors went through a period where their effective population size crashed to approximately one-tenth of its earlier size, overlapping the period when modern human fossils and artefacts start to appear across Europe and Asia. But, for at least the first 20,000 years of this period, it appears that the out-of-Africa and African populations were not genetically separated. A possible explanation could be that new emigrants from Africa continued to join the out-of-Africa populations long after the original exodus.

"This elegant tool provides opportunities for further research to enable us to learn more about population history," says co-author Heng Li, from the Sanger Institute. "Each human genome contains information from the mother and the father, and the differences between these at any place in the genome carry information about its history. Since the genome sequence is so large, we can combine the information from tens of thousands of different places in the genome to build up a composite history of the ancestral contributions to the particular individual who was sequenced.

"We can also get at the historical relationship between two different ancestral populations by comparing the X chromosomes from two males. This works because men only have one copy of the X chromosome each, so we can combine the X chromosomes of two men and treat them in the same way as the rest of the genome for one person, with the results telling us about the way in which the ancestral populations of the two men separated.

"The novel statistical method we developed is computationally efficient and doesn't make restrictive assumptions about the way that population size changed. Although not inconsistent with previous results, these findings allow new types of historical events to be explored, leading to new observations about the history of mankind." The researchers believe that this technique can be developed further to enable even more fine-grained discoveries by sequencing multiple genomes from different populations. In addition, beyond human history, there is also the potential to investigate the population size history of other species for which a single genome sequence has been obtained.

Story Source:

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Journal Reference:

1. Heng Li, Richard Durbin. **Inference of human population history from individual whole-genome sequences**. *Nature*, 2011; DOI: 10.1038/nature10231

http://www.sciencedaily.com/releases/2011/07/110713131419.htm

Efficient Process Using microRNA Converts Human Skin Cells Into Neurons

Skin. The addition of two particular gene snippets to a skin cell's usual genetic material is enough to turn that cell into a fully functional neuron, report researchers from the Stanford University School of Medicine. (Credit: © Aaron Amat / Fotolia)

ScienceDaily (July 13, 2011) — The addition of two particular gene snippets to a skin cell's usual genetic material is enough to turn that cell into a fully functional neuron, report researchers from the Stanford University School of Medicine. The finding, to be published online July 13 in *Nature*, is one of just a few recent reports of ways to create human neurons in a lab dish.

The new capability to essentially grow neurons from scratch is a big step for neuroscience research, which has been stymied by the lack of human neurons for study. Unlike skin cells or blood cells, neurons are not something that's easy for a living human to donate for research.

"A major problem in neurobiology has been the lack of a good human model," said senior author Gerald Crabtree, MD, professor of pathology and of developmental biology. "Neurons aren't like blood. They're not something people want to give up."

Generating neurons from easily accessible cells, such as skin cells, makes possible new ways to study neuronal development, model disease processes and test treatments.

It also helps advance the effort, still in its infancy, to replace damaged or dead neurons with new ones.

Before succeeding at turning skin cells straight into neurons, scientists had discovered two years ago that they could get similar results if they transformed the skin cell first into a stem cell and then coaxed the stem cell into becoming a neuron. But Crabtree's new study and two studies by others show it's possible to go straight from skin cell to neuron without the stem-cell pit stop.

Crabtree's study is unique among the efforts because of the surprising identity of the molecules that nudged the cells to switch -- short chains of genetic material called microRNA, best known for their ability to bind to specific genetic transcripts to turn off their activity.

"In this case, though, they're playing an instructive role," Crabtree said.

The discovery of the microRNAs' ability to switch the cells came to light when Andrew Yoo, PhD, then a postdoctoral researcher in Crabtree's lab (now on the faculty of Washington University in St. Louis), was trying to better understand what makes neural stem cells move on to become mature neurons. He found that two microRNAs, miR-9/9* and miR-124, trigger it by controlling a molecular machine (called the BAF chromatin remodeling complex) that shapes chromosomes so they'll direct the cell to remain a stem cell.

"When the microRNAs bind to one subunit of this 13-membered complex they turn this function off, and the cells begin to grow up and connect to one another -- that is, they become mature, functioning neurons," said Crabtree. After they published this in *Nature* in 2009, Yoo went on to try to understand how the two microRNAs functioned. One way he did this was to watch what happened when he introduced them into cells that normally lacked them.

At first he didn't believe what he was seeing through the microscope: The cells with the additional microRNAs had started to look like neurons. "It was very weird. We were astounded," said Crabtree, who is also the David Korn, MD, Professor of Pathology.

Yoo, one of the new report's lead authors, continued to study the phenomenon with others at Stanford. They used a virus to carry the snippets into skin cells and investigated whether the resulting cells really were neurons. They found that 2 to 3 percent of the skin cells reliably converted to neurons: The cells generated the electrical signals neurons use to communicate with one another, and they budded off small globules, called synaptic vesicles, just as the adult neurons ordinarily do.

"What we made are neurons that are characteristic of the frontal cortex -- actually what you'd imagine would be the most difficult to make. They're the ones we think with, that we use to put two things together and see connections, not the ones involved in evolutionarily older emotional responses," said Crabtree. "We also find inhibitory neurons among the converted cells, whose role is to keep the activity of other neurons at a resting, controlled state."

The team improved the efficiency of the transformation to 20 percent by adding two of the factors used in a similar experiment by colleague Marius Wernig, MD, assistant professor of pathology, in the first published account of converting a human skin cell directly to a neuron. In May this year, Wernig reported in Nature that the combination of four particular proteins can convert skin cells directly into functional neurons with 2 to 4 percent efficiency. (Even more recently, on July 3, *Nature* published a study led by a researcher at the San Raffaele Scientific Institute in Milan, Italy, showing a mix of three other proteins can set off the conversion.)

"It's been a long time in coming to this," said Crabtree. "But science often progresses in leaps and starts, and then all of a sudden many scientists come to the same position at the same time. Now these studies have come out, and more will be coming, all of which are going to say that not only can you can make neurons different ways, but also you can make neurons of different types."

Wernig's study produced the same "thinking" neurons as Crabtree's did, but did not find inhibitory neurons. The Italian study produced neurons that release dopamine, a chemical that affects many behaviors, from moving, to learning, to sleeping.

Among the projects taking off from this finding is an effort to set up a model for Down syndrome. Stanford graduate student Alfred Sun, a co-leader of the study, has obtained skin cells from patients and converted them to neurons. Now he can try to see what's different about them.

"Our belief is there are certain biochemical abnormalities that might be correctable," Crabtree said.

The other researchers involved in the newly published study are the two additional co-lead authors, postdoctoral researcher Alex Shcheglovitov, PhD, and medical student Li Li; postdoctoral researchers Thomas Portmann, PhD, and Yulong Li, PhD; MD/PhD student Chris Lee-Messer; associate professor of neurobiology Ricardo Dolmetsch, PhD; and professor of molecular and cellular physiology Richard Tsien, PhD.

The work was funded by the National Institutes of Health and the Howard Hughes Medical Institute and Stanford's Department of Pathology.

Story Source:

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1. Andrew S. Yoo, Alfred X. Sun, Li Li, Aleksandr Shcheglovitov, Thomas Portmann, Yulong Li, Chris Lee-Messer, Ricardo E. Dolmetsch, Richard W. Tsien, Gerald R. Crabtree. **MicroRNA-mediated conversion of human fibroblasts to neurons**. *Nature*, 2011; DOI: 10.1038/nature10323

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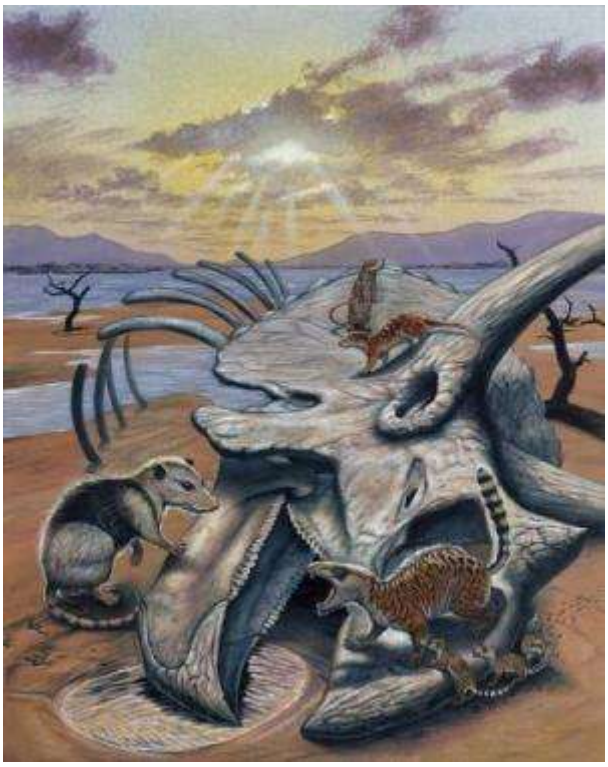
Last Dinosaur Before Mass Extinction Discovered



Three small primitive mammals walk over a Triceratops skeleton, one of the last dinosaurs to exist before the mass extinction that gave way to the age of mammals. (Credit: Mark Hallett)

ScienceDaily (July 13, 2011) — A team of scientists has discovered the youngest dinosaur preserved in the fossil record before the catastrophic meteor impact 65 million years ago. The finding indicates that dinosaurs did not go extinct prior to the impact and provides further evidence as to whether the impact was in fact the cause of their extinction.

Researchers from Yale University discovered the fossilized horn of a ceratopsian -- likely a Triceratops, which are common to the area -- in the Hell Creek formation in Montana last year. They found the fossil buried just five inches below the K-T boundary, the geological layer that marks the transition from the Cretaceous period to the Tertiary period at the time of the mass extinction that took place 65 million years ago.

Since the impact hypothesis for the demise of the dinosaurs was first proposed more than 30 years ago, many scientists have come to believe the meteor caused the mass extinction and wiped out the dinosaurs, but a sticking point has been an apparent lack of fossils buried within the 10 feet of rock below the K-T boundary. The seeming anomaly has come to be known as the "three-meter gap." Until now, this gap has caused some paleontologists to question whether the non-avian dinosaurs of the era -- which included Tyrannosaurus rex, Triceratops, Torosaurus and the duckbilled dinosaurs -- gradually went extinct sometime before the meteor struck. (Avian dinosaurs survived the impact, and eventually gave rise to modern-day birds.)

"This discovery suggests the three-meter gap doesn't exist," said Yale graduate student Tyler Lyson, director of the Marmarth Research Foundation and lead author of the study, published online July 12 in the journal *Biology Letters*. "The fact that this specimen was so close to the boundary indicates that at least some dinosaurs were doing fine right up until the impact."

While the team can't determine the exact age of the dinosaur, Lyson said it likely lived tens of thousands to just a few thousand years before the impact. "This discovery provides some evidence that dinosaurs didn't slowly die out before the meteor struck," he said.

Eric Sargis, curator of vertebrate paleontology at the Yale Peabody Museum of Natural History, and graduate student Stephen Chester discovered the ceratopsian last year while searching for fossilized mammals that evolved after the meteor impact. At first, Lyson said, the team thought it was buried within about three feet of the K-T boundary, but were surprised to learn just how close to the boundary -- and hence, how close in time to the impact -- it was. They sent soil samples to a laboratory to determine the exact location of the boundary, which is marked by the relative abundance of certain types of fossilized pollen and other geological indicators but is difficult to determine visually while in the field.

Because the dinosaur was buried in a mudstone floodplain, the team knew it hadn't been re-deposited from older sediments, which can sometimes happen when fossils are found in riverbeds that may have eroded and re-distributed material over time.

The team is now examining other fossil specimens that appear to be buried close to the K-T boundary and expect to find more, Lyson said. He suspects that other fossils discovered in the past may have been closer to the boundary than originally thought and that the so-called three-meter gap never existed.

"We should be able to verify that using the more sophisticated soil analysis technique rather than estimating the boundary's location based solely on a visual examination of the rock formations while in the field, which is what has typically been done in the past," Lyson said.

Other authors of the paper include Eric Sargis and Stephen Chester (Yale University); Antoine Bercovici (China University of Geosciences); Dean Pearson (Pioneer Trails Regional Museum) and Walter Joyce (University of Tübingen).

Story Source:

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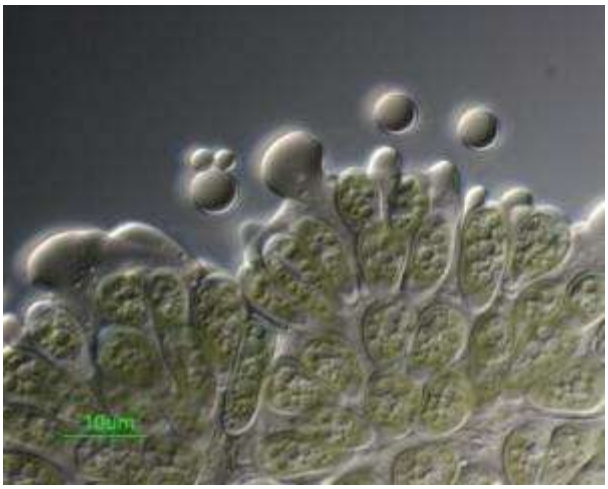
Ancient Algae: Genetically Engineering a Path to New Energy Sources?



Botryococcus braunii, Race B, is an ancient, colony-forming green alga that has attracted interest because it accumulates large amounts of high-value, petrochemical replacement oils. The oil oozing from the algal colony is evident in this picture. (Credit: Photograph courtesy of Taylor Weiss, Andreas Holzenburg, Stanislav Vitha and Timothy P. Devarenne at Texas A&M University)

ScienceDaily (July 13, 2011) — A team of researchers led by University of Kentucky College of Agriculture Professor Joe Chappell is making a connection between prehistoric times and the present -- ancient algae that can produce their own biofuel -- that could result in genetically creating a replacement for oil and coal shale deposits. Their discovery could have fundamental implications for the future of Earth's energy supplies.

Tom Niehaus, completing his doctorate in the Chappell laboratory; Shigeru Okada, a sabbatical professor from the aquatic biosciences department at the University of Tokyo; Tim Devarenne, a UK graduate and now professor of biochemistry and biophysics at Texas A&M University; and UK colleagues, Chappell, David Watt, professor of cellular and molecular biochemistry (College of Medicine) and his post-doctoral associate Vitaliy Sviripa report their latest research in the *Proceedings of the National Academy of Sciences (PNAS)*. Their findings go well beyond the basic science dealing with the origins of oil and coal.

While scientists previously established that oil and coal have their roots in the organisms that lived on the planet over 500 million years ago, one micro-organism directly contributed to these natural resources. That organism is a species of algae called *Botryococcus braunii*, which left behind its chemical fingerprints -- an oil that over geological time has turned into oil and coal shale deposits.

"Even more exciting is that this unique alga, *B. braunii*, still exists today and has been the target of studies from the large chemical and petrochemical industries," said Chappell.

B. braunii are very slow growing algae, so the organism is not necessarily a good source for biofuels. However, if scientists can capture its genetic blueprints for the biosynthesis of these high value oils, then these genes could be used to generate alternative production platforms.

This team of investigators isolated the necessary genes, characterized the biochemical traits encoded by these genes, and then genetically engineered yeast to produce this very high-value oil. This work has provided the first example of recreating a true direct replacement for oil and coal shale deposits.

Chappell said, "This represents the culmination of an outstanding effort to understand a fundamental process that has direct ramifications for a real-world problem -- how are we going to generate a truly renewable biofuel supply?"

Devarenne added, "This study identifies a very remarkable molecular mechanism for the production of hydrocarbons that, as far as we can tell, is not found in any other organism. Thus, it offers a unique insight into how hydrocarbons were produced hundreds of millions of years ago."

Story Source:

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1. Tom D. Niehaus, Shigeru Okada, Timothy P. Devarenne, David S. Watt, Vitaliy Sviripa, Joe Chappell. **Identification of unique mechanisms for triterpene biosynthesis in Botryococcus braunii**. *Proceedings of the National Academy of Sciences*, 2011; DOI: 10.1073/pnas.1106222108

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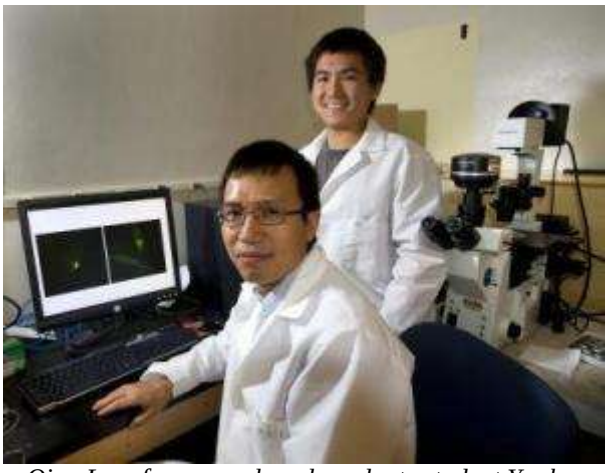
Biologists Identify New Strategy Used by Bacteria During Infection



Purdue associate professor of biological sciences Zhao-Qing Luo, foreground, and graduate student Yunhao Tan identified a new way in which bacteria modify healthy cells during infection. Shown on the computer screen are cells infected with a mutant strain of the bacteria Legionella pneumophila used in their research. (Purdue University photo/Mark Simons) (Credit: Purdue University photo/Mark Simons)

ScienceDaily (July 13, 2011) — Purdue University biologists identified a new way in which bacteria hijack healthy cells during infection, which could provide a target for new antibiotics.

Zhao-Qing Luo, the associate professor of biological sciences who led the study, said the team discovered a new enzyme used by the bacterium *Legionella pneumophila* -- which causes Legionnaires' disease -- to control its host cell in order to take up residence.

"Legionnaires' disease is a severe form of pneumonia, and this finding could lead to the design of a new therapy that saves lives," Luo said. "At the same time it also provides great insight into a general mechanism of both bacterial infection and cell signaling events in higher organisms including humans."

Successful infection by *Legionella pneumophila* requires the delivery of hundreds of proteins into the host cells that alter various functions to turn the naturally hostile environment into one tailor-made for bacterial replication. These proteins tap into existing communication processes within the cells in which an external signal, such as a hormone, triggers a cascade of slight modifications to proteins that eventually turns on a gene that changes the cell's behavior, he said.

"Pathogens are successful because they know how information in our cells is relayed and they amplify some signals and block others in order to evade the immune system and keep the cell from defending itself," Luo said. "Despite our understanding of this, we do not know much about how the proteins delivered by the bacteria accomplish this -- how they work. This time we were able to pinpoint an enzyme and see how it disrupted and manipulated a specific signaling pathway in order to create a better environment for itself."

The signaling pathway involved was only recently identified, and the discovery by Luo and graduate student Yunhao Tan also provides a key insight into its process. A paper detailing their National Institutes of Health-funded work is published online in the current issue of the journal *Nature*.

The signaling pathway involves a new form of protein modification called AMPylation in order to relay instructions to change cell behavior and has been found to be used by almost all organisms, Luo said.

The bacterial enzyme discovered by the Purdue team, named SidD, reverses or stops the AMPylation process, he said.

"It had not been known before if the AMPylation signaling process was reversible or if it was regulated by specific enzymes," Luo said. "Now we know that it is, and we have a more complete picture that will allow us to use it as a scientific tool to learn more about complex cellular processes. By being able to turn the signaling on and off, we can control different activities and detect mechanisms we wouldn't see under normal physiological conditions."

The bacterium affects the host cell's functions differently during different phases of the infection process, tapping into signaling pathways to turn on and off certain natural cellular activities. SidD stops the AMPylation process four hours after the start of infection in order to reverse an earlier modification that would be detrimental to the cell if left in place, he said.

"During its process of infection, the bacteria can trigger reactions that can lead to the death of the host cell," Luo said. "Of course this is not in the best interest of the bacteria because it would no longer be able to replicate and continue infection, so it has evolved mechanisms to neutralize such reactions and keep the host cell alive."

Luo said further investigation of the structure and function of the SidD enzyme is needed to better understand its role in the infection process and its involvement in other cellular processes.

"The more we can learn about an infectious agent, the better equipped we will be to design a therapy to fight it," he said. "Before a new antibiotic therapy can be created, we must understand the enzyme enough to find chemicals to inhibit its activity. Further, because the bacteria have coevolved with us for millions of years, they provide some of the best tools for us to understand the intricacy of cellular processes."

Luo plans to further study SidD and investigate other proteins used by *Legionella pneumophila* bacteria.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Purdue University**. The original article was written by Elizabeth K. Gardner.

Journal Reference:

1. Yunhao Tan, Zhao-Qing Luo. **Legionella pneumophila SidD is a deAMPylase that modifies Rab1**. *Nature*, 2011; DOI: 10.1038/nature10307

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http://www.sciencedaily.com/releases/2011/07/110712152206.htm

Bodyguard for the Brain: Researchers Identify Mechanism That Seems to Protect Brain from Aging

Researchers from the Universities of Bonn and Mainz have discovered a mechanism that seems to protect the brain from aging. (Credit: Image copyright University of Bonn)

ScienceDaily (July 13, 2011) — Researchers from the Universities of Bonn and Mainz have discovered a mechanism that seems to protect the brain from aging. In experiments with mice, they switched off the cannabinoid-1 receptor. As a consequence, the animals showed signs of degeneration -- as seen in people with dementia -- much faster.

The research results are presented in a current issue of the *Proceedings of the National Academy of Sciences (PNAS).*

Humans are getting older and older, and the number of people with dementia is increasing. The factors controlling degeneration of the brain are still mostly unknown. However, researchers assume that factors such as stress, accumulation of toxic waste products as well as inflammation accelerate aging. But, vice versa, there are also mechanisms that can -- like a bodyguard -- protect the brain from degenerating, or repair defective structures.

Researchers from the Universities of Bonn and Mainz have now discovered a hitherto unknown function of the cannabinoid-1 receptor (CB1). A receptor is a protein that can bind to other substances, triggering a chain of signals. Cannabinoids such as THC -- the active agent in cannabis sativa -- and endocannabinoids formed by the body bind to the CB1 receptors. The existence of this receptor is also the reason for the intoxicating effect of hashish and marijuana.

Not only does the CB1 receptor have an addictive potential, but it also plays a role in the degeneration of the brain. "If we switch off the receptor using gene technology, mouse brains age much faster," said Önder Albayram, principal author of the publication and a doctoral student on the team of Professor Dr. Andreas

Zimmer from the Institut für Molekulare Psychiatrie at the University of Bonn. "This means that the CB1 signal system has a protective effect for nerve cells."

Mice prove their brain power in a pool

The researchers studied mice in different age categories -- young six week old animals, middle-aged ones at five months, and those of an advanced age at 12 months. The animals had to master various tasks -- first, they had to find a submerged platform in the pool. Once the mice knew its location, the platform was moved, and the animals had to find it again. This was how the researchers tested how well the rodents learned and remembered.

The animals in which the CB1 receptor had been switched off (the knock-out mice) clearly differed from their kind. "The knock-out mice showed clearly diminished learning and memory capacity," said Privatdozent Dr. Andras Bilkei-Gorzo from Professor Zimmer's team, who led the study. So, animals that did not have the receptor were less successful in their search for the platform. "In addition, they showed a clear loss of nerve cells in the hippocampus," he explained further. This part of the brain is the central area for forming and storing information. In addition, the researchers found inflammation processes in the brain. As the mice advanced in age, the degenerative processes became increasingly noticeable.

Amazing parallels with the human brain

The animals with the intact CB1 receptor, to the contrary, did clearly better with regard to their learning and memory capabilities, as well as the health of their nerve cells. "The root cause of aging is one of the secrets of life," commented Albayram. This study has begun to open the door to solving this enigma. The processes in the mouse brains have a surprising number of parallels with age-related changes in human brains. So, the endocannabinoid system may also present a protective mechanism in the aging of the human brain.

The principal author cautioned, "This will require additional research." The scientists would like to better understand the mechanism by which CB1 receptors protect the brain from inflammation processes. And based on these signal chains, it might then be possible to develop substances for new therapies.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Bonn**, via AlphaGalileo.

Journal Reference:

1. O. Albayram, J. Alferink, J. Pitsch, A. Piyanova, K. Neitzert, K. Poppensieker, D. Mauer, K. Michel, A. Legler, A. Becker, K. Monory, B. Lutz, A. Zimmer, A. Bilkei-Gorzo. **Role of CB1 cannabinoid receptors on GABAergic neurons in brain aging**. *Proceedings of the National Academy of Sciences*, 2011; 108 (27): 11256 DOI: 10.1073/pnas.1016442108

http://www.sciencedaily.com/releases/2011/07/110712093856.htm

Bold New Approach to Wind 'Farm' Design May Provide Efficiency Gains

Research at the Caltech Field Laboratory for Optimized Wind Energy, directed by John Dabiri, suggests that arrays of closely spaced vertical-axis wind turbines produce significantly more power than conventional wind farms with propeller-style turbines. (Credit: John Dabiri, Caltech)

ScienceDaily (July 13, 2011) — Conventional wisdom suggests that because we're approaching the theoretical limit on individual wind turbine efficiency, wind energy is now a mature technology. But California Institute of Technology researchers revisited some of the fundamental assumptions that guided the wind industry for the past 30 years, and now believe that a new approach to wind farm design -- one that places wind turbines close together instead of far apart -- may provide significant efficiency gains.

This challenges the school of thought that the only remaining advances to come are in developing larger turbines, putting them offshore, and lobbying for government policies favorable to the further penetration of wind power in energy markets.

"What has been overlooked to date is that, not withstanding the tremendous advances in wind turbine technology, wind 'farms' are still rather inefficient when taken as a whole," explains John Dabiri, professor of Engineering and Applied Science, and director of the Center for Bioinspired Engineering at Caltech. "Because conventional, propeller-style wind turbines must be spaced far apart to avoid interfering with one another aerodynamically, much of the wind energy that enters a wind farm is never tapped. In effect, modern wind farms are the equivalent of 'sloppy eaters.' To compensate, they're built taller and larger to access better winds."

But this increase in height and size leads to frequently cited issues such as increased cost and difficulty of engineering and maintaining the larger structures, other visual, acoustic, and radar signatures problems, as well as more bat and bird impacts.

Dabiri is focusing on a more efficient form of wind 'farm' design, relegating individual wind turbine efficiency to the back seat. He describes this new design in the American Institute of Physics' *Journal of Renewable & Sustainable Energy*.

"The available wind energy at 30 feet is much less abundant than that found at the heights of modern wind turbines, but if near-ground wind can be harnessed more efficiently there's no need to access the higher altitude winds," he says. "The global wind power available at 30 feet exceeds global electricity usage several times over. The challenge? Capturing that power."

The Caltech design targets that power by relying on vertical-axis wind turbines (VAWTs) in arrangements that place the turbines much closer together than is possible with horizontal-axis propeller-style turbines.

VAWTs provide several immediate benefits, according to Dabiri, including effective operation in turbulent winds like those occurring near the ground, a simple design (no gearbox or yaw drive) that can lower costs of operation and maintenance, and a lower profile that reduces environmental impacts.

Two of the primary reasons VAWTs aren't more prominently used today are because they tend to be less efficient individually, and the previous generation of VAWTs suffered from structural failures related to fatigue.

"With respect to efficiency issues, our approach doesn't rely on high individual turbine efficiency as much as close turbine spacing. As far as failures, advances in materials and in predicting aerodynamic loads have led to new designs that are better equipped to withstand fatigue loads," says Dabiri.

Field data collected by the researchers last summer suggests that they're on the right track, but this is by no means 'mission accomplished.' The next steps involve scaling up their field demonstration and improving upon off-the-shelf wind turbine designs used for the pilot study.

Ultimately, the goal of this research is to reduce the cost of wind energy. "Our results are a compelling call for further research on alternatives to the wind energy status quo," Dabiri notes. "Since the basic unit of power generation in this approach is smaller, the scaling of the physical forces involved predicts that turbines in our wind farms can be built using less expensive materials, manufacturing processes, and maintenance than is possible with current wind turbines."

A parallel effort is underway by the researchers to demonstrate a proof-of-concept of this aspect as well.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **American Institute of Physics**, via EurekAlert!, a service of AAAS.
http://www.sciencedaily.com/releases/2011/07/110713131644.htm

Computer Learns Language by Playing Games

"Civilization" is a strategy game in which players build empires by, among other things, deciding where to found cities and deploy armies. (Credit: Image courtesy of Sid Meier's Civilization V)

ScienceDaily (July 12, 2011) — Computers are great at treating words as data: Word-processing programs let you rearrange and format text however you like, and search engines can quickly find a word anywhere on the Web. But what would it mean for a computer to actually understand the meaning of a sentence written in ordinary English -- or French, or Urdu, or Mandarin?

One test might be whether the computer could analyze and follow a set of instructions for an unfamiliar task. And indeed, in the last few years, researchers at MIT's Computer Science and Artificial Intelligence Lab have begun designing machine-learning systems that do exactly that, with surprisingly good results.

In 2009, at the annual meeting of the Association for Computational Linguistics (ACL), researchers in the lab of Regina Barzilay, associate professor of computer science and electrical engineering, took the best-paper award for a system that generated scripts for installing a piece of software on a Windows computer by reviewing instructions posted on Microsoft's help site. At this year's ACL meeting, Barzilay, her graduate student S. R. K. Branavan and David Silver of University College London applied a similar approach to a more complicated problem: learning to play "Civilization," a computer game in which the player guides the development of a city into an empire across centuries of human history. When the researchers augmented a machine-learning system so that it could use a player's manual to guide the development of a game-playing strategy, its rate of victory jumped from 46 percent to 79 percent.

Starting from scratch

"Games are used as a test bed for artificial-intelligence techniques simply because of their complexity," says Branavan, who was first author on both ACL papers. "Every action that you take in the game doesn't have a predetermined outcome, because the game or the opponent can randomly react to what you do. So you need a technique that can handle very complex scenarios that react in potentially random ways."

Moreover, Barzilay says, game manuals have "very open text. They don't tell you how to win. They just give you very general advice and suggestions, and you have to figure out a lot of other things on your own." Relative to an application like the software-installing program, Branavan explains, games are "another step closer to the real world."

The extraordinary thing about Barzilay and Branavan's system is that it begins with virtually no prior knowledge about the task it's intended to perform or the language in which the instructions are written. It has a list of actions it can take, like right-clicks or left-clicks, or moving the cursor; it has access to the information displayed on-screen; and it has some way of gauging its success, like whether the software has

been installed or whether it wins the game. But it doesn't know what actions correspond to what words in the instruction set, and it doesn't know what the objects in the game world represent.

So initially, its behavior is almost totally random. But as it takes various actions, different words appear on screen, and it can look for instances of those words in the instruction set. It can also search the surrounding text for associated words, and develop hypotheses about what actions those words correspond to. Hypotheses that consistently lead to good results are given greater credence, while those that consistently lead to bad results are discarded.

Proof of concept

In the case of software installation, the system was able to reproduce 80 percent of the steps that a human reading the same instructions would execute. In the case of the computer game, it won 79 percent of the games it played, while a version that didn't rely on the written instructions won only 46 percent. The researchers also tested a more-sophisticated machine-learning algorithm that eschewed textual input but used additional techniques to improve its performance. Even that algorithm won only 62 percent of its games.

"If you'd asked me beforehand if I thought we could do this yet, I'd have said no," says Eugene Charniak, University Professor of Computer Science at Brown University. "You are building something where you have very little information about the domain, but you get clues from the domain itself."

Charniak points out that when the MIT researchers presented their work at the ACL meeting, some members of the audience argued that more sophisticated machine-learning systems would have performed better than the ones to which the researchers compared their system. But, Charniak adds, "it's not completely clear to me that that's really relevant. Who cares? The important point is that this was able to extract useful information from the manual, and that's what we care about."

Most computer games as complex as "Civilization" include algorithms that allow players to play against the computer, rather than against other people; the games' programmers have to develop the strategies for the computer to follow and write the code that executes them. Barzilay and Branavan say that, in the near term, their system could make that job much easier, automatically creating algorithms that perform better than the hand-designed ones.

But the main purpose of the project, which was supported by the National Science Foundation, was to demonstrate that computer systems that learn the meanings of words through exploratory interaction with their environments are a promising subject for further research. And indeed, Barzilay and her students have begun to adapt their meaning-inferring algorithms to work with robotic systems.

Story Source:

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Gray Whales Likely Survived the Ice Ages by Changing Their Diets

A grey whale mother and calf off the coast of Baja California. If ancient gray whale populations migrated and fed the same as today's whales, what happened during the Ice Ages, when their major feeding grounds disappeared? (Credit: iStockphoto/Marshall Bruce)

ScienceDaily (July 7, 2011) — If ancient gray whale populations migrated and fed the same as today's whales, what happened during the Ice Ages, when their major feeding grounds disappeared? UC Berkeley and Smithsonian paleontologists argue that gray whales utilized a range of food sources in the past, including herring and krill, in addition to the benthic organisms they consume today. As a result, pre-whaling populations were two to four times greater than today's population of around 22,000.

Gray whales survived many cycles of global cooling and warming over the past few million years, likely by exploiting a more varied diet than they do today, according to a new study by University of California, Berkeley, and Smithsonian Institution paleontologists.

The researchers, who analyzed California gray whale (*Eschrichtius robustus*) responses to climate change over the past 120,000 years, also found evidence to support the idea that the population of gray whales along the Pacific Coast before the arrival of humans was two to four times today's population, which stands at about 22,000. The whale is considered a conservation success story because protections instituted as early as the 1930s have allowed populations to rebound from fewer than 1,000 individuals in the early 20th century, after less than 75 years of systematic whaling.

"There almost certainly were higher gray whale populations in the past," said evolutionary biologist David Lindberg, a UC Berkeley professor of integrative biology who coauthored the paper with his former student, Nicholas D. Pyenson, now curator of fossil marine mammals at the Smithsonian in Washington, D.C. The paper appears on July 6 in the online, open-access journal *PLoS ONE*.

Lindberg and Pyenson suggest that higher populations in the past were possible because gray whales utilized a greater variety of food resources -- resources that today's whales are only now beginning to exploit. According to Lindberg, gray whales were once thought to feed only by suctioning seafloor sediment and filtering out worms and amphipods -- so-called benthic organisms. But some whales are now eating herring and krill as well, just like their baleen whale relatives, which include the humpback and the blue.

Some whales are even dropping out of the migratory rat race. One group hangs out year-round off Vancouver Island in Canada, where they chase herring and krill.

"We propose that gray whales survived the disappearance of their primary feeding ground by employing generalist filter-feeding modes, similar to the resident gray whales found between northern Washington State and Vancouver Island," the scientists wrote in their paper.

"A combination of low population numbers and a species migrating between places where humans didn't bother them gave us the impression that gray whales have a stereotypical migratory and feeding behavior that may not be historically correct," Lindberg said.

The new population numbers accord with a 2007 estimate that the California gray whale population was likely 76,000 to 120,000 before humans began hunting them. That estimate, by Stephen Palumbi of Stanford University and his collaborators, was based on an analysis of gray whale genetic diversity.

The numbers clash, however, with claims by some ecologists that populations of between 15,000 and 20,000 are likely the most that the Pacific Coast -- specifically along the whales' 11,000 kilometer (6,900 mile) migratory route from Baja California to the Bering Sea -- could support, today or in the past.

"Our data say that, if the higher estimates are right, gray whales would have made it through the Ice Ages in numbers sufficiently large to avoid bottlenecking," Pyenson said. "If gray whale populations were at the lower levels, they would only have squeaked through the ice ages with populations of hundreds or a few thousand. That would have left bottlenecking evidence in their DNA."

Bottlenecking is when populations drop so low that inbreeding becomes common, decreasing the genetic diversity in the species and making them less able to adapt to environmental change.

The new assessment is good news for gray whales, which appear to have "a lot more evolutionary plasticity than anyone imagined," Lindberg said. This could help them survive the climate change predicted within the next few centuries that is characterized by an expected sea level rise of several meters.

"I suspect the gray whales will be among the winners in the great climate change experiment," Pyenson said.

Lindberg and Pyenson initiated the study several years ago in the face of conflicting and contentious estimates for past gray whale populations. They thought that an understanding of how gray whales adapted to climate change over the past 3 million years, the period called the Pleistocene, might provide insight into how they will adapt to climate change today.

Since gray whales arose -- the oldest fossils date from 2.5 million years ago -- Earth has gone through more than 40 major cycles of warming and cooling, each of which significantly affected the world's flora and fauna. During the last glacial cold spell, between 50,000 and 10,000 years ago, most of the large terrestrial mammals disappeared through a combination of climate change and human depredation, Lindberg noted. The marine realm, however, experienced almost no extinctions and very few new originations during that same period.

The California, or eastern, gray whale, one of two surviving populations of gray whale, can be traced back about 150,000-200,000 years. Pyenson and Lindberg looked closely at only the past 120,000 years, during which Earth transitioned from a warm period to a glacial period and then to today's warmer climate.

During the glaciated period, ocean water became locked up in land-based glaciers, drawing down the sea level by about 120 meters, or nearly 400 feet. That drop eliminated nearly 60 percent of the Bering Sea Platform, a shallow area that is part of the continental shelf and the major summer feeding area for today's gray whales. Gray whales can engage in benthic feeding no deeper than about 75 meters (250 feet), Pyenson said, and during the glacial period, waters offshore of the Bering platform would have been much deeper than that.

"If gray whales were primarily feeding on the Bering Platform, it's hard to see how they could have avoided a population crash," Lindberg said.

By calculating the amount of food lost because of dropping sea levels, and combining this with estimates of the food needed to keep a whale alive, the two researchers calculated the impact of global cooling on gray whale populations and the populations that would have had to exist in order for the whales to survive.

They concluded that populations would have had to have alternative feeding modes sufficient to support a population of around 70,000 during warm periods so that population drops during glacial periods wouldn't be below 5,000-10,000 whales. Much lower numbers would have produced a genetic bottleneck obvious in the DNA of the whales, and such a signature has not yet been seen.

"We don't yet have the ability to look deep enough into the whale genome to see this type of bottleneck," Pyenson added, though genetic analysis that has been done shows no evidence of a bottleneck much shallower in time, just before humans targeted the mammals for whaling.

The carrying capacity of the North Pacific could have been as high as 170,000, "assuming modern day values for benthic productivity, food density, and gray whale energetics," the authors concluded. If gray whales also exploited non-benthic organisms, such as krill, the populations could have been even higher.

If gray whales do respond well to the rising temperatures and sea levels predicted for the future, that may not be true for the birds and other marine mammals that feed in the Bering Sea, one of the most productive marine ecosystems during the summer.

"If this environment disappears in glacial maxima, we really need to rethink what we know about the ecological history of all the other organisms that make a living in the Bering Sea," Pyenson said. He and Lindberg urge other scientists to focus on the historical ecology of species to fully understand their complex interactions with a changing environment.

"We really make a lot of conservation decisions without a lot of data," Lindberg said. "Integrating paleontological and geological data in the context of known ecological traits can help us address impending biological changes in marine ecosystems."

The work was supported by the National Science Foundation, the Natural Sciences and Engineering Research Council of Canada and the Smithsonian Institution.

Pyenson performed part of this research while a post-doctoral fellow at the University of British Columbia. Lindberg is also a member of the Center for Computational Biology and the Museum of Paleontology at UC Berkeley.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of California - Berkeley**. The original article was written by Robert Sanders, Media Relations.

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1. Nicholas D. Pyenson, David R. Lindberg. **What Happened to Gray Whales during the Pleistocene? The Ecological Impact of Sea-Level Change on Benthic Feeding Areas in the North Pacific Ocean**. *PLoS ONE*, 2011; 6 (7): e21295 DOI: 10.1371/journal.pone.0021295

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How the Battle Was Won, if Not Yet the War

By ALEXANDER ROSE

Keystone-France/Gamma-Keystone via Getty Images

Members of 101st Airborne posing with a captured flag in Normandy on D-Day, June 6, 1944.

There comes a time in every military historian's life—or so it seems—when he feels strangely compelled to publish a book on the Normandy campaign of World War II. Think only of John Keegan's "Six Armies in Normandy" (1982), Antony Beevor's "D-Day" (2009), Max Hastings's "Overlord" (1984), Carlo D'Este's "Decision in Normandy" (1983), Stephen Ambrose's "D-Day" (1994) and "Band of Brothers" (1992) and, lest we forget, Cornelius Ryan's "The Longest Day" (1959).

And now John Prados has thrown his hat into the ring with "Normandy Crucible," a workmanlike account of the campaign from D-Day to the closing of the Falaise Gap in late August 1944.

As a work of old-school operational history—its focus is not on the blood-and-guts of the front but on rear-echelon command decisions and the movements of armies and divisions—"Normandy Crucible" is satisfactory. But Mr. Prados's motivating conceit—that Normandy was "the decisive battle" in the European theater—leads him into a minefield.

For how do we define "decisive"? Is a decisive battle one in which there is an obvious loser and winner, tactically speaking? That has always been the easiest rule of thumb, making a clash like Cannae (216 B.C.), where the Carthaginians liquidated a Roman army, the embodiment of a decisive battle. But is it really that simple? Hannibal may have won in the field, but he failed to realize his greater objectives and would lose the Second Punic War. Not so decisive, then.

A corollary, therefore, might be that a sound battlefield thrashing must be accompanied by the attainment of these larger goals. The problem here is that at the time it is not always clear who won, nor whose goals were achieved. Gettysburg, for instance, is only today counted as a definite Union win, yet Lincoln believed that Gen. Meade had not conclusively beaten his foe, and the Confederates chalked the battle up as a draw. Gen. Lee himself considered his strategic plans completed: Had his advance not penetrated deep into Northern territory, drawn Union troops across the Potomac and given Honest Abe a scare? Unionists, however, thought that Lee's "raid" had only inflicted disastrous losses on his own army while solidifying Northern support for a long war. Whatever else it was, Gettysburg was not decisive.

Time Life Pictures/Getty Images

US Army cemetery at Omaha Beach.

Normandy Crucible

By John Prados
NAL Caliber, 320 pages, $25.95

Sometimes even an unequivocal military triumph accompanied by the unquestionable achievement of one's objectives may not equate to decisiveness. Consider the fall of Constantinople to the Ottoman Turks in 1453. What might otherwise be conventionally counted as a decisive event is mitigated by Sultan Mehmet II's existing control over Anatolia. Wresting Constantinople from the Byzantine emperor merely certified a process already nearly complete. Storming the last redoubt at the great church of Hagia Sophia was the final stage in a long series of events, one no more decisive than the last minute of rain before a flood.

Which brings us to the battle of Normandy. Was it decisive? Mr. Prados claims so and says why: "Without doubt," he states, "the outcome of the Normandy campaign was a huge military disaster for Nazi Germany." Simple enough, but military disaster does not a decisive battle necessarily make.

In this case, it is true that there was a clear winner and loser: The western Allies forced a German retreat, and Nazi losses were heavy. Some 39 Allied divisions were available for D-Day, pitted against 38 German infantry and nine armored ones; by September, Field Marshal von Rundstedt could scrape together just 21 infantry divisions, most of which had lost their vehicles and artillery. His precious, lethal panzers had fared ill as well: The average armored division began with 160 tanks; by late August, with 1,500 panzers destroyed, the Germans could round up a total of 70 battered tanks. One entire tank division had been vaporized, three possessed no tanks at all and five had no artillery whatsoever.

Normandy nonetheless was by no means an Allied walkover. German casualties may have been 450,000, with more than half dead or wounded, but the Allies suffered 210,000 casualties (37,000 dead) and an additional 17,000 aircrew killed. Equipment losses actually exceeded those of the Germans in key areas: 4,100 aircraft and 4,000 tanks. The difference was that the Allies could afford such losses and the Germans could not.

The Non-Decisive Battle for Normandy

The Longest Day

by Cornelius Ryan (1959)

The grand-daddy of all Normandy histories is based on the direct recollections of participants. Yet it never loses sight of the big picture or the hard decisions. Every subsequent author is indebted to this unsurpassed, almost novelistic tale of heroism and tragedy on a grand scale.

D-Day: The Battle for Normandy

by Antony Beevor (2009)

Using the episodic-narrative style he wielded so powerfully in "Stalingrad" (1998), Mr. Beevor takes the Normandy story through the liberation of Paris. More inclined to objective analysis of what went right and what went wrong than Ryan, he also highlights overlooked areas, such as the invasion's devastating impact on French civilians.

Overlord

by Max Hastings (1984)

Combining stateliness with sensitivity, this is a sober narrative broken up by vivid quotations and startling facts. Mr. Hastings is even more unsentimental and clear-eyed than Mr. Beevor—and often sharper and more iconoclastic in his judgments. What both authors share is a dislike of the comforting, nationalistic approach of books like Stephen Ambrose's "D-Day" (1995).

Six Armies in Normandy

by John Keegan (1982)

Mr. Keegan elegantly traces the course of the battle by focusing on a single participating army (American, Canadian, British, German, Polish and French) during each successive stage. What "Six Armies" lacks in original research is more than compensated for by the originality of the retelling.

Decision in Normandy

by Carlo D'Este (2000)

Centering on Montgomery's role in the campaign, this is the natural next stop for those who have graduated from general histories of the fighting and wish to learn more about the campaign's operational dimensions.

—*Alexander Rose*

It can also be agreed that the Allies yoked their strategic objectives to their tactical success. Normandy was always intended as the first stage in the eviction of the Germans from occupied Europe. And so it was. On June 5, 1944, the Oberkommando der Wehrmacht, the once-storied supreme German command overseeing the Western Front, held sway over France, Belgium and Holland; by the end of the year its writ extended to little more than an area around the Siegfried Line on the German border.

Yet, despite inflicting a tactical and strategical defeat on Germany, pace Mr. Prados, the Allied victory in the west was not a decisive one. Thanks to its astonishing regenerative power, the Reich would not surrender for another 11 months. In 1944, a very hard year, Germany actually produced more aluminum, synthetic rubber and coal than in 1941 and just slightly less synthetic oil and steel. Weaponry, too. In 1941, Germany manufactured 3,790 tanks, 11,776 aircraft and 11,200 heavy guns. In 1944: 19,002 tanks, 39,807 aircraft and 70,700 heavy guns. Not bad for a power "decisively" beaten in Normandy.

Despite the colossal losses in France, Germany had a lot of fight left in it. That it eventually succumbed without the use of atomic bombs is owed mostly to the other dog in the fight. Shockingly, the impact of the Soviet front on the Normandy theater is ignored by Mr. Prados (and many other American historians).

Operation Bagration may lack the instant name recognition of Overlord, but its scale and ferocity dwarfed that of the Normandy attack. Opening on June 22, 1944—16 days after D-Day—Bagration hurled 2.3 million Soviet troops, 2,700 tanks and 5,300 aircraft against Germany's beleaguered 3rd Panzer, 4th and 9th Armies. By September, even as the western Allies had finally managed to liberate Paris, the Russians were closing on Warsaw, the gateway to Berlin.

In those three months alone, Hitler lost almost every acre of Russian land he possessed and operational control over an entire army group. The butcher's bill for the summer's eastern offensives amounted to two million Germans killed, wounded, captured or missing. The Soviet toll, by the way, would be 250,000 killed and 810,000 wounded—casualty numbers inconceivable to Anglo-American generals but regarded as perfectly normal, even pleasingly modest, in the Golgotha of the Nazi-Soviet War.

View Full Image

US Army/Time & Life Pictures/Getty Images

With this in mind, the Normandy front played a major but distinctly secondary role in the defeat of Germany. It allowed the Allies and the Soviets to coordinate a pincer movement that began with their armies 2,000 miles apart and ended on the German meridian. "Secondary" because, had D-Day collapsed or the liberation of France stalemated, Stalin would still have taken Berlin by sheer weight of numbers. As it was, Operation Bagration prevented Hitler from shunting a million seasoned troops, thousands of tanks and hundreds of bombers to the Western Front. Once we account for this indirect Soviet contribution to the success in Normandy, the latter's "decisiveness" is again revealed as an illusion.

The reason for the Allied inability to win outright, swiftly, is simple: The character and tempo of the 20th century's major wars were tectonic, not volcanic. Battle after battle, campaign after campaign, opponents ground each other down, neither able to deal the sudden, decisive death-blow believed typical of the Napoleonic Wars (such as Napoleon's brilliant victory at Austerlitz). Our wars were always cumulative, never "decisive," which is why the continuing devotion of Mr. Prados and other military historians to the "decisive battle" is so puzzling.

The very notion, after all, was invented by Edward Creasy in his "Fifteen Decisive Battles of the World: From Marathon to Waterloo" way back in 1851. While that book is a splendid monument to its author's Victorian faith in Whiggish progress, the Church of England and British superiority in all things, it remains a cultural artifact of a singular time and place that causes problems (as we've seen) when contemporaries heedlessly apply the model to modern combat. The decisive battle, in short, met its Waterloo a long time ago—and Normandy was no Austerlitz.

—Mr. Rose is the author of "American Rifle: A Biography" and "Washington's Spies: The Story of America's First Spy Ring."

http://online.wsj.com/article/SB10001424052702304803104576428172120064178.html?mod=WSJ_Books_LS_Books_6

The Rise and Rise of the Flying Reptiles: Pterosaurs Not Driven Into Extinction by Birds, Study Reveals

New research finds that pterosaurs, flying reptiles from the time of the dinosaurs, were not driven to extinction by the birds, but in fact they continued to diversify and innovate for millions of years afterward. (Credit: iStockphoto/Linda Bucklin)

ScienceDaily (July 7, 2011) — Pterosaurs, flying reptiles from the time of the dinosaurs, were not driven to extinction by the birds, but in fact they continued to diversify and innovate for millions of years afterwards.

A new study by Katy Prentice, done as part of her undergraduate degree (MSci in Palaeontology and Evolution) at the University of Bristol, shows that the pterosaurs evolved in a most unusual way, becoming more and more specialised through their 160 million years on Earth. The work is published in the *Journal of Systematic Palaeontology*.

"Usually, when a new group of animals or plants evolves, they quickly try out all the options. When we did this study, we thought pterosaurs would be the same," said Katy. "Pterosaurs were the first flying animals -- they appeared on Earth 50 million years before Archaeopteryx, the first bird -- and they were good at what they did. But the amazing thing is that they didn't really begin to evolve until after the birds had appeared."

Katy's study was done in conjunction with her supervisors, Dr Marcello Ruta and Professor Michael Benton. They looked at 50 different pterosaurs that ranged in size from a blackbird to the largest of all, Quetzalcoatlus, with a wingspan of 12 metres, four times the size of the largest flying bird today, the albatross. They tracked how all the pterosaur groups came and went through their history and recorded in detail their body shapes and adaptations.

The new work shows that pterosaurs remained conservative for 70 million years, and then started to experiment with all kinds of new modes of life. After birds emerged and became successful, the pterosaurs were not pushed to extinction, as had been suggested. It seems they responded to the new flyers by becoming larger and trying out new lifestyles. Many of the new lifestyle adaptations were seen in the pterosaurs skulls, as they adapted to feed on different food sources; some were seed-eaters, many ate fish, and later ones even lost their teeth. The rest of the body also showed a surprising amount of variation between different groups, when considering that the body forms have to retain many features to allow flight.

"Pterosaurs were at the height of their success about 125 million years ago, just as the birds became really diverse too," said Dr Marcello Ruta. "Our new numerical studies of all their physical features show they became three times as diverse in adaptations in the Early Cretaceous than they had been in the Jurassic, before Archaeopteryx and the birds appeared."

Pterosaurs dwindled and disappeared 65 million years during the mass extinction that killed the dinosaurs. In their day they had been a fair match for the birds, and the two groups divided up aerial ecospace between them, so avoiding conflict.

"We're delighted to see a student mastering some tough mathematical techniques, and coming up with such a clear-cut result," said Professor Michael Benton. "Palaeontologists have often speculated about the coming and going of different groups of animals through time, but the new study provides a set of objective measurements of the relative success and breadth of adaptation of pterosaurs through their long time on the Earth."

Further information can be found on the Palaeobiology and Biodiversity Research Group's website: The rise and rise of the flying reptiles (http://palaeo.gly.bris.ac.uk/macro/pterosaurs.html).

Story Source:

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

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http://www.sciencedaily.com/releases/2011/07/110706101608.htm

Why My Father Hated India

*Aatish Taseer**, the son of an assassinated Pakistani leader, explains the history and hysteria behind a deadly relationship***

By AATISH TASEER

Ten days before he was assassinated in January, my father, Salman Taseer, sent out a tweet about an Indian rocket that had come down over the Bay of Bengal: "Why does India make fools of themselves messing in space technology? Stick 2 bollywood my advice."

My father was the governor of Punjab, Pakistan's largest province, and his tweet, with its taunt at India's misfortune, would have delighted his many thousands of followers. It fed straight into Pakistan's unhealthy obsession with India, the country from which it was carved in 1947.

View Full Image

Agence France-Presse/Getty Images

Mohandas Gandhi visits Muslim refugees in New Delhi as they prepare to depart to Pakistan on Sept. 22, 1947.

Though my father's attitude went down well in Pakistan, it had caused considerable tension between us. I am half-Indian, raised in Delhi by my Indian mother: India is a country that I consider my own. When my father was killed by one of his own bodyguards for defending a Christian woman accused of blasphemy, we had not spoken for three years.

To understand the Pakistani obsession with India, to get a sense of its special edge—its hysteria—it is necessary to understand the rejection of India, its culture and past, that lies at the heart of the idea of Pakistan. This is not merely an academic question. Pakistan's animus toward India is the cause of both its unwillingness to fight Islamic extremism and its active complicity in undermining the aims of its ostensible ally, the United States.

The idea of Pakistan was first seriously formulated by neither a cleric nor a politician but by a poet. In 1930, Muhammad Iqbal, addressing the All-India Muslim league, made the case for a state in which India's Muslims would realize their "political and ethical essence." Though he was always vague about what the new state would be, he was quite clear about what it would not be: the old pluralistic society of India, with its composite culture.

Iqbal's vision took concrete shape in August 1947. Despite the partition of British India, it had seemed at first that there would be no transfer of populations. But violence erupted, and it quickly became clear that in the new homeland for India's Muslims, there would be no place for its non-Muslim communities. Pakistan and India came into being at the cost of a million lives and the largest migration in history.

This shared experience of carnage and loss is the foundation of the modern relationship between the two countries. In human terms, it meant that each of my parents, my father in Pakistan and my mother in India, grew up around symmetrically violent stories of uprooting and homelessness.

Rex USA

Salman Taseer, governor of Pakistan's Punjab province, in May 2009. He was assassinated in January 2011.

But in Pakistan, the partition had another, deeper meaning. It raised big questions, in cultural and civilizational terms, about what its separation from India would mean.

In the absence of a true national identity, Pakistan defined itself by its opposition to India. It turned its back on all that had been common between Muslims and non-Muslims in the era before partition. Everything came under suspicion, from dress to customs to festivals, marriage rituals and literature. The new country set itself the task of erasing its association with the subcontinent, an association that many came to view as a contamination.

Had this assertion of national identity meant the casting out of something alien or foreign in favor of an organic or homegrown identity, it might have had an empowering effect. What made it self-wounding, even nihilistic, was that Pakistan, by asserting a new Arabized Islamic identity, rejected its own local and regional culture. In trying to turn its back on its shared past with India, Pakistan turned its back on itself.

But there was one problem: India was just across the border, and it was still its composite, pluralistic self, a place where nearly as many Muslims lived as in Pakistan. It was a daily reminder of the past that Pakistan had tried to erase.

Pakistan's existential confusion made itself apparent in the political turmoil of the decades after partition. The state failed to perform a single legal transfer of power; coups were commonplace. And yet, in 1980, my father would still have felt that the partition had not been a mistake, for one critical reason: India, for all its democracy and pluralism, was an economic disaster.

Pakistan had better roads, better cars; Pakistani businesses were thriving; its citizens could take foreign currency abroad. Compared with starving, socialist India, they were on much surer ground. So what if India had democracy? It had brought nothing but drought and famine.

But in the early 1990s, a reversal began to occur in the fortunes of the two countries. The advantage that Pakistan had seemed to enjoy in the years after independence evaporated, as it became clear that the quest to rid itself of its Indian identity had come at a price: the emergence of a new and dangerous brand of Islam.

As India rose, thanks to economic liberalization, Pakistan withered. The country that had begun as a poet's utopia was reduced to ruin and insolvency.

The primary agent of this decline has been the Pakistani army. The beneficiary of vast amounts of American assistance and money—$11 billion since 9/11—the military has diverted a significant amount of these resources to arming itself against India. In Afghanistan, it has sought neither security nor stability but rather a backyard, which—once the Americans leave—might provide Pakistan with "strategic depth" against India.

In order to realize these objectives, the Pakistani army has led the U.S. in a dance, in which it had to be seen to be fighting the war on terror, but never so much as to actually win it, for its extension meant the continuing flow of American money. All this time the army kept alive a double game, in which some terror was fought and some—such as Laskhar-e-Tayyba's 2008 attack on Mumbai—actively supported.

The army's duplicity was exposed decisively this May, with the killing of Osama bin Laden in the garrison town of Abbottabad. It was only the last and most incriminating charge against an institution whose activities over the years have included the creation of the Taliban, the financing of international terrorism and the running of a lucrative trade in nuclear secrets.

This army, whose might has always been justified by the imaginary threat from India, has been more harmful to Pakistan than to anybody else. It has consumed annually a quarter of the country's wealth, undermined one civilian government after another and enriched itself through a range of economic interests, from bakeries and shopping malls to huge property holdings.

The reversal in the fortunes of the two countries—India's sudden prosperity and cultural power, seen next to the calamity of Muhammad Iqbal's unrealized utopia—is what explains the bitterness of my father's tweet just days before he died. It captures the rage of being forced to reject a culture of which you feel effortlessly a part—a culture that Pakistanis, via Bollywood, experience daily in their homes.

This rage is what makes it impossible to reduce Pakistan's obsession with India to matters of security or a land dispute in Kashmir. It can heal only when the wounds of 1947 are healed. And it should provoke no triumphalism in India, for behind the bluster and the bravado, there is arid pain and sadness.

—Mr. Taseer is the author of "Stranger to History: A Son's Journey Through Islamic Lands." His second novel, "Noon," will be published in the U.S. in September.

http://online.wsj.com/article/SB10001424052702304911104576445862242908294.html?mod=WSJ_Books_LS_Books_5

Beauty Is in the Medial Orbito-Frontal Cortex of the Beholder

New research finds that a region at the front of the brain 'lights up' when we experience beauty in a piece of art or a musical excerpt. (Credit: © Sam Spiro / Fotolia)

ScienceDaily (July 7, 2011) — A region at the front of the brain 'lights up' when we experience beauty in a piece of art or a musical excerpt, according to new research funded by the Wellcome Trust. The study, published July 6 in the open access journal *PLoS One*, suggests that the one characteristic that all works of art, whatever their nature, have in common is that they lead to activity in that same region of the brain, and goes some way to supporting the views of David Hume and others that beauty lies in the beholder rather than in the object.

"The question of whether there are characteristics that render objects beautiful has been debated for millennia by artists and philosophers of art but without an adequate conclusion," says Professor Semir Zeki from the Wellcome Laboratory of Neurobiology at UCL (University College London). "So too has the question of whether we have an abstract sense of beauty, that is to say one which arouses in us the same powerful emotional experience regardless of whether its source is, for example, musical or visual. It was time for neurobiology to tackle these fundamental questions."

Twenty-one volunteers from different cultures and ethnic backgrounds rated a series of paintings or excerpts of music as beautiful, indifferent or ugly. They then viewed these pictures or listened to the music whilst lying in a functional magnetic resonance imaging (fMRI) scanner, which measures activity in the brain.

Professor Zeki and colleague Dr Tomohiro Ishizu found that an area at the front of the brain known as the medial orbito-frontal cortex, part of the pleasure and reward centre of the brain, was more active in subjects when they listened to a piece of music or viewed a picture which they had previously rated as beautiful. By contrast, no particular region of the brain correlated generally with artwork previously rated 'ugly,' though the experience of visual ugliness when contrasted with the experience of beauty did correlate with activation in a number of regions.

The medial orbito-frontal cortex has previously been linked to appreciation of beauty, but this is the first time that scientists have been able to show that the same area of the brain is activated for both visual and auditory beauty in the same subjects. This implies that beauty does, indeed, exist as an abstract concept within the brain.

The medial orbito-frontal cortex was not the only region to be activated by beauty. As might be expected, the visual cortex, which responds to visual stimuli, was more active when viewing a painting than when listening to music, and vice versa for the auditory cortex.

However, particularly interesting was that activity in another region, the caudate nucleus, found near the centre of the brain, increased in proportion to the relative visual beauty of a painting. The caudate nucleus has been reported previously to correlate with romantic love, suggesting a neural correlate for the relationship between beauty and love.

Professor Zeki adds, "Almost anything can be considered art, but we argue that only creations whose experience correlates with activity in the medial orbito-frontal cortex would fall into the classification of beautiful art.

"A painting by Francis Bacon, for example, may have great artistic merit but may not qualify as beautiful. The same can be said for some of the more 'difficult' classical composers -- and whilst their compositions may be viewed as more 'artistic' than rock music, to someone who finds the latter more rewarding and beautiful, we would expect to see greater activity in the particular brain region when listening to Van Halen than when listening to Wagner."

Professor Zeki was the recipient of a £1million Wellcome Trust Strategic Award in 2007 to establish a programme of research in the new field of 'neuroaesthetics' in search of the neural and biological basis for creativity, beauty and love. The research brings together science, the arts and philosophy to answer fundamental questions about what it means to be human.

Story Source:

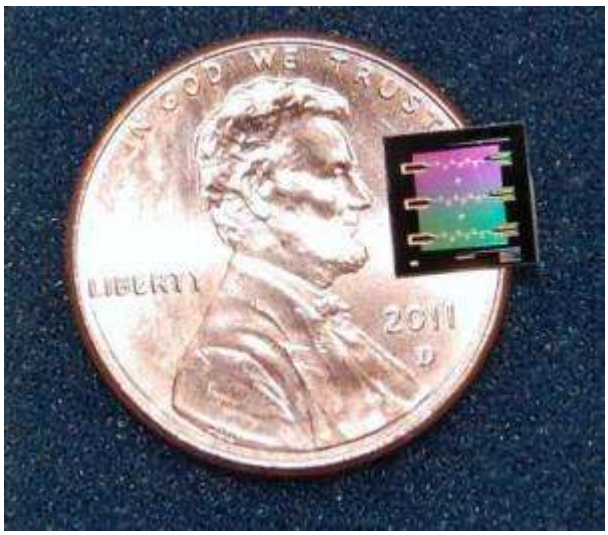
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Wellcome Trust**.

Journal Reference:

1. Tomohiro Ishizu, Semir Zeki. **Toward A Brain-Based Theory of Beauty**. *PLoS ONE*, 2011; 6 (7): e21852 DOI: 10.1371/journal.pone.0021852

http://www.sciencedaily.com/releases/2011/07/110706195800.htm

Mechanical Micro-Drum Cooled to Quantum Ground State



Multiple versions of NIST's superconducting circuit containing a "micro drum" were fabricated on this sapphire chip, shown next to a penny for scale. NIST scientists cooled one such drum to the lowest possible energy level, the quantum ground state. (Credit: Teufel/NIST)

ScienceDaily (July 7, 2011) — Showcasing new tools for widespread development of quantum circuits made of mechanical parts, scientists from the National Institute of Standards and Technology (NIST) have demonstrated a flexible, broadly usable technique for steadily calming the vibrations of an engineered mechanical object down to the quantum "ground state," the lowest possible energy level.

Described in a *Nature* paper posted online July 6, the NIST experiments nearly stop the beating motion of a microscopic aluminum drum made of about 1 trillion atoms, placing the drum in a realm governed by quantum mechanics with its energy below a single quantum, or one unit of energy. Like a plucked guitar string that plays the same tone while the sound dissipates, the drum continues to beat 11 million times per second, but its range of motion approaches zero. The cooling technique and drum device together promise new machinery for quantum computing and tests of quantum theory, and could help advance the field of quantum acoustics exploring the quantum nature of mechanical vibrations.

NIST scientists used the pressure of microwave radiation, or light, to calm the motion of the drum, which is embedded in a superconducting circuit. The circuit is designed so that the drum motion can influence the microwaves inside an electromagnetic cavity. The cooling method takes advantage of the microwave light's tendency to change frequency, if necessary, to match the frequency, or tone, at which the cavity naturally resonates.

"I put in the light at the wrong frequency, and it comes out at the right frequency, and it does that by stealing energy from the drum motion," says John Teufel, a NIST research affiliate who designed the drum. Teufel led the cooling experiments in NIST physicist and co-author Konrad Lehnert's lab at JILA, a joint institute of NIST and the University of Colorado Boulder.

Compared to the first engineered object to be coaxed into the quantum ground state, reported by California researchers last year, the NIST drum has a higher quality factor, so it can hold a beat longer, and it beats at a much slower rate, or lower frequency. As a result, individual packets of energy, or quanta, can be stored 10,000 times longer (about 100 microseconds) -- long enough to serve as a temporary memory for a quantum computer and a platform for exploring complex mechanical and quantum states. In addition, the drum motion is 40 times greater per quantum, offering the possibility, for instance, of generating larger entangled "cat states" -- objects that are in two places at once and also entangled, with properties that are linked even at a distance -- for tests of theories such as quantum gravity. The NIST apparatus also allows researchers to measure the position of the drum directly, which is useful for force detection, with a precision closer than ever to the ultimate limit allowed by quantum mechanics.

To make engineered bulk objects obey the rules of quantum mechanics, typically observed only in atoms and smaller particles, scientists must lower an object's temperature beyond the reach of conventional refrigeration.

The California researchers were able to use a passive cryogenic refrigeration technique to chill their high-frequency device enough to reach the ground state, avoiding the need for specialized techniques.

NIST's drum required the use of "sideband cooling" to reach much colder temperatures, taking advantage of strong interactions between the drum and the microwaves. This is the same idea as laser cooling of individual atoms, first demonstrated at NIST in 1978. Now a basic tool of atomic physics worldwide, laser cooling enabled many significant advances by allowing researchers to reduce the vibrational motion of trapped atoms to less than a single quantum. Sideband refers to a collection of light particles (photons) just above or below a specific target frequency. In the case of NIST's superconducting circuit, this stray radiation pressure, as it adjusts to the surrounding environment of the cavity, steadily removes energy from the drum motion in the same way that laser cooling slows atoms in a gas.

In the NIST experiments, the drum is first chilled in a cryogenic refrigerator using liquid helium. This lowers the drum energy to about 30 quanta. Sideband cooling then reduces the drum temperature from 20 milliKelvin (thousandths of a degree above absolute zero) to below 400 microKelvin (millionths of a degree above absolute zero), steadily lowering the drum energy to just one-third of 1 quantum.

Scientists begin the sideband cooling process by applying a drive tone to the circuit at a particular frequency below the cavity resonance. The drumbeats generate sideband photons, which naturally convert to the higher frequency of the cavity. These photons leak out of the cavity as it fills up. Each departing photon takes with it one mechanical unit of energy -- one phonon -- from the drum motion. At a drive intensity that corresponds to 4,000 photons in the cavity, the drum motion slows to less than 1 quantum. By detecting the scattered photons leaving the cavity, scientists can measure the mechanical motion near the lowest possible limits of uncertainty. Collectively, these steps proved that the mechanical drum entered the quantum regime.

The drum apparatus has applications in quantum computers, which could someday solve certain problems that are intractable today, even with the best supercomputers. Quantum information can be stored in the mechanical state for more than 100 microseconds before absorbing one phonon from the environment -- much longer than conventional superconducting quantum bits can maintain information. The drum, thus, might serve as a short-term memory device in a superconducting quantum computer circuit, a technology under development by the same NIST research group. In addition, because mechanical oscillators can interact with light of any frequency, they could act as intermediaries for transferring quantum information between microwave and optical components.

The research was supported in part by the Defense Advanced Research Projects Agency.

Story Source:

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

Journal Reference:

1. J. D. Teufel, T. Donner, Dale Li, J. W. Harlow, M. S. Allman, K. Cicak, A. J. Sirois, J. D. Whittaker, K. W. Lehnert, R. W. Simmonds. **Sideband cooling of micromechanical motion to the quantum ground state**. *Nature*, 2011; DOI: 10.1038/nature10261

http://www.sciencedaily.com/releases/2011/07/110706134132.htm

Rhesus Monkeys Appear to Have a Form of Self-Awareness Not Previously Attributed to Them, Research Suggests

Cognitive psychologist Justin Couchman is seen here with Murph, one of the rhesus monkeys who helped Couchman demonstrate that his species does indeed possess a form of self awareness. (Credit: University at Buffalo)

ScienceDaily (July 6, 2011) — In the first study of its kind in an animal species that has not passed a critical test of self-recognition, cognitive psychologist Justin J. Couchman of the University at Buffalo has demonstrated that rhesus monkeys appear to have a sense of self-agency -- the ability to understand that they are the cause of certain actions -- and possess a form of self-awareness previously not attributed to them.

The study, which will be published July 6 in *Biology Letters*, a journal of the Royal Society, may illuminate apparent self-awareness deficits in humans with autism, schizophrenia, Alzheimer's disease and developmental disabilities.

Rhesus monkeys are one of the best-known species of Old World monkeys, and have been used extensively in medical and biological research aimed at creating vaccines for rabies, smallpox and polio and drugs to manage HIV/AIDS; analyzing stem cells and sequencing the genome. Humans have sent them into space, cloned them and planted jellyfish genes in them.

Couchman, a PhD candidate at UB, is an instructor at UB and at the State University of New York College at Fredonia. He points out that previous research has shown that rhesus monkeys, like apes and dolphins, have metacognition, or the ability to monitor their own mental states. Nevertheless, the monkeys consistently fail the mirror self-recognition test, which assesses whether animals can recognize themselves in a mirror, and this is an important measure self-awareness.

"We know that in humans, the sense of self-agency is closely related to self-awareness," Couchman says, "and that it results from monitoring the relationship between pieces of intentional, sensorimotor and perceptual information.

"Based on previous findings in comparative metacognition research, we thought that even though they fail the mirror test, rhesus monkeys might have some other form of self-awareness. In this study we looked at whether the monkeys have a sense of self agency, that is, the understanding that some actions are the consequence of their own intentions."

For the study, Couchman trained 40 UB undergraduates and four male rhesus monkeys, housed in the Language Research Center of Georgia State University, to move a computer cursor with a joystick while a distractor cursor partially matched their movements. After moving the cursor, both humans and monkeys

were asked to identify the computer cursor that they controlled -- the one that matched their movements and intentions. Both species were able to select the cursor they controlled from an array of choices, including the distractor cursor, at greater than chance levels.

"This suggests that the monkeys, like humans, have some understanding of self agency," says Couchman. "This awareness or implicit sense that it is 'me' who is presently executing a bodily movement or thinking thoughts is an important form of self-awareness."

Couchman says that because this is the first such demonstration of self-agency in a species that has not passed the mirror self-recognition test, the results may shed light on apparent self-awareness deficits in humans.

"Mirror self-recognition is developmentally delayed in autistic children and absent in many who are mentally retarded, have Alzheimer's disease or are schizophrenic. It is not clear why this deficit occurs, but like rhesus monkeys," he says, "these groups may simply have biases against mirrors.

"If, when studied, such individuals attempted to distinguish self-generated actions from partially altered actions in the paradigm reported in this study," Couchman say, "it might offer information as to whether the breakdown in their mirror self-recognition is due to a difficulty in processing certain kinds of perceptual or cognitive information."

Decades of psychological research has established that the concept of agency implies an active organism, one who desires, makes plans and carries out actions. The sense of agency and its scientific study is significant in the study of social cognition, moral reasoning and psychopathology because of its implications for intention, consciousness, responsibility, desire and development.

"Self agency also plays a pivotal role in cognitive development," Couchman says.

"It is linked to metacognition, the first stages of self-awareness and theory of mind (understanding the mental states of others). These abilities give humans the sense that they are entities separate from the external world, and allow them to interact with other agents and the environment in intelligent ways. If rhesus monkeys are able to recognize themselves as agents that cause certain actions," he says, "then they probably have a similar understanding that they are entities independent from the environment."

Story Source:

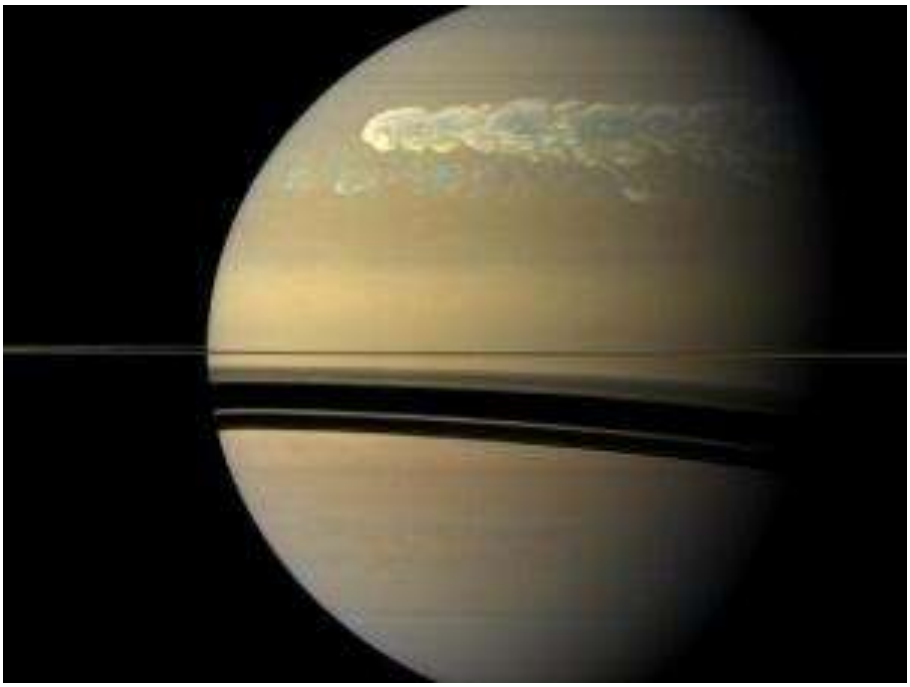
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University at Buffalo**.

Journal Reference:

1. J. J. Couchman. **Self-agency in rhesus monkeys**. *Biology Letters*, 2011; DOI: 10.1098/rsbl.2011.0536

http://www.sciencedaily.com/releases/2011/07/110705183630.htm

Cassini Captures Images and Sounds of Saturn Storm



The huge storm churning through the atmosphere in Saturn's northern hemisphere overtakes itself as it encircles the planet in this true-color view from NASA's Cassini spacecraft. (Credit: NASA/JPL-Caltech/SSI)

ScienceDaily (July 6, 2011) — Scientists analyzing data from NASA's Cassini spacecraft now have the first-ever, up-close details of a Saturn storm that is eight times the surface area of Earth.

On Dec. 5, 2010, Cassini first detected the storm that has been raging ever since. It appears approximately 35 degrees north latitude of Saturn. Pictures from Cassini's imaging cameras show the storm wrapping around the entire planet covering approximately 2 billion square miles (4 billion square kilometers).

The storm is about 500 times larger than the biggest storm previously seen by Cassini during several months from 2009 to 2010. Scientists studied the sounds of the new storm's lightning strikes and analyzed images taken between December 2010 and February 2011. Data from Cassini's radio and plasma wave science instrument showed the lightning flash rate as much as 10 times more frequent than during other storms monitored since Cassini's arrival to Saturn in 2004. The data appear in a paper published this week in the journal *Nature*.

"Cassini shows us that Saturn is bipolar," said Andrew Ingersoll, an author of the study and a Cassini imaging team member at the California Institute of Technology in Pasadena, Calif. "Saturn is not like Earth and Jupiter, where storms are fairly frequent. Weather on Saturn appears to hum along placidly for years and then erupt violently. I'm excited we saw weather so spectacular on our watch."

At its most intense, the storm generated more than 10 lightning flashes per second. Even with millisecond resolution, the spacecraft's radio and plasma wave instrument had difficulty separating individual signals during the most intense period. Scientists created a sound file from data obtained on March 15 at a slightly lower intensity period.

Cassini has detected 10 lightning storms on Saturn since the spacecraft entered the planet's orbit and its southern hemisphere was experiencing summer, with full solar illumination not shadowed by the rings. Those storms rolled through an area in the southern hemisphere dubbed "Storm Alley." But the sun's illumination on the hemispheres flipped around August 2009, when the northern hemisphere began experiencing spring.

"This storm is thrilling because it shows how shifting seasons and solar illumination can dramatically stir up the weather on Saturn," said Georg Fischer, the paper's lead author and a radio and plasma wave science team member at the Austrian Academy of Sciences in Graz. "We have been observing storms on Saturn for almost seven years, so tracking a storm so different from the others has put us at the edge of our seats."

The storm's results are the first activities of a new "Saturn Storm Watch" campaign. During this effort, Cassini looks at likely storm locations on Saturn in between its scheduled observations. On the same day that the radio and plasma wave instrument detected the first lightning, Cassini's cameras happened to be pointed at the right location as part of the campaign and captured an image of a small, bright cloud. Because analysis on that image was not completed immediately, Fischer sent out a notice to the worldwide amateur astronomy community to collect more images. A flood of amateur images helped scientists track the storm as it grew rapidly, wrapping around the planet by late January 2011.

The new details about this storm complement atmospheric disturbances described recently by scientists using Cassini's composite infrared spectrometer and the European Southern Observatory's Very Large Telescope. The storm is the biggest observed by spacecraft orbiting or flying by Saturn. NASA's Hubble Space Telescope captured images in 1990 of an equally large storm.

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. NASA's Jet Propulsion Laboratory in Pasadena manages the mission for the agency's Science Mission Directorate in Washington. The radio and plasma wave science team is based at the University of Iowa, Iowa City, where the instrument was built. The imaging team is based at the Space Science Institute in Boulder, Colo. JPL is a division of the California Institute of Technology, Pasadena.

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

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **NASA/Jet Propulsion Laboratory**.

Journal Reference:

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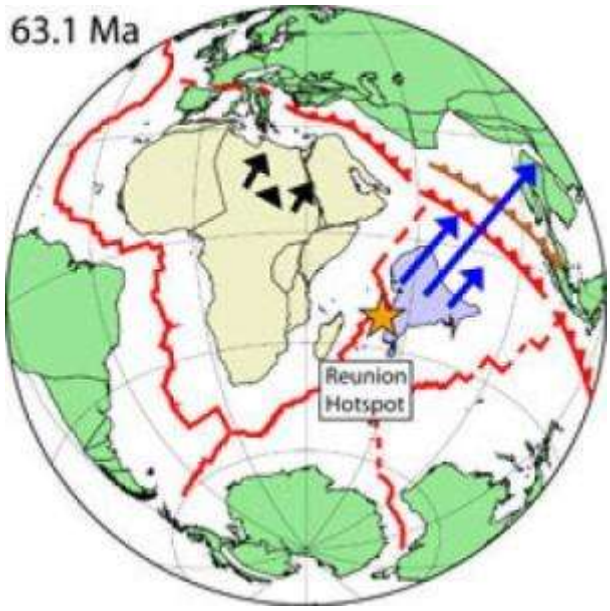
http://www.sciencedaily.com/releases/2011/07/110706143305.htm

New Force Driving Earth's Tectonic Plates



Reconstruction of the Indo-Atlantic Ocean at 63 million years, during the time of the superfast motion of India which Scripps scientists attribute to the force of the Reunion plume head. The arrows show the relative convergence rate of Africa (black arrows) and India (dark blue) relative to Eurasia before, during and after (from left to right) the period of maximum plume head force. The jagged red and brown lines northeast of India show two possible positions of the trench (the subduction zone) between India and Eurasia depending on whether the India-Eurasia collision occurred at 52 million years or 43 million years. (Credit: Scripps Institution of Oceanography, UC San Diego)

ScienceDaily (July 6, 2011) — Bringing fresh insight into long-standing debates about how powerful geological forces shape the planet, from earthquake ruptures to mountain formations, scientists at Scripps Institution of Oceanography at UC San Diego have identified a new mechanism driving Earth's massive tectonic plates.

Scientists who study tectonic motions have known for decades that the ongoing "pull" and "push" movements of the plates are responsible for sculpting continental features around the planet. Volcanoes, for example, are generally located at areas where plates are moving apart or coming together. Scripps scientists Steve Cande and Dave Stegman have now discovered a new force that drives plate tectonics: Plumes of hot magma pushing up from Earth's deep interior. Their research is published in the July 7 issue of the journal *Nature*.

Using analytical methods to track plate motions through Earth's history, Cande and Stegman's research provides evidence that such mantle plume "hot spots," which can last for tens of millions of years and are active today at locations such as Hawaii, Iceland and the Galapagos, may work as an additional tectonic driver, along with push-pull forces.

Their new results describe a clear connection between the arrival of a powerful mantle plume head around 70 million years ago and the rapid motion of the Indian plate that was pushed as a consequence of overlying the plume's location. The arrival of the plume also created immense formations of volcanic rock now called the "Deccan flood basalts" in western India, which erupted just prior to the mass extinction of dinosaurs. The Indian continent has since drifted north and collided with Asia, but the original location of the plume's arrival has remained volcanically active to this day, most recently having formed Réunion island near Madagascar.

The team also recognized that this "plume-push" force acted on other tectonic plates, and pushed on Africa as well but in the opposite direction.

"Prior to the plume's arrival, the African plate was slowly drifting but then stops altogether, at the same time the Indian speeds up," explains Stegman, an assistant professor of geophysics in Scripps' Cecil H. and Ida M. Green Institute of Geophysics and Planetary Physics. "It became clear the motion of the Indian and African plates were synchronized and the Réunion hotspot was the common link."

After the force of the plume had waned, the African plate's motion gradually returned to its previous speed while India slowed down.

"There is a dramatic slow down in the northwards motion of the Indian plate around 50 million years ago that has long been attributed to the initial collision of India with the Eurasian plate," said Cande, a professor of marine geophysics in the Geosciences Research Division at Scripps. "An implication of our study is that the slow down might just reflect the waning of the mantle plume-the actual collision might have occurred a little later."

Funding for the research was provided by the National Science Foundation.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Scripps Institution of Oceanography, University of California - San Diego**.

Journal Reference:

1. Steven C. Cande, Dave R. Stegman. **Indian and African plate motions driven by the push force of the Réunion plume head**. *Nature*, 2011; 475 (7354): 47 DOI: 10.1038/nature10174

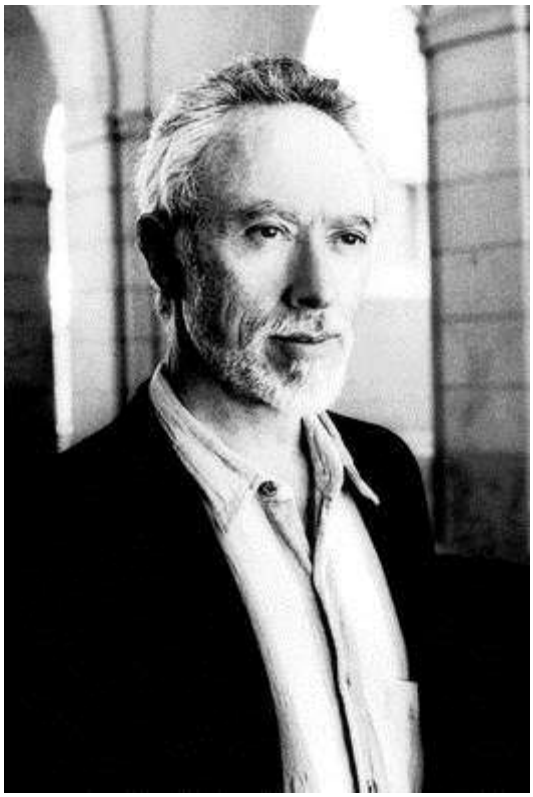
http://www.sciencedaily.com/releases/2011/07/110706134139.htm

Cruelty in Fact and Fiction

By ADAM ROSS

The Fatal Shore

By Robert Hughes (1986)



Jerry Bauer/AFP/Getty Images

The novelist won his second Booker Prize for 'Disgrace.'

Lyrical and often horrifying, this masterpiece recounts Australia's founding in all its Brueghel-like detail. Britain, with an exploding crime rate at the turn of the 18th century and its jails crammed past capacity with mostly minor felons, arrived at a solution: the establishment of an antipodal maximum-security prison whose perimeters were on the other side of the world and guarded by the thundering Pacific. The policy had a name, "transportation," that only the most semantically inventive and dehumanizing bureaucracy could dream up. The "hell ships" that made the eight-month voyage delivered their cargo to a lifetime sentence of forced labor, rape and unendurable deprivations, all under constant threat of the lash. The penal settlements spawned sadists who invented tortures rivaling any gulag's. In the end, a country was founded, but the aboriginal population was nearly wiped out. "Cruelty," Hughes writes, "is an appetite that grows with feeding."

The Lime Twig

By John Hawkes (1961)

The plot of this hallucinatory novel is as streamlined as a Hollywood pitch: A group of desperate men in post-World War II England steal a racehorse to substitute it in another race. The scheme is the brainchild of Michael Banks, who dreams of a better life for himself and his wife. But when a gang takes him under its wing, he is instantly seduced by the hedonism of the underworld. The novel's title provides the central theme: A lime twig is a bird trap that can also trap the soul. And as Michael becomes more deeply enmeshed in the caper, his wife falls into jeopardy as well. His cruelty is of the unwitting kind: He loses sight of her in his pursuit of fast money at high stakes, and it is his neglect that brings disaster down on her.

The Journals of John Cheever

Edited by Robert Gottlieb (1991)

'In middle age there is mystery, there is mystification," John Cheever begins the journals he kept religiously for some 30 years. The entries reveal the underbelly of his stories and novels, producing along the way an epic and unflinching self-portrait. Cheever guarded the journals fiercely while alive, stipulating only a posthumous publication. He is brutally honest about his doubts, whether over his writing or his sexuality, and freely describes his countless affairs with men and women alike; and he unwaveringly chronicles the ravages of his alcoholism. Above and beyond these painful motifs, however, there is the story of his difficult, lifelong marriage to Mary Cheever, a woman who suffers all his ambivalences and sins and whose sorrow occasionally peeks through the cracks of her husband's cruelty. She tells him: "I am going away. I will take a little apartment and live there with the children. You are torturing me to death. You are torturing me to death."

Tiger, Tiger

By Margaux Fragoso (2011)

Margaux Fragoso's unyielding examination of her 15-year relationship with her victimizer, Peter Curran, is not for the faint of heart. Fragoso was 7 years old when she introduced herself to the 51-year-old at a public swimming pool in Union City, N.J., saying innocently: "Can I play with you?" As Curran—who eventually committed suicide—nurtures a horrible privacy with the little girl, readers will constantly fight the urge to recoil. His predatory behavior has devastating effects on her, of course, from depression to emotional isolation and, most heart-rending of all, an inability to distinguish between authentic love and the perversions to which the author had grown accustomed. Yet readers may well deduce that a subtler and perhaps causative cruelty played a part in this story—namely the role of the writer's parents. By continually putting her at the center of their own fraught relationship—causing their daughter to yearn for stable adult love—they had made her vulnerable to a predator's sinister affections.

Disgrace

By J.M. Coetzee (1999)

In post-apartheid South Africa, this novel's protagonist, a professor named David Lurie, flees to his daughter Lucy's farm to escape the scandal provoked by his affair with a student. After years of disaffection, David and Lucy enjoy a rapprochement. But after an attack in which Lucy is sexually assaulted, they are forced to re-examine their relationships with both each other and their homeland. J.M. Coetzee is insightful about the violence at the heart of male sexuality and about the unbridgeable distance between parents and children. Finally, though, "Disgrace" is a meditation on cruelty, whether that inflicted by state-sponsored apartheid or by South Africans reclaiming their country or by the owners of the animals rescued by the shelter where David volunteers. Despite cruelty's depredations, though, Coetzee ultimately shows us that a path to redemption can be found.

—Mr. Ross is the author of the novel "Mr. Peanut," now available in paperback, and of the story collection "Ladies and Gentlemen," published in June.

http://online.wsj.com/article/SB10001424052702303365804576434310686222184.html?mod=WSJ_Books_LS_Books_6

Hydrogen Peroxide Found in Space

The colorful Rho Ophiuchi star formation region, about 400 light-years from Earth, contains very cold (around -250 degrees Celsius), dense clouds of cosmic gas and dust, in which new stars are being born. The clouds are mostly made of hydrogen, but contain traces of other chemicals, and are prime targets for astronomers hunting for molecules in space. Astronomers using the APEX telescope to observe this region discovered hydrogen peroxide molecules in interstellar space for the first time, in the area marked with the red circle. This is also a rich region for amateur observations. Rho Ophiuchi itself is the bright star near the top of the image. The bright yellowish star in the bottom left is Antares, one of the brightest stars in the sky. Below and to Antares' right is the globular cluster Messier 4. This image of the region was obtained from the Paranal Observatory by observing with a 10-cm Takahashi FSQ106Ed f/3.6 telescope and a SBIG STL CCD camera, using a NJP160 mount. Images were collected through three different filters (B, V and R) and then stitched together. It was originally created as part of ESO's Gigagalaxy Zoom project. (Credit: ESO/S. Guisard (www.eso.org/~sguisard))

ScienceDaily (July 6, 2011) — Molecules of hydrogen peroxide have been found for the first time in interstellar space. The discovery gives clues about the chemical link between two molecules critical for life: water and oxygen. On Earth, hydrogen peroxide plays a key role in the chemistry of water and ozone in our planet's atmosphere, and is familiar for its use as a disinfectant or to bleach hair blonde. Now it has been detected in space by astronomers using the European Southern Observatory-operated APEX telescope in Chile.

An international team of astronomers made the discovery with the Atacama Pathfinder Experiment telescope (APEX), situated on the 5000-metre-high Chajnantor plateau in the Chilean Andes. They observed a region in our galaxy close to the star Rho Ophiuchi, about 400 light-years away. The region contains very cold (around -250 degrees Celsius), dense clouds of cosmic gas and dust, in which new stars are being born. The clouds are mostly made of hydrogen, but contain traces of other chemicals, and are prime targets for astronomers hunting for molecules in space. Telescopes such as APEX, which make observations of light at millimetre- and submillimetre-wavelengths, are ideal for detecting the signals from these molecules.

Now, the team has found the characteristic signature of light emitted by hydrogen peroxide, coming from part of the Rho Ophiuchi clouds.

"We were really excited to discover the signatures of hydrogen peroxide with APEX. We knew from laboratory experiments which wavelengths to look for, but the amount of hydrogen peroxide in the cloud is just one molecule for every ten billion hydrogen molecules, so the detection required very careful observations," says Per Bergman, astronomer at Onsala Space Observatory in Sweden. Bergman is lead author of the study, which is published in the journal *Astronomy & Astrophysics*.

Hydrogen peroxide (H2O2) is a key molecule for both astronomers and chemists. Its formation is closely linked to two other familiar molecules, oxygen and water, which are critical for life. Because much of the water on our planet is thought to have originally formed in space, scientists are keen to understand how it is created [1].

Hydrogen peroxide is thought to form in space on the surfaces of cosmic dust grains -- very fine particles similar to sand and soot -- when hydrogen (H) is added to oxygen molecules (O2). A further reaction of the hydrogen peroxide with more hydrogen is one way to produce water (H2O). This new detection of hydrogen peroxide will therefore help astronomers better understand the formation of water in the Universe.

"We don't understand yet how some of the most important molecules here on Earth are made in space. But our discovery of hydrogen peroxide with APEX seems to be showing us that cosmic dust is the missing ingredient in the process," says Berengere Parise, head of the Emmy Noether research group on star formation and astrochemistry at the Max-Planck Institute for Radio Astronomy in Germany, and a co-author of the paper.

To work out just how the origins of these important molecules are intertwined will need more observations of Rho Ophiuchi and other star-forming clouds with future telescopes such as the Atacama Large Millimeter/submillimeter Array (ALMA) -- and help from chemists in laboratories on Earth.

APEX is a collaboration between the Max-Planck Institute for Radio Astronomy (MPIfR), the Onsala Space Observatory (OSO) and ESO. The telescope is operated by ESO.

Notes:

[1] The new discovery of hydrogen peroxide may also help astronomers understand another interstellar mystery: why oxygen molecules are so hard to find in space. It was only in 2007 that oxygen molecules were first discovered in space, by the satellite Odin.

This research is published in the journal *Astronomy & Astrophysics*.

The team is composed of P. Bergman (Onsala Space Observatory, Chalmers University of Technology, Onsala, Sweden), B. Parise (Max-Planck Institute for Radio Astronomy, Bonn, Germany), R. Liseau (Chalmers University of Technology, Onsala, Sweden), B. Larsson (Stockholm University, Sweden), H. Olofsson (Onsala Space Observatory, Chalmers University of Technology), K. M. Menten (Max-Planck Institute for Radio Astronomy) and R. Gusten (Max-Planck Institute for Radio Astronomy).

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **European Southern Observatory - ESO**.

Journal Reference:

1. P. Bergman, B. Parise, R. Liseau, B. Larsson, H. Olofsson, K. M. Menten, R. Güsten. **Detection of interstellar hydrogen peroxide**. *Astronomy & Astrophysics*, 2011; 531: L8 DOI: 10.1051/0004-6361/201117170

http://www.sciencedaily.com/releases/2011/07/110706093854.htm

Research and Politics

August 12, 2011

In the late 1990s, Raymond Bradley, a climatologist at the University of Massachusetts at Amherst, collaborated with two researchers on a pair of studies that altered the dialogue on climate change. The studies, a collaboration between Bradley, a geophysicist named Michael Mann (then finishing up his Ph.D. at Yale University) and University of Arizona climatologist Malcolm Hughes, presented evidence of global climate change over the past millennium and set off a political firestorm. The work was widely cited by those who (like the vast majority of scientists) take climate change seriously, but was doubted by skeptics of climate.

The study that caused the greatest uproar was a comparison of climate change going back to the year 1000. The results were represented by a line graph shaped like a hockey stick, which has become iconic in the debate over global warming -- even as the scholars noted many limitations in their work.

In a new book, *Global Warming and Political Intimidation: How Politicians Cracked Down on Scientists as the Earth Heated Up* (University of Massachusetts Press), he describes how his work made him a target for conservative politicians. "The hockey stick scientific debate is over," he writes, "but government interference in science at the state, local, and national levels remains a contentious issue in the United States and must not be ignored."

Bradley responded via e-mail to questions about the book.

Q: What are some of the lessons other scientists could draw from your experience? Do you think they could do more to engage the public, educate politicians, or be politically active?

A: First, scientists should be aware that they are no longer working in an academic bubble. Regrettably, politics intrudes on almost all aspects of our research nowadays. This has been driven by ideologues on the right and the left, and fueled by the easy access to data and records on the Internet. Of course, this is especially true of issues that may have some economic significance ... but few issues are very far from such considerations anymore. Having said that, scientists should not hesitate to respond to attacks on their credentials if the attacks come from politicians or political organizations.

Scientists can certainly do more to explain their research, by writing articles for popular science magazines and giving lectures to local organizations. And we should all make contact with politicians and their staff, to let them know what we are working on. Most federal politicians have a staff member who is responsible for science and technology matters.

As for combating the pervasive influence of lobbyists and well-funded political action committees, all we can really do is publish our research without exaggerating the implications, but make sure as many people as possible find out about it. Often, university press officers can be helpful in putting out summaries of important research, and making it accessible to the general public. In the end, the public must make decisions about what are the important issues, and make their influence known through the ballot box.

Q: Can graduate programs better prepare scientists for the kinds of political encounters they are likely to have?

A: It would be a good idea for departments to offer a graduate seminar, where issues about how to engage the public, and policy makers could be discussed. It might be enlightening for students to listen to some Congressional hearings and get a sense of how the political system works (or doesn't work…).

Q: The debate around your study looking at past climate patterns seemed to explode after you extended it to include projections going all the way back to 1000. In hindsight, do you think this was overreaching? From a purely political standpoint, did this hurt the case for climate change?

A: Our reconstruction of temperatures over the last 1000 years was titled, "Northern Hemisphere temperatures during the past millennium: inferences, uncertainties, and limitations" (*Geophysical Research Letters* 26, 759–762; 1999). In the abstract, we stated: "We focus not just on the reconstructions, but on the uncertainties therein, and important caveats" and noted that "expanded uncertainties prevent decisive conclusions for the period prior to AD 1400." We concluded by stating: "more widespread high-resolution data are needed before more confident conclusions can be reached."

It is hard to imagine how much more explicit we could have been about the uncertainties in the reconstruction; indeed, that was the point of the article! So, the topic of the paper had very little to do with the subsequent furor that surrounded it. One figure from our paper was selected for use in the Intergovernmental Panel on Climate Change's "Summary for Policy-Makers." Because it was a rather compelling image (easy to understand) it was reproduced in many magazines and newspapers, and quickly became an icon for the IPCC's message that human activity was affecting climate. Those opposed to legislation that would set controls on greenhouse gas emissions thus decided to try and destroy the credibility of our research, in order to cast doubt on the entire IPCC report.

The idea that the conclusions of the IPCC rested entirely on our study was absolutely ridiculous, but from a political point of view, they had a good strategy. By creating the impression that there was something bad about our research, they cast a shadow over the entire IPCC Report. In that sense, I don't think the politicians had any real interest in what our research showed — the attacks on our reputations were just a way to get the media to report on a controversy. This was reinforced by a few trivial errors in the IPCC Report, and the hacked e-mails from the University of East Anglia. This all contributed to the overall plan, to cast doubt on the quality of the IPCC Report, and the supposed ulterior motivations of climate scientists, in order to stall policies on controlling greenhouse gas emissions. And it worked very well. In the United States, no legislation has been passed, and currently nothing is even being considered.

Q: How could you have done things differently?

A: I don't think we could have written the papers any differently; they were peppered with caveats and presented what was essentially a working hypothesis for others to test. And that has been done many times since 1999, with very little that changes our basic conclusions.

Q: How did the hockey stick debate change your attitude about politicians and their role in scientific research?

A: Until this experience, I had not had much interaction with politicians. But this experience opened my eyes to how industry money and extreme political ideology now drive our political system. In fact, I believe there is a fundamental problem with our Congressional system as it now stands. Far too much power is in the hands of a few committee chairs; they have significant budgets, so can hire a large staff, some of whom can be assigned to harass people if that seems to be politically expedient. They can demand records, and even subpoena individuals, or hold that prospect over their heads as a looming threat. Hearings are no longer held to objectively examine and understand an issue; they are political theater, where witnesses are selected to spin the story that those controlling the committees want heard. And committee chairs can simply refuse to consider an issue, if that is politically useful. Needless to say, these individuals attract huge financial support from vested interests. It is not an exaggeration to say that our system has been hijacked by those with specific financial interests, who sponsor key politicians to ensure their interests are promoted.

Q: How much has changed since the beginning of the Obama presidency? How prevalent are some of the problems you mentioned in the book today, with Democrats in control of the executive branch and the Senate?

A: It is astonishing to see how discussion of human-induced climate change has disappeared from the political debate. In fact, for the right wing, the topic has become completely off-limits for aspiring politicians. Those seeking the Republican nomination for president are afraid to address the matter. Meanwhile, Democrats have also dropped the topic, seemingly accepting the notion that we can't afford to deal with it while the economy is in a mess. Ironically, many studies have shown that taking steps to control greenhouse gases can be very good for economic growth, leading to new industries and job creation. President Obama occasionally alludes to this, in talking about "green jobs," but he almost never ties this to climate change. No doubt this will all change (again) when the next Katrina-size hurricane hits the U.S., or some other climate-related disaster grabs the media's and the public's attention.

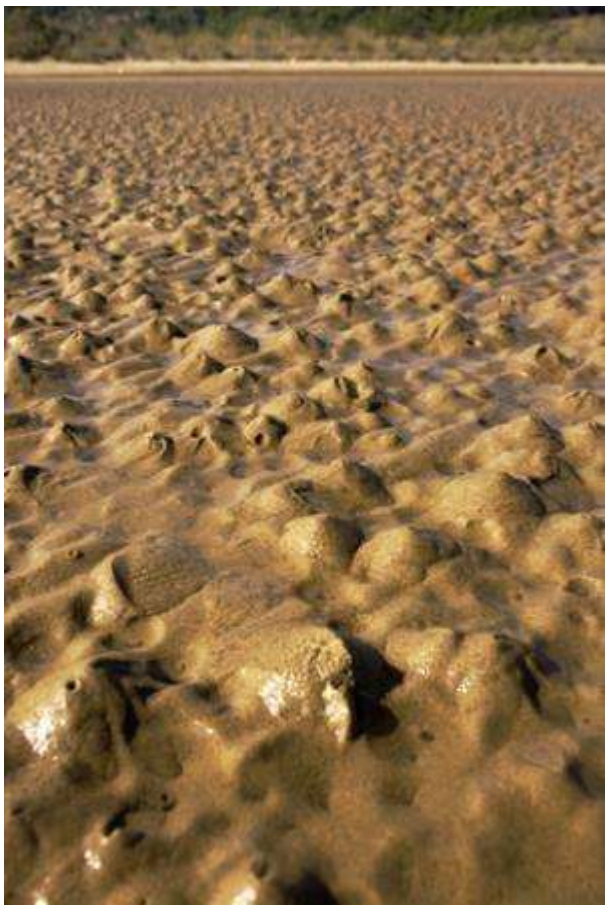
Q: Do you see the same kind of government interference in other scientific fields? What will the next "hockey stick debate" be about?

A: Those who feel that a particular line of research may affect the profitability of a company, and those who have a strong ideological belief that all legislation is unnecessary (free market fundamentalists) have a well-developed strategy: if they don't like the message of science, they target the messengers. This is happening in many areas of science, and so we have to be aware that intimidation and harassment of scientists is often used for political purposes. It appears that the latest example is the suspension and investigation of a scientist who reported his observations about drowned polar bears north of Alaska. He has had to defend his study in a sworn deposition to investigating attorneys. Now he is being investigated for his handling of government contracts. Could this have anything to do with the oil industry's push to drill off the north coast of Alaska, versus the proposal to declare polar bears an endangered species? It seems to me that this is a perfect example of another scientist being intimidated and harassed, for (im)purely political reasons.

— Derek Quizon

http://www.insidehighered.com/news/2011/08/12/climate_change_q_a

How Hot Did Earth Get in the Past? Team of Scientists Uncovers New Information



Modern day clam bed. New research sheds light on Earth's temperature approximately 50 million years ago. The findings are based on a chemical analysis of the growth rings of the shells of fossilized bivalve mollusks and on the organic materials trapped in the sediment packed inside the shells. (Credit: © bepsphoto / Fotolia)

ScienceDaily (July 6, 2011) — The question seems simple enough: What happens to Earth's temperature when atmospheric carbon dioxide levels increase? The answer is elusive. However, clues are hidden in the fossil record. A new study by researchers from Syracuse and Yale universities provides a much clearer picture of Earth's temperature approximately 50 million years ago when CO_2 concentrations were higher than today. The results may shed light on what to expect in the future if CO_2 levels keep rising.

The study, which for the first time compared multiple geochemical and temperature proxies to determine mean annual and seasonal temperatures, is published online in the journal *Geology*, published by the Geological Society of America, and is forthcoming in print Aug. 1.

SU Alumnus Caitlin Keating-Bitonti '09 is the corresponding author of the study. She conducted the research as an undergraduate student under the guidance of Linda Ivany, associate professor of earth sciences, and Scott Samson, professor of earth sciences, both in Syracuse University's College of Arts and Sciences. Early results led the team to bring in Hagit Affek, assistant professor of geology and geophysics at Yale University, and Yale Ph.D. candidate Peter Douglas for collaborative study. The National Science Foundation and the American Chemical Society funded the research.

"The early Eocene Epoch (50 million years ago) was about as warm as the Earth has been over the past 65 million years, since the extinction of the dinosaurs," Ivany says. "There were crocodiles above the Arctic Circle and palm trees in Alaska. The questions we are trying to answer are how much warmer was it at different latitudes and how can that information be used to project future temperatures based on what we know about CO_2 levels?"

Previous studies have suggested that the polar regions (high-latitude areas) during the Eocene were very hot -- greater than 30 degrees centigrade (86 degrees Fahrenheit). However, because the sun's rays are strongest at Earth's equator, tropical and subtropical areas (lower latitude) will always be at least as warm as polar areas, if not hotter. Until now, temperature data for subtropical regions were limited.

The SU and Yale research team found that average Eocene water temperature along the subtropical U.S. Gulf Coast hovered around 27 degrees centigrade (80 degrees Fahrenheit), slightly cooler than earlier studies predicted. Modern temperatures in the study area average 75 degrees Fahrenheit. Additionally, the scientists

discovered that, during the Eocene, temperatures in the study area did not change more than 3 to 5 degrees centigrade across seasons, whereas today, the area's seasonal temperatures fluctuate by 12 degrees centigrade. The new results indicate that the polar and sub-polar regions, while still very warm, could not have been quite as hot as previously suggested.

The findings are based on a chemical analysis of the growth rings of the shells of fossilized bivalve mollusks and on the organic materials trapped in the sediment packed inside the shells, which was conducted by Keating-Bitonti and her colleagues. Ivany collected the fossils from sediment layers exposed along the Tombigbee River in Alabama. The mollusks lived in a near-shore marine environment during a time when the sea level was higher and the ocean flooded much of southern Alabama. The sediments that accumulated there contain one of the richest and best-preserved fossil records in the country.

"Our study shows that previous estimates of temperatures during the early Eocene were likely overestimated, especially at higher latitudes near the poles," Keating-Bitonti says. "The study does not mean elevated atmospheric CO_2 levels did not produce a greenhouse effect -- the Earth was clearly hotter during the early Eocene. Our results support predictions that increasing levels of atmospheric CO_2 will result in a warmer climate with less seasonality across the globe."

To determine the average seasonal temperatures in the study area, Keating-Bitonti sampled the mollusk shells for high-resolution oxygen and strontium isotope analyses, which were done at SU. The Yale team analyzed shells and sediments for clumped-isotope and tetraether-lipid analysis. The results were consistent across all of the independent analytic methods. The scientists believe the multiple methods of analysis have yielded a more complete and accurate picture of ancient climate than previously possible.

The study also marks the first time clumped-isotope analysis has been used alongside traditional oxygen isotope and organic geochemical analyses in paleoclimate work. The research team is currently using the same analytical process to determine Eocene Epoch mean annual and seasonal temperatures in polar-regions.

"Clumped isotopes is a new way to measure past temperatures that offers a distinct advantage over other approaches because the technique requires fewer assumptions; it's based on well understood physics," Affek says. "The agreement among different methods gives us confidence in the results and enables us to use these methods in other locations, such as Antarctica."

Keating-Bitonti recently completed a master's degree in geology at the University of Wisconsin and will be continuing her studies at Stanford University as a Ph.D. student in the Department of Geological and Environmental Sciences, School of Earth Sciences.

Story Source:

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

Journal Reference:

1. C. R. Keating-Bitonti, L. C. Ivany, H. P. Affek, P. Douglas, S. D. Samson. **Warm, not super-hot, temperatures in the early Eocene subtropics**. *Geology*, 2011; DOI: 10.1130/G32054.1

http://www.sciencedaily.com/releases/2011/07/110705183847.htm

Environs Prompt Advantageous Gene Mutations as Plants Grow; Changes Passed to Progeny

Research shows that if a person were to climb a towering redwood and take a sample from the top and a sample from the bottom of the tree, a comparison would show that the two DNA samples are different. (Credit: © Galyna Andrushko / Fotolia)

ScienceDaily (July 5, 2011) — If a person were to climb a towering redwood and take a sample from the top and a sample from the bottom of the tree, a comparison would show that the two DNA samples are different.

Christopher A. Cullis, chair of biology at Case Western Reserve University, explains that this is the basis of his controversial research findings.

Cullis, who has spent over 40 years studying mutations within plants, most recently flax (*Linum usitatissimum*), has found that the environment not only weeds out harmful and useless mutations through natural selection, but actually influences helpful mutations.

Cullis published his findings in the *International Journal of Genetics and Molecular Biology* and repeated them in the *Journal of Visualized Experiments*, where he challenged other scientists to repeat his experiment themselves.

Specifically, Cullis focuses on mutations involving the appearance of a small sequence of DNA known as LIS-1 and how the environment affects these changes.

The controversy stems from the idea that the environment changes organisms as they grow and these changes are passed on.

While originally accepted, the theory was eventually thrown out because science revealed that animals pass along DNA through their gamete or sex cells, which are not affected by the environment. This concept was assumed to be the same for plants, but Cullis's research says otherwise.

In his second study, three separate strands (the plastic strand, short strand, and tall strand) of the Stormont Cirrus variety of flax were grown under three separate conditions.

Each of the strands had been bred over multiple generations under different conditions: The plastic strand's ancestors were grown under control conditions, the short strand's ancestors were grown under low-nutrient conditions, and the tall strand's ancestors were grown under high-nutrient conditions.

The experiment showed each strand responded to each condition in a different way, corresponding to the environment its ancestors were grown in. The plastic strand outgrew the other strands under control conditions, the short strand outgrew the other strands when few nutrients were available, and the tall strand grew best when nutrients were readily available.

All this information does not completely explain Cullis's assertion that the environment can in a single generation help sift out the useful mutations.

This is where polymerase chain reaction (PCR) amplification of DNA comes in. Through this process, the researchers could see when a specific DNA sequence (in this case LIS-1) appears or disappears.

When the plastic strand is grown under low nutrient conditions, the LIS-1 sequence, which had been absent, appears and continues for future generations. Since the LIS-1 sequence helps plants survive when there is a shortage of nutrients, its presence helps confirm Cullis's belief that the environment can act on how a plant mutates and keep helpful mutations, even within one generation.

These findings help explain why the top of a redwood is genetically different from the bottom. Young redwoods grow by the tips of the existing branches budding into meristems. Each new meristem is different from the tree because the environment has affected its genetic makeup. And as the redwood grows, the top becomes more and more genetically different from the bottom.

Due to the controversy surrounding Cullis's findings, many scientists are hesitant to accept them as true. Cullis himself recalls at first being skeptical and thinking, "If this really works… [we can] get a plant that's better adapted to its environment in one generation."

These adapted plants have practical uses. Cullis hopes to identify the specific gene sequence responsible for flax's ability to withstand harsh environments and insert it into the DNA sequence of other plants so that they too can withstand trying environments.

This would bypass the current method of genetically engineering plants, which involves isolating specific DNA sequences that control heat-resistance, cold-resistance, pest-resistance, etc., and instead narrows the effort down to one DNA sequence.

By inserting this sequence into the plant and growing it in a specific trying environment, scientists could make the plant resistant to what they want. All of that plant's offspring would be adapted to the environment and ready to grow.

By making the plant do all the work, the price of producing better crops would be greatly reduced. This would greatly benefit developing nations that need a large supply of food in an otherwise harsh environment. The DNA sequence may no longer just help the plant survive, but can now help entire countries thrive.

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. The original article was written by Kyle Smith.

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http://www.sciencedaily.com/releases/2011/07/110701121627.htm

Hot Springs Microbe Yields Record-Breaking, Heat-Tolerant Enzyme

A 94°C geothermal pool, with a level-maintaining siphon, near Gerlach, Nevada. Sediment from the floor of this pool was enriched on pulverized miscanthus at 90°C and subsequently transferred to filter paper in order to isolate microbes able to subsist on cellulose alone. (Credit: Frank Robb, University of Maryland School of Medicine)

ScienceDaily (July 5, 2011) — Bioprospectors from the University of California, Berkeley, and the University of Maryland School of Medicine have found a microbe in a Nevada hot spring that happily eats plant material -- cellulose -- at temperatures near the boiling point of water.

In fact, the microbe's cellulose-digesting enzyme, called a cellulase, is most active at a record 109 degrees Celsius (228 degrees Fahrenheit), significantly above the 100°C (212°F) boiling point of water.

This so-called hyperthermophilic microbe, discovered in a 95°C (203°F) geothermal pool, is only the second member of the ancient group Archaea known to grow by digesting cellulose above 80°C. And the microbe's cellulase is the most heat tolerant enzyme found in any cellulose-digesting microbe, including bacteria.

"These are the most thermophilic Archaea discovered that will grow on cellulose and the most thermophilic cellulase in any organism," said coauthor Douglas S. Clark, UC Berkeley professor of chemical and biomolecular engineering. "We were surprised to find this bug in our first sample."

Clark and coworkers at UC Berkeley are teaming with colleagues, led by Frank T. Robb, at the University of Maryland (U-Md) School of Medicine in Baltimore, to analyze microbes scooped from hot springs and other extreme environments around the United States in search of new enzymes that can be used in extreme industrial processes, including the production of biofuels from hard-to-digest plant fiber. Their team is

supported by a grant from the Energy Biosciences Institute (EBI), a public-private collaboration that includes UC Berkeley, in which bioscience and biological techniques are being applied to help solve the global energy challenge.

"Our hope is that this example and examples from other organisms found in extreme environments -- such as high-temperature, highly alkaline or acidic, or high salt environments -- can provide cellulases that will show improved function under conditions typically found in industrial applications, including the production of biofuels," Clark said.

Clark, Robb and their colleagues, including UC Berkeley professor Harvey W. Blanch and postdoctoral researcher Melinda E. Clark, and U-Md postdoctoral researcher Joel E. Graham, will publish their results on July 5, in the online-only journal *Nature Communications.*

Many industrial processes employ natural enzymes, some of them isolated from organisms that live in extreme environments, such as hot springs. The enzyme used in the popular polymerase chain reaction to amplify DNA originally came from a thermophilic organism found in a geyser in Yellowstone National Park.

But many of these enzymes are not optimized for industrial processes, Clark said. For example, a fungal enzyme is currently used to break down tough plant cellulose into its constituent sugars so that the sugars can be fermented by yeast into alcohol. But the enzyme's preferred temperature is about 50^{o}C (122^{o}F), and it is not stable at the higher temperatures desirable to prevent other microbes from contaminating the reaction.

Hence the need to look in extreme environments for better enzymes, he said.

"This discovery is interesting because it helps define the range of natural conditions under which cellulolytic organisms exist and how prevalent these bugs are in the natural world," Clark said. "It indicates that there are a lot of potentially useful cellulases in places we haven't looked yet."

Robb and his colleagues collected sediment and water samples from the 95^{o}C (203^{o}F) Great Boiling Springs near the town of Gerlach in northern Nevada and grew microbes on pulverized Miscanthus gigas, a common biofuel feedstock, to isolate those that could grow with plant fiber as their only source of carbon.

After further growth on microcrystalline cellulose, the U-Md and UC Berkeley labs worked together to sequence the community of surviving microbes to obtain a metagenome, which indicated that three different species of Archaea were able to utilize cellulose as food. Using genetic techniques, they plucked out the specific genes involved in cellulose degradation, and linked the most active high-temperature cellulase, dubbed EBI-244, to the most abundant of the three Archaea.

Based on the structure of the enzyme, "this could represent a new type of cellulase or a very unusual member of a previously known family," Clark said.

The enzyme is so stable that it works in hot solutions approaching conditions that could be used to pretreat feedstocks like Miscanthus to break down the lignocelluloses and liberate cellulose. This suggests that cellulases may someday be used in the same reaction vessel in which feedstocks are pretreated.

The newly discovered hyperthermophilic cellulase may actually work at too high a temperature for some processes, Clark said. By collecting more hyperthermophilic cellulases, protein engineers may be able to create a version of the enzyme optimized to work at a lower temperature, but with the robust structural stability of the wild microbe.

"We might even find a cellulase that could be used as-is," he said, "but at least they will give us information to engineer new cellulases, and a better understanding of the diversity of nature."

The EBI partnership, which is funded with $500 million for 10 years from the energy company BP, includes researchers from the UC Berkeley; the University of Illinois at Urbana-Champaign; and the Lawrence Berkeley National Laboratory.

Story Source:

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Journal Reference:

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Why Is Contemporary Art Addicted to Violence?

By LAURA KIPNIS
THE ART OF CRUELTY

A Reckoning

By Maggie Nelson

288 pp. W. W. Norton & Company. $24.95.

Well-meaning laments about violence in the media usually leave me wanting to bash someone upside the head with a tire iron. To begin with, the reformist spirit is invariably aimed down the rungs of cultural idioms, at cartoons, slasher films, pornography, rap music and video games, while the carnage and bloodletting in Shakespeare, Goya and the Bible get a pass. Low-culture violence is literal, while high-culture violence is symbolic or allegorical and subject to critical interpretation. Low-culture violence coarsens us, high-culture violence edifies us. And the lower the cultural form, or the ticket price, or — let's just say it — the presumed education level of the typical viewer, the more depictions of violence are suspected of inducing mindless emulation in their audiences, who will soon re-enact the mayhem like morally challenged monkeys, unlike the viewers of, say, "Titus Andronicus," about whose moral intelligence society is confident.

Maggie Nelson has her laments about violent representations, but in "The Art of Cruelty" she refreshingly aims them largely up the cultural ladder, at the fine arts, literature, theater — even poetry. What interests her is the "full-fledged assault on the barriers between art and life that much 20th-century art worked so hard to perform," often by enlisting violence and cruelty, simulated or actual, including cruelties inflicted physically on the person of the artist, or affectively on the psyches of the audience.

Of course, the aesthetic program of cultural modernism has long been summed up by the maxim épater la bourgeoisie. Rather than taking this directive for granted, Nelson delves into the varieties of cruelty perpetrated on us bourgeois for our supposed betterment, what the art critic Grant Kester has called the "orthopedic aesthetic." The art of cruelty aestheticizes violence, in not necessarily scrupulous ways. It can be reckless and scattershot, provoked by the desire to make others feel as bad as the sufferers of injustice and trauma whose experiences are vicariously borrowed by artists shopping for shocks. It bludgeons audiences into getting the point. It's responsible for a century of art-world Nurse Ratcheds, wielding jolts of aesthetic electroshock therapy and taking unseemly pleasure at rubbing people's noses in pain.

This is an important and frequently surprising book. By reframing the history of the avant-garde in terms of cruelty, and contesting the smugness and didacticism of artist-clinicians like the notorious Viennese Actionist Hermann Nitsch and other heirs of Sade and Artaud, Nelson is taking on modernism's (and postmodernism's) most cherished tenets. After all, aesthetic shock has underwritten most of our cultural innovation for over a century. So this book could be read as the foundation for a post-avant-garde aesthetics, one that, Nelson imagines, "might deliver us . . . to a more sensitive, perceptive, insightful, enlivened, collaborative and just way of inhabiting the earth."

But not so fast with the world-improvement plans. Nelson's punning title reflects a certain duality in her thinking: the dance of indictment is entwined with large doses of appreciation, not to say fascination, with the art of cruelty. She objects to its messianic impulses while being addicted to its frissons; though worried about art that perpetuates the cycle of violence, she's captivated by the brutality of artists like Francis Bacon, a touchstone for the book. She keeps coming back to him as if to an art-world bad boyfriend, circling his oeuvre, obsessing and remonstrating — he amplifies pain unnecessarily, he courts and exalts it — before finally renouncing him over his collages of Algerian body parts, the last straw in their relationship. Except

this provides the opportunity to extol Warhol's car crash and electric chair images instead, because they're "clean and clear — without pretension, without existential apparatus."

Nelson's opinions can be quirky and hard to square with one another, but they never fail to be interesting, quite some accomplishment in what could have been a free-form ramble through the mires of someone else's aesthetic preoccupations. And to say she's contradictory is not a criticism: how exactly should we deal with the knowledge that something ethically squalid can also be exciting?

Hopping like a jackrabbit between genres and media, including forays into the swamps of pop culture, Nelson is strongest when at her most rageful, writing with controlled fury at the anti-intellectualism and crassness of the present. She has no time for fake populism, she's an unabashed cultural elitist: withering about reality TV, Lars von Trier and the middlebrow brutality dispenser Neil LaBute (whose plays she calls "sophomoric" and "weak-minded"). She employs herself as a registering instrument, constantly taking her aesthetic temperature: "I felt angry. Then I felt disgusted. Finally, I felt bored." These reports have a phenomenological brio, laced with physiological detail. She recalls "a kind of vibrating memory of the unnerving psychic state" induced by the video art of Ryan Trecartin. About a Yoko Ono piece, she writes: "I long to see Ono's clothes fall, to see her breasts bared. Yet I also feel a mounting sense of alarm, empathy and injustice in watching her body be made vulnerable." She likes art that makes her morally uncomfortable, and from the laudatory way she quotes Kafka — "What we need are books that hit us like a most painful misfortune" — I assume she wishes to induce the same state in her readers.

Often she does, moving at breakneck speed from real-life political violence to the images of such violence (including those on human rights Web sites), to real violence in performance art (Chris Burden asking a friend to shoot him; Marina Abramovic inviting viewers to injure her), to the violent impulses of artists like Bacon. Occasionally I felt an urge to protest these rather balletic leaps, but Nelson, who is also a poet, is such a graceful writer that I finally just sat back and enjoyed the show. Along with her subjects, Nelson is constantly attenuating the art-life distinction, steering us, for example, from the cruelty of the artist Ana Mendieta's blood-spilling installations to an actual shooting spree by a female college professor, then pausing mid-jeté to deliver a figurative kneecapping to male critics who regard such instances of female violence as a perverse index of gender equality.

Nelson understands that what makes violence so absorbing, as subject and spectacle, is the impossibility of separating what's "out there" from what's "in here," and her distinction-blurring trains of association model the problem. Most of us, as she points out, have "wily reserves of malice, power-mongering, self--centeredness, fear, sadism or simple meanness of spirit." We do occasionally feel the urge to injure and destroy. Nelson is no reformist — in fact, she's wonderfully fearless when it comes to belittling the well meaning, as critical of the "idiot compassion" of social justice seekers (too often patronizing and ineffectual) as she is of the misogynist gore in exploitation films. She suspects that the human condition *is* suffering. The best art dramatizes what happens when ethical impulses collide with the monsters within, but these enactments themselves leave behind a nasty residue.

What do we do with this violent surplus? It's a question that haunts the book. What's not mentioned is that Nelson has written two previous books, a memoir and a poetry-prose collection, about an instance of violence in her own family history: the 1969 murder of an aunt she'd never met, her mother's younger sister. So Nelson has been a practitioner of the art of cruelty, too, transforming violence into a métier. It's exactly these unsaids, the unmastered fascinations being worked out on the page, that make this book so unpredictable and original.

Laura Kipnis is a professor in the radio-TV-film department at Northwestern University. Her most recent book, "How to Become a Scandal," will be released in paperback next month.

http://www.nytimes.com/2011/07/17/books/review/book-review-the-art-of-cruelty-by-maggie-nelson.html?_r=1&nl=books&emc=booksupdateema1

A View Inside King Kong's Perch
By EDWARD ROTHSTEIN

I am pressing against a secure wall, not daring to step away. The wind is whipping against me — or is it howling? My feet feel rubbery on the narrow walkway. I think of those balconies on the upper floors of colonial homes in old ports, where pacing wives would gaze out to sea, seeking the long-overdue ships of sailor husbands: widows' walks. If this particular walk were open to an anxiously pacing public, I can only imagine how many new widows and widowers would be left behind. But I look out, and the vision is literally breathtaking, the Hudson shimmering in the west, and a patch of green off to the north — Central Park — lying just beyond some half-hearted high-rises.

I am standing a floor above the highest observation deck of the Empire State Building just outside a room with cables and communications equipment. The walkway circles around the building's narrow spire, which, in 1930, was envisioned as a mooring mast for dirigibles; as it turned out, only King Kong ever reliably used it for support.

And though the view from the glassed-in deck on the 102nd floor below is almost as remarkable, I am glad that Jean-Yves Ghazi, the director of the observatory, has led me up here, because what I have been made forcefully aware of by the jolts of wind is not the building as completed object, secure and established, dominating the cityscape, but the building as it came to be. Because it was in the midst of these whipping winds and unsettling heights that welders, riveters, steamfitters, bricklayers, marble setters, metal lathers, glaziers and roofers pieced this building together in unforgiving, empty space in an astounding 11 months.

That sense of venture — and adventure — is also the subject of a new, untitled exhibition on the 80th floor, through which three and a half million visitors a year will walk, on their way to the elevators leading upward. It is a modest show of panels and images, taking up just 3,000 square feet, but it is part of a renovation and modernization costing more than $550 million.

That project has made the Art Deco lobby a gleaming display of marble and gilt; it includes the replacement of every window and the remaking of the climate-control system (saving, we are informed, almost 40 percent in energy costs). And it has also given rise to a series of animated panels about its environmental achievements, on display in the ticket area, where adults wait to pay at least $22 each on lines that snake around stanchions.

But this exhibition on the 80th floor does something else. It

is safe to say that visitors to the Empire State Building don't really come to see the building. They come to see the city around it. This show, whose curator is Carol Willis, the founder and director of the Skyscraper Museum, redirects attention from what the building lets us see, to what we see in the building, which is considerable. On its opening on May 1, 1931, we are told, the Empire State "had broken every record in the book in terms of both size and speed of construction."

The windows on the 80th floor do not look out on the cityscape; there is time for that upstairs. Instead they are covered with enlarged, semi-translucent photographs taken during the building's construction in 1930. In one pair of windows we seem to be looking east, toward the river and the rival Chrysler building, finished just months before and doomed to have its height record surpassed. Another window gives us a glimpse of men riveting steel on the 86th floor. A third shows the setting of steel columns in the open air on another nearby floor.

Industriousness abounds, but still, how could the Empire State have been built in so short a time? Within 20 months of the signed contracts with the architects (Shreve, Lamb & Harmon), the building was ready for tenants. Yet it was greater in scale than any yet constructed.

It required 57,000 tons of steel, 10 million bricks, 62,000 cubic yards of concrete and 67 elevators. At one point more than 3,400 workers were employed. And the building grew one story a day. "No comparable structure," we read, "has since matched that rate of ascent."

In her researches for her own museum, Ms. Willis found a typed manuscript on blue-lined graph paper, which she published in facsimile in 1998 in "Building the Empire State."

The manuscript, resembling a notebook and lacking any attribution, is titled "Notes on Construction of Empire State Building" and meticulously annotates the work accomplished and its cost. It seems written by someone associated with the contractor, Starrett Brothers & Eken.

After its publication, heirs of the contractor contacted Ms. Willis, offering a "family scrapbook" of more than 500 photos of the tower's construction. Those photographs are used in this exhibition, images of the building as a work in progress. They are also accompanied by pages from the notebook, with financial accounts. We learn that $15,507.53 was spent on workmen like those portrayed in an adjacent photo, cleaning and pointing limestone. The building's total job cost, one spreadsheet says, was $25,679,772, which amounted to about 71 cents per cubic foot.

Ms. Willis suggests that the speed was a result of teamwork combined with the genius of the contractors. The company's president, Paul Starrett, later wrote of the Empire State: "I doubt that there was ever a more harmonious combination than that which existed between owners, architects, and builder. We were in constant consultation."

But the achievement is still astonishing. The contractors could not rely on previous experience; building taller does not always mean building more of the same. It was noticed, for example, that the 85th floor was six inches lower than it was supposed to be: the weight of the steel had compressed the lower floors.

The exhibition does not cover the building's post-construction life, but Ms. Willis tells us that for all its triumphs, at first the Empire State was "shaping up to be a colossal financial failure." In the early '30s it suffered from an oversupply of office space in the city, a Depression economy and a bad location. In 1933 only a quarter of the space was rented; 56 floors remained empty. It wasn't until after World War II that the building began to flourish.

But there is another aspect of this project worth examining. The construction notebook reveals a remarkable combination of hard-headed calculation and sentimental warmth. At one point the author writes, "Every large construction project exacts its toll of human life." He pays tribute to "fellow-workmen" who died during the

project, six while working on the building. The author even becomes religious, acknowledging "our debt to them," along with our "universal kinship" with the "lowly Carpenter of Nazareth." Was that sense of humble mission part of this project's culture? If so, it could have helped inspire workers and managers alike. Nothing was taken casually.

The Empire State's observatory might benefit from higher ambitions as well. It is fine to describe changing light bulbs to save energy, but it would be more effective if visitors were presented with a context for understanding the history of the building and its place in the city.

And after Ms. Willis's show takes us through the building's construction, why not conclude by turning outward again, toward the city, which so many have come to see? Why not give some sense of the changing urban landscape and its significance? On the observatory deck it would be helpful to see maps of the terrain, identifying major landmarks.

As for the reasons for the extraordinary accomplishments, another clue comes in the notebook. The author, near the end, mentions a quotation from the art critic John Ruskin that "has been used frequently as an inspirational thought." Did it resemble the motivation he offered his team? It would help explain a lot. And it wouldn't hurt if it were mounted today in the exhibition as well:

"When we build, let us think that we build forever. Let it not be for present delight, nor for present use alone; let it be such work as our descendants will thank us for ... and that men will say, as they look upon the labor and wrought substance of them, 'See! this our fathers did for us.' "

The show at the Empire State Building is on permanent view on the 80th floor; esbnyc.com.

http://www.nytimes.com/2011/07/16/arts/design/empire-state-buildings-new-exhibition-review.html?ref=design

At the Met, a Canvas Ahead of Its Time

By ROBERTA SMITH

The one thing I want to do this summer is swing by the 20th-century galleries at the Metropolitan Museum of Art and spend some time with "Strasse auf Helgoland II," a nearly abstract street scene painted in 1924 by the Romanian artist Arthur Segal (1875-1944), who was affiliated with everything from Post Impressionism to Cubo-Futurism, with German Expressionism and Dada in between. Glowing, dramatically shaded geometric planes in tones of brown, blue and green extend outward to cover a wide and ersatz wood frame in this astute and irreverent synthesis of modernist tendencies and tics. It never fails to jolt my eye or remind me that art history is essentially nonlinear and full of overlooked treasures awaiting rediscovery.

This painting, executed in oil on board, entered the Met's collection in 2003 as a gift from the Rolf and Margit Weinberg Foundation in Zurich and is probably the only painting by Segal in a major New York museum.

When I first saw it a few years ago, I was drawn to its stage-set artifice and nearly fluorescent radiance, but mainly I was floored by its 1924 date, which seemed at odds with its freshness. The work's atmospheric checkerboard and found-object frame suggested a remade ready-made that could easily have been by some regular of the mid-1980s East Village art scene: Peter Schuyff, say, or Philip Taaffe or maybe Andrew Masullo.

At the Met "Strasse auf Helgoland II" holds its own in a gallery lined with Cubist works by the likes of Picasso, Braque, Juan Gris and Fernand Léger, artists to whom it is clearly indebted. It may not be earth-shakingly original, but its combination of wit, style and touch are Segal's own and award it an irrefutable integrity.

That may be what it really takes for an artwork to wait out history.

http://www.nytimes.com/2011/07/15/arts/design/arthur-segals-strasse-auf-helgoland-ii-at-the-met.html?ref=design

Past Meets Present in Walk After Dark

By HOLLAND COTTER

Middle of the night is my time, always has been, especially in New York in the summer. The city looks better, sounds better, feels softer, or at least a little less specific. I think and remember better late, or imagine I do.

I thought of all this when I saw a penumbral little summer exhibition at the Met titled "Night Vision: Photography After Dark." Black-and-white photography is a made-for-night medium, and the show covers a lot of New York ground: a misted Midtown illuminated by arc lamps around 1910; Little Italy popping with festival lights in the 1940s; a Lower East Side gallery, open late, all but empty, in 1960, when the downtown art world was still a small, up-all-hours place.

My own favorite city night spot has always been Lower Manhattan, where I lived in the '70s. It was deserted after Wall Street shut down for the day. And because the wiring in our tenement was too funky for air-conditioners, my neighbors and I did what New Yorkers have always done on summer nights: we moved out to the street. This meant a 1 a.m. walk to Battery Park to catch a harbor breeze and a glimpse of the Statue of Liberty shimmering in a heat haze. Maybe a 2 a.m. ride on the Staten Island Ferry and back. Then more walking, along the bend of Manhattan to the seaport.

Night's the time for ghosts, and that part of the city has many. Herman Melville, nocturnalist, prowling the South Street docks. Edgar Allan Poe, insomniac, brooding in a Greenwich Street boarding house. Agnes Martin, in the '50s, looking at the Brooklyn Bridge from her Coenties Slip loft. Walt Whitman, strolling across the bridge in a multitudinous mood. Hart Crane stumbling around in the dark beneath it, looking for love.

The Met show makes me want to take that walk again, though I don't live downtown now. And where I did live has changed: more people, noise. But I'm thinking about it this summer, and here I am writing about it, at 3 a.m., when the past is present, and all, as far as I know, is well.

http://www.nytimes.com/2011/07/15/arts/design/night-vision-photography-after-dark-at-the-met.html?ref=design

New Herbicide Suspected in Tree Deaths

By JIM ROBBINS

A recently approved herbicide called Imprelis, widely used by landscapers because it was thought to be environmentally friendly, has emerged as the leading suspect in the deaths of thousands of Norway spruces, eastern white pines and other trees on lawns and golf courses across the country.

Manufactured by DuPont and conditionally approved for sale last October by the federal Environmental Protection Agency, Imprelis is used for killing broadleaf weeds like dandelion and clover and is sold to lawn care professionals only. Reports of dying trees started surfacing around Memorial Day, prompting an inquiry by DuPont scientists.

"We are investigating the reports of these unfavorable tree symptoms," said Kate Childress, a spokeswoman for DuPont. "Until this investigation is complete, it's difficult to say what variables contributed to the symptoms."

DuPont continues to sell the product, which is registered for use in all states except California and New York. The company said that there were many places where the product had been used without damaging trees.

The E.P.A. has begun gathering information on the deaths from state officials and DuPont as well as through its own investigators. "E.P.A. is taking this very seriously," the agency said in a statement.

In a June 17 letter to its landscape customers, Michael McDermott, a DuPont products official, seemed to put the onus for the tree deaths on workers applying Imprelis. He wrote that customers with affected trees might not have mixed the herbicide properly or might have combined it with other herbicides. DuPont officials have also suggested that the trees may come back, and have asked landscapers to leave them in the ground.

Mr. McDermott instructed customers in the letter not to apply the herbicide near Norway spruce or white pine, or places where the product might drift toward such trees or run off toward their roots.

For some landscapers, the die-off has been catastrophic. “It’s been devastating,” said Matt Coats, service manager for Underwood Nursery in Adrian, Mich. “We’ve made 1,000 applications and had 350 complaints of dead trees, and it’s climbing. I’ve done nothing for the last three weeks but deal with angry customers.”

“We’re seeing some trees doing O.K., with just the tips getting brown, and others are completely dead and it looks like someone took a flamethrower to them,” he said.

So far, the herbicide seems to affect trees with shallow root systems, including willows, poplars and conifers, he said.

Underwood Nursery is replacing the trees, which its liability insurance covers, but faces a $500 deductible for each incident. “It’s already cost us $150,000,” Mr. Coats said. Some landscapers are finding that their insurance does not cover the tree deaths at all.

The chemical name of the product is aminocyclopyrachlor, one of a new class of herbicides that has been viewed as safer than earlier weed killers.

DuPont, landscapers and others had high hopes for the product. It has low toxicity to mammals, works at low concentrations and can kill weeds that other herbicides have trouble vanquishing, like ground ivy, henbit and wild violets. It works on the weeds’ roots as well as their leaves.

No firm estimate exists on the extent of the tree die-off. But Bert Cregg, an associate professor of horticulture and forestry and an extension specialist with Michigan State University who has fielded many calls from landscapers and inspected affected trees, said the problem existed across the country. Many extension services have issued warnings, Dr. Cregg said.

“This is going to be a large-scale problem, affecting hundreds of thousands of trees, if not more,” he said. Imprelis is used on athletic fields and cemeteries as well as on private lawns and golf courses, he noted.

While landscapers are replacing some of the trees, they cannot replace large mature ones, meaning that some homeowners have lost some of their biggest and oldest trees.

“I’m very concerned,” said Amy Frankmann, executive director of the Michigan Nursery and Landscape Association, who has heard from many members and who says the disaster could threaten the livelihoods of landscapers whose insurance will not cover the cost. “Absolutely. One member is looking at having to replace a thousand trees.”

Mark Utendorf, owner of Emerald Lawn Care in Arlington, Heights, Ill., has seen dozens of customers’ trees turn brown. “It’s unfortunate, because the product works exceedingly well on turf,” he said.

“It kills creeping Charlie, and that’s something that’s very hard to kill,” Mr. Utendorf said, referring to a type of ivy that has been known to take over lawns.

He noted that the product had been viewed as part of a more environmentally safe lawn industry and a game changer. “I hope people will give DuPont a chance to make this product work,” Mr. Utendorf said, adding that he was still using it, though very carefully and not where there were conifers.

Imprelis went through about 400 trials, including tests on conifers, and performed without problems, according to experts at DuPont and at the E.P.A. The agency reviewed the herbicide for 23 months before granting its conditional approval, meaning that all of the safety data was not yet in but the agency judged Imprelis to be a good product.

Even if the product is eventually proved to be a tree killer, it is considered unlikely that the E.P.A. will ban it, experts said. The agency would probably work with DuPont to change the herbicide's labeling or to mandate larger buffer zones, they added.

Imprelis is not approved for use in New York and California because both states have separate review procedures for such products. New York State officials say they have told DuPont that it has detected two problems: the herbicide does not bind with soil, and it leaches into groundwater. The state has told DuPont it will therefore not allow Imprelis to be sold unless the company provides evidence to the contrary.

California officials say they are still reviewing the product.

The United States Composting Council, meanwhile, warned in May that grass clippings from lawns treated with Imprelis should not be composted because the chemical survives the process and can kill flowers and vegetables that are treated with the compost. That warning is included on the Imprelis product label.

Dr. Cregg, the extension service specialist at Michigan State University, said it was possible that many of the affected trees could recover if left in place for a year to a few years, even if damage appeared severe, because he had seen such a turnaround after similar damage to trees. "A lot of it comes down to the homeowner's tolerance," he said. "How long can they stand to look at this thing in the yard?"

Janet and Robert DaPrato of Columbus, Ohio, are facing that question as they gaze upon a 10-foot-high Norway spruce that started withering a month after a worker applied Imprelis in their yard. Then the needles fell off.

"The tree looks pretty well dead," Mr. DaPrato said.

http://www.nytimes.com/2011/07/15/science/earth/15herbicide.html?ref=science

After 8 Decades, Tiny Toad Resurfaces in Asia

By THOMAS LIN

Indraneil DasAn adult female Borneo rainbow toad, also known as the Sambas stream toad (Ansonia latidisca), which is about only two inches long.

Fieldiana ZoologyBefore the rediscovery of the Borneo rainbow toad this summer, this sketch was the only image of the mysterious creature.

The Borneo rainbow toad, with its long spindly legs, looks a bit like an Abstract Expressionist canvas splattered in bright green, purple and red. But when this amphibian was last seen, in 1924, the painter Jackson Pollock was just 12, and the only image of the mysterious creature was a black-and-white sketch.

That changed this summer when the toad was rediscovered high in the ridges of the Gunung Penrissen range of Western Sarawak, between Sarawak State in Malaysia and Kalimantan Barat Province in Indonesia. Because of market demand for bright-colored amphibians, which are sold as pets, Indraneil Das, a herpetologist at the University of Malaysia at Sarawak who led the research team that found the toad, declined to be more specific about the location, saying only that it was spotted about six feet up a tree in that region on the night of June 12 by one of his graduate students, Pui Yong Min. Dr. Das answered a few questions about the find by e-mail.

Q.

The Borneo rainbow toad has not been seen in 87 years. How did your team go about trying to find it?

A.

We started searching at the locality it was found in the last century [Gunung Penrissen], using standard search techniques appropriate for amphibians in rainforest habitats, drawing inspiration from Conservation International's Search for Lost Frogs, an international campaign to discover amphibians not seen for a decade, initiated by Dr. Robin Moore. I had to read the published journals of explorers at the time of the expedition to determine what route they took.

Q.

Why has it been so long since the last sighting?

A.

Few herpetologists have worked in these remote mountains that straddle the Indonesia-Malaysia border. It's only now that the site is accessible, thanks to a resort featuring an 18-hole golf course.

Q.

Describe some of the challenges of the months-long search.

A.

Team members of course had to be fit to climb the mountains. And lug along heavy gear for measurements and documentation. Permits had to be received for accessing the area, and it turned out to be expensive field work, as we had to stay at a high-end golf resort. Of course, there were dangers and annoyances, such as getting lost along poorly marked trails (necessitating rescue operations), leeches, encounters with gun-wielding poachers, getting drenched in the rain at over 1,000 meters elevation at night, etc, etc.

Q.

What are some of the special characteristics of this species? Have you learned anything new about these toads?

A.

We still know little about this species, apart from its arboreal (tree-dwelling) habits. It apparently inhabits high elevations, and the moss-like colors of its dorsum may be adaptive for camouflage on moss-covered tree bark. A two-year grant from the University of Malaysia at Sarawak will permit us to answer these and other questions.

Q.

How many do you think are left? What are the biggest threats to the remaining population of Borneo rainbow toads?

A.

No data on population size are available, and the greatest threat to the species is habitat loss (the area is not under a national park or a nature reserve) and especially, fragmentation. Additionally, the resort is also visited by collectors from a certain country that shall go unnamed who illegally collect beetles and butterflies. The bright colors of the Borneo rainbow toad may also tempt suppliers of the pet trade locally and internationally.

http://green.blogs.nytimes.com/2011/07/15/after-8-decades-tiny-toad-resurfaces-in-asia/?ref=science

Internet Use Affects Memory, Study Finds

By PATRICIA COHEN
The widespread use of search engines and online databases has affected the way people remember information, researchers are reporting.

The scientists, led by Betsy Sparrow, an assistant professor of psychology at Columbia, wondered whether people were more likely to remember information that could be easily retrieved from a computer, just as students are more likely to recall facts they believe will be on a test.

Dr. Sparrow and her collaborators, Daniel M. Wegner of Harvard and Jenny Liu of the University of Wisconsin, Madison, staged four different memory experiments. In one, participants typed 40 bits of trivia — for example, "an ostrich's eye is bigger than its brain" — into a computer. Half of the subjects believed the information would be saved in the computer; the other half believed the items they typed would be erased.

The subjects were significantly more likely to remember information if they thought they would not be able to find it later. "Participants did not make the effort to remember when they thought they could later look up the trivia statement they had read," the authors write.

A second experiment was aimed at determining whether computer accessibility affects precisely what we remember. "If asked the question whether there are any countries with only one color in their flag, for example," the researchers wrote, "do we think about flags — or immediately think to go online to find out?"

In this case, participants were asked to remember both the trivia statement itself and which of five computer folders it was saved in. The researchers were surprised to find that people seemed better able to recall the folder.

"That kind of blew my mind," Dr. Sparrow said in an interview.

The experiment explores an aspect of what is known as transactive memory — the notion that we rely on our family, friends and co-workers as well as reference material to store information for us.

"I love watching baseball," Dr. Sparrow said. "But I know my husband knows baseball facts, so when I want to know something I ask him, and I don't bother to remember it."

The Internet's effects on memory are still largely unexplored, Dr. Sparrow said, adding that her experiments had led her to conclude that the Internet has become our primary external storage system.

"Human memory," she said, "is adapting to new communications technology."

http://www.nytimes.com/2011/07/15/health/15memory.html?ref=science

How Much Does Global Warming Cost?

A new report suggests that the social cost of carbon — the economic damage done by one ton of carbon dioxide emissions — could be drastically higher than government agencies have estimated.

By Dan Watson

Melting snows at Kilimanjaro are visceral, but it is trickier to determine carbon pollution's economic costs to society. (abridgeover/Flickr)

Most people understand that global warming is happening, but it is hard to get a firmer sense of exactly what effects it is going to have on the future of the world. Governments have started to approach climate change as a situation to evaluate using cost-benefit analysis: How much should we spend to fix the problem? How much will it cost us if we don't?

As Judith Schwartz detailed in February ("The Social Cost of Carbon"), the U.S. government began regulating carbon dioxide emissions via the Environmental Protection Agency's enforcement of the Clean Air Act. The U.S. calculated the social cost of carbon — the economic damage done by 1 ton of carbon dioxide emissions — through an Interagency Working Group made up of many different cabinet departments and agencies. They estimated the economic damage per ton of CO2 to be just $21, or only about 21 cents per gallon of gasoline.

That price was quite similar to the AUS$23 per metric ton Australia is assessing its 500 top carbon emitters beginning July 1, 2012, according to an announcement Prime Minister Julia Gillard made earlier this month. (That AUS$23 is roughly US$24.50 at current exchange rates.)

"[Five hundred big polluters] now know how much they will pay unless they cut their pollution," she said in a nationwide address. "And they can start planning to cut pollution now. … By 2020, our carbon price will take 160 million [metric] tons of pollution out of the atmosphere every year. That's the equivalent of taking 45 million cars off the road."

A new peer-reviewed report, "Climate Risks and Carbon Prices: Revising the Social Cost of Carbon," by economists Frank Ackerman of Tufts and Elizabeth A. Stanton of the Stockholm Environmental Institute, suggests that the true cost of carbon most likely is drastically higher than either government's estimates. The report was published by E3 Network (Economics for Equity & Environment), "a national network of economists developing new arguments for the active protection of human health and the environment."

Of the government's $21-per-ton number, the authors admit: "Such low costs are difficult to reconcile with the belief that it is urgent to take action to address serious climate risks."

But how much do they think it costs?Rather than start from scratch, the authors used the same models as the government's working group did, tweaking them only to account for a few "big uncertainties."

The uncertainties boil down to these two: First, an estimation should take into account how quickly global warming will occur. Second, it is simple enough to understand that the economic damage will be greater in the longer term as temperature rises, but it is less certain exactly what it will cost and when. The calculation has to be built on this interrelated range of possibilities, from the mild to the catastrophic.

How do their findings compare with the government's? "Our re-analysis, including those factors, shows that the [social cost of carbon] could be much higher [than $21 per ton]. In our worst case, it could be almost $900 in 2010, rising to $1,500 in 2050. If the damages per ton of carbon dioxide are that high, then almost anything that reduces emissions is worth doing."In terms of a policy response, the authors conclude that it is likely that the social cost of carbon is either equal to or far greater than the maximum amount that could feasibly be spent on reducing emissions. "It is unequivocally less expensive to reduce greenhouse gas emissions," they write, "than to suffer climate damages."

It's doubtful that the current Congress will respond in any way to Ackerman and Stanton's report. Rather than addressing the economic damage created by pollution, for example, it's defunding the government's enforcement of its existing energy efficiency standards.

In Australia, Gillard told the nation that a carbon tax, while assessed on big companies, ultimately will be felt by individuals. "Some of the cost paid by big polluters will be passed through to the prices of the goods you buy. The price impact will be modest but I know family budgets are always tight. So I have decided most of the money raised from the carbon price will be used to fund tax cuts, pension increases and higher family payments."

If Ackerman and Stanton's analysis is correct, Australia's new carbon tax is probably far too low. But it is a huge and praiseworthy step to go from large companies having no accountability for the negative externalities of their carbon pollution, to having some accountability. From there, the amount of the tax can change as our understanding of the social cost of carbon changes. The first step is the hardest.

http://www.miller-mccune.com/environment/how-much-does-global-warming-cost-33864/

In Search of a Robot More Like Us

By JOHN MARKOFF

MENLO PARK, Calif. — The robotics pioneer Rodney Brooks often begins speeches by reaching into his pocket, fiddling with some loose change, finding a quarter, pulling it out and twirling it in his fingers.

The task requires hardly any thought. But as Dr. Brooks points out, training a robot to do it is a vastly harder problem for artificial intelligence researchers than I.B.M.'s celebrated victory on "Jeopardy!" this year with a robot named Watson.

Although robots have made great strides in manufacturing, where tasks are repetitive, they are still no match for humans, who can grasp things and move about effortlessly in the physical world.

Designing a robot to mimic the basic capabilities of motion and perception would be revolutionary, researchers say, with applications stretching from care for the elderly to returning overseas manufacturing operations to the United States (albeit with fewer workers).

Yet the challenges remain immense, far higher than artificial intelligence hurdles like speaking and hearing.

"All these problems where you want to duplicate something biology does, such as perception, touch, planning or grasping, turn out to be hard in fundamental ways," said Gary Bradski, a vision specialist at Willow Garage, a robot development company based here in Silicon Valley.

"It's always surprising, because humans can do so much effortlessly."

Now the Defense Advanced Research Projects Agency, or Darpa, the Pentagon office that helped jump-start the first generation of artificial intelligence research in the 1960s, is underwriting three competing efforts to develop robotic arms and hands one-tenth as expensive as today's systems, which often cost $100,000 or more.

Last month President Obama traveled to Carnegie Mellon University in Pittsburgh to unveil a $500 million effort to create advanced robotic technologies needed to help bring manufacturing back to the United States. But lower-cost computer-controlled mechanical arms and hands are only the first step.

There is still significant debate about how even to begin to design a machine that might be flexible enough to do many of the things humans do: fold laundry, cook or wash dishes. That will require a breakthrough in software that mimics perception.

Today's robots can often do one such task in limited circumstances, but researchers describe their skills as "brittle." They fail if the tiniest change is introduced. Moreover, they must be reprogrammed in a cumbersome fashion to do something else.

Many robotics researchers are pursuing a bottom-up approach, hoping that by training robots on one task at a time, they can build a library of tasks that will ultimately make it possible for robots to begin to mimic humans.

Others are skeptical, saying that truly useful machines await an artificial intelligence breakthrough that yields vastly more flexible perception.

The limits of today's most sophisticated robots can be seen in a towel-folding demonstration that a group of students at the University of California, Berkeley, posted on the Internet last year: In spooky, anthropomorphic fashion, a robot deftly folds a series of towels, eyeing the corners, smoothing out wrinkles and neatly stacking them in a pile.

It is only when the viewer learns that the video is shown at 50 times normal speed that the meager extent of the robot's capabilities becomes apparent. (The students acknowledged this spring that they were only now beginning to tackle the further challenges of folding shirts and socks.)

Even the most ambitious and expensive robot arm research has not yet yielded impressive results.

In February, for example, Robonaut 2, a dexterous robot developed in a partnership between NASA and General Motors, was carried aboard a space shuttle mission to be installed on the International Space Station. The developers acknowledged that the software required by the system, which is humanoid-shaped from the torso up, was unfinished and that the robot was sent up then only because a rare launching window was available.

"We're in a funny chicken-and-egg situation," Dr. Brooks said. "No one really knows what sensors or perceptual algorithms to use because we don't have a working hand, and because we don't have a grasping strategy nobody can figure out what kind of hand to design."

Dr. Brooks is also tackling the problem: In 2008 he founded Heartland Robotics, a Boston-based company that is intent on building a generation of low-cost robots.

And the three competing efforts to develop robotic arms and hands with Darpa financing — at SRI International, Sandia National Laboratories and iRobot — offer some reasons for optimism.

Recently at an SRI laboratory here, two Stanford University graduate students, John Ulmen and Dan Aukes, put the finishing touches on a significant step toward human capabilities: a four-finger hand that will grasp with a human's precise sense of touch.

Each three-jointed finger is made in a single manufacturing step by a three-dimensional printer and is then covered with "skin" derived from the same material used to make the touch-sensitive displays on smartphones.

"Part of what we're riding on is there has been a very strong push for tactile displays because of smartphones," said Pablo Garcia, an SRI robot designer who is leading the design of the project, along with Robert Bolles, an artificial intelligence researcher.

"We've taken advantage of these technologies," Mr. Garcia went on, "and we're banking on the fact they will continue to evolve and be made even cheaper."

Still lacking is a generation of software that is powerful and flexible enough to do tasks that humans do effortlessly. That will require a breakthrough in machines' perception.

"I would say this is more difficult than what the Watson machine had to do," said Gill Pratt, the computer scientist who is the program manager in charge of Darpa's Autonomous Robot Manipulation project, called ARM.

"The world is composed of continuous objects that have various shapes" that can obscure one another, he said. "A perception system needs to figure this out, and it needs the common sense of a child to do that."

At Willow Garage, Dr. Bradski and a group of artificial intelligence researchers and roboticists have focused on "hackathons," in which the company's PR2 robot has been programmed to do tasks like fetching beer from a refrigerator, playing pool and packing groceries.

In May, with support from the White House Office of Science and Technology Policy, Dr. Bradski helped organize the first Solutions in Perception Challenge. A prize of $10,000 is offered for the first team to design a robot that is able to recognize 100 items commonly found on the shelves of supermarkets and drugstores. Part of the prize will be given to the first team whose robot can recognize 80 percent of the items.

At the contest, held during a robotics conference in Shanghai, none of the contestants reached the 80 percent goal. The team that did best was the laundry-folding team from Berkeley, which has named its robot Brett, for Berkeley Robot for the Elimination of Tedious Tasks.

Brett was able to recognize 68 percent of a smaller group of 50 objects. And the team has made progress in its quest to build a machine to do the laundry; it recently posted a new video showing how much it has sped up the robot.

"Our end goal right now is to do an entire laundry cycle," said Pieter Abbeel, a Berkeley computer scientist who leads the group, "from dirty laundry in a basket to everything stacked away after it's been washed and dried."

http://www.nytimes.com/2011/07/12/science/12robot.html?ref=science

Working for the Weekend

The Monday blues are a myth, if you believe a new study of American happiness. (Nor does "hump day" pack much of a punch.) U.S. residents have roughly the same levels of happiness, enjoyment, and laughter—not to mention worry, sadness and anger—from Monday through Friday. The real difference lies between weekdays and weekends.

Researchers studied the survey responses of nearly half a million respondents to a daily Gallup-Healthways poll conducted from January 2008 through June 2009. The respondents were asked to evaluate their life in general terms, on a scale of 0 to 10, and to say whether they had experienced particular emotions "a lot" on the previous day.

There were no day-to-day effects on the life-evaluation question, which suggests that the evaluation of one's life is shaped by broad, long-term forces. But people reported more positive emotions, and fewer negative ones, on weekends. And the cause, according to the data, was additional time spent with family and friends: an extra 1.7 hours daily, on average. Weekend socializing boosted people's aggregate happiness by 2%.

Full-time workers faced a greater happiness drop on weekdays than part-time workers. On the other hand, however, they were also happier overall.

It also mattered whether people felt their supervisors acted like "bosses" or "partners." For the latter group, the weekday happiness decline was half as large.

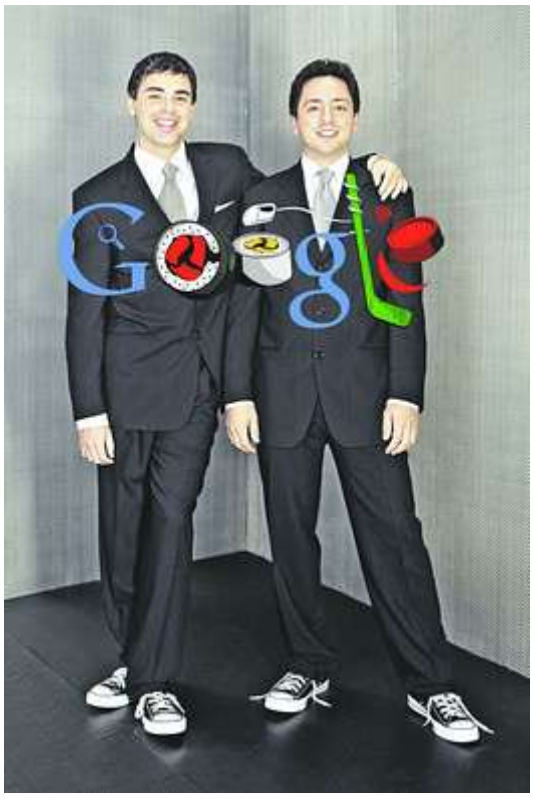
Source: "Weekends and Subjective Well-Being," John F. Helliwell and Shun Wang, NBER Working Paper (June)

http://blogs.wsj.com/ideas-market/2011/07/14/working-for-the-weekend/tab/print/

The Beginning

An insider recounts the early days: the bizarre job interview, April Fools' pranks that enraged users, roller hockey, platters of sushi—and the uneasy leap to the mainstream.

By DOUGLAS EDWARDS



Getty Images/Michael Grecco; Google Type: Vault 49

Co-founders Larry Page and Sergey Brin in 2002.

In November 1999, Douglas Edwards became fledgling Google's first "brand manager," making him employee No. 59. In this excerpt from his new book, "I'm Feeling Lucky," Mr. Edwards gives an inside view of the company's early days, starting with his job interview with co-founder Sergey Brin, then 26 years old.

Cindy McCaffrey, director of public relations, brought me back to the conference room to wait for Sergey. I wasn't nervous. Sergey was about the age of my favorite T-shirt (I was 41) and a Russian by birth. I had lived in Russia. I spoke some Russian. I had Russian friends.

I felt unusually confident that the interview would go well. Perhaps I would become his mentor and we would toast each other's health with fine Siberian vodka. Sergey showed up wearing roller-hockey gear: gym shorts, a T-shirt and in-line skates. He had obviously been playing hard. I had known better than to wear a tie, but he took office casual to a new level.

Sergey pored over my résumé and began peppering me with questions. "What promotion did you do that was most effective?" "What metrics did you use to measure it?" "What types of viral marketing did you do?"

"How much do you think a company our size should spend on marketing?" Sergey asked me. Based on his earlier questions, it was easy to guess what he wanted to hear from me. "I don't think at this stage you should spend much at all," I said. "You can do a lot with viral marketing and small budgets."

He nodded his agreement, then asked about my six months in Siberia, casually switching to Russian to see how much I had picked up. Finally, he leaned forward and fired his best shot, what he came to call "the hard question."

"I'm going to give you five minutes," he told me. "When I come back, I want you to explain to me something complicated that I don't already know." He then rolled out of the room toward the snack area. I looked at Cindy. "He's very curious about everything," she told me. "You can talk about a hobby, something technical, whatever you want. Just make sure it's something you really understand well."

I reached for a piece of scrap paper as my mind raced. What complicated thing did I know well enough to describe to Sergey? I decided to go with the general theory of marketing, which was fresh in my mind, because I'd only learned it recently.

One of my dirty little secrets was a complete lack of academic preparation for the business world. Fortunately, my boss at the San Jose Mercury News, where I was working as a brand manager, had a Harvard MBA and a desire to drive some business theory into my thick skull. She had given me a bunch of her old textbooks, along with strong hints that I should spend time reading them. I began regurgitating everything that I could remember onto the paper in front of me: The five P's (or was it six?), the four M's, barriers to entry, differentiation on quality or price.

By the time Sergey came back, I had enough to talk for 10 minutes and was confident I could fill any holes with the three Bs (Buckets of Baffling Bulls—). I went to the whiteboard and began drawing circles and squares and lots of arrows. I was nervous, but not very. Sergey bounced on a ball and asked questions that required me to make up things on the spot.

"What's more important: product differentiation or promotion?"

"How does the strategy change if the price is zero?"

He seemed to be paying attention, and I began enjoying myself. We were developing a special rapport! Clearly, he wanted to hear what I had to say and valued my opinions. Later I found out that Sergey did this with everyone he interviewed. An hour wasted with an unqualified candidate wasn't a total loss if Sergey gained insight into something he didn't already know.

The light was fading by the time I finished, and Sergey invited me to join the staff for dinner, which was being brought into a small kitchen across from the conference room. A crowd of hungry engineers bounced from plate to plate with chopsticks picking at a large selection of sushi.

"We just hired a chef, so this is a temporary set-up," Sergey told me. "And we've got a couple of massage therapists coming in as well."

A warning light flashed in my head at that. This was the guy who didn't think there should be a marketing budget, and he had hired a chef and two massage therapists? But then I saw the platters of fatty tuna and shrimp and salmon and yellowtail. I grabbed some chopsticks and began loading my plate. Concerns about a business plan and revenue streams and organizational structure faded away.

View Full Image

William McLeod

Larry Page and Sergey Brin in their first office -- a garage -- in Menlo Park, Calif., in January 1999 One of Mr. Brin's early marketing ideas was to inoculate Chechen refugees against cholera.

Google met most of my requirements. It offered at least the appearance of superior Internet-related technology, some eccentric genius types, funding that should last at least a year and a fun consumer brand that I could help to develop. Two weeks later, on Nov. 29, 1999, I started work as Google's online brand manager.

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You would have needed uncanny foresight or powerful pharmaceuticals to envision Google's success in 1999. Or maybe just money to burn. Kleiner Perkins and Sequoia Capital had something, because the two venture capital firms invested $12.5 million each, leading cynics in the Valley to define "Googling" as "getting funding without a business plan."

It's just as well that I hadn't realized how fragile Google truly was as I set up the meeting to discuss next steps for my marketing plan.

"The most important thing to consider," I began, "is that our own internal research shows our competitors are beginning to approach Google's level of quality. In a world where all search engines are equal, we'll need to rely on branding to differentiate us from everyone else." The room grew quiet.

I looked around nervously. Had I said something wrong? Yes. Not just wrong but heretical to engineers who believed anything could be improved through the iterative application of intelligence. Co-founder Larry Page made my apostasy clear. "If we can't win on quality," he said quietly, "we shouldn't win at all."

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Sometimes a founder put forth "a good idea."

"I have a good idea," Sergey informed marketing manager Susan Wojcicki a couple of weeks after I started. "Why don't we take the marketing budget and use it to inoculate Chechen refugees against cholera. It will help our brand awareness, and we'll get more new people to use Google."

Our company was barely a year old at the time. We had no real revenue. Spending a million dollars of our investors' money on a land war in Asia would indeed be a revolutionary approach to growing market share.

February 1999

8 Employees
500,000 searches a day

2011

28,768 employees
3.6 billion searches a day

Sources: Google, comScore

Looking back a dozen years later, I kind of get Sergey's perspective. Saving lives was a better use of our budget than running ads, which just annoyed people to no effect—and were therefore evil. Why not make a big donation to a humanitarian cause and build awareness by doing good? It had all the classic elements of a Sergey solution: a wildly unconventional approach to a common problem, technology harnessed to improve the human condition, an international scope.

Sergey didn't ask my marketing colleague Shari or me what we thought of his idea. He knew that we would have ridiculed it. Instead, he turned to Susan, an early member of the inner circle. Sergey had met her family (he'd later marry her sister), and Susan understood Sergey well enough not to dismiss his outlandish suggestions out of hand.

Instead, she went to gather data, which in this case meant asking her mom, a teacher in Palo Alto. As an educator, Susan's mother carried authority with Sergey, and when she confessed to being confused about our plan to support a rebel army in Russia, it took some of the wind out of his sails.

He had a backup plan, though. "What if we gave out free Google-branded condoms to high-school students?"

Sergey asked Shari and me to investigate other charitable promotions along these lines, and we dutifully did, but it wasn't lost on us that our opinions had only been sought as an afterthought.

Michael Jackson's birthday, 2009

April was right around the corner. My first April at Google. My first Google April Fools' joke.

April Fools' Day would become a perennial black hole in my calendar, a gravity well into which my attention would be sucked from increasingly great distances in time. Sergey, on the other hand, loved April Fools'. When it came to April Fools', he dynamited decorum and put moderation to the torch.

My idea for our first prank was "ante-temporal search," a breakthrough development that anticipated user requests. The tone was heavily geekish, but Susan liked it. Sergey thought it was overdone (akin to the pope saying you're overly religious), but encouragingly, he said it had potential. An engineer pinned the name "MentalPlex" on our new mind-reading technology.

That settled, I hashed out the text for a link on the home page and a dozen error messages that would be displayed randomly if someone entered a query in the MentalPlex search box.

Someone pointed out that with our newly launched foreign-language interfaces, we could extend the joke beyond English. "One of the error messages should say that MentalPlex has detected foreign thoughts," she suggested, "and then we can translate the interface text on the results page into German."

The joke went up on Friday night. Soon Google users would see a spinning cartoon spiral on our homepage inviting them to try MentalPlex. I was relieved that we'd made the deadline. I was also terrified.

As soon as we hit Submit on the push, I started compulsively refreshing my inbox to check for feedback from users. At 8:01 the first email arrived. "Google is great!" was the header. More emails started trickling in. People were surprised. They didn't think search engines had a sense of humor. They liked it. They were: LOL. ROFL. ROFLMAO. A chorus of hosannas sounded over the next few hours.

"Turn it off. It thinks I'm German." The off-key refrain caught my ear.

"I found MentalPlex mildly amusing, but the different languages on the results page make it harder to use. The joke gets old very quickly."

Discordant voices increasingly sang about confusion and annoyance.

Unfortunately, it was a Friday night. The engineering staff were with Sergey at Zibibbo, a trendy restaurant 20 minutes away in downtown Palo Alto. No one in the office was authorized to make changes to the joke.

We were taking a pounding on email. Finally, an engineer stepped in. Now our unwanted results were in Portuguese. The engineers thought the joke was just too funny to eliminate entirely, so they simply shifted the interface to another language.

Complaints kept coming. Though the tone was less virulent, users were still unhappy that they couldn't navigate the site easily. I had worked at Google long enough not to be intimidated by an org chart. I called Sergey. It was hard to hear over the background noise of rowdy engineers in a crowded restaurant, but I could tell he was surprised when I insisted that we drop all the foreign-language results.

Sergey reluctantly agreed. It was midnight before all the foreign-language text was stripped off the site.

"A not-insignificant fraction of our users are complete idiots," groused one engineer, "if they can't figure out how to use our site, just because it's all in Portuguese." Google had clearly crossed the gap from serving the tech elite to playing in the mainstream market—an online segment that he knew to be densely populated with the clueless.

"I'm more worried that we got spooked by a little negative feedback," said another engineer. "We backed off the playfulness that's an important part of Google. We watered down our April Fools' joke to make it less invasive. I guess that's what happens as we grow up—we become a more conservative company." He did not see that as a positive development.

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I've heard the speculation about Google since I've left. That it's a monopoly. That it's tracking users. That it's in cahoots with the government. That it spies on people. That it's evil.

Well, maybe it is all that. I haven't worked there in more than five years. Things change. But based on the people I knew during my time in the Plex—many of whom still put in long hours perfecting a product used by millions every day—I'd say that's highly unlikely.

Is Google secretive? No question. Arrogant? Maybe. Tone-deaf to the concerns of the very users it claims to serve? Occasionally. But evil? I don't think so.

I started my career working at ad agencies. It was fun, challenging and potentially well-paying. I quit because I didn't like the idea that I might have to sell something I didn't believe in. I worked in public broadcasting and then newspapers, where I found co-workers who sacrificed material rewards to be part of something more connected to the common good than selling someone else's products. I got that same sense at Google, but with greater intensity and urgency. And stock options.

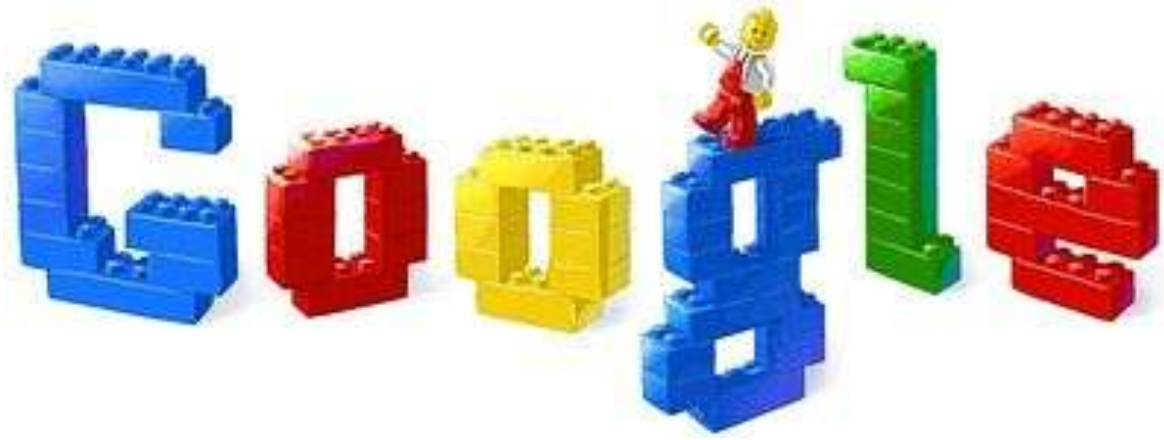
This was no institution continuing a long tradition of public service. This was a headlong rush to reshape the world in a generation. And therein lies the company's biggest flaw in my estimation—impatience with those not quick enough to grasp the obvious truth of Google's vision.

"When were we ever wrong?" Larry once asked me.

Not often. But "not often" is not never. If Google's leaders accepted that reality, they might understand why some people are unwilling to suspend skepticism and surrender to Google's assurances that the company can be trusted.

After Google, I find myself impatient with the way the world works. Why is it so hard to schedule a recording on my DVR? Why aren't all the signal lights synched to keep traffic flowing at optimum speed? Why, if I punch in my account number when I call customer service, do I have to give it to them again when I get a live person? These are all solvable problems. Smart people, motivated to make things better, can do almost anything. I feel lucky to have seen firsthand just how true that is.

The Unlikely Making of the Google 'Doodle'



LEGO anniversary, 2008

One of the convictions that I brought with me to Google was that you needed to present your company's graphic signature in a monomaniacally consistent manner; to pound it into the public consciousness with a thousand tiny taps, each one exactly the same as the one before.

So when Sergey reminded me that he wanted us to play with Google's signature home-page graphic in 1999, I put my foot down. This was not only the most prominent placement of our logo; it was the only placement of our logo. We weren't advertising on TV or on billboards or in print. The logo floating in all that white space was it.

Sergey didn't see the big deal. He had changed the logo twice during Google's infancy, adding a clip-art turkey on Thanksgiving in 1998 and putting up a Burning Man cartoon when the staff took off to explore nakedness in the Nevada desert. But now Google was a real company, I told him. Real companies don't do that.

Even as we argued, Sergey enlisted webmaster Karen White to resurrect the turkey for Thanksgiving, create a holiday snowman in December and festoon the logo with a hat and confetti for New Year's 2000.

"What about aliens?" he asked. "Let's put aliens on the home page. We'll change it every day. It will be like a comic strip that people come back to read."

I tried not to be condescending. I gave him my spiel about consistency of messaging and uniform touchpoints and assured him that it wasn't just my opinion; it was the consensus of marketing professionals world-wide. I knew I had finally convinced him when he stopped asking me about it.

I was wrong. Sergey wasn't convinced; he just didn't like repeating himself. So he turned to marketing manager Susan Wojcicki, who found illustrator Ian Marsden and put him to work. In May 2000, Ian created the first Google doodle. It featured—surprise, surprise—aliens making off with our logo.

Our users loved the randomness of the logo artwork and sent us dozens of appreciative emails. Google's brilliant strategy of humanizing an otherwise sterile interface with cute little cartoon creatures was an enormous hit.

Cookie Monster, 2009

It was so blindingly obvious that I was right, yet I was so clearly wrong. Google did that to you—it made you challenge all your assumptions and experience-based ideas until you began to wonder if up was really up, or if it might not actually be a different kind of down.

—Douglas Edward
http://online.wsj.com/article/SB10001424052702304911104576444363668512764.html?mod=WSJ_LifeStyle_Lifestyle_5

Isn't Love Divine

By CHARLOTTE ALLEN

Raymond Depardon/Magnum Photos

When God died—that is, when Western intellectuals and artists of the 18th and 19th centuries began finding themselves unable to believe in the Christianity of their forebears or its deity—the idea took hold that in selfless love for another person one could find the same absolute intensity of feeling, capacity for moral regeneration and conviction of one's own immortality that had been previously associated with the love of God.

Simon May, a philosophy professor at the University of London's Birkbeck College and the author of "Love: A History," describes this phenomenon, peculiar to modernity, as the "divinization of human love." In the Western imagination, he says, "love came to play God"—that is, the belief in the power of love supplanted religion as "our ultimate source of meaning and happiness, and of power over suffering and disappointment." Mr. May describes the humanist funerals he has attended in which there is typically a declaration that this will be a "godless ceremony"—accompanied by an equally adamant declaration that the love between the deceased and those close to him somehow "survives" his death.

All About Love

By Lisa Appignanesi
Norton, 399 pages, $28.95

The story told by Mr. May—and also, in their own ways, by Lisa Appignanesi in "All About Love" and by Paul Hollander in "Extravagant Expectations"—is not a new one, of course. It is the story of the rise of Romanticism, which exalted feeling and conceived of a heroic self ever in search of an ideal human Other, one in whom the self could find perfect consummation, even if that consummation violated conventional social and moral norms concerning marriage and chastity. As early as 1939, Denis de Rougemont, in his "Love in the Western World," located the origins of the modern conception of all-consuming human love in the lyrics that 12th-century Occitanian troubadours composed in praise of their (usually married) mistresses. The troubadours' idealization of the beloved and of amorous passion itself helped inspire the Romantic sensibility several centuries later.

During the rapidly secularizing 20th century, as divorce and sex outside of marriage became accepted (a process accelerated during the 1960s by rebellion against convention and efficient birth control), the Romantic championing of all-consuming human love, once mostly the province of disheveled geniuses, became democratized. Nowadays everyone seems to be seeking someone upon whom to bestow a love that is "enduring, unconditional, and selfless" (Mr. May's words) and expecting reciprocation from the chosen object of affection. When that chosen object proves to be either nonexistent or all too humanly disappointing, there might be a divorce, a breakup or bitter resentment—but the search usually goes on.

In the view of novelist Lisa Appignanesi, even a bitter outcome is not such a bad thing. "Affairs, great or casual loves, make the story we tell about ourselves, about our lives, rich and varied. They proffer meaning. And the pleasures of passion," she writes in "All About Love." Although people also expect "a predictable steadfastness" and a sense of "exclusive specialness" from their beloveds, especially spouses, the expectation should be tempered by a realization that "the love that sees us through life is a gift freely given by the other, not a form of enslavement."

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Ms. Appignanesi's rambling, minimally organized "All About Love" is a kind of case study that bolsters Mr. May's arguments about the displacement of religiosity by a mushy, self-regarding amorous sentimentality. Ms. Appignanesi's book is part autobiographical memoir (with much lurid emphasis on her psychically straitened—as she tells it—although comfortably middle-class childhood in repressed pre-Trudeau Quebec); part collection of interviews with informants (her friends?) who are startlingly candid about their sexual and marital adventures; part dogged Freudian analysis (Ms. Appignanesi has written several Freud-centric books and is taken with the postmodernist literary theories of the French neo-Freudian Jacques Lacan); and part—no, mostly—exhaustive summary of the many, many books that Ms. Appignanesi has read, from canonical literature to self-help guides. If you would like to read Cliffs Notes-style cheat sheets for "Madame Bovary" and "Anna Karenina," the complete text of Shakespeare's sonnet "Let me not to the marriage of true minds," or every single one of the "Rules" against throwing yourself at men, as devised by Ellen Fein and Sherrie Schneider (Ms. Appignanesi is not a fan), then "All About Love" is the book for you.

There is also feminism, feminism, feminism. If the book has a chronological and thematic spine, it is that women endured millennia of oppression under strict regimes of chastity and lifelong marriage until, voilá, our own liberated time. These days all might not be entirely well (or "easy," as Ms. Appignanesi would say), but it's an improvement over what went before. "All About Love" is the sort of book that refers to any defense of marital tradition as "shrill" and sugarcoats the effects of divorce. When the children of divorce are obliged to live with other children of divorce after parents remarry, the "range of step-siblings," we're told, can "provide new interest and give love other shapes, grow the range of affections and ways of caring." We need love, Ms. Appignanesi concludes, "because it confronts us with the heights and depths of our being." Those 12th-century Occitanian troubadours have a lot to answer for.

Paul Hollander, professor emeritus of sociology at the University of Massachusetts Amherst, might be called the anti-Lisa Appignanesi. In "Extravagant Expectations" he covers much of the same ground that she does

(including a plot summary of "Madame Bovary" and unkind words for "The Rules"), except in a dystopian context.

Mr. Hollander duly notes the effect of democratized Romanticism—combined with the crumbling of Western marriage norms—on people's conceptions about the formation of intimate ties. "The core conviction of romantics is that uniquely meaningful and satisfying relationships between a man and a woman can be established under unspecified conditions, based on the revelation of profound mutual attraction and some essential compatibility." The result is those "extravagant expectations" concerning the attributes of their hoped-for love-objects and the power of love itself.

Extravagant Expectations

By Paul Hollander
Ivan R. Dee, 250 pages, $27.95

For sociological data, Mr. Hollander mines the dating and marriage guides written by such self-proclaimed love experts as Dr. Phil, Dr. Joyce Brothers, John "Men Are From Mars" Gray, and Greg Behrendt and Liz Tuccillo of "He's Just Not That Into You" fame, not to mention the "Rules" duo. Mr. Hollander also looks at the ways in which users of Internet dating sites present themselves and the ideal mates for whom they quest. A "fun orientation" is the No. 1 quality most sought after, even in the religiously and politically conservative Midwest and South. Although many of the Internet romance-seekers claim to be searching for serious long-term relationships, few express much interest in the qualities that have traditionally denoted husband and wife material, such as being a good provider or skilled homemaker. Finally, Mr. Hollander takes a look at personals ads, especially the ads in the New York Review of Books, the most entertaining material in "Extravagant Expectations." The New York Review's ad-placers, two-thirds of whom are female and few of whom will ever see 45 again, carefully signal to prospective mates their "trim" figures, their "progressive" politics and most of all their expensive highbrow tastes—just mentioning "Tuscany" and "exploring restaurants" gets the job done.

Unfortunately, Mr. Hollander has little of interest to conclude about what he has found, except that it is evidence of the "consumerism" and "individualism" rampant in contemporary American life. Well, maybe. That makes Mr. May's "History of Love" by default the most intellectually engaging of the three studies. Indeed, Mr. May actually offers a serious definition of love. He calls love a feeling of "ontological rootedness" in another—whether spouse, lover, child, friend or even a thing or idea. In loving a person, Mr. May says, we are inspired by the sense that we will feel "at home" with our beloved: Being with the person will bring a sense of "validity and solidity" to our existence, one that will overcome our persistent sense of vulnerability. For that reason, Mr. May theorizes, human love is not—despite the story line promoted by the Romantics and their heirs—selfless, unconditional or eternal. In short, he says, it in no way resembles the limitlessly generous divine love of conventional Christian belief. The most ardent of human lovers fall out of love fast when they discover something distasteful about their beloved. Even parents, although they hate to admit it, have favorites among their children. Love—in contrast to admiration or a sense of duty—is rare, selective and fickle.

Love: A History

By Simon May
Yale, 304 pages, $27.50

Mr. May's thesis is provocative, but it is also problematic, because he bases it on his own eccentric and decidedly hostile reading of the Bible. In his view, the God of Judaism and Christianity is a caricature out of an atheist website: a celestial grumpy-pants who inflicts "horrors" on even his faithful Israelites. Jesus fares no better. Mr. May interprets the parable of the Prodigal Son, for example, as not about divine forgiveness but

about a father who happens to prefer his wastrel offspring to his dutiful brother. Christian theology was just following Jesus' lead, the author says, when it consigned outsiders to hell and heretics to the Inquisition. Nonetheless, Mr. May argues that the biblical commandment to love God with all one's heart provides a "template for a successful human relationship . . . a way of saying that our flourishing is founded upon a lifelong search for a powerful relationship to the ground of our being." One may wonder why that should be so, if the Bible is supposed to be bunk.

"Love: A History" is cloaked in pessimism about the modern world, but in the end Mr. May's exaltation of love doesn't sound much different from that of Lisa Appignanesi and the ever-hopeful authors of personals ads. He turns out to be another Romantic. That may be the point. As creatures of a secular age, we may be stuck with Romanticism, criticize it though we may. The only alternative for the godless, as Mr. May says, is despair.

—Ms. Allen is a contributing editor of the Manhattan Institute's Minding the Campus website.

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When the West Coast Went Pop

By PETER PLAGENS

Where else would Andy Warhol have actually met his conceptual godfather, Marcel Duchamp, in the flesh but in Los Angeles in the 1960s? The occasion was the opening of Duchamp's first American retrospective, in 1963, at the old Pasadena Art Museum. There's a wonderful photograph in Hunter Drohojowska-Philp's "Rebels in Paradise," showing Billy Al Bengston, the dapper bad boy of the incipient local art scene, squeezing Andy's cheeks in that way that friendly bullies have of forcing the nerd to smile. (Dennis Hopper looks on and laughs.) Little more than a year earlier, Warhol's first solo show as a Pop artist—the infamous Campbell's soup-can paintings—had taken place in an L.A. gallery, and the meaning of the photograph is clear: Mr. Bengston is saying, "Thanks for the jumpstart, Andy, but we'll take it from here."

The result was a brief but incandescent heyday of what some critics blanketed as "the L.A. Look"—which ranged from Ed Ruscha's deft and light-touch Pop, through Larry Bell's ethereally Minimalist glass boxes, to Robert Irwin's hovering translucent discs that literally blurred the boundaries between the art object and its environment. The aesthetic common denominator was a "finish fetish" (or "fetish finish," your choice) borrowed from the southern California demimonde of hot rods and custom cars—i.e., the kind of slick, finicky attention to smooth perfection required when applying dozens of hand-rubbed coats of cherry-red enamel to an auto body. In art the upshot was, for example, De Waine Valentine's casting a 6-foot disc of transparent blue polyester resin without a single 7-Up-sized bubble in it.

Julian Wasser

Andy Warhol, Billy Al Bengston and Dennis Hopper at the opening of Marcel Duchamp's 1963 retrospective at the Pasadena Art Museum.

The attitudinal glue, though, was an offhand, ahistorical, surfer-dude casualness in arriving at such an aesthetic. As the author describes it: "One morning [artist Craig Kauffman] stopped in a doughnut shop to get a cup of coffee and noticed a sign shaped like molded plastic fruit and started wondering how it was made. He drove over to a small industrial plant in the suburb of Paramount called Planet Plastics, where he learned about molds and vacuum-form machinery. In 1964, he amplified and simplified shapes into low-relief wall

pieces he called 'erotic thermometers.' He sprayed the reverse side of the clear plastic with acrylic paint in the intense colors of Jell-O."

The best of L.A.'s similarly inclined artists gathered in the Ferus Gallery, a joint enterprise run by brilliant and unreliable curator Walter Hopps ("Mad Men" appearance, madman methods), ur-assemblagist Ed Kienholz (probably the greatest artist the city has ever produced) and former Knoll salesman and Cary Grant lookalike Irving Blum, whose baritone mock-certainty could have provided the perfect voiceover for the whole scene.

Rebels in Paradise

By Hunter Drohojowska-Philp
Henry Holt, 263 pages, $32.50

This snappy, gossipy book is, however, more about artists than art. This is as it should be. L.A.'s serious art of the 1960s veers either toward self-explanatory Pop or extreme, phenomenological abstraction, off which words slide like raindrops off, well, a molded plastic fruit sign. The artists themselves, by contrast, present a fascinating profusion of kinship patterns, which mostly have to do with girlfriends and show business: "Ruscha made a small version of [his painting] 'Annie' for his intimate friend Ann Marshall, daughter of actor Herbert Marshall and best friend of Michelle Phillips, the gorgeous nymphet singer of the Mamas and the Papas. Along with Toni Basil, the dancer and choreographer who was dating Dean Stockwell, and Terri Garr, the dancer and actress who was dating Bengston, these adventurous and beautiful young women embodied the essence of California girls."

Want more? Walter Hopps married his wife Shirley at Simon Rodia's Watts Towers, the outsider-artist masterpiece. When the couple split, Shirley married Irving Blum; their son's middle name is Ferus. Meanwhile, Hopps enjoyed a 19-year-old extra-marital squeeze named Eve Babitz, who is the naked woman playing chess with Duchamp in the famous photo taken at his Pasadena retrospective. Ms. Babitz later became Ed Ruscha's inamorata.

The People-magazine-meets-modern-art tone might be tedious if it weren't for Ms. Drohojowska-Philp's way with capsule descriptions: "They were quite the odd couple: The square-jawed, sandy-haired Hopps was so often outfitted in a shirt and tie, sporting black, square-rimmed glasses, that his friends used to tease him about being in the CIA. In contrast, Kienholz was a cherubic farm boy and aspiring Beat with a receding hairline, a goatee, and an expanding belly. Both were autodidacts who were seemingly incapable of getting along."

L.A. Rising

By Lyn Kienholz

California/International Arts Foundation, 509 pages, $125

Not to shortchange the art history, though: In 1955, Kauffman, Hopps and Jim Newman mounted an art exhibition on a canvas "wall" covering the merry-go-round on the Santa Monica pier. Paintings by the likes of Clyfford Still and Richard Diebenkorn revolved slowly to the accompaniment of a calliope, jazz platters, a dozen radios performing a John Cage score and recorded recitations by Allen Ginsberg and Jack Kerouac. Ten years later, and four years before the Art Workers' Coalition was formed in New York, "a giant artists' 'Peace Tower' protesting the Vietnam war went up on a vacant lot on the Sunset Strip." Take that, Manhattan!

The relatively minor faults of "Rebels" have to do with a tinge of gushiness—which is understandable when, bottom line, you're trying to make a case for L.A.'s scene in the 1960s being in the same ballpark as New

York's in the 1940s, when Hans Hofmann and Willem de Kooning had long since emigrated to the city and Jackson Pollock and Franz Kline were relatively young Turks. Ms. Drohojowska-Philp also takes a lot of artists at their word. Did Kauffman really get drunk and "power his Jaguar roadster in muddy circles on the well-manicured lawns of the [San Fernando] Valley?" Did Mr. Bengston really get into the Ferus stable by stepping in front of an oncoming car and yelling "Halt!" while Kienholz watched? Maybe, but I'll go ahead and assume that Kienholz and his fourth-wife-to-be, Lyn, actually "went on a date at Edna Earle's Fog Cutter restaurant with [curator Maurice] Tuchman and his wife Blossom," because that's my segue into the second of these two necessary books on L.A. art, Lyn Kienholz's "L.A. Rising."

Edward Ruscha

Ed Ruscha's 'A Blvd. Called Sunset' (1974).

At this point, a little disclosure. I'm a critic who is quoted approvingly a few times by Ms. Drohojowska-Philp and a painter who is included in "L.A. Rising," which is a kind of yearbook that gathers more than 500 artists with birthdates from 1886 to the 1950s: Each artist receives a full page consisting of two color reproductions and a snippet or two of contemporary critical comment. Whatever salt-ingesting my confession should provoke, I can say without fear of contradiction that "L.A. Rising" is (a) wonderful simply for its existence and (b) a little more wonderful because Ms. Kienholz and her researchers and designers have done such a good job.

Oh, there are omissions—oversights go with the territory in such a project. I wish that a very good abstract painter (and, yes, a friend) Jim DeFrance had been given a page and that dealer Michael Walls at least had appeared in the appendix. But my complaints are quibbles.

Oddly, these two books present the West Coast art of the era as a kind of retroactive preview of the art world we have now. Mr. Bengston thought that the whole Abstract Expressionist ambience still prevalent in New York was theatrically abject and melodramatic. He advocated artists dressing well and turning goodly portions of their studios into showrooms for sales. He hobnobbed with actresses and manipulated the media. The "rebels" consorted with fashion designers (remember Rudi Gernreich and the monokini?), engaged in outrageous-lite behavior and made the art scene fully compatible with L.A.'s version of café society. A jump-cut to today's art fairs, gossipy Internet chatter, and ubiquitous and extreme extensions of what an L.A. artist

said to me in the 1970s—"Hey Pete, I think I've figured out a way to make some paintings"—is hardly a jump at all.

Virginia Dwan, the owner of the influential 1960s L.A. art emporium the Dwan Gallery, says in "Rebels": "It was a playful period. It wasn't that people weren't taking the art seriously but there was an openness to enjoyment and having fun in the process." True enough, but there was a downside. You've noticed that all the players were guys and the supporting cast was mostly female? Vivian Kauffman, one of Craig's many wives, recalls: "It was a boys' club, and I think it was pretty difficult to live with those people. They had to be so concentrated, they led very selfish lives, and all the women were left in the wake." That's since been corrected. Sort of.

—Mr. Plagens, a writer and painter, is at work on a book about the artist Bruce Nauman.

http://online.wsj.com/article/SB10001424052702303365804576431992568209306.html?mod=WSJ_Books_LS_Books_6

Saving Gas Via Underpowered Death Traps

Research confirms that increasing fuel economy standards does cost lives on the road. But economist Mark Jacobsen explains how that doesn't have to be the case.

By Emily Badger

Economists have shown that separate fuel efficiency standards for cars and trucks lead to deadly accidents. But a single standard for all vehicles — big and small — would lead to almost none. (SpikeHoban/Flickr.com)

After the Obama Administration unveiled new fuel-economy standards last week for cars, light trucks and SUVs – setting an average goal of 54.5 miles per gallon by 2025 – perennial critics of the policy pounced on one of its feared side effects.

"This will take away consumer choice," warned Sterling Burnett, a senior fellow with the free-market think thank National Center for Policy Analysis, "and force all but the wealthiest drivers into small, underpowered death traps."

The center's press release even links to a terrifying chart illustrating, along a steep diagonal line, of the extra people killed per hundred-pound downsizing of new cars thanks to increased fuel-economy standards.

This worry – that more efficiency means more fatalities as we make cars smaller and lighter – has dogged the program for years. But the reality isn't so linear, in large part because those hulking trucks and SUVs that do such a good job of protecting their passengers also pose the greatest threat to everyone else on the road.

Recent research that takes that into account, alongside other factors from driver behavior to vehicle model to weather conditions, suggests something else.

Yes, it's true that the fuel-economy standards the U.S. has been using cost lives. Economist Mark Jacobsen has estimated that for every mile-per-gallon we raise the standards, 149 traffic fatalities occur per year. That would mean 1,490 deaths if the standards were raised from, say, 30 miles-per-gallon to 40. But this doesn't have to be the case. It's possible, Jacobsen has concluded, to increase fuel efficiency without also decreasing safety. And if government officials are smart, they'll tailor the regulations behind the new standards to do this.

According to Jacobsen's data, the worst accidents are those that pit the smallest vehicles against the largest ones. And, often, it's the driver in the smaller vehicle who dies. If, for instance, a compact car and a large pickup collide, a fatality in the compact car is seven times more likely than one in the pickup.

Jacobsen also puts it this way: A vehicle that is 1,000 pounds heavier than the ones around it imposes about 40 percent more risk of fatality on other drivers in the area. A Ford F-150? It weighs 1,500 pounds more than a Toyota Camry.

Drivers intuitively understand some of this because they've been embarking on what economist Michelle White dubbed the "arms race" on American roads.

"This is people buying bigger cars than they might even really want just to try to protect themselves from everyone else," Jacobsen said. "You get this inefficient outcome where everyone has a car that's too big as a result."

The concept suggests that we need a kind of "disarmament" — a policy to bring down the size of everyone's vehicles. But even more important, Jacobsen says, is the need to bring the size of vehicles more in line with each other, reducing the likelihood of the worst accidents that occur when tiny cars crash into monstrous ones.

The fuel economy standards we've been using actually make that discrepancy worse. The government deploys a separate, higher standard for cars than for light trucks and SUVs. And this essentially encourages carmakers to make small cars even smaller — without doing the same to trucks and SUVs and without providing any incentive for drivers to downsize from an SUV into a car.

Jacobsen's solution: one average fuel economy standard for all light vehicles (which is how the EPA now regulates auto emissions). Combining what engineers have learned about vehicle safety with what economists have studied about the auto "arms race," Jacobsen's model produces a startling result. Separate standards for cars and trucks lead to deadly accidents; a single standard for all vehicles would lead to almost none.

"If you just have a unified standard, cars do become slightly more similar, and that's the most important thing for safety: how similar cars are in weight and size," he said. "Our existing fuel economy standards don't do that at all. They in fact do the opposite."

Tom Wenzel, a research scientist at the Lawrence Berkeley National Laboratory, concurs with this.

"Having separate fuel economy standards for cars and trucks encourages people to continue to use trucks as if they were cars," he said. "They buy a truck, but they drive it as if it were a car. They don't necessarily need the bed or the four-wheel drive."

When fuel economy standards were introduced in the early 1970s, just about the only people buying trucks were those who really needed them — farmers, ranchers, construction workers. But by creating separate fuel

economy standards for those vehicles — and making them less expensive than they would be if they had to meet the higher gas mileage of cars — the government may have encouraged more people to start driving them.

Unifying all light vehicles under the same standard today would inevitably hike the price of trucks and SUVs. That doesn't trouble Wenzel or Jacobsen.

"My response to that is, 'Well that's fine," Wenzel said. "If consumers still demand pickup trucks and all of those features, it's not like we're preventing them from buying them. They just will have to pay more."

The government could give tax breaks to farmers and construction workers who really do need them, he suggests. Anyone else who simply wants one, Jacobsen adds, would now have to pay what economists would say is a more accurate price.

"When you buy a large SUV, you're not paying for the risk you pose to everyone else on the road," Jacobsen said. And in a framework where the government can increase fuel efficiency without also costing lives, he suggests you should.

http://www.miller-mccune.com/business-economics/saving-gas-via-underpowered-death-traps-34722/

Two decades of the web: a utopia no longer

Evgeny Morozov

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Evgeny Morozov traces the development of the web from the laboratories of the Cold War to the world of venture capital and big money

The "virtual community": an idea that was the antithesis of Cold War paranoia

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The internet is a child with many fathers. It is an extremely complex multi-module technology and each module—from communication protocols to browsers—has a convoluted history. The internet's earliest roots lie in the rise of cybernetics during the 1950s. Later breakthroughs included the invention of packet switching in the 1960s, a novel way for transmitting data by breaking it into chunks. Various university and government networks began to appear in the early 1970s, and were interlinked in the 1980s. The first browsers came on line in the early 1990s—20 years ago this August.

Many seemingly unrelated developments in the computer industry played an important role. The idea of personalised, decentralised and playful computing was being advanced by the likes of Apple and Microsoft in the 1970s. In contrast, IBM's idea of computing was of an expensive, centralised and institutional activity. If this latter view had prevailed, the internet might have never developed beyond email, which would probably have been limited to academics and investment bankers. That your mobile phone moonlights as a computer is not the result of inevitable technological trends, but the outcome of deeply ideological and now almost forgotten struggle between two different visions of computing.

Much of the credit for the technical advances of the internet goes to individuals such as Vint Cerf, creator of the first inter-network protocol, which helped to unify the numerous pre-internet networks; David D Clark, who helped to theorise the "end-to-end" principle, the precursor to the modern concept of "net neutrality"; and Tim Berners-Lee, who invented the world wide web.

But studying the history of the internet is impossible without studying the ideas, biases, and desires of its early cheerleaders, a group distinct from the engineers. This included Stewart Brand, Kevin Kelly, John Perry Barlow, and the crowd that coalesced around Wired magazine after its launch in 1993. They were male, California-based, and had fond memories of the tumultuous hedonism of the 1960s.

These men emphasised the importance of community and shared experiences; they viewed humans as essentially good, influenced by rational deliberation, and tending towards co-operation. Anti-Hobbesian at heart, they viewed the state and its institutions as an obstacle to be overcome—and what better way to transcend them than via cyberspace? Their values had profound effects on the mechanics of the internet, not all of them positive. The proliferation of spam and cybercrime is, in part, the consequence of their failure to predict what might happen as a result of the internet's open infrastructure. The first spam message dates back to 1978; now, 85 per cent of all email traffic in the world is spam.

Perhaps the cheerleaders' greatest achievement was in wresting dominance of the internet from the founding engineers, whose mentality was that of the Cold War. These researchers greatly depended on the largesse of the US department of defence and its nervous anticipation of a nuclear exchange with the Soviet Union. The idea of the "virtual community"—the antithesis of Cold War paranoia—was popularised by the writer and thinker Howard Rheingold. The term arose from his experiences with Well.com, an early precursor to Facebook.

But this cyber-boosterism was not without a serious side. Figures such as Nicholas Negroponte, co-founder of the MIT Media Laboratory and the spiritual leader of the "One Laptop per Child" movement, Bill Gates of Microsoft, and Esther Dyson, the commentator and entrepreneur, helped to assure the public that the internet was not just a hangout for Bay Area hippies— it was also a serious place for doing business. And as the cyber-pundits kept promising, it was also a place for "getting empowered," an attitude that made it a good fit for the broader neoliberal agenda of the 1990s.

This empowerment was supposed to come through the removal of intermediaries. Mainstream media outlets were to be replaced by bulletin boards, e-zines and later by forums and blogs. Elected representatives were to be replaced by "electronic townhalls" and direct online voting. This political aspiration even had its own founding document. Back in 1996, John Perry Barlow, a former Grateful Dead lyricist and one of the founders of the Electronic Frontier Foundation, penned the famous A Declaration of the Independence of Cyberspace. Barlow hoped that the nation state would leave cyberspace alone. (French President Nicolas Sarkozy's recent pledge to "civilise the internet" suggests that some nation states didn't get Barlow's memo.)

Overall, this vision of a world without intermediaries satisfied the communitarian former hippies *and* the libertarian anti-system cyber-pundits. They both wanted the internet to "flatten" the world, by which they meant level things out—make things fairer. (This was a decade before the author Thomas Friedman stumbled on the same metaphor and wrote his book The World is Flat, on the consequences of globalisation). That former hippies found themselves dining with venture capitalists only seemed to confirm the great bridging potential of the internet. The ex-hippies genuinely believed that all their utopian blueprints could be executed with the help of private capital.

Why the venture capitalists found the internet so appealing is a mystery: the market for online advertising at the time was tiny and the number of internet users negligible. In 1995, there were only 15m users, according to the website Internet World Stats. Start-ups were everywhere, but most were trading in promises of a bright future, not real services. The investors' disregard for traditional methods of gauging financial performance—

which eventually led to the dotcom bubble—suggests that their judgement was clouded by a toxic combination: rhetoric from the internet's New Age cheerleaders; and neoliberal promises of new ways of doing commerce. Pets.com, which sold pet products to retail customers, is a textbook example. At one point, the website was spending close to $12m on advertising on revenues of $619,000. In 2000, the company collapsed in a heap of debt.

If there was one site that seemed to validate the ethos of the early pioneers—that people are good and, under the right conditions, will co-operate in the name of shared goals—it was Wikipedia. It is also one of the few sites that defied the for-profit model typical of internet start-ups. Wikipedia refuses to show ads or pay contributors. Instead, the site depends on donations from users and grants from foundations. Wikipedia is a painful reminder of what the web could have been had the early vision of the internet as a shared, communal space not been co-opted by big business.

Most internet enterprises had to build their business around advertising, which meant being subject to the trends of that industry—the most important of which is personalisation. Online ads are tailored to the interests of a given user. The more the website knows about a user, the more effective its advertising pitch. A clear picture of a user's interests will also allow a website to tailor its content. Data from Google News shows that users who see a page with news that was collated on the basis of their previous activity end up clicking on more stories.

The logical end of this ever-increasing personalisation is of each user having his or her own online experience. This is a far cry from the early vision of the internet as a communal space. Instead of the internet, we may as well start talking of a billion "internets"—one for each user. Even the browser, the last bastion of shared experience, is on the way out, replaced by a panoply of apps for mobile phones and tablets such as the iPad that each provide a customised experience. This seems a clear deviation from the original plan.

It is not the only deviation. For many internet users, empowerment was an illusion. They may think they enjoy free access to cool services, but in reality, they are paying for that access with their privacy. Much of our information-sharing seems trivial—should we really care that some company knows what music we like? But, once this information is analysed alongside data from other similar services, it can generate insights about individuals and groups that are deeply interesting to most marketers and intelligence agencies. Based on its extensive data-mining across the web, RapLeaf, a San Francisco start-up, came up with the conclusion that Google's engineers tend to eat more junk food than Microsoft's.

If they can find out what you eat, they can find out what you read as well; from there, it's not so hard to predict your political preferences—and manipulate you. We are careening towards a future where privacy becomes a very expensive commodity. There are already several start-ups providing privacy "at a fee." Ironically, venture capitalists love these companies, and are busily funding solutions to the very problems they have previously helped to create.

The removal of online material is also a booming industry. For a fee that ranges from $3,000 to $15,000, a company such as Reputation.com can ensure that any sensitive information is buried deep in the last pages of Google's search results, or disappears from the internet altogether. That company rose to prominence after it removed from the internet hundreds of photos of a Californian teenager who died in a car crash, at the request of the victim's family. This, too, creates new kinds of inequalities: the maintenance of online reputation is dependent on ability to pay. At this point, the law can intervene, as in Finland, for example, where employers are banned from Googling the names of prospective employees. In Germany too, companies cannot check a potential employee's social networking sites; but it is unlikely that such measures would take off in countries with weaker employment protection laws.

While we are being empowered as consumers, we are simultaneously being disempowered as citizens, something that the cyber-libertarian digital prophets didn't foresee. "Electronic town halls" never took off

either. When Barack Obama tried to hold one shortly after being elected president, the most popular question posed to him concerned the legalisation of mari-juana. The internet does not and cannot replace politics—it augments and amplifies it. The Tea Party in the US does not limit its activism to social media, but uses it as part of a broader political campaign. Politics is still primary and technology secondary.

However, one set of intermediaries may well be on the decline—print media—which has been quickly jettisoned by the younger generation. Search engines and social networking sites hold as much power today as newspapers and radio stations did three decades ago. The fact that they prefer to disguise their editorial practices in the form of nominally objective algorithms doesn't make them any less political and influential.

Perhaps the mismatch between digital ideals and reality can be ascribed to the naivety of the technology pundits. But the real problem was that the internet's early visionaries never translated their aspirations for a shared cyberspace into a set of concrete principles on which online regulation could be constructed. It's as if they wanted to build an exemplary city on the hill, but never bothered to spell out how to keep it exemplary once it started growing.

Some fundamental questions about the communal aspects of the internet were sidestepped. Who would take out the trash—that is, deal with spamming and scamming? Who would be in charge of preserving historical memorabilia: the ephemeral tweets and blog posts that tend to disappear into the digital void? Who would deal with the problem of pollution—insidious practices such as "search engine optimisation," or content farms that produce trivial content to earn advertising revenue? Who would protect the dignity of online citizens? Who would secure their privacy and protect them from defamation and libel?

These issues were perhaps not so pressing or evident in a decade when search engines were rudimentary and tweets and blogs didn't exist. But it's not so obvious that John Perry Barlow's call on governments to exit cyberspace was a good one. In the absence of strong public institutions with oversight, corporations felt they could do what they wanted. In most cases, they just pretended these problems didn't exist.In the early days of the era of Web 2.0—the second-generation websites which had dynamic, shareable content or were social networks—it seemed that many such problems were imaginary: who needs to preserve tweets and blog posts if they can be easily found online? Now, with well-known services such as Digg, Flickr, and Delicious going through rough times, it's not a given that your data is safe with them, for they might go under. There is always Google, which keeps a copy of most things—but then, one day it may go under too.

What the internet badly needed in its first two decades of existence, and what it needs still, is a book akin to Jane Jacob's 1961 The Death and Life of Great American Cities which attacked the practices and attitudes of 1950s US urban planners and proved hugely influential. The structure of online space requires a similar critique.

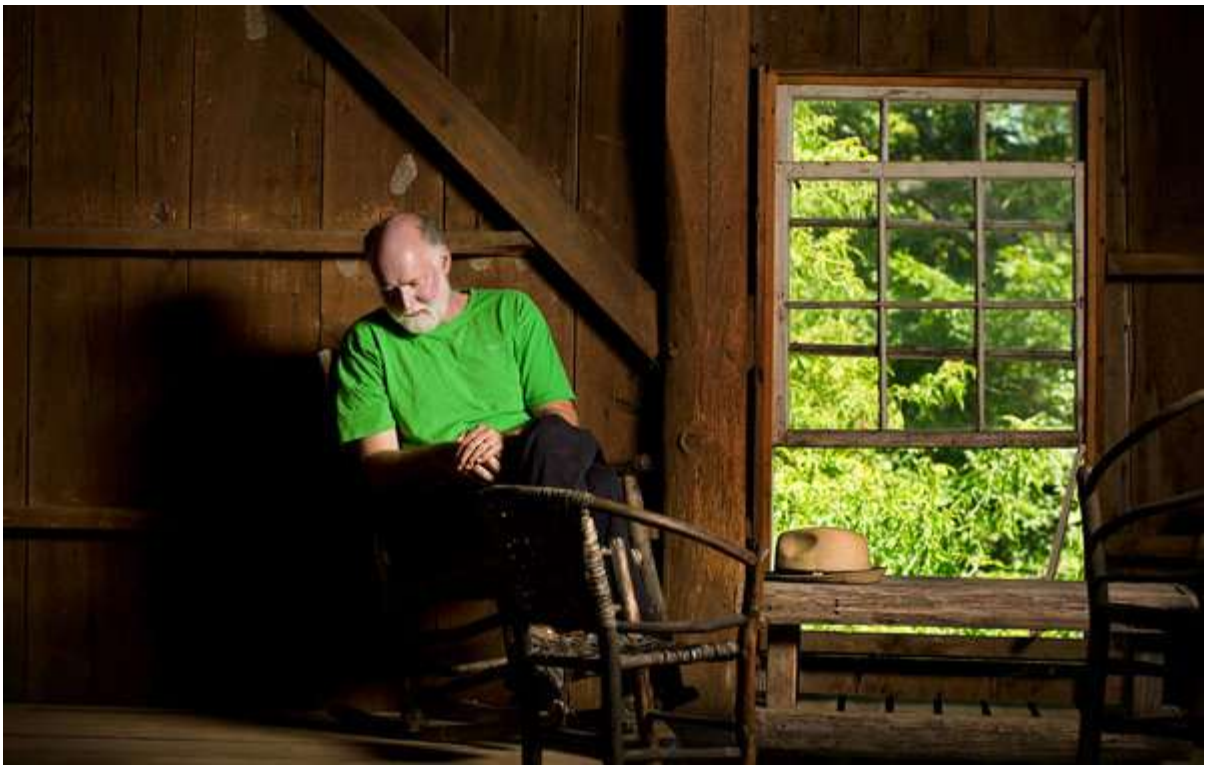
The founding fathers of the internet had laudable instincts: the utopian vision of the internet as a shared space to maximise communal welfare is a good template to work from. But they got co-opted by big money, and became trapped in the self-empowerment discourse that was just an ideological ruse to conceal the interests of big companies and minimise government intervention.

The current state of affairs is not irreversible. We still have some privacy left and internet companies can still be swayed by smart regulation. But we need to stop thinking of the internet as a marketplace first and a public forum second. What is long overdue is a fundamental reconsideration of the primacy of the internet's civic and aesthetic dimensions. It's time to decide whether we want the internet to look like a private mall or a public square.

http://www.prospectmagazine.co.uk/2011/06/morozov-web-no-utopia-twenty-years-short-history-internet/

The Mad Scientist of Smut

By CHARLES McGRATH



Elinor Carucci for The New York Times

Baker in his barn, which sometimes serves as a writing space.

Nicholson Baker does not look like a dirty-book writer. His color is good. His gaze is direct, with none of the sidelong furtiveness of the compulsive masturbator. He wears round, owlish glasses, and in early book-jacket photographs, when his beard was darker and more closely trimmed than it is now, he reminds you of one of those earnest Russian intellectuals of the 19th century. Nowadays, with the beard grown out and nearly white, he could easily get seasonal work as a shopping-mall Santa.

Baker is tall and a little awkward, with size 14 feet that keep getting in his own way. And he is shy and sweet-natured. Talking about sex makes him turn maroon. Yet he is the author of "Vox," the 1992 phone-sex novel so steamy that Monica Lewinsky gave it as a gift to Bill Clinton. It ends with a woman on one end of the line crying out: "Oh! Nnnnnnnn! Nnn! Nnn! Nnn! Nnn! Nnn! Nnn!" and climaxing so powerfully that she sees the great seal of the Commonwealth of Massachusetts. Two years later, Baker published "The Fermata," a sequel of sorts, about a man who has the ability to stop time and uses it to undress women.

Baker's new novel, "House of Holes," which comes out this month, has the apt subtitle "A Book of Raunch" and is dirtier than "Vox" and "The Fermata" combined. It's a series of loosely linked vignettes set in a sexual theme park where the attractions include Masturboats; the Porndecahedron, a 12-screen planetarium showing nonstop blue movies; and the Velvet Room, where the Russian composers Borodin and Rimsky-Korsakov use their genitals to give foot massages. One visitor to the House of Holes temporarily surrenders his right arm in exchange for a larger penis, while the arm enjoys a happy sex life of its own. Another voluntarily submits to head detachment and becomes a walking pair of gonads. The book coins dozens of new terms for the male

member, like “thundertube,” “seedstick” and the “Malcolm Gladwell,” and near the end there is a sort of Joycean explosion, an “Atlas-shrug shudderation of arrival” that makes a young woman named Shandee “shiver her way through the seven, eight, nine, twelve seconds of worldwide interplanetary flux of orgasmic strobing happy unmatched tired coughing ebbing thrilled spent ecstasy.”

What kind of person dreams up this stuff? It’s as funny as it is filthy and breathes new life into the tired, fossilized conventions of pornography in a way that suggests a deep, almost scholarly familiarity with the ancient tropes. “When ‘Vox’ came in, I thought it was both hilarious and horny,” David Rosenthal, until recently the executive vice president and publisher of Simon & Schuster and Baker’s editor in the ’90s, recalled in June. “I kept thinking, Where on earth did this come from?” Before leaving to become the president and publisher of Blue Rider, a new imprint at Penguin, Rosenthal also saw an early version of “House of Holes.” “It pains me that I’m not there to publish it,” he said, adding: “The fantasy life of Nicholson Baker — that would be a great psychological study.”

As Rosenthal pointed out, Baker is no ordinary, adult-bookstore pornographer. In addition to what might be called his sex trilogy, he is the author of six other novels, none of them racy in the least. “Mezzanine,” his first, takes place entirely inside the head of an office worker going out to buy shoelaces at lunchtime. It was followed by “Room Temperature,” about a man giving his infant daughter a bottle. “The Anthologist,” his most recent novel before “House of Holes,” is about a second-rate poet unable to finish an introduction he’s supposed to be writing for an anthology of rhyming verse.

Baker has also written several nonfiction books, including “U and I,” a memoir about his lifelong infatuation with John Updike; “Double Fold,” a manifesto against libraries overeager to dump their physical books and newspaper collections in favor of microfilm and digitized versions; and “Human Smoke,” a long, documentarylike account of World War II that implicitly makes a pacifist case, suggesting that a truce could have been negotiated and that Churchill was almost as much of a madman as Hitler.

Baker lives in South Berwick, Me., a small town not far from the New Hampshire border, in a white colonial-style house, bolted together from a wing built in the 18th century and one from the 19th. The south side badly needs a coat of paint, and the first story of the barn is so filled with books that last winter the floor caved in and had to be shored up. In person, Baker is a little like his house: a wired-together bundle of charming, eccentric, mismatched parts. He is happily married, with two children, sociable but also a bit of a loner. He says he has trouble forming male friendships and doesn’t know how to talk to other writers. “I don’t do all that well in the writerly world,” he told me recently, sitting at his kitchen table, a faucet dripping loudly behind him. “I’m happier being outside the flow.”

Baker is very funny but also a little melancholy. He sighs a lot. He is modest to a fault, so polite and decorous that he would never dream of employing in conversation the kind of vocabulary that lights up “House of Holes,” a blue-flaring plume of smut-talk. Baker is a classically trained musician who listens to trance and electronica, a retiring, mild-mannered person given to strong feelings and passionate obsessions. I gathered that there was a period not long ago when he tended to get a little emotional at South Berwick town meetings when some locals wanted to tear down an old building and replace it with a new one. In 1999, during his “Double Fold” phase, he got so upset that the British Library was deaccessioning its collection of 19th- and early-20th-century American newspapers that he cashed in a large part of his retirement savings and bought them himself: five trailer-truck loads, 6,000 bound volumes and another thousand wrapped bundles, which he stored in an old mill building in nearby Rollinsford, N.H. The other tenants were the Humpty Dumpty Potato Chip Company, a French thermal-underwear company and an outfit that collected old medical equipment — gurneys, examination tables and what Baker described as monster-movie X-ray machines.

When he is not writing about sex (and also when he is), Baker is one of the most beautiful, original and ingenious prose stylists to have come along in decades. He has some of his idol Updike’s visual acuity and some of Nabokov’s gift for metaphor, but he is funnier than either and takes a kind of mad scientist’s delight

in the way things work and how the world is put together. Here is the narrator of "Room Temperature" describing his infant daughter, whom he has nicknamed the Bug: "The Bug's nostril had the innocent perfection of a Cheerio (and Cheerios were in my mind, since lately we had begun to offer them to her), a tiny dry clean salty ring, so small, with the odd but functional smallness of the tires on passenger planes, or the smooth rim around the pistil of the brass pump head that you fitted over a tire's stem valve to inflate it to a pressure you preset with a crank on the air machine."

Years before David Foster Wallace popularized the extended digressive footnote, Baker stuffed "Mezzanine" with dozens of small-type, bottom-of-the-page mini-essays about doorknobs, staplers, plastic drinking straws and this one, about Jiffy Pop: "Jiffy Pop was the finest example of the whole aluminous genre: a package inspired by the fry pan whose handle is also the hook it hangs from in the store, with a maelstrom of swirled foil on the top that, subjected to the subversion of the exploding kernels, first by the direct collisions of discrete corns and then in a general indirect uplift of the total volume of potentiated cellulose, gradually unfurls its dome, turning slowly as it despirals itself, providing in its gradual expansion a graspable, slow-motion version of what each erumpant particle of corn is undergoing invisibly and instantaneously beneath it."

Some critics have called this style miniaturist, which is true up to a point, and even minimalist, which seems all wrong. Baker prefers to think of himself as a maximalist: a writer who, in books where very little seems to happen, packs in "the most thought per elapsed unit of time." Another way to think of his writing is that the kind of precision that Updike uses to render the background of his books becomes in Baker almost the whole point. In one of the very few passages in "U and I" that take issue with the master, Baker chides Updike for complaining about descriptive passages that "clog" a narrative and says: "The only thing I like are the clogs — and when, late in most novels, there are no more in the pipeline to slow things down, I get that fidgety feeling and I start bending the pliable remainder of the book so that it makes a popping sound, and I pick off the price sticker on the back and then regret doing so and stick it back on."

Not surprisingly, Baker's evolution as a writer has taken a roundabout route. He was born in New York City in 1957 but grew up in Rochester, where his father ran a small ad agency and his mother taught art. He went to a public experimental school, a place so free-form that there were no grades and his only transcripts were ones Baker typed himself. "At the time I thought: Give me structure!" he told me. "I yearned for a more traditional school. But now I think it was the best thing. I learned what it was like to be incredibly bored." Baker's main interest then was playing the bassoon, an instrument that originally appealed to him because he thought it looked like a steam engine and that he grew to love because of the beautiful middle-range melodies it could produce. At 13 he began taking lessons with Abraham Weiss, the principal bassoonist of the Rochester Philharmonic. Weiss was then only 21, and the two became unusually close. "I had a one-track mind when it came to music," Weiss said recently, "and Nick had this incredible range of interests. It amazed me that he could be so good at the bassoon and also know all this other stuff. He was always using new words. I remember he came to a lesson once and he had the word 'phlegm' Scotch-taped to his bassoon."

Baker eventually became good enough that when the Rochester Philharmonic needed an extra bassoonist for a Mahler symphony, say, he was enlisted. He had his own tux and union card. Weiss thinks that he was talented enough to make a life in music, but Baker disagrees. "I really practiced hard and got to a certain level of technical proficiency," he said. "I overcame some of my limitations. I was a hard-working, dedicated bassoonist, but I have to say I'm not a natural musician." He went for a year to the Eastman School of Music, in Rochester, and then transferred to Haverford College, where he majored in English. "The music wasn't going to happen," he said, "and I realized I had read so little. I didn't know my way around any century. I was very underread."

In his junior year at Haverford, Baker roomed in a co-ed dorm at neighboring Bryn Mawr, where he met and fell in love with Margaret Brentano, the daughter of a Berkeley history professor. She is now his wife. "It was incredible," Baker said of that chapter in his life, which sounds like a more innocent, pre-lapsarian episode

from “House of Holes.” “I’m very happy around women, and I had this tremendous experience there in the third floor of Rhodes Hall. Even the bathrooms were co-ed. It was very heady and exciting. I was very shy and somewhat awkward. I studied too hard. And to have this exciting dorm life was a whole new thing.” One way the students entertained themselves was by giving dramatic readings from the Penthouse letters department — the ones that begin, “I never thought I’d be writing this, but. . . .”

By then Baker already had notions of becoming a writer, even though one of his teachers put this comment on a story he turned in: “This, to be frank, is boring.” (Margaret remembers that he had a chart keeping track of all the rejection letters he received.) Before he became a full-time writer, though, Baker had a misguided interval of trying to be a businessman, and briefly even became a neoconservative. “I liked the idea of picking good companies and helping the American industrial miracle,” he recalled. “Now I have my reservations. I know I was a very confused young man.”

For a year or so Baker was a stock analyst on Wall Street. “I didn’t exactly get fired, but it wasn’t the best exit,” he told me. “I didn’t make any great contribution to the world of finance — let’s put it that way.” Even more briefly and disastrously, he was a broker whose few clients included an uncle and Abe Weiss, his old bassoon teacher. While selling a few stories to The New Yorker and The Atlantic, he temped for a couple of years — an experience that he actually enjoyed and that supplied many of the details of office life in “The Mezzanine” and “The Fermata.” Perhaps because he spends so much time alone, writing in his barn, at the kitchen table, even in his car (where he wrote much of “Human Smoke,” storing his research material in the back seat), Baker loves workplaces. “I sometimes think I’d be happier doing restaurant work or manual labor,” he said after describing how difficult it is to make a living as a writer. “I remember one of my temp jobs was working for a part of Gillette that was selling blister packs of shampoo to Bolivia. I was part of this team. I love all that.”

Baker’s last real job was as a writer of technical manuals, which he held until he grew so anxious and obsessed that Margaret figured out a way to support them for six months while he devoted himself to writing the novel that would become “Mezzanine.” Part of what sealed his resolve was a remembered moment of literary Freudianism so pure that Harold Bloom might have made it up: one day he heard his mother laughing out loud at a humor piece by John Updike.

That Baker wrote “Vox” right after “U and I” is probably no accident. It takes an Updikean delight in sensuality. What accounts for the novel’s title is that he was trying and failing to learn Latin. “Latin is actually an extremely idiomatic, very messy language, and I was so far from being able to master it,” he said. “One day I said to myself: I know English. I know English so well I can make up a conversation right now.” He added: “This was 1990, when it felt like there was a mini-sexual revolution going on after the real sexual revolution. And I felt that by starting the book with that phrase, ‘What are you wearing,’ it just tilted everything forward. It seemed like literary novels then had a very set sexual pattern: four or five sex scenes among some literary-sounding writing. So I said to myself: ‘Just do it. Stay with the sex. Accept that you’re reading and writing this with mixed motives.’ ”

Baker began “The Fermata” in part because he had stuff, including scenes that involved a lawn mower, dildos and a cat, left over from “Vox,” but the novel’s central fantasy — the idea of stopping time — is one that has been with him since he was 12 or 13. “I imagined a small box with a toggle switch,” he said. “it had a red light on it, and it was very heavy, like an electric train transformer. I’d click it on and the universe would stop. What would happen? What would I do?” While working on the book, Baker interviewed people, asking what they would do if they had the ability to stop time, and found that the responses divided pretty evenly between something sexual and stealing money. One man said the first thing he would do was head for the locker room of a women’s basketball team.

“The Fermata” sold less well than “Vox,” which spent several weeks on the Times best-seller list. Its protagonist, Arno Strine, is less likable than Jim, the male partner in “Vox,” and some readers complained

that the book allowed him to get away with some fairly creepy behavior. But “The Fermata” is actually a better book, or a better-written one, than “Vox,” and it supplies an important clue to Baker’s work and even his life. His preservationist impulses, his hoarding of books and newspapers; that microscopic, slow-motion style, filling an instant with cascades of thought and remembrance; even his way of writing about sex, which in “House of Holes,” a raunchier and less leisurely book than “Vox” or “The Fermata,” is still more about foreplay than climax — what are they but ways of arresting time, of preserving the moment and staving off the end?

One day last spring I went with Baker to visit the mill where he warehoused his old newspapers, which were taken over by the Duke University library after Baker found caring for them too nerve-wracking and expensive. We sat in the parking lot for a while, and he grew a little wistful. “I think that was the great adventure of my life, really,” he said. “The whole excitement of the unloading. I had an electric pallet jack, and when I moved all the papers in, they looked like a giant locomotive. I feel like I could probably have spent my whole life rooting around in there, discovering things.”

Margaret later told me that she missed the papers, too. “I was not perfect about it at the beginning,” she said. “I sometimes get too much credit. I put up a few fussy objections, but Nick’s passions are very convincing. He had to do it. It was thrilling — all those pallets.”

The newspaper episode was a watershed in another way. Ever since, Baker has been trying to speed up his prose a little. “Since 1999 I haven’t felt the same urge to be so lavishly specific,” he explained. The urgency of the need to save the newspapers had brought a new focus to his writing. “Human Smoke,” which came out in 2008, is written in a matter-of-fact style with no Baker-like touches at all. He composed part of “The Anthologist,” his next book, by videotaping himself speaking in the persona of Paul Chowder, the novel’s narrator. He also adopted a method, which he used again for “House of Holes,” that he calls “speak-typing”: essentially, he dictates to himself, typing rapidly as he goes.

There are a lot of typos, he admitted, especially when, as sometimes happens, he writes at night. One of the loveliest scenes in “The Anthologist,” when Paul Chowder contemplates the moon while sitting outside on a wet plastic lawn chair, was written exactly as the book describes. Baker went outside, dumped a puddle of rainwater from the chair, sat down in his pajamas and began typing on his laptop. The advantage of speak-typing, he explained, is that “the words come out differently. The sentences come out simpler, and there’s less of a temptation to go back and add more foliage. I’m trying for a simpler kind of storytelling, and maybe I feel that I did that other stuff and maybe I can’t do that anymore. It may be that a certain kind of writing is not attainable anymore.”

Someday, he added, he would like to write a big, traditional novel, with lots of characters and a real plot. “I would love to, and I’m going to, damn it, before my day is done. I’ve vowed to, and each time I somehow fall short. I get to the point where there should be a major thing that goes wrong and I don’t want it to happen. It doesn’t feel true to me. I don’t feel entitled, because very few bad things have happened to me.”

He sighed, and added: “You have to grow up. I’m very slow about some things. I feel like I’m chronicling my midlife crisis and my halting progress toward adulthood at the same time. It has taken me a long time to get things that other people understand about novels and about why people read them — what they’re looking for in books.”

Baker has no idea whether people are looking for a book about a sexual theme park. “I don’t know how this book will be accepted,” he said. “You could almost say we’re in the postpornographic era now. There’s so much porn around it’s part of everybody’s life. It’s not something you find in a certain seedy part of town or in discreetly wrapped parcels that come in the mail.”

His main goal was just to write something entertaining. “I wanted to avoid the flavor of arty erotica,” he said and admitted that “House of Holes,” which is written in a quicker, less baroque style than, say, “The Fermata,” in some ways resembles a porn movie. “It has characters,” he said. “But how deeply do we know them? It’s not like I’m plumbing the depths of each person’s soul. Initially, I thought I would have fewer characters, but it’s actually less sexually exciting if you have the same people doing things.”

Baker would like to think that “House of Holes” is more than just a guilty pleasure. “You want to have some surprises and some literary value,” he said. “After all, I’m in the novel-writing business. But it has to be arousing. A book with this level of smut, filth, whatever — there would be no point if it wasn’t arousing to write. There’s nothing like writing a sex scene. You’re writing a little slower. You’re in a world that you’ve invented, and you’re slowly describing it. It’s a turn-on, no question. It’s self-seductive.”

Margaret is always Baker’s first reader. He hovers on the stairs sometimes, listening for a laugh or the sound of her pencil making a note on the manuscript. She was a little squeamish about a scene in “House of Holes” in which a woman who has been magically miniaturized finds herself trapped inside a man’s penis and can be released only by ejaculation. Baker made a few changes, and she told me she now likes the book a lot, even if she decided not to mention the title or subtitle to her mother. “She’s in her 80s now,” she added, “and she loves Nick. She loves that he’s a good dancer.”

Baker’s 24-year-old daughter, Alice, who was the model for his novel “The Everlasting Story of Nory,” about a 9-year-old attending an English day school, lives in New York now, where she is trying to become a novelist herself. She and her father are very close, but as far as Baker knows, she hasn’t read any of his novels.

Baker’s son, Elias, who is 17 and still lives at home, is working this summer on a nonfiction book about high school. He has seen the cover of “House of Holes” and thoroughly approves of the title but, very sensibly, has decided to put off reading it. “That’s for some years in the future,” he said. “Maybe when I’m living in a different house.”

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Making Clouds Less Ominous

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A group of 12 high-profile research universities is currently negotiating with commercial e-mail providers to create a standard contract that would reduce the costs and anxieties associated with outsourcing the handling of sensitive institutional data to cloud-based vendors.

If successful, the talks could pave the way for universities to move other types of data to the cloud — a migration that has been stalled by persistent concerns among institutions that are worried about putting sensitive university data on non-university servers, campus technology officials say. The discussions might also provide a model for other joint contracts between universities and technology vendors.

Companies that run university e-mail systems negotiate individual contracts with their various clients. These negotiations often involve haggling over whether the company can provide its services in a way that does not put the university at risk of violating state and federal laws — as well as its own policies — regarding privacy, data security, accessibility, and other matters.

"Every time we go to vendors, we start those conversations anew — it's like *Groundhog Day*," says James Hilton, the CIO of the University of Virginia, one of the institutions involved in the talks. "It's inefficient on their side, and it's inefficient on our side." The idea behind the group push for a standard contract is to "aggregate some of our terms and needs upfront and just do it once," Hilton says.

According to campus officials, the 12 universities have been hammering out the details of a possible standard contract with cloud-based e-mail vendors for the last year or so. The universities at the table include Virginia, Duke University, and 10 other "premier research universities," says Hilton. (The effort grew out of conversations among members of the Common Solutions Group, a consortium that includes six universities from the Ivy League and five from the Big Ten.) On the vendor side, Microsoft, the second-largest e-mail provider for colleges and universities, confirmed that it is involved in the talks. The largest provider, Google, would not comment.

The most salient concerns around outsourcing to cloud providers — compliance with the Family Education Rights and Privacy Act (FERPA), the Health Insurance Portability and Accountability Act (HIPAA), the Americans With Disabilities Act (ADA), and other laws — are common to many colleges and universities. A standard document addressing those concerns could allow institutions and cloud-based vendors to check off compliance issues with a single stroke, eliminating many billable hours on both sides of the negotiating table, says Tracy Futhey, the CIO at Duke.

"There's not necessarily a single answer that fits all [institutions'] needs uniformly," Futhey says. "But there are, we've found out through this process, a core set of expectations and requirements for moving to these externally hosted systems."

Storing data with cloud providers is often less expensive than housing it on university servers. Companies such as Google and Microsoft sometimes even offer to host data on their own services free of charge, as they currently do with student e-mail systems.But institutional hand-wringing over how universities can protect institutional data while placing them in the care of an outside company has dictated the pace at which campus officials have moved various data-rich systems to the cloud. Information protected by FERPA and HIPAA is less likely to go through student e-mail systems; accordingly, more than half of institutions have already outsourced student e-mail to Google or Microsoft, according to the Campus Computing Project. By contrast, only 15 percent of institutions have moved faculty and staff e-mail to the cloud, and nearly two-thirds say they have purposefully decided not to do so. Universities also have tended to keep faculty research data close

at hand, since they can contain personal information about research subjects, such as Social Security numbers or confidential medical records.

"When the data is in an institution, we can protect [those data] ourselves," says Futhey. "But when we take someone's private health information and give it to a third party to hold, it is incumbent upon us to make sure that a third party has the appropriate protections in place."A positive outcome to the negotiations over e-mail could make universities more comfortable unloading some of those more sensitive data environments into the cloud, campus officials say. "If you can solve policy and compliance issues that outsourcing faculty and student e-mail raises, then you have, in principle, solved them for almost everything," says Hilton.

Futhey, the informal leader of the university group, says that some of the more difficult issues in the negotiations have been "around the communication around breaches, notification, [and] liability" in the case of a breach. If a university server gets hacked and sensitive data are exposed, it is clear that the university is at fault; if a Microsoft server gets hacked and sensitive university data are exposed, things get more complicated, Futhey says.Another issue has been where, geographically, the university data end up, she says. When a university outsources data storage to "the cloud," those data actually get sent to servers somewhere in a company's network of server farms — some of which are located in foreign countries. Some universities involved in the negotiations need to keep their data in the United States, Futhey says.

Still, Futhey says she is optimistic that the two sides will find enough common ground to produce a document that could eliminate redundancy in future negotiations between universities and commercial cloud providers. "I think we're getting down to questions of [whether] what vendors are able to provide is something universities are willing to contract for," she says. "I think we're in the closing period."At the same time as these 12 universities have been collaborating behind closed doors, a broader discussion about the need for greater collaboration among technology buyers in higher education has been going on in a more public forum. Universities need to stand together if they wish to avoid being pinned under the thumb of technology companies, Bradley Wheeler, the CIO at Indiana University, recently told his colleagues.

In the wake of last week's merger between higher education's two largest software companies, Datatel and SunGard Higher Education, Wheeler sparked a discussion on an Educause listserv when he pointed out that while companies that sell technology to universities have consolidated, the community of university technologists negotiating with those companies has remained atomized, to the peril of institutional budgets.

While this does not quite apply to institutional e-mail, corporate consolidation in scholarly publishing, learning-management systems (LMS), and enterprise resource planning systems (ERP) has allowed companies to hold institutions "over a barrel" on annual licensing fees, Wheeler explained in an interview with *Inside Higher Ed*. "There's been lots of aggregation over the years on the sell side, and the buy side has remained very fractured," he says.

The situation has left universities in a lousy negotiating position, Wheeler says. "We face a decade that's going to have vastly reduced resources for higher education," he says. "And we really have to be prudent in taking care of our buy-side interests."

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— Steve Kolowich

http://www.insidehighered.com/news/2011/08/12/research_universities_unite_to_negotiate_contracts_with_commercial_email_providers

An end to polio?

Elizabeth Pisani

23rd February 2011 — Issue 180

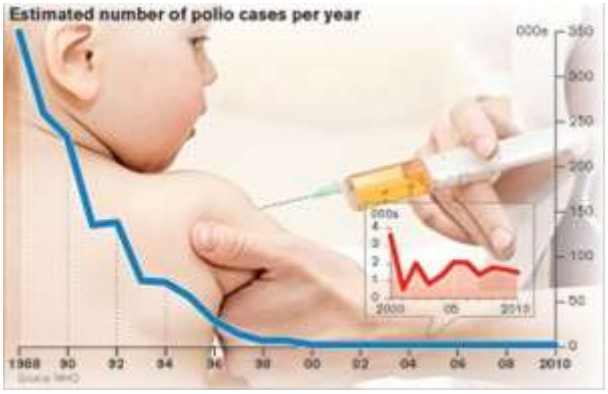
Bill Gates wants to eradicate the disease in the next two years. But that's tricky, and are we even right to try?

It's not often that I admit to being born in Cincinnati, Ohio. Less often still that I admit to being born 46 years ago. I fess up now because of Aidan Cockburn, assistant commissioner of health in Cincinnati in the year I was born. Cockburn wrote a book, The Evolution and Eradication of Infectious Diseases (1963), in which he speculated that a number of infectious diseases could be wiped out entirely: smallpox, malaria, tuberculosis, cholera, polio and yaws.

He was inspired to this view in part because Cincinnati was the site of some of the earliest mass trials of polio vaccination, first with Jonas Salk's injected vaccine in 1954-56, then with Albert Sabin's oral dosing four years later. In 1960, there were no reported cases of locally acquired polio in the stolid midwestern city of my birth.

Cockburn's belief that it was possible to wipe diseases off the face of the Earth appeared vindicated when the World Health Organisation (WHO) declared the world free of smallpox in 1979. It was a colossal victory for the public health establishment; one that we have singularly failed to repeat with any other human disease. The WHO put polio in the crosshairs in 1988, when the disease was paralysing an estimated 350,000 children a year across the world. It valiantly set the virus's death sentence for the year 2000. It didn't make the deadline, but the result is still admirable: worldwide, fewer than 1,000 cases of paralytic polio were reported in 2010.

We're closer to eradicating polio than any of the other diseases on Cockburn's list, partly because many older adults in rich countries recall the waves of crippling disease that washed over cities like Cincinnati in summer. Measles, sometimes spoken of as a candidate for eradication, doesn't deliver the poster children on crutches that polio does, so it's less politically compelling. As for malaria, the mosquito's role in infection cranks up the complexity of ridding the world of that disease.



Yet though $9bn has been sloshed under the bridge on global eradication campaigns, polio continues to circulate uninterrupted in Nigeria, India, Pakistan and Afghanistan. In 2010, 60 per cent of reported cases were in 16 countries that were once free of the virus. Worryingly, in a handful of those, including Angola and DR Congo, polio seems to be digging back in.

This is a cause of huge frustration to Bill Gates, who appointed himself crusader-in-chief against polio. In January, he slapped $102m on top of the $200m he already had on the table for polio eradication, then put the screws on others to do the same. The crown prince of Abu Dhabi stumped up $50m. David Cameron pledged to double British taxpayers' contributions to £40m a year for the next two years, as long as other nations matched the new money five to one.

Gates says that's still short by $700m a year—but he's confident that we can close that gap and eradicate polio over the next two years. "I truly believe we can succeed," he said in a recent webcast. "We have the science, the money and the organisation." Some, including Richard Horton, editor of the medical journal the Lancet, think that Gates is obsessed. "It's a quasi religious belief; he feels he has to prove that he can do it. And it would be a fantastic thing to have been the person to have led the crusade to eradicate polio. But it is sucking the oxygen away from other priorities."

The "we have what it takes to do this within two years" mantra is something I've been reading in the scientific literature for over 15 years. So why is polio still with us? For a start, the disease—which can cripple a child in a matter of hours—is more complicated than smallpox in almost every way. Over 90 per cent of infections show no symptoms initially, so the virus can be circulating widely before an outbreak is identified. It survives in the gut and is spread through faeces, so it does well in places with lots of people and few drains.

Then there's the vaccine: with smallpox, a single dose provided immunity in most cases. But there are three different strains of polio and several different vaccines, all of which require repeated doses. The main division is between the injected vaccines, made of virus that has been inactivated, and oral vaccines, made of virus that has been weakened so it prompts an immune response without making children sick. Most oral vaccines are trivalent, working (not that well) against all three stains of polio, though recently monovalent vaccines, which work (really quite well) against one strain have been introduced.

Oral vaccines are far cheaper and easier to make than the inactivated vaccines, but they have major drawbacks. Firstly, in extremely rare cases, the oral vaccine can cause the very paralysis it's designed to avoid. Secondly, and more worryingly, the weakened virus can, once reintroduced into the human gut and ecosystem, regain its strength and become as dangerous as wild-type polio. So "eradication" of wild-type polio doesn't mean the end of the disease. As soon as cases related to "wild" infections disappear, we'll probably need to stop using oral vaccines and switch to injectibles for five or ten years, just to protect against leftover oral vaccine viruses which may be girding their loins for a comeback.

Poor countries can't switch to inactivated vaccines because they can't afford it—and anyway, there's not enough vaccine available. "And you need large numbers of staff that can give injections in big campaigns," said Paul Fine, professor of communicable disease epidemiology at the London School of Hygiene and Tropical Medicine. "The disruption to health services can be immense." The displacement effect of the existing campaigns of oral vaccines is bad enough. "There's already a really high level of fatigue among village health workers," says Sanjoy Bhattacharya, a historian who studies public health campaigns in India. "People are just fed up."

That fatigue is induced in part by the frequent failure of oral vaccine to induce immunity in northern Indian children who live squeezed into slums with rotten sanitation. These kids can swallow their drops ten times or more and still get polio, because the vaccine runs straight through them. "You just hammer away with dose after dose, and hope that eventually you'll get them on a day when they don't have diarrhoea," says Linda Venczel, senior programme officer working on polio at the Bill and Melinda Gates Foundation.

I suggest that perhaps it might be wise to invest some money in better drains in these areas. "I sooooo hear what you're saying," said Venczel. "But Bill Gates thinks it's a black hole to address water and sanitation." Lately, the Foundation has begun to work more on generating community support, realising that it's a key part of success. Opposition from religious leaders in northern Nigeria derailed anti-polio efforts there for over five years and allowed the virus to be exported across Africa.

Polio eradication has become a priority for politicians and donors, but it cannot work without the buy-in of parents and community health workers. That gives those communities arm-twisting rights, which they can use to get services that meet their own priorities. In northern India, some mothers are beginning to use participation in the endless vaccination rounds as a bargaining chip to get new roads and new schools.

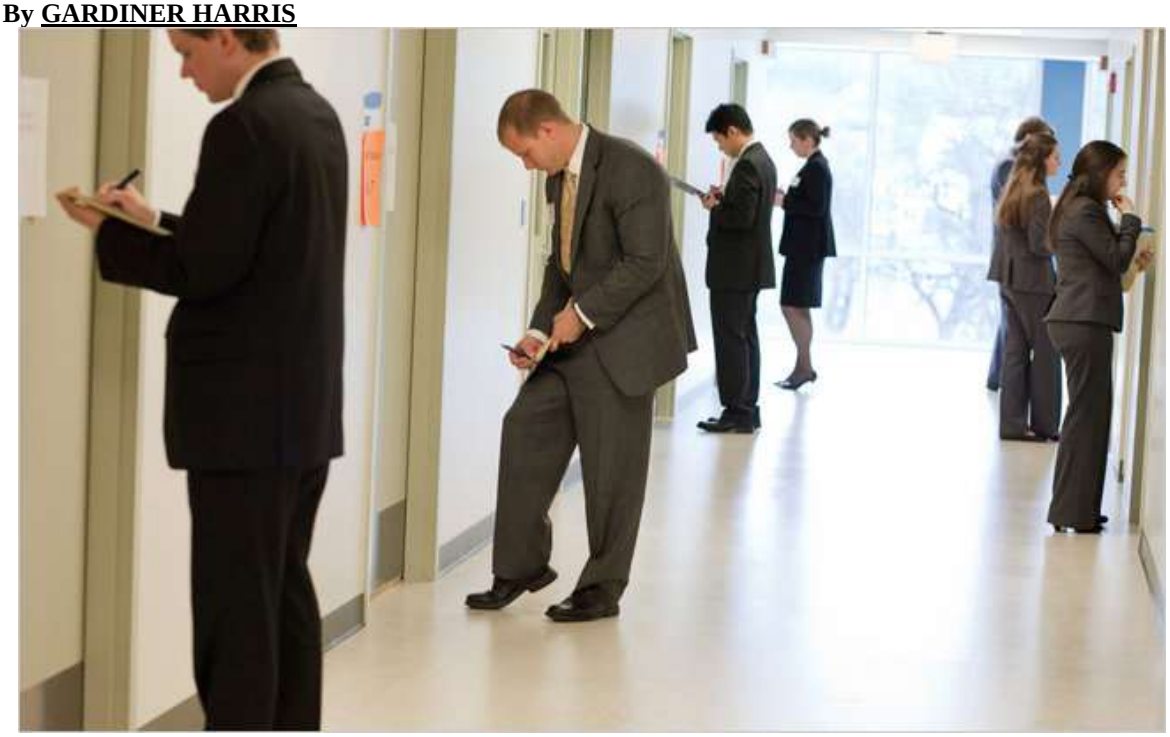
Some of the challenges may be met with better technology, especially cheaper inactivated vaccines that don't require refrigeration or injection. But even if the answer to "Can we eradicate polio?" is yes, the question of "Should we?" remains. Should we go the last mile, knowing it will be expensive, and perhaps as difficult as the first 99 miles put together? And eradicating polio may not remove the need for vaccination; many countries will want to keep immunising against it in case of bioterrorism.

Better sanitation, education and job opportunities would protect many more people against much more than just a single virus, but those messy, big-picture issues aren't sexy. According to Bill Gates, eradicating polio "will energise the field of global health… and illustrate how a major advance in the human condition requires resolve and courageous leadership." Drains, in contrast, don't make heroes.

http://www.prospectmagazine.co.uk/2011/02/end-to-polio-bill-gates/

New for Aspiring Doctors, the People Skills Test

By GARDINER HARRIS



Jeremy M. Lange for The New York Times

ROANOKE, Va. — Doctors save lives, but they can sometimes be insufferable know-it-alls who bully nurses and do not listen to patients. Medical schools have traditionally done little to screen out such flawed applicants or to train them to behave better, but that is changing.

At Virginia Tech Carilion, the nation's newest medical school, administrators decided against relying solely on grades, test scores and hourlong interviews to determine who got in. Instead, the school invited candidates to the admissions equivalent of speed-dating: nine brief interviews that forced candidates to show they had the social skills to navigate a health care system in which good communication has become critical.

The new process has enormous consequences not only for the lives of the applicants but, its backers hope, also for the entire health care system. It is called the multiple mini interview, or M.M.I., and its use is spreading. At least eight medical schools in the United States — including those at Stanford, the University of California, Los Angeles, and the University of Cincinnati — and 13 in Canada are using it.

At Virginia Tech Carilion, 26 candidates showed up on a Saturday in March and stood with their backs to the doors of 26 small rooms. When a bell sounded, the applicants spun around and read a sheet of paper taped to the door that described an ethical conundrum. Two minutes later, the bell sounded again and the applicants charged into the small rooms and found an interviewer waiting. A chorus of cheerful greetings rang out, and the doors shut. The candidates had eight minutes to discuss that room's situation. Then they moved to the next room, the next surprise conundrum and the next interviewer, who scored each applicant with a number and sometimes a brief note.

The school asked that the actual questions be kept secret, but some sample questions include whether giving patients unproven alternative remedies is ethical, whether pediatricians should support parents who want to circumcise their baby boys and whether insurance co-pays for medical visits are appropriate.

Virginia Tech Carilion administrators said they created questions that assessed how well candidates think on their feet and how willing they are to work in teams. The most important part of the interviews are often not candidates' initial responses — there are no right or wrong answers — but how well they respond when someone disagrees with them, something that happens when working in teams.

Candidates who jump to improper conclusions, fail to listen or are overly opinionated fare poorly because such behavior undermines teams. Those who respond appropriately to the emotional tenor of the interviewer or ask for more information do well in the new admissions process because such tendencies are helpful not only with colleagues but also with patients.

"We are trying to weed out the students who look great on paper but haven't developed the people or communication skills we think are important," said Dr. Stephen Workman, associate dean for admissions and administration at Virginia Tech Carilion.

Dr. Charles Prober, senior associate dean at the Stanford University School of Medicine, said Stanford always valued social skills in students — particularly the ability to work collaboratively with colleagues and establish trust with patients — but did not have a reliable way of ferreting these skills out until adopting mini interviews.

The system grew out of research that found that interviewers rarely change their scores after the first five minutes, that using multiple interviewers removes random bias and that situational interviews rather than personal ones are more likely to reveal character flaws, said Dr. Harold Reiter, a professor at McMaster University in Hamilton, Ontario, who developed the system.

In fact, candidate scores on multiple mini interviews have proved highly predictive of scores on medical licensing exams three to five years later that test doctors' decision-making, patient interactions and cultural competency, Dr. Reiter said.

A pleasant bedside manner and an attentive ear have always been desirable traits in doctors, of course, but two trends have led school administrators to make the hunt for these qualities a priority. The first is a growing catalog of studies that pin the blame for an appalling share of preventable deaths on poor communication among doctors, patients and nurses that often results because some doctors, while technically competent, are socially inept.

The second and related trend is that medicine is evolving from an individual to a team sport. Solo medical practices are disappearing. In their place, large health systems — encouraged by new government policies — are creating teams to provide care coordinated across disciplines. The strength of such teams often has more to do with communication than the technical competence of any one member.

"When I entered medical school, it was all about being an individual expert," said Dr. Darrell G. Kirch, the president and chief executive of the Association of American Medical Colleges. "Now it's all about applying that expertise to team-based patient care."

The nation's 134 medical schools have long relied almost entirely on college grades and a standardized test, the Medical College Admission Test, to sort through more than 42,000 applicants for nearly 19,000 slots. One-on-one interviews are offered but provide poor assessments of a candidate's social skills because they reflect only one person's view, often focus on academic issues and elicit practiced responses to canned questions like "Why do you want to become a doctor?"

Administrators at Virginia Tech Carilion say teamwork has become so essential to medicine that the school not only chooses its students based on their willingness and ability to collaborate effectively, but also requires students to take teamwork classes.

The school invests more effort in honing students' social skills than almost any other and requires that students undertake community projects with nurses and other health professionals, who are even invited to school dances.

"Our school intends to graduate physicians who can communicate with patients and work in a team," said Dr. Cynda Ann Johnson, the dean of the Virginia Tech Carilion School of Medicine, which opened in August 2010. "So if people do poorly on the M.M.I., they will not be offered positions in our class."

The problems these efforts address are profound. Dr. Leora Horwitz, an assistant professor of medicine at Yale, recalled an incident in her residency at Mount Sinai Medical Center in New York when a medical student marched into the hospital room of an elderly minister surrounded by his wife and several parishioners. "And he announces in front of everyone: 'We found the reason for your problem. The syphilis test is positive,' " Dr. Horwitz said. "It was a devastating event for the family and the whole church, and this student had no sense for that."

Even more dangerous is when poor communication becomes so endemic that the wrong operations are performed. A 2002 study published in The Annals of Internal Medicine of one such incident found that the patient, doctors and nurses went along with the mistaken treatment because they were used to being kept in the dark about medical procedures. A survey by the Joint Commission, a hospital accreditation group, found communication woes to be among the leading causes of medical errors, which cause as many as 98,000 deaths each year.

Using mini interviews to help address these problems, though, left applicants at Virginia Tech Carilion wide-eyed. One said one of her interviewers hated her, so she was thrilled to talk to others. Another said the system was unfair because some of the situations were drawn from news events she had not followed.

Of the 2,700 applications received by the school over the past year, admissions officers selected 239 to participate in mini interviews conducted over six weekends from August through March. The school has 42 positions in each class. Virginia Tech Carilion trained 80 people to be interviewers, including doctors and businesspeople from the community.

Andrew Snyder, 25, was clearly nervous when the bell rang the first time, but he seemed to relax as the process continued and was smiling by the end. Mr. Snyder said he loved moving from room to room and being asked to discuss some of medicine's thorny problems. He was accepted and plans to attend Virginia Tech Carilion in August.

"I thought the whole process was more geared toward problem-solving than to me talking about who I was as an applicant," he said. "And I liked that."

http://www.nytimes.com/2011/07/11/health/policy/11docs.html?_r=1&nl=health&emc=healthupdateema4

Ocean Index Navigates Between the Politic, the Pristine

Scientists are from Mars, policymakers are from Venus, and bridging that gap is one of the goals of those designing the Ocean Health Index.

By Ben Halpern, Karen McLeod and Jameal Samhouri

The differences between scientists and policymakers are like Mars and Venus. The Ocean Health Index is making an effort to straddle the two. (Thinkstock.com/Google Images)

Differences in perspective shape the way we see the world. Toddlers see nothing but joy in a mud puddle, while parents see piles of undone, badly stained laundry. The sheer cliff face that screams adventure to a climber instills sheer panic in others.

Such differences plague the relationship between scientists and policymakers, making it difficult for them to connect in meaningful ways. We repeatedly hear from national and international groups (like the 2002 World Summit on Sustainable Development or the 2004 U.S. Commission on Ocean Policy) that the oceans are in trouble and that we need science to help. But engaging scientists and policymakers in conversations that can seed science-based solutions for ocean policy turns out to be far more difficult.

In 2008, COMPASS and Stanford Law School's Environmental and Natural Resources Law and Policy Program brought together a small group of scientists and policy experts to begin a dialogue about science-based solutions for the health of ocean ecosystems.

It went something like this.

POLICY EXPERT: As a scientist, you have dedicated your life to understanding how the ocean is changing and why, so I'm sure you can answer this: If ecosystem health is so important, what does that mean and how do we measure it?

SCIENTIST: I've never thought about it that way, and frankly, that hurts my brain.

POLICY EXPERT: OK. While you're exercising your brain muscles, we'll have to make up some answers and move on without your input.

And then the flip side.

SCIENTIST: Imagine that we scientists could agree on what 10 measures of ocean health might be. How would you lawyers build those into new federal policy? Would these measures supersede existing water quality standards or fisheries management?

POLICY EXPERT: Admittedly that's not quite as ironed out as we'd like, either.

SCIENTIST: Sounds like we both have our work cut out for us …

This conversation highlighted a recurrent theme at the interface of science and policy. Our perspectives are often so different that we might as well be from Mars and Venus. It took some serious effort to bridge the gap between the two planets on the important issue of ocean health. As we described briefly last month, this 2008 workshop gave rise to the working group sponsored by the National Center for Ecological Analysis and Synthesis, which then combined forces with the Ocean Health Index project founded by Conservation International, the New England Aquarium and the National Geographic Society. We also formed and engaged a policy advisory committee with the explicit intent of keeping the 'Venutian' perspective front and center in our efforts to develop and implement the Ocean Health Index.

So how are we designing the Ocean Health Index to narrow the distance between science and policy?

Let's dig a little deeper into the sources of tension. Scientists desire precision, thrive on complexity and nuance, and on the whole are an incredibly precautionary bunch. We will much more readily tell you what we don't know rather than dare admit that we actually know something. We are happy to share our perspective but not our opinions. We're driven by a passion for discovery and satisfaction of our own curiosity.

Policymakers desire simplicity, and by necessity must be incredible generalists. For example, members of U.S. Congress must make decisions about everything from public health to funding for the military to cybersecurity to whether or not to raise the debt ceiling. In the midst of all of that, we're trying to get their attention about the ocean. They thrive on opinion and are driven by the needs to make very specific decisions and satisfy their constituents.

We are designing the Ocean Health Index to take the pulse of the ocean, to provide a set of vital signs that will help managers, policymakers and the public quickly diagnose where problems lie and identify possible solutions.

One of the most crucial decisions we made at the outset of this project was how to define health. We are not defining healthy as pristine, free from the influence of people. An index of 'pristineness' would have no relevance to policy, since ocean policy is made for the people, by the people. The ocean and people are inextricably linked, from sustenance to jobs to spiritual connections; people use, influence, or value every corner of the world's oceans.

Based on our conversations thus far, this decision to recognize human dimensions is popular with our Venutian colleagues as it makes our science relevant. It has been somewhat less popular with more conservation-oriented colleagues who equate healthy with pristine. By measuring health through the lens of benefits to people, we include both conservation and sustainable-use values.

The things the public desires from the ocean (and thus our public policy goals) are incredibly diverse. They include food security (seafood is the primary source of protein for more than 1 billion people); bountiful possibilities for recreation and tourism; diverse livelihoods, cultures and traditions; thriving coastal economies; coastal habitats that store carbon and protect coastlines from flooding and erosion; subsistence opportunities for billions of people; rich biodiversity; and clean waters and beaches. The Ocean Health Index will track the ability of the ocean to provide this spectrum of benefits to people, both now and in the future.

Diversity matters.
We recognize that people have very different ideas of what a healthy ocean should look like. For some, the most important pieces might be diverse habitats, iconic species and clean beaches. Others would emphasize healthy fisheries and coastal livelihoods. In a future installment of this series, we will describe how we will deal with those differences, as transparently and thoughtfully as we can.

Speaking of the future, a key piece of our definition of ocean health is the emphasis on sustainability, with a focus on both current *and* future health. The Ocean Health Index will estimate whether things are likely to be getting better or worse in the future. One of the biggest challenges we face in public policy (in oceans and elsewhere) is how to balance short-term needs with ensuring that the ecosystem will be able to continue to provide benefits to future generations.

For example, we could harvest a species to extinction and get lots of short-term profit, but this comes at great long-term cost to food security for future generations. The Ocean Health Index will provide a new tool for policymakers to address a pivotal question: Is the ocean more or less likely to be able to continue to provide the spectrum of benefits my constituents want and need? How we make operational this concept of sustainability will be the focus of a future piece.

The final design feature of the Ocean Health Index intended to maximize its relevance to policy is its flexibility. It is a framework that can be used to assess the health of an individual estuary or a larger region, like the U.S. West Coast, to the exclusive economic zone of an entire country, to the entire globe. It can be used in places where we know a lot as well as those where we know very little, in places with lots of people or fewer, and in tropical, temperate and polar regions.

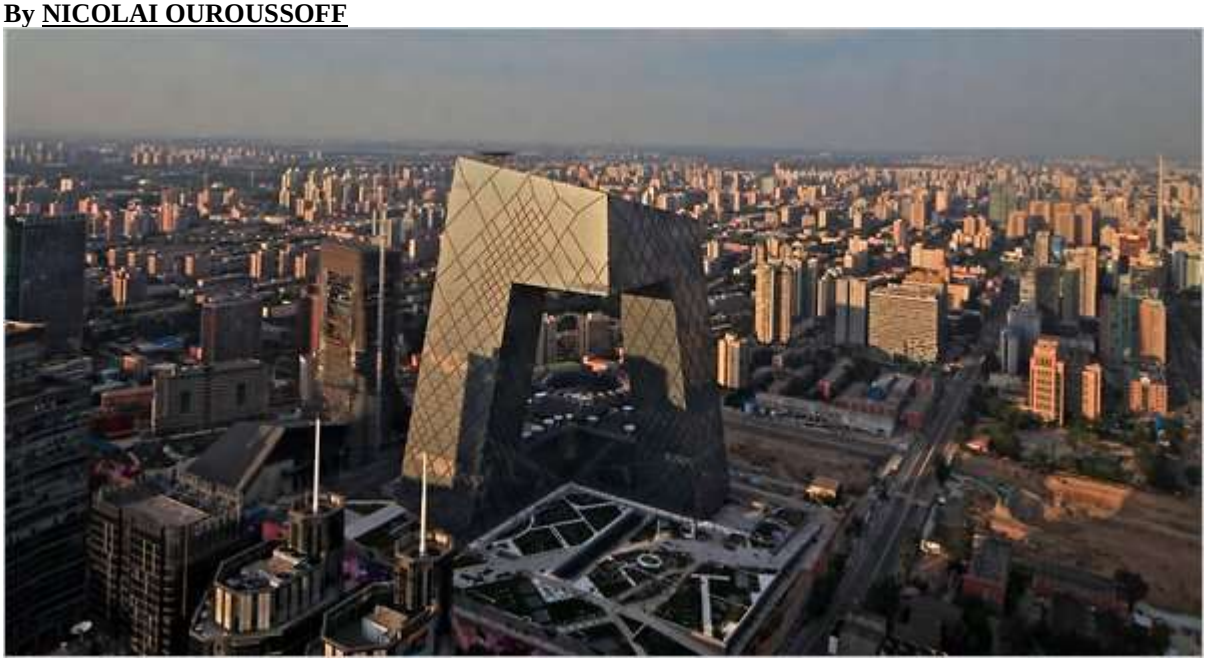
We are currently calculating a unique value of the index for the coastal waters of every country in the world and within three initial and more detailed case studies: the U.S. West Coast, the Mid-Atlantic Bight of the United States' Northeast Shelf, and Fiji's exclusive economic zone.

We've made a number of deliberate choices to create an Ocean Health Index that will be relevant and useful to policymakers. We're fully aware that the cultural divides between science and policy will always persist. But if we actually want to develop science with an eye to informing what's happening in the real world, it's in our best interest, as scientists from Mars, to do our best to understand what life is like on Venus.

http://www.miller-mccune.com/environment/ocean-index-navigates-between-the-politic-the-pristine-34757/

Koolhaas, Delirious in Beijing

By NICOLAI OUROUSSOFF



Philippe Ruault
The CCTV building in Beijing, the headquarters of China Central Television designed by Rem Koolhaas, has a contorted form that frames an enormous void at its center

BEIJING — Aside from the new World Trade Center, it's hard to think of a more contentious architectural project in the last few years than the CCTV building, the headquarters of China Central Television here. After Rem Koolhaas, the project's architect, unveiled the design in 2003 he was pilloried by Western journalists for glorifying a propaganda organ of the Chinese government. Several years later a fire at the site nearly burned down a neighboring building, also designed by Mr. Koolhaas, landing the director of the project and 19 others in prison for negligence and significantly delaying construction.

And then there's something about the building's appearance that seems to unsettle people. Just when things got back on track after the fire, a Chinese critic published an article saying that the building's contorted form, which frames an enormous void at its center, was modeled on a pornographic image of a naked woman on her hands and knees. The piece ignited a storm of negative press, forcing Mr. Koolhaas to issue a denial.

Yet for all that, the CCTV headquarters may be the greatest work of architecture built in this century. Mr. Koolhaas, of the Office for Metropolitan Architecture, has always been interested in making buildings that expose the conflicting energies at work in society, and the CCTV building is the ultimate expression of that aim, beginning with the slippery symbolism of its exterior. At moments monumental and combative, at others strangely elusive, almost retiring, it is one of the most beguiling and powerful works I've seen in a lifetime of looking at architecture.

What grabs the imagination as much as anything is the vision the building offers of this particular period in history. Mr. Koolhaas has created an eloquent architectural statement about China's headlong race into the future and, more generally, life in the developed world at the beginning of the 21st century. It captures our era much as the great works of the early Modernists did theirs.

Mr. Koolhaas has been one of architecture's most influential thinkers since the late 1970s, when his book "Delirious New York" offered a celebration of the "culture of congestion" in Manhattan at a time when many middle-class New Yorkers were still fleeing to the suburbs.

Over the next few decades he established himself as both an architect of extraordinary talent and the profession's reigning enfant terrible. His 1997 competition entry for an expansion of the Museum of Modern

Art, which would have sunk the museum's beloved sculpture garden into the ground and stowed curators in a tower labeled MoMA Inc., enraged many people at that institution but could well have reinvigorated an institution struggling to reimagine its identity. The 2004 Seattle Central Library, an uneven stack of slabs shrink-wrapped in a glass-and-steel web, was at once an evocative memorial to the conventional library and a monument to the new Information Age.

Mr. Koolhaas was offered the CCTV commission in late 2002, around the time he was invited to participate in redevelopment plans for ground zero in Lower Manhattan, and he immediately decided he could not take on both. "It was a matter of focus," he said. By then the redevelopment plans at ground zero had become so politically and emotionally heated that Mr. Koolhaas was skeptical that anything of real architectural value could be produced there.

CCTV had its own problems; for one, its construction was widely seen as part of a huge public relations campaign in the run-up to the 2008 Olympic Games here. But Mr. Koolhaas was fascinated by Beijing's mix of ancient hutongs, Stalinist-era workers' housing and 1960s megastructures. And unlike New York, an aging city that was becoming increasingly nostalgic, Beijing was in the midst of a major modernization push.

"I was aware of negative developments there, of course," Mr. Koolhaas said. "But on the whole there was also an incredible sense of change at that moment. There was a real desire to improve things, especially in Beijing."

No building has since done more to burnish the reputation of Beijing as a city of the future than Koolhaas's. His CCTV building, nearing completion, has been a highly visible part of the cityscape in this nation's capital since late in the last decade, rising across an elevated freeway from the generic towers of Beijing's new business district. Its two 50-story legs, which house offices and production studios, are joined at the top by a 13-story bridge whose angled form juts out precariously over a plaza.

The more time you spend with it, the harder it is to pin the building down. The legs, which taper as they rise to slightly different heights, distort your normal sense of perspective, and Mr. Koolhaas represses all the most obvious signs of human scale, like the repetitive windows and floor slabs of a conventional tower. From a distance it's virtually impossible to get a grip on the building's size — an apt metaphor for the way giant media companies like CCTV have collapsed the scale of our world.

Approaching from the direction of the freeway, with the massive bridge looming directly ahead, the building can look dark and menacing. From another angle the legs seem almost fragile. And from yet another the bridge's tilted roof gives the building a strangely two-dimensional quality.

These distortions are reinforced by the structural system, an irregular network of steel cross-bracing that looks as if it were etched into the building's skin. Because the cross-bracing becomes denser where the stresses are most severe — for example, where the bridge connects to the towers — at certain points the structure seems to be straining against all odds to stay up.

The forms are a reworking of classical perspective; the irregular structure is an attack on Modernist ideas about structural purity. Both are an effort to break down what Mr. Koolhaas, like a number of other architects of his generation, sees as the oppressiveness of the Cartesian order that has shaped architecture for centuries. The design is also striving to make room for the impurities and imperfections that make us human.

Mr. Koolhaas, of course, also had to deal with the mundane issues of how the building works. It is raised on a concrete plinth, contributing to a sense that it is a monolithic world, disconnected from the life of the city. But that impression changes once you walk inside.

The main lobby, in a low structure at the base of one of the towers, is classic Koolhaas: a montage of colliding forms. Light pours in through big rhomboid-shaped skylights. Walls tilt on two sides, creating a slight sense of compression that nudges you forward. A walkway in front of you cuts across the room toward the elevator banks. Stepping onto it, you look down several stories into a vertiginous underworld of escalators, beams and bridges.

The view is startling, not least because it undermines the impression of CCTV as a walled compound. Every morning a subway station will disgorge thousands of workers who will climb the escalators up to the lobby, passing through a security barrier and a row of 50-foot-tall yellow travertine pillars, to the elevators beyond.

A separate entry to one side of the lobby leads down a wide staircase to an exhibition space for tourists and other visitors. Above the stair, a glass-enclosed V.I.P. lounge overlooks the lobby. Another staircase leads up to a garden on the plaza for employees. People in these spaces will be in constant eye contact with one another, although they will rarely mix.

The limited interaction of disparate social groups becomes far more limited higher in the building. The doors that separate executives from their underlings are as firmly shut as they would be in any Western corporation. The director's office, a sequence of spacious rooms clad in more yellow travertine, comes equipped with a plush apartment. Executives lunching in the V.I.P. dining room — a spectacular space braced by heavy steel columns — can stare up through a big skylight at other V.I.P.'s landing on a helipad.

And public access to the building will be limited to what Mr. Koolhaas calls "the loop": a sequence of exhibition spaces, restaurants and viewing areas that climb up one tower, cross the bridge and descend the other.

At one point you end up at a public observation deck, a cavernous room crisscrossed with beams and columns at the angle of the bridge. Three big round windows are cut into the deck's floor, with views down to the employees' garden. Seen from here, the garden turns out to be a blown-up version of Piranesi's 18th-century map of an imaginary Rome from his engraving series "Il Campo Marzio dell'Antica Roma." The map represents an urban ideal, one in which the greatness of cities is seen to arise from a clash of architectural visions built up over centuries, and where each of these visions is given equal weight.

In its allusion to a vital city built from the ruins of a once mighty empire, the garden is an obvious allegory for China. Mr. Koolhaas seems to be reminding us that all empires fade; it is the cultural triumphs — including the great buildings — that will remain the most enduring testament to who we were and what we hoped to become.

http://www.nytimes.com/2011/07/13/arts/design/koolhaass-cctv-building-fits-beijing-as-city-of-the-future.html?ref=design

Combining People and Machines in Venice

By ROBERTA SMITH

Ruth Fremson/The New York Times
Gloria An inverted tank comes to life for part of each hour when a runner begins a stationary journey on the treadmill on top of this piece from the American exhibition by Allora & Calzadilla at the Venice Biennale

VENICE — "Gloria," the exhibition with which Jennifer Allora and Guillermo Calzadilla are representing the United States at the Venice Biennale, has a clenched, unforgiving energy. I don't much care for it, but its starkness has stuck with me. It is unlike almost anything else at the Biennale.

The show, organized by the Indianapolis Museum of Art, seems to exist in its own bubble, as if surrounded by an invisible shield. Certainly its centerpiece, "Track and Field," gives it a slightly armed and dangerous feeling: installed in front of the American Pavilion, the piece is an immense inverted military tank topped by a treadmill that shifts into noisy action for 15 minutes every hour when a runner uses the treadmill.

The works that Allora & Calzadilla, as the two are known, have brought to Venice definitely make you think about American presumption and military and financial might, as well as nationalism and its various expressions, like Olympic sports.

The artists are hardly the first to use the country-by-country setup of the Biennale as a chance to question patriotism. (Hans Haacke's jackhammering the floor of the German Pavilion into a pile of postwar rubble in 1993 is a leading example.) But Allora & Calzadilla's approach has an unusual vehemence, even within this genre. Their efforts tend to lack artistic paradox, nuance or form — the things that allow viewers to think for themselves. Instead they offer an angry, sophomoric Conceptualism that borders on the tyrannical and that in many ways mimics the kinds of forces they criticize.

After "Stop, Repair, Prepare: Variations on 'Ode to Joy' for a Prepared Piano," the artists' star turn at the Museum of Modern Art last winter, I expected more. That performance-art sculpture, which the Modern acquired, consisted of a baby grand piano on wheels with a large hole cut in its center from which a pianist played the "Ode to Joy" segment of Beethoven's Ninth Symphony upside down while guiding the instrument around the museum's spacious atrium like an awkward bumper car (or, come to think of it, a tank). The fusion of human performer, object and music coalesced into a strange, mutant form that was mysterious and equivocal and far more than the sum of its parts.

In contrast, the parts in Allora & Calzadilla's works in Venice remain quite distinct: one plus one is rarely more than two. Instead of synthesis the artists resort to rather violent juxtaposition. They simply slam different things together — objects, bodies, skills and functions — and let the symbolism fall as it may, which tends to be obviously and simplistically. Their combinations may adhere to the Surrealist tradition of a sewing machine on an ironing board and all that, except that they yield little in the way of enigma. Either you can instantly parse them or they are impenetrable.

Inside the pavilion, the work "Algorithm" consists of a large pipe organ fit for a church and equipped with a functioning cash machine programmed to play random bits of music every time a bank card is inserted. Its conflation of religion and money may be unsubtle, but it's sure better than the sullen arbitrariness of "Armed Freedom Lying in a Sunbed." This consists of a high-end, switched-on tanning bed containing a darkly patinated bronze statue of a neo-Classical female figure, a reduced copy of the Statue of Freedom that has stood atop the dome of the United States Capitol since 1863. This is Duchamp 101.

"Body in Flight (Delta)" and "Body in Flight (American)" are on view in the two galleries flanking the vestibule. As in "Track and Field," performances by trained athletes, in this case gymnasts, provide momentary life. Here polychrome wood replicas of airplane seats — a Delta first-class flatbed seat and an American business-class reclining seat in sleep-ready position — serve as gym equipment while also reflecting both the luxuries and the class distinctions of air travel.

The Delta seat functions as a balance beam for a female gymnast whose sensuous performance evokes an attractive model demonstrating appliances or cars at a trade show. The male gymnast uses the American seat as a pommel horse, and the loud thumps of his many energetic jumps, mounts and dismounts, executed without benefit of padding, provided a painful sound accompaniment. It seemed like debilitating, delegated endurance art.

The performances reinforce stereotypical gender roles, although this may be attempted irony. More interesting perhaps is the juxtaposition of rather banal but highly disciplined and widely admired skills: gymnastics and hyperrealism in the mode of artists like Duane Hanson or Marilyn Levine. In addition, as in "Stop, Repair, Prepare," these two works present demanding performances carried out under compromised conditions, in this case idiosyncratic gym equipment.

Nonetheless, the only work in "Gloria" to approach the transformation achieved by "Stop, Repair, Prepare" is not surprisingly the quietest and least assuming: a silent double-screen video projection titled "Half-Mast/Full-Mast." Stacked one over the other, the projections show different, mostly outdoor locations around Vieques, the small Puerto Rican island that served for years as a site for military maneuvers by the United States Navy, with devastating ecological effects. Each scene has a flagpole whose placement on the screen never changes, and the poles align so perfectly that they seem to form a single element.

In alternation, a gymnast appears in one frame and then the other, grabs the pole and cantilevers his body parallel to the ground, resembling a flag. (Fittingly, the stunt is known as flagging.) Performed in the top screen, this feat resembles a flag at full-mast, suggesting ascendancy and security; in the lower screen, it evokes half-staff, and mourning or distress.

The brief and modest displays of skill against the verdant landscape of Vieques have an emotional subtleness and fullness otherwise lacking in this exhibition. Furthermore, the seemingly single unwavering flagpole staunchly perpendicular to the floor of the pavilion viscerally unites video space and the room where the viewer stands. This is the only point in all of "Gloria" at which form overtakes narrative and pomp and bluster bow to immediate experience.

The Venice Biennale runs through Nov. 27; labiennale.org/en/Home.

http://www.nytimes.com/2011/07/09/arts/design/allora-and-calzadilla-at-venice-biennale-review.html?ref=design

Border Fences Pose Threats to Wildlife On US-Mexico Border, Study Shows

Left: The California border region has many threatened species, species with small ranges, and human-created barriers to animal migration. Lasky et. al. highlight two species at risk, the Arroyo Toad, which is federally endangered, and the Colorado Desert Fringe-toed Lizard, which is a federal species of concern. Right: Coues' Rice Rat and Reticulated Collared Lizard are both Texas threatened species. Coue's Rice Rat occurs in Texas at the edge of its range and has most of its border range occupied by areas of high human impact and pedestrian fences. Reticulated Collared Lizards were identified as a species that would be at risk if extensive barriers were built across its range in the future. (Credit: Jesse Lasky, The University of Texas at Austin)

ScienceDaily (July 12, 2011) — Current and proposed border fences between the United States and Mexico pose significant threats to wildlife populations, with those animals living in border regions along the Texas Gulf and California coasts showing some of the greatest vulnerability, a new study from The University of Texas at Austin shows.

"Our study is the first comprehensive analysis of threats to species across the entire U.S.-Mexico border," says Jesse Lasky, a graduate student in the laboratory of Tim Keitt, associate professor of integrative biology. "The scale at which these fences stretch across the landscape is large, so it's important for us to also have a large- scale view of their effects across the continent."

Among the species at risk include four species listed as threatened globally or by both the U.S. and Mexico, and another 23 with small range sizes. The animals include the Arroyo toad, the California red-legged frog and the jaguarundi.

"We were able to identify a list of animal species that are most at risk and should be prioritized and monitored for change," says Lasky. "We're hoping this helps point decision-makers towards the animals to look at first when making priorities for conservation."

Most at risk of extinction are smaller populations of wildlife that occur in more specialized habitats, the study shows. Even animals that may appear to have large ranges may live in isolated habitats within those ranges that can be heavily disturbed by border fences. Human population growth along the border also poses threats to the wildlife.

Lasky says when the ranges of these animals are separated by barriers, including border fences and roads, the animals' ability to move is limited. The isolated populations are then more vulnerable to unforeseen disturbances, such as a hurricane or fire, which can wipe out an entire population. The isolation also increases inbreeding depression, which means the animals have limited opportunities to mix their genes with others and accumulate harmful mutations.

The study analyzed the ranges of 313 non-flying mammals, reptiles and amphibians and identified three major regions where wildlife is most vulnerable: the high human population areas of coastal California and coastal Texas and the unique "sky island" Madrean archipelago habitat in southeastern Arizona.

These regions have high numbers of vulnerable species. Some species in California have barriers that block as much as 75 percent of their ranges.
"The U.S.-Mexico border spans regions of extraordinary biological diversity as well as intense human impacts," says Keitt. "Loss of biological diversity can have negative impacts on the ecosystem services that are the basis of our life-support system."
The U.S. Department of Homeland Security is waived from environmental regulations when building security infrastructure. There are about 750 miles of border fences and human migration barriers along the border.
The study, by Lasky, Keitt and coauthor Walter Jetz, an associate professor in the Department of Ecology and Evolutionary Biology at Yale University, appeared May 3 online in the journal *Diversity and Distributions*.

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Texas at Austin**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Jesse R. Lasky, Walter Jetz, Timothy H. Keitt. **Conservation biogeography of the US-Mexico border: a transcontinental risk assessment of barriers to animal dispersal**. *Diversity and Distributions*, 2011; 17 (4): 673 DOI: 10.1111/j.1472-4642.2011.00765.x

http://www.sciencedaily.com/releases/2011/07/110712102324.htm

Botanist Brings Trees to the Israeli Desert

Deep in the driest and hottest part of Israel, a California-born botanist is trying to remake the Negev Desert with productive trees that thrive on abuse.

By Judith D. Schwartz

A view of the Arava Valley in Israel. One California-born botanist is trying to remake this dry, dusty place productive with trees that thrive under the harshest of circumstances. (Michael Privorotsky/Flickr.com)

The desert sky was an odd brooding gray as we pulled into McDonald's, the arches looming bright and preternaturally yellow out of the dusty landscape. By the time we'd finished our McKebab sandwiches — much better than you might expect — it was raining: a steady, drumming, respectable rain.

It almost never rains in Israel's Arava Valley, the driest, hottest and southernmost part of Israel. I was about to meet a desert botanist, Elaine Solowey, so I was anxious to hear what she'd say. I assumed she'd be excited about the rain and wax rhapsodic about making the desert bloom and all that.

But no, she seemed annoyed. She pointed out that a light rain just moves the surface salts down to the plant roots and that you then have to use more water to get rid of it. "What I wish is for rain in the north where it can do some good."

I spent the afternoon with Solowey at Kibbutz Ketura, where she's lived since its founding in the early 1970s. Ketura is also now home to the Arava Institute for Environmental Studies, where Solowey runs the Center for Sustainable Agriculture. Solowey, who was raised in California's Central Valley — another hot locale but one

with considerably more water sources and more fertile — has a no-nonsense manner that can come off as brusque. Fair enough: When you've spent your career working some of the world's least forgiving soil, you're unlikely to suffer fools — gladly or otherwise.

Solowey made news in 2005 when she accomplished what was thought to be botanically impossible: germinating a 2,000-year-old date seed that had been found during an excavation at Masada. She showed me earlier this year the spot where Methuselah, as the sapling is known, was to be planted in the ground — noting that it will be on a security system.

Solowey is a champion of improbable plants. Her "experimental orchard," a nursery for mostly forgotten and endangered desert species, includes 1,000 varieties of trees, cacti and grains. The orchard is a small Eden in the wilderness, lush with exotic fruit species — sapodilla, yellow pitaya, Yemenite pomegranate — and other productive plants that thrive in arid, saline soil.

View The Arava Institute/Center for Sustainable Agriculture in a larger map

Nearby, next to the rows of date palms that represent one of the kibbutz's sources of income, is the broad acacia tree that started it all. The tree was about to be taken down to make room for the dates, but Solowey protested — she saw that this was not just a tree but an entire ecosystem. Birds nested there, jackals slept in its branches, grasses flourished under its canopy.

Such observations launched her quest to understand desert plants and explore their ecological and economic potential — a potential she believes remains largely untapped.

"More than 15,000 edible, medicinal or useful products come from perennial plants that have not been domesticated," she wrote in her 2003 book, *Small Steps Towards Abundance: Crops for a More Sustainable Agriculture*. Her research focuses on identifying and nurturing trees and other perennials that yield food for people and livestock, as well as serve other functions like building soil and stopping erosion. A particular interest is cultivating medicinal plants; she works closely with the Natural Medicine Research Unit at Hadassah Hospital in Jerusalem on domesticating wild medicinal plants and preserving endangered species with medicinal properties. She pointed out a row of neem trees, members of the mahogany family, which, she said, have so many medical uses in India they're called the "pharmacy of the village."

"They also act as a windbreak for the arganias," she said. "We have 300 of them, and I'm glad."

Many orchard specimens have been forgotten to the point of extinction. "There are plants here in the south that are going extinct, and no one is noticing," she said. "As for most of those, we don't know the duties they perform, the animals that live in them. Why in the world should we let them die when with so little effort we can keep them alive?"

She has a grove of 150 marula trees from Africa, a prolific producer whose fruit is useful for liqueurs and animal fodder. Another current favorite is the *Argania spinosa*, from Morocco, known for nuts that make high-quality oil — and which, significantly, survives on very little water.

"We're hoping to find people new crops to make a living on," she said. "Until we get a handle on these trees, get a sense of the life cycle, we can't do it."

She says she's always on the lookout for plants that are "salt tolerant, heat tolerant, dry tolerant and pretty tough. Changing the desert for our plants is expensive and not sustainable. We should only be growing things here that are biologically appropriate." This includes domesticating plants with high-value crops, like dates:

"Dates need seven months of no rain. If you've got lemons, make lemonade. What we have is 350 days of full sunlight."

Her efforts span borders. For example, in a joint program with the Jordan University of Science and Technology, her program exchanges seeds of now-rare native plants for research and looks for salt-tolerant, water-saving plants that might do well in the region. One of her projects involving medicinal species involves Tibetan plants, and as a result she gave the Dalai Lama a tour of her orchard.

Given the range of benefits from trees, and, compared to annual crops, how much less energy, water and labor they require, Solowey believes people should devote more effort to long-lived plants, and especially in a place like Israel. This she learned after years on the kibbutz. "Because of the Mediterranean climate, it's easier to grow fruits than vegetables here," she said. "Two-thirds of Israel is desert or semi-desert. Very few vegetables like that climate."

Because, in its early years, the kibbutz banked on crops like lettuce, cucumbers and tomatoes that take lots of work in that environment, everyone had to pitch in, she recalled. "We had to do vegetable work after we came home from our other jobs. And what did we get? One-shekel-20 a kilo."

She's since decided annual crops were a mistake. "Ecologically, the more fragile the ecosystem, the more easy it is to mess it up. The soil dries, blows away more easily, gets compacted by tractors, and the minerals get washed away. If you abuse it, it turns into a parking lot."

One inspiration of hers is the work of J. Russell Smith, an American geographer and economist who observed how conventional agriculture ravaged the landscape around the world, leaving gullies and hills of sand where there had been plants. In his classic 1929 book *Tree Crops*, he portrayed trees as the answer.

"When you replant [with trees], you slow or stop the wind, you stop the loss of topsoil and erosion from rain," says Solowey. "The only way you can stop desertification is with plants, rows of trees. In 10 years, the neem tree makes you several inches of topsoil, and it forms a microclimate that holds moisture. Acacias are nitrogen-fixing trees, and can be used for land restoration. It drops its leaves before the rainy season [which turns into] litter so rich other plants grow around it. A wonderful thing, an acacia tree.

http://www.miller-mccune.com/environment/botanist-brings-trees-to-the-israeli-desert-33935/

One in 10 Species Could Face Extinction: Decline in Species Shows Climate Change Warnings Not Exaggerated, Research Finds

The study covered a wide range of species in all types of habitat across the globe. (Credit: © Stasys Eidiejus / Fotolia)

ScienceDaily (July 11, 2011) — One in 10 species could face extinction by the year 2100 if current climate change impacts continue. This is the result of University of Exeter research, examining studies on the effects of recent climate change on plant and animal species and comparing this with predictions of future declines. Published in leading journal *Proceedings of the National Academy of Sciences* (PNAS), the study uses the well-established IUCN Red List for linking population declines to extinction risk. The research examines nearly 200 predictions of the future effects of climate change from studies conducted around the world, as well as 130 reports of changes which have already occurred.

The research shows that on average the declines that have already happened match predictions in terms of the relative risk to different species across the world.

Many studies have predicted that future climate change will threaten a range of plants and animals with extinction. Some of these studies have been treated with caution because of uncertainty about how species will respond to climate change. But widely published research showing how animals and plants are already responding to climate change gave the Exeter team the opportunity to check whether the predictions were wide of the mark. By producing the largest review ever of such studies, they show that predictions have, on average, been accurate, or even slightly too cautious.

Lead author Dr Ilya Maclean of the University of Exeter said: "Our study is a wake-up call for action. The many species that are already declining could become extinct if things continue as they are. It is time to stop using the uncertainties as an excuse for not acting. Our research shows that the harmful effects of climate change are already happening and, if anything, exceed predictions."

The study covered a wide range of species in all types of habitat across the globe. The findings confirm that human-induced climate change is now a threat to global biodiversity.

Co-author Dr Robert Wilson, also of the University of Exeter, said: "By looking at such a range of studies from around the world, we found that the impacts of climate change can be felt everywhere, and among all groups of animals and plants. From birds to worms to marine mammals, from high mountain ranges to jungles and to the oceans, scientists seem to have been right that climate change is a real threat to species.

"We need to act now to prevent threatened species from becoming extinct. This means cutting carbon emissions and protecting species from the other threats they face, such as habitat loss and pollution."

Examples of existing responses to climate change:

Decreased ice cover in the Bering Sea reduced the abundance of bivalve molluscs from about 12 to three per square metre over a very short period of time (1999-2001). These shells are the main food source for species higher up the food chain, such as Spectacled Eider.

Climatic warming and droughts are causing severe declines in once-common amphibian species native to Yellowstone National Park in the United States of America. Between 1992-1993 and 2006- 2008, the number of blotched tiger salamander populations fell by nearly half, the number of spotted frog populations by 68 per cent, and the number of chorus frog populations by 75 per cent.

In Antarctica, few animals exist on land, but one of the most abundant, a nematode worm living in the soil in dry, cold valleys experienced a 65 per cent decline between 1993 and 2005 as a result of climate change.

Examples of predicted responses to climate change:

On Tenerife, an endemic plant, the Caňadas rockrose has a 74 to 83 per cent chance of going extinct in the next 100 years as a result of climate change related droughts.

In Madagascar, climate warming is predicted to cause endemic reptiles and amphibians, often found in mountain ranges, to retreat towards the summit of the mounts. With a warming of just two degrees Celsius, well within current projections, three species are predicted to lose all of their habitat.

Birds living in northern Boreal Forests in Europe are expected to decline as a result of global warming. Species such as Dotterel are predicted to decline by 97 per cent by 2100 and species such as Two-barred Crossbill and Pine Grosbeak could lose their entire range within Fenno-Scandia.

story Source:

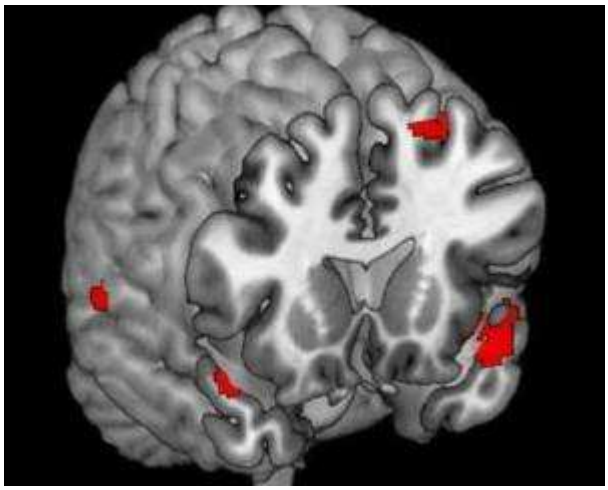
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Exeter**.

Journal Reference:

1. Ilya M. D. Maclean, Robert J. Wilson. **Recent ecological responses to climate change support predictions of high extinction risk**. *Proceedings of the National Academy of Sciences*, 2011; DOI: 10.1073/pnas.1017352108

http://www.sciencedaily.com/releases/2011/07/110711151457.htm

Biomarker for Autism Discovered



Researchers have identified the reduced activity in a part of the brain associated with empathy and argue it may be a 'biomarker' for a familial risk of autism. (Credit: Michael Spencer)

ScienceDaily (July 12, 2011) — Siblings of people with autism show a similar pattern of brain activity to that seen in people with autism when looking at emotional facial expressions. Researchers at the University of Cambridge identified the reduced activity in a part of the brain associated with empathy and argue it may be a 'biomarker' for a familial risk of autism.

Dr Michael Spencer, who led the study from the University's Autism Research Centre, said: "The findings provide a springboard to investigate what specific genes are associated with this biomarker. The brain's response to facial emotion could be a fundamental building block in causing autism and its associated difficulties."

The Medical Research Council funded study is published on the 12th of July, in the journal *Translational Psychiatry*.

Previous research has found that people with autism often struggle to read people's emotions and that their brains process emotional facial expressions differently to people without autism. However, this is the first time scientists have found siblings of individuals with autism have a similar reduction in brain activity when viewing others' emotions.

In one of the largest functional MRI (fMRI) studies of autism ever conducted, the researchers studied 40 families who had both a teenager with autism and a sibling without autism. Additionally, they recruited 40 teenagers with no family history of autism. The 120 participants were given fMRI scans while viewing a series of photographs of faces which were either neutral or expressing an emotion such as happiness. By comparing the brain's activity when viewing a happy verses a neutral face, the scientists were able to observe the areas within the brain that respond to this emotion.

Despite the fact that the siblings of those with autism did not have a diagnosis of autism or Asperger syndrome, they had decreased activity in various areas of the brain (including those associated with empathy, understanding others' emotions and processing information from faces) compared to those with no family history of autism. The scans of those with autism revealed that the same areas of the brain as their siblings were also underactive, but to a greater degree. (These brain regions included the temporal poles, the superior temporal sulcus, the superior frontal gyrus, the dorsomedial prefrontal cortex and the fusiform face area.)

Because the siblings without autism and the controls differed only in terms of the siblings having a family history of autism, the brain activity differences can be attributed to the same genes that give the sibling their genetic risk for autism.

Explaining why only one of the siblings might develop autism when both have the same biomarker, Dr Spencer said: "It is likely that in the sibling who develops autism additional as yet unknown steps -- such as further genetic, brain structure or function differences -- take place to cause autism."

It is known that in a family where one child already has autism, the chances of a subsequent child developing autism are at least 20 times higher than in the general population. The reason for the enhanced risk, and the

reason why two siblings can be so differently affected, are key unresolved questions in the field of autism research, and Dr Spencer's group's findings begin to shed light on these fundamental questions.
Professor Chris Kennard, chairman of the Medical Research Council funding board for the research, said: "This is the first time that a brain response to different human facial emotions has been shown to have similarities in people with autism and their unaffected brothers and sisters. Innovative research like this improves our fundamental understanding of how autism is passed through generations affecting some and not others. This is an important contribution to the Medical Research Council's strategy to use sophisticated techniques to uncover underpinning brain processes, to understand predispositions for disease, and to target treatments to the subtypes of complex disorders such as autism."

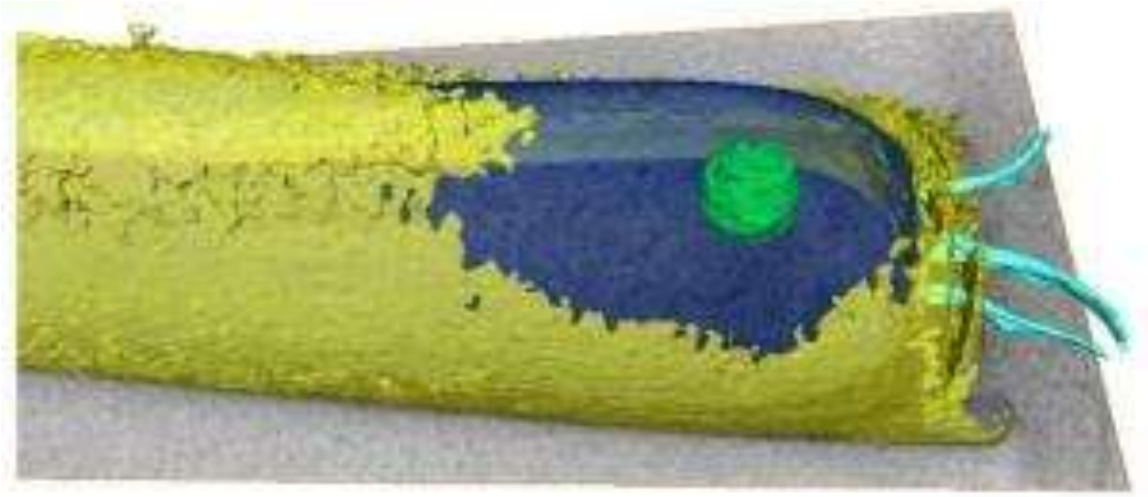
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Cambridge**.

Journal Reference:

1. M D Spencer, R J Holt, L R Chura, J Suckling, A J Calder, E T Bullmore, S Baron-Cohen. **A novel functional brain imaging endophenotype of autism: the neural response to facial expression of emotion**. *Translational Psychiatry*, 2011; 1 (7): e16 DOI: 10.1038/tp.2011.18

http://www.sciencedaily.com/releases/2011/07/110712102316.htm

Energy-Storage Capacity of Ancient Microorganism Could Lead to Power Source for Synthetic Cells



A 3-D rendering of the M. hungatei, showing a granule at one end, represented by the green sphere. (Credit: Image courtesy of UCLA)

ScienceDaily (July 12, 2011) — *Archaea* are among the oldest known life-forms, but they are not well understood. It was only in the 1970s that these single-celled microorganisms were designated as a domain of life distinct from bacteria and multicellular organisms called eukaryotes.

Robert Gunsalus, a UCLA professor of microbiology, immunology and molecular genetics, developed an interest in *Archaea* because of their ability to thrive in harsh environments. Now, using state-of-the-art imaging equipment at the California NanoSystems Institute (CNSI) at UCLA, he has shown for the first time that a type of *Archaea* known as *Methanosprillum hungatei* contains incredibly efficient energy-storage structures.

The findings are published in the current issue of the journal *Environmental Microbiology*.

M. hungatei is of considerable environmental significance because of its unique ability to form symbiotic relationships with syntrophic bacteria to break down organic matter and produce methane gas. Yet while their important role in the food chain has been studied, little has been known about how they generate and store energy.

Gunsalus has researched anaerobic organisms like *M. hungatei* -- microbes that thrive in oxygen-depleted environments where energy is often extremely limited -- for a number of years. And when Hong Zhou, a professor of microbiology, immunology and molecular genetics, arrived at UCLA in 2006, Gunsalus saw an opportunity to delve further into their mysteries.

"When Hong came to UCLA, his reputation in imaging nanoscale structures was already well established," said Gunsalus, who is also a member of the UCLA-Department of Energy Institute for Genomics and Proteomics. "His arrival on campus brought together the expertise to do what no one had yet done -- a detailed study of the sub-cellular structures in *M. hungatei*."

Much of the actual imaging work for the study was performed by Dan Toso, a graduate student in Zhou's lab, using equipment from the Electron Imaging Center for Nanomachines (EICN), a core lab at the CNSI directed by Zhou. When Toso and the rest of the team produced the most detailed images yet made of the *M. hungatei* interior, they were surprised by the appearance of granules, structures measuring approximately 150 nanometers in diameter that store energy.

"Once we imaged the *M. hungatei*, we noticed how dark the granules appeared," said Zhou, a researcher at the CNSI. "The darkness arises from their density, and by studying this density, we discovered their energy-storage capacity."

The group was able to determine the granule density -- about four times that of water -- by using a Titan scanning transmission electron tomography (STEM) microscope, cryo-electron microscopy, and energy-dispersive X-ray spectroscopy, all part of the EICN lab's extensive tool set.

The tiny granules, which account for less than 0.5 percent of the cell, are so efficient that they each store 100-fold more energy than the entire rest of the cell. Each *M. hungatei* produces two granules, one at each end of the cell. Because all *M. hungatei* produce granules in the same location, and typically at the same time in their life-cycle, it is likely that their DNA contains specific genetic instructions for the creation and positioning of the granules.

The researchers hope to utilize knowledge gained from the recent sequencing of the *M. hungatei* genome by the U.S. Department of Energy Joint Genome Institute to further study the structures. If the specific genetic instructions for creating granules can be found in the genome, it might be possible to use the granules as a sort of chemical battery for engineered synthetic cells.

Beyond their energy-storage capacity, *M. hungatei* still have more secrets to reveal, according to the researchers. They also produce a distinct nanostructure sheath around their cell membrane that might serve as a sort of protection, or "cell armor," against the harsh environments in which they are typically found. Though the sheaths were discovered in the 1970s, the technology necessary for studying them in detail had yet to be developed at that time.

"*M. hungatei* have evolved unique features in order to survive in very harsh and low-energy environments," Gunsalus said. "The presence of cutting-edge equipment and world-class experts at UCLA allows us to closely study them, hopefully revealing their myriad of secrets."

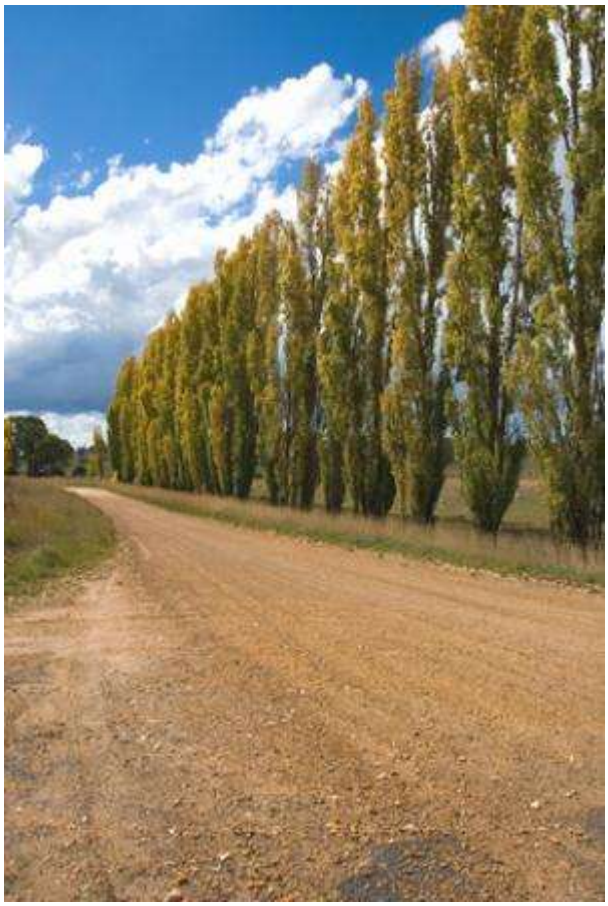
The researchers' next goals are to elucidate the exact biological function of the granules and sheaths in *M. hungatei*. Many functions have been proposed for the granules, including as energy sources for cell division, or to power flagella that move the cells, or even as a protection against metal toxicity from heavy metals like iron or copper.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of California - Los Angeles**. The original article was written by Mike Rodewald.

http://www.sciencedaily.com/releases/2011/07/110706093910.htm

Forest Trees Remember Their Roots



A row of poplars. When it comes to how they respond to the environment, trees may not be that different from humans. Recent studies showed that even genetically identical human twins can have a different chance of getting a disease. This is because each twin has distinct personal experiences through their lifetime. (Credit: © Phillip Minnis / Fotolia)

ScienceDaily (July 11, 2011) — When it comes to how they respond to the environment, trees may not be that different from humans. Recent studies showed that even genetically identical human twins can have a different chance of getting a disease. This is because each twin has distinct personal experiences through their lifetime.

It turns out that the same is likely true for forest trees as well, according to new research from the University of Toronto Scarborough (UTSC).

"The findings were really quite stunning," says Malcolm Campbell, a biologist and lead author of the study. "People have been talking about a so-called "nursery effect" for a long time."

The study looked at the theory that trees and other plants, even when they were genetically identical, grew differently and responded to stress differently depending on the nursery that the plants were obtained from. Campbell says the research findings not only provide a strong affirmation of this effect, but also reveal insight on a molecular level. "Our results show that there is a form of molecular 'memory' in trees where a tree's previous personal experience influences how it responds to the environment."

In the new study, Campbell's graduate student Sherosha Raj used genetically identical poplar trees that had been grown in two different regions of Canada. These stem cuttings were then used to regrow the trees under identical climate-controlled conditions in Toronto. Raj subjected half of the trees to drought conditions while the remaining trees were well watered.

Since the trees were regrown under identical conditions, Campbell and his research group predicted all the specimens would respond to drought in the same manner, regardless of where they had come from. Remarkably, genetically identical specimens of two poplar varieties responded differently to the drought treatment depending on their place of origin.

Campbell's research group also showed that this difference occurred at the most fundamental level -- the one of gene activity. Even though the specimens were all genetically identical, trees that had been obtained from Alberta used a different set of genes to respond to drought than the ones that had been obtained from Saskatchewan.

The findings of this study are relevant to foresters and gardeners in highlighting the importance of the nursery source for trees and other plants, which can determine how the plant will grow and resist stress in a forest or the garden. Additionally, the "memory" of previous experience discovered in this study could also help determine plant survival in response to changes in climate, or other environmental stresses like diseases or pests.

Dr. Campbell's research team included co-first author Dr. Katharina Bräutigam, Erin Hamnishi and Dr. Olivia Wilkins, all of the University of Toronto. The work was done in collaboration with colleagues at the University of British Columbia, Simon Fraser University, and the University of Alberta.

The research was supported by Natural Sciences and Engineering Research Council of Canada competitive research funds, and in kind contributions from Alberta Pacific Forest Industries, and Agriculture and Agrifood Canada.

The study appears in this week's issue of PNAS: The *Proceedings of the National Academy of Sciences.*

Story Source:

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

Journal Reference:

1. Sherosha Raj, Katharina Bräutigam, Erin T. Hamanishi, Olivia Wilkins, Barb R. Thomas, William Schroeder, Shawn D. Mansfield, Aine L. Plant, and Malcolm M. Campbell. **Clone history shapes Populus drought responses**. *Proceedings of the National Academy of Sciences*, July 11, 2011 DOI: 10.1073/pnas.1103341108

http://www.sciencedaily.com/releases/2011/07/110711164557.htm

Most of World's 'Missing Species' Live in Known Hotspots, Study Finds

Blue poison dart frog Dendrobates azureus at Bristol Zoo, England. (Credit: Adrian Pingstone via Wikimedia Commons, public domain)

ScienceDaily (July 4, 2011) — Most of the world's "missing" or undiscovered species live in regions already identified by scientists as conservation priorities, according to a new study published in the journal *Proceedings of the National Academy of Sciences*.

The study's findings suggest recent conservation efforts have been on target and should reduce uncertainty over global conservation priorities, its team of international authors say. But, they add, the extinction threat for many of the as-yet undiscovered species is worse than previously feared.

"We show that the majority of the world's 'missing species' are hiding away on some of the most threatened landscapes in the world," says Stuart Pimm, Doris Duke Professor of Conservation at Duke University's Nicholas School of the Environment. "This considerably increases the number of threatened and endangered species around the world."

With limited resources and accelerating threats to nature, conservation biologists have long sought to identify areas around the world where effective conservation actions could save the most species. Biodiversity hotspots -- places with extreme rates of habitat loss as well as unusually high numbers of endemic species -- are priorities.

The problem is that knowledge of species is seriously incomplete -- many species are as-yet unknown.

"We know we have an incomplete catalogue of life," says lead author Lucas Joppa of Microsoft Research in Cambridge, U.K., who received his PhD in ecology from Duke in 2009. "If we don't know how many species there are, or where they live, then how can we prioritize places for conservation? What if the places we ignore now turn out to be those with the most unknown species?"

To address this dilemma, Joppa and his coauthors created a model that incorporates taxonomic effects over time to estimate how many species of flowering plants, which form the basis of the biodiversity hotspots concept, remain to be discovered in regions around the world. They then compared those estimates with regions currently identified as global conservation priorities. The two sets matched.

Six regions already identified by conservation scientists as hotspots -- Mexico to Panama; Colombia; Ecuador to Peru; Paraguay and Chile southward; southern Africa; and Australia -- were estimated by the models to contain 70 percent of all predicted missing species. Only two regions with high estimates of missing species -- the region from Angola to Zimbabwe, and the northern Palearctic, which encompasses parts of Europe and Asia -- contained no biodiversity hotspots.

"It was a huge relief that those places in which we are already investing our resources are also those which house the majority of the world's undiscovered species," says David Roberts of the Durrell Institute of Conservation and Ecology at the University of Kent. "It didn't have to turn out that way!"

Norman Myers of Oxford University and the originator of the "hotspots" idea, says, "these findings really validate all of the time and effort I have put into fighting for the preservation of the world's biodiversity. Now we can get on with trying to save these unique and threatened places."
While showing that conservation action is already directed at the most appropriate places, the study's results bring an increased sense of urgency to the global extinction crisis.
The authors stress that results like these make it even more important to effectively conserve large areas of land.
"How can you save a species you don't even know exists?" asks Joppa. "You can't. But you can protect places where you predict they occur."

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

Journal Reference:

1. Lucas N. Joppa, David L. Roberts, Norman Myers, Stuart L. Pimm. **Biodiversity hotspots house most undiscovered plant species**. *Proceedings of the National Academy of Sciences*, 2011; DOI: 10.1073/pnas.1109389108

http://www.sciencedaily.com/releases/2011/07/110704151441.htm

Deformed Limbs One of Several Birth Defects Linked to Smoking in Pregnancy

New research into common birth defects associated with smoking during pregnancy shows that public health guidance should now be more explicit about the specific malformations associated with maternal smoking, in order to try and reduce the numbers of pregnant women who smoke. (Credit: © hartphotography / Fotolia)

ScienceDaily (July 12, 2011) — Missing or deformed limbs, clubfoot, facial disorders and gastrointestinal problems are some of the most common birth defects found to be associated with smoking during pregnancy, according to a major new report led by scientists at University College London.

The study, published July 12 in *Human Reproduction Update*, is the first comprehensive review to identify the specific birth defects (malformations) most associated with smoking.

Despite public health advice which warns of the harms of maternal smoking, such as miscarriage and premature birth, in the UK 45% of women under 20 and 17% overall still smoke during pregnancy, according to the national figures (Office for National Statistics 2006). In the USA, 20% of women aged under 25 years smoke during pregnancy, compared to 9% among those aged over 35.

The authors examined a total of 172 research papers published over the last 50 years, which looked at a combined total of 174,000 cases of malformation alongside 11.7 million controls. The risk was increased by 26% for having a baby with missing or deformed limbs, 28% for clubfoot, 27% for gastrointestinal defects, 33% for skull defects, 25% for eye defects, and 28% for cleft lip/palate. The greatest increase in risk (50%) was for a condition called gastroschisis, where parts of the stomach or intestines protrude through the skin.

The research authors recommend that public health guidance should now be more explicit about the specific malformations associated with maternal smoking, in order to try and reduce the numbers of pregnant women who smoke.

Lead author Professor Allan Hackshaw, UCL Cancer Institute and member of the Royal College of Physicians Tobacco Advisory Group, said: "People may think that few women still smoke when pregnant. But the reality is that, particularly in women under 20, the numbers are still staggeringly high.
"Maternal smoking during pregnancy is a well established risk factor for miscarriage, low birthweight and premature birth. However, very few public health educational policies mention birth defects when referring to smoking and those that do are not very specific -- this is largely because of past uncertainty over which ones are directly linked.
"Now we have this evidence, advice should be more explicit about the kinds of serious defects such as deformed limbs, and facial and gastrointestinal malformations that babies of mothers who smoke during pregnancy could suffer from. The message from this research is that women should quit smoking before becoming pregnant, or very early on, to reduce the chance of having a baby with a serious and lifelong physical defect."
Co-author, Professor Charles Rodeck, UCL Institute for Women's Health, added: "The results of this research are of the greatest significance for the health of mothers and babies and for public health policy. If the recommendations are implemented, they will lead to a reduction in the incidence of several common malformations, and also to greater efficacy of smoking prevention programmes, as the warning of a birth defect adds weight to that of a small or premature baby."

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University College London**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Allan Hackshaw, Charles Rodeck, Sadie Boniface. **Maternal smoking in pregnancy and birth defects: a systematic review based on 173 687 malformed cases and 11.7 million controls**. *Human Reproduction Update*, 2011; DOI: 10.1093/humupd/dmr022

http://www.sciencedaily.com/releases/2011/07/110711195019.htm

Owl Study Expands Understanding of Human Stereovision

Barn owl. Using owls as a model, a new research study reveals the advantage of stereopsis, commonly referred to as stereovision, is its ability to discriminate between objects and background; not in perceiving absolute depth. (Credit: © TomFrank / Fotolia)

ScienceDaily (July 11, 2011) — Using owls as a model, a new research study reveals the advantage of stereopsis, commonly referred to as stereovision, is its ability to discriminate between objects and background, not in perceiving absolute depth.

The findings were published in a recent *Journal of Vision* article entitled "Owls see in stereo much like humans do."

The purpose of the study, which was conducted at RWTH Aachen (Germany) and Radboud University (Nijmegen, Netherlands), was to uncover how depth perception came into existence during the course of evolution.

"The reason why studying owl vision is helpful is that, like humans, owls have two frontally placed eyes," said author Robert F. van der Willigen, PhD, of Donders Institute for Brain, Cognition and Behavior at Radboud. "As a result, owls, like humans, could appreciate the 3-dimensional shape of tangible objects through simultaneous comparison of the left and right eye."

van der Willigen studied two trained barn owls (*Tyto alba*) by conducting a series of six behavioral experiments equivalent to those used on humans. He used computer-generated binocular random-dot patterns to measure stereo performance, which showed that the owl's ability to discriminate random-dot stereograms is parallel to that of humans despite the owl's relatively small brain. The results provided unprecedented data on stereovision, with findings that debunk the long-held consensus that the evolutionary advantage of seeing in stereo must be depth vision.

He contends the findings demonstrate that while binocular disparity, the slight difference between the viewpoints of the right and left eyes, does play a role in perceiving depth, it allows owls, like humans, to perceive relative depth rather than absolute distance. "It is useful, therefore, not so much in controlling goal-directed movements as it is in recognition."

In looking at future studies, van der Willigen hopes that scientist will consider that human or primate vision is not the only way to examine the stereovision experience. "My present work on the owl highlights underappreciated, but fundamental aspects of stereopsis," he says. "Nonetheless, final proof should come with behavioral demonstration of equivalent stereoscopic abilities in animals other than the owl. Hopefully, my current work will encourage scientists to investigate other animal species."

story Source:

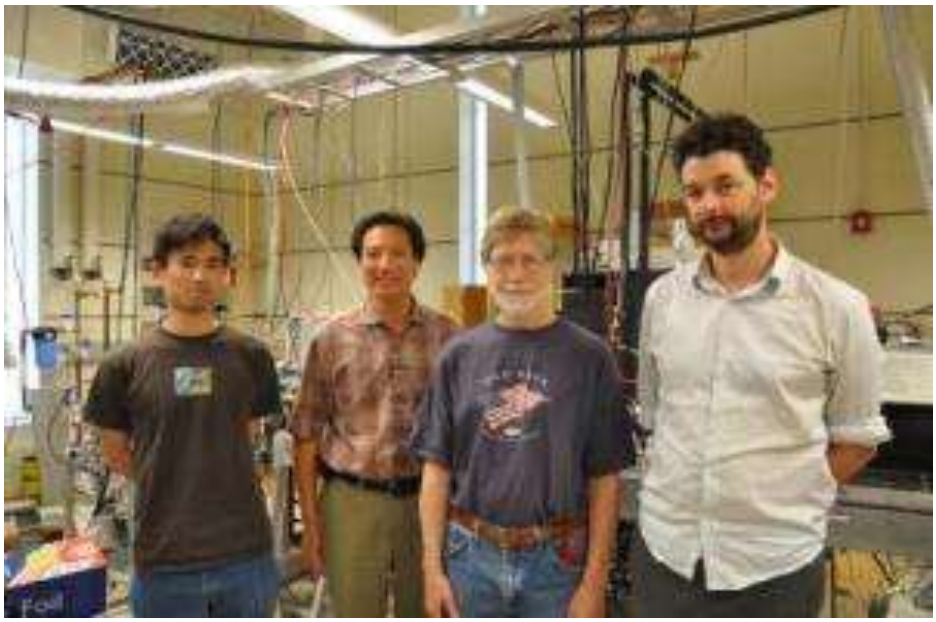
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Association for Research in Vision and Ophthalmology**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. R. F. van der Willigen. **Owls see in stereo much like humans do**. *Journal of Vision*, 2011; 11 (7): 10 DOI: 10.1167/11.7.10

http://www.sciencedaily.com/releases/2011/07/110711164559.htm

Physicists Discover New Way to Produce Antimatter-Containing Atom



Researchers Tomu H. Hisakado, Harry Tom, Allen Mills and David Cassidy have found a new way to produce positronium. (Credit: M. Kelley, UCR Strategic Communications)

ScienceDaily (July 11, 2011) — Physicists at the University of California, Riverside report that they have discovered a new way to create positronium, an exotic and short-lived atom that could help answer what happened to antimatter in the universe, why nature favored matter over antimatter at the universe's creation. Positronium is made up of an electron and its antimatter twin, the positron. It has applications in developing more accurate Positron Emission Tomography or PET scans and in fundamental physics research.

Recently, antimatter made headlines when scientists at CERN, the European Organisation for Nuclear Research, trapped antihydrogen atoms for more than 15 minutes. Until then, the presence of antiatoms was recorded for only fractions of a second.

In the lab at UC Riverside, the physicists first irradiated samples of silicon with laser light. Next they implanted positrons on the surface of the silicon. They found that the laser light frees up silicon electrons that then bind with the positrons to make positronium.

"With this method, a substantial amount of positronium can be produced in a wide temperature range and in a very controllable way," said David Cassidy, an assistant project scientist in the Department of Physics and Astronomy, who performed the research along with colleagues. "Other methods of producing positronium from surfaces require heating the samples to very high temperatures. Our method, on the other hand, works at almost any temperature -- including very low temperatures."

Cassidy explained that when positrons are implanted into materials, they can sometimes get stuck on the surface, where they will quickly find electrons and annihilate.

"In this work, we show that irradiating the surface with a laser just before the positrons arrive produces electrons that, ironically, help the positrons to leave the surface and avoid annihilation," said Allen Mills, a professor of physics and astronomy, in whose lab Cassidy works. "They do this by forming positronium, which is spontaneously emitted from the surface. The free positronium lives more than 200 times longer than the surface positrons, so it is easy to detect."

Study results appear in the July 15 issue of *Physical Review Letters*.

The researchers chose silicon in their experiments because it has wide application in electronics, is robust, cheap and works efficiently.

"Indeed, at very low temperatures, silicon may be the best thing there is for producing positronium, at least in short bursts," Cassidy said.
The researchers' eventual goal is to perform precision measurements on positronium in order to better understand antimatter and its properties, as well as how it might be isolated for longer periods of time.
Cassidy and Mills were joined in the research by Harry Tom, a professor and the chair of physics and astronomy, and Tomu H. Hisakado, a graduate student in Mills's lab.
In the near future, this research team hopes to cool the positronium down to lower energy emission levels for other experimental uses, and create also a "Bose-Einstein condensate" for positronium -- a collection of positronium atoms that are in the same quantum state.
"The creation of a Bose-Einstein condensate of positronium would really push the boundaries of what is possible in terms of real precision measurements," Cassidy said. "Such measurements would shed more light on the properties of antimatter and may help us probe further into why there is asymmetry between matter and antimatter in the universe."
Grants from the National Science Foundation and the US Air Force Research Laboratory funded the study.

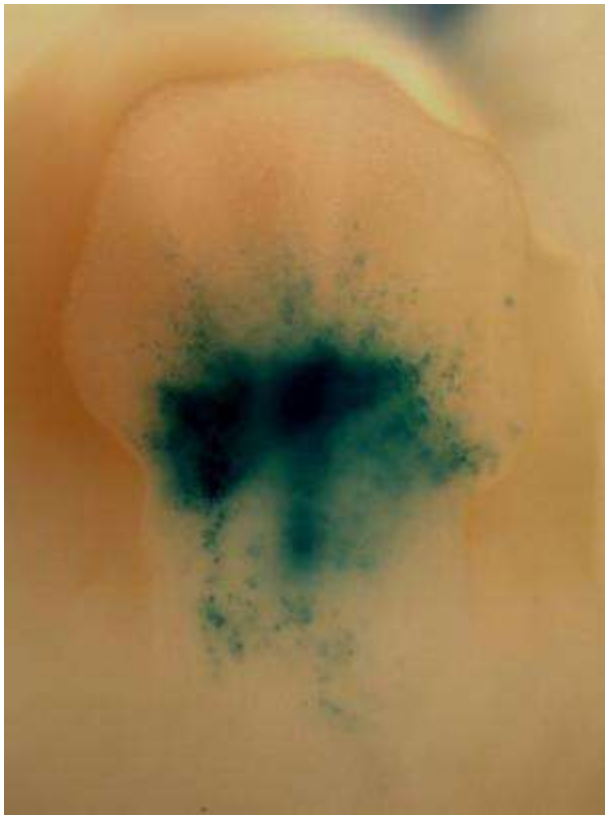
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of California - Riverside**.

Journal Reference:

1. D. B. Cassidy, T. H. Hisakado, H. W. K. Tom, and A. P. Mills Jr. **Photoemission of positronium from Si**. *Physical Review Letters*, 2011; (in press)

http://www.sciencedaily.com/releases/2011/07/110711172229.htm

Genetic Switch for Limbs and Digits Found in Primitive Fish: Before Animals First Walked On Land, Fish Carried Gene Program for Limbs



A genetic switch taken from the skate activates a marker gene in the distal limb of the mouse embryo. (Credit: Igor Schneider, University of Chicago)

ScienceDaily (July 11, 2011) — Genetic instructions for developing limbs and digits were present in primitive fish millions of years before their descendants first crawled on to land, researchers have discovered. Genetic switches control the timing and location of gene activity. When a particular switch taken from fish DNA is placed into mouse embryos, the segment can activate genes in the developing limb region of embryos, University of Chicago researchers report in *Proceedings of the National Academy of Sciences*. The successful swap suggests that the recipe for limb development is conserved in species separated by 400 million years of evolution.

"The genetic switches that drive the expression of genes in the digits of mice are not only present in fish, but the fish sequence can actually activate the expression in mice," said Igor Schneider, PhD, postdoctoral researcher in the Department of Organismal Biology and Anatomy at the University of Chicago and lead author on the paper. "This tells us how the antecedents of the limb go back in time at every level, from fossils to genes."

The genetic hunt was inspired by a famous fossil find -- the 2004 discovery of the transitional fossil Tiktaalik in the Canadian Arctic by a team led by Neil Shubin of the University of Chicago. A transitional species between fish and the four-legged tetrapods, Tiktaalik possessed fins containing a skeletal structure similar to the limbs of later land-dwelling animals.

Those similarities -- particularly the wrist and hand-like compartments present in the fins of Tiktaalik and its peers -- inspired a laboratory experiment to look at the homology, or shared physical and genetic traits, of fish and limbed animals.

"This is really a case where knowing something about the fossils and the morphology led us to think about genetic experiments," said Shubin, PhD, the Robert R. Bensley Professor of Organismal Biology and

Anatomy and senior author of the study. "Tiktaalik and its cousins showed us that this limb compartment is not an utter novelty in tetrapods, as was thought for a long time. So an antecedent of that program must exist."
The research team compared a genetic switch region called CsB, known to regulate limb development in humans, with similar regions in mice, chickens, frogs, and two fish species: the zebrafish and the skate. Because the last common ancestor of all these species pre-dates Tiktaalik-like "fishapods," the comparison offered a glimpse at biology before animals made their first steps on land.
Schneider and colleagues compared the CsB regions from all five species and found that certain sequences were shared between the fish species and the tetrapods. The conservation allowed the researchers to try swapping switch sequences between species to see if they could still drive gene expression in the fin or limb. Remarkably, mouse CsB could turn on gene expression at the outer edge of the developing fin region of zebrafish, and both skate and zebrafish CsB were capable of activating gene expression in the wrist and proximal digits of the mouse limb.
"These sequences function in these organisms despite 400 million years of separation," Schneider said. "The homologies that are perhaps not evident by morphology -- just comparing a hand and a fin -- can be traced back to the genome, where you find that the regulatory regions that control the making of those structures are actually present and shared between these organisms."
The results contradict a previous finding that a developmental switch from pufferfish DNA was not capable of gene expression in the limbs of mice, suggesting that tetrapods evolved a novel developmental system. But the new experiments suggest that the genetic switch controlling limb development was in fact present deep in Earth's evolutionary tree.
"There previously was the idea that these switches had to be generated from scratch de novo, but no, they already existed, they were already there," said Marcelo Nobrega, MD, PhD, assistant professor of human genetics at the University of Chicago Medical Center and another author of the study. "Maybe the key was expressing a gene earlier or later or in a specific territory, but it was just a modification of a program that was already encoded in the genomes of fish almost half a billion years ago and remains there to this day."
"These new results are actually in line with both the fossil data and the expression data," Schneider said. "So now we can tell a story where the fossils and gene expression make sense in light of the genetic regulation."
Future experiments will focus more closely on how the gene regulation system functions, examining the differences between the segments in fish and tetrapods that control development of either a fin or a limb. Subtle changes in the timing or location of gene expression may produce the dramatic differences in anatomy that first allowed animal life on Earth to explore land.
"There is a whole universe of questions that are opened up by this discovery," Shubin said.
The paper, "Appendage expression driven by the Hoxd global control region is an ancient gnathostome feature," will be published online the week of July 11 by the *Proceedings of the National Academy of Sciences*. In addition to Shubin, Schneider, and Nobrega, authors include Ivy Aneas and Andrew R. Gehrke of the University of Chicago, and Randall D. Dahn of Mount Desert Island Biological Lab.
Funding for the research was provided by the American Heart Association and the University of Chicago Biological Sciences Division.

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Chicago Medical Center**.

Journal Reference:

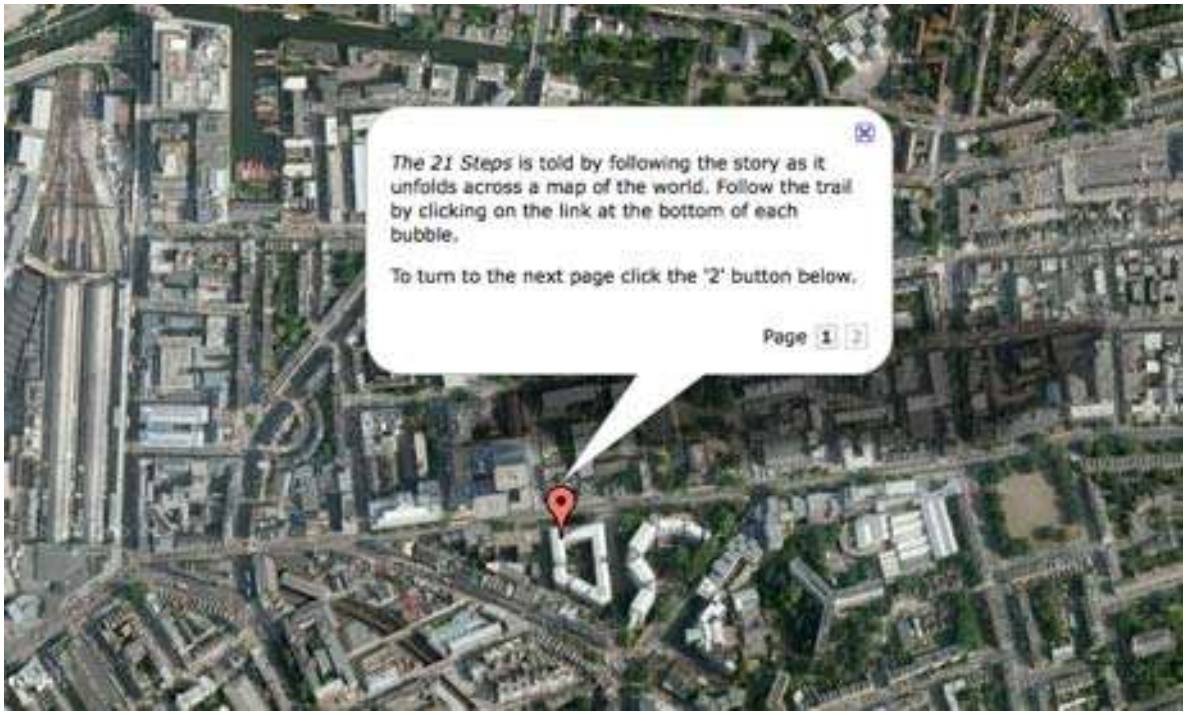
1. Schneider et al. **Appendage expression driven by the Hoxd global control region is an ancient gnathostome feature**. *Proceedings of the National Academy of Sciences*, 2011; (in press)

http://www.sciencedaily.com/releases/2011/07/110711151453.htm

Storytelling: digital technology allows us to tell tales in innovative new ways

As the tools available to publishers grow more sophisticated, it's up to us to experiment and see what sticks

- Aleks Krotoski
- The Observer, Sunday 7 August 2011



A web page from Penguin's We Tell Stories project, which used maps, blogs and other tools to develop plots.

The Edinburgh international book festival begins this week, featuring a fortnight of storytelling and literati self-promotion. Looking at the 17 packed days of a programme filled with debates, talks, readings and keynotes, I've noticed that there is virtually no reflection on the cards for the "dead tree" version of the story that is threatening to shake-up publishing's centuries-old foundation. More so, it is surprising given the "digital first" bent of its headline sponsor, the *Guardian*, that there's no mention of apps, digital extensions or the new, multiformatted way of telling stories that's emerging among a new and talented crop of content creators supported by innovative and risk-taking storytelling outlets.

But I admit, picking on the book festival is unfair; linear stories still dominate the page, our TVs, our radios, our games consoles and the theatre. Yet the process of telling a story doesn't have to be unidirectional.

Stories are memory aids, instruction manuals and moral compasses. When enlisted by charismatic leaders and turned into manifestos, dogmas and social policy, they've been the foundations for religions and political systems. When a storyteller has held an audience captive around a campfire, a cinema screen or on the page of a bestseller, they've reinforced local and universal norms about where we've been and where we're going. And when they've been shared in the corner shop, at the pub or over dinner they've helped us define who we are and how we fit in.

Human experience is a series of never-ending, overlapping stories bumping into one another in expected and unexpected ways. Our days are made up of personal narratives of good and evil, joy and conflict, magic potions and angry gnomes. They are naturally co-creations based on a push and pull of projection and interpretation. We interpret, analyse and synthesise the characters and events in our lives to help us make sense of the world, and these have been translated by professionals into folk tales, myths, legends, pantomime, bestsellers, soap operas and Hollywood blockbusters. Storytellers are simply curators of information who finesse the elements of a yarn into a beginning, middle and end.

But the tools they use to tell tales are evolving, becoming more modular and tailored, more participatory and more engaging than just the printed word or the moving image. The new form of storytelling that's coming from a digitally enabled cabal moves beyond reinterpreting a text for radio or screen. Some creatives have taken their inspirations from Kit Williams's 1979 picture book *Masquerade*, which motivated a generation of people to pour over symbols in illustrations to find a treasure buried in the Midlands, starting their stories anywhere – online or off. They weave narratives from seemingly innocuous blogs, magazine ads, TV slots, fashion labels and public phone calls. Clues in the alternate realities designed by authors are littered in the physical and the virtual; consumers simply need to be tuned in to see them, and willing to take part in the unfolding narrative.

Frank Rose, author of *The Art of Immersion: How the Digital Generation is Remaking Hollywood, Madison Avenue and the Way We Tell Stories*, believes this is exactly what people want from their story experience. "The kind of multi-way conversation that the web makes possible is what we've always wanted to do," he says. "The technology finally enables it."

Rose celebrates the way that the new kinds of storytelling brings audiences together to traverse plots, but recognises that there are challenges for consumers and for creators: "It's very different when you have a medium that forces you to engage with other people," he says, reflecting on the arc of a narrative that is necessarily more complex, multifaceted, and demands more flexibility. "You don't know if you're going to have to tell a story for one hour, two hours or 10 years."

Other creatives are using digital media to extend their storytelling palate in a similar way to what Tom Stoppard did for Shakespeare's *Hamlet* in *Rosencrantz and Guildenstern Are Dead*. George Lucas, *Matrix* directors the Wachowski brothers and *Lost* creator JJ Abrams have each taken their cinematic plotlines across other media, exclusively evolving minor characters and side stories in these different formats to enhance the original narrative for the people who choose to tap in.

Rose believes stories are in an exciting period of flux. "We're in one of those 50-year windows when an entirely new medium is being created and no one knows what to do with it," he says. "All you can do is throw stuff out there and experiment." And some are. When at Penguin publishing, Jeremy Ettinghausen was a leader in this regard, crowdsourcing a story in the wikinovel *A Million Penguins* in 2006 and commissioning We Tell Stories, a series of pieces situated in the physical context using GPS-enabled devices, in 2008. Increasingly, other innovators realise what connected media can do and have taken steps to reinterpret the hero's journey in a way that puts the reader/viewer/consumer in the central role. Think *Choose Your Own Adventure* when there are millions of possible options, not just turning to page 33.

Admittedly, multimedia storytelling isn't for everyone – consumers or creators – nor is it appropriate all the time. Some people naturally see Twitter as an opportunity to retell *Romeo and Juliet*, while others feel more comfortable with pen and paper. The Edinburgh book festival has chosen to celebrate the latter. I wonder what will happen when the former gets a festival of its own.

Multimedia storytelling

Online Caroline: This early 2000s experiment in interactive storytelling drew consumers/participants into an immersive drama about Caroline and her boyfriend. Created by the UK-based XPT(Rob Bevan and Tim Wright), it told its story with the reader, sending personalised emails and narrative video clips based on feedback to the site. Split into 24 parts, the whole story took a minimum of 24 days to complete.

The Lost Experience: The TV drama *Lost* littered its plot with conundrums but few people knew that there was a much more intricately woven plot in the real world, told through clues in websites, advertorials in US magazines and newspapers, TV commercials and recorded messages.

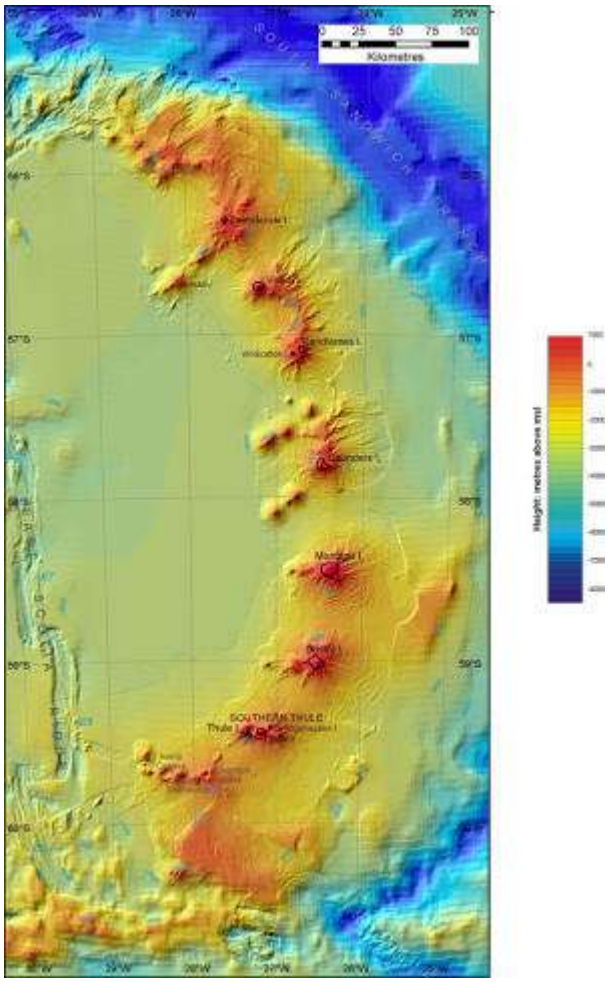
The Blair Witch Project: The 1998 horror movie, which showed a group of friends seemingly stalked by a malevolent enemy, was most remarkable for the buzz that it built online before its cinema release. The important elements were leaked online, a forum was set up, new footage was shot and the rumours of the veracity of the so-called "documentary" spread like wildfire. Its storytelling approach has often been replicated, but never with such success.

We Tell Stories: Penguin Publishing commissioned London company Six to Start to help six writers tell stories using digital media in compelling ways. Over six weeks, notable authors played with Google Maps, infographics, blogs, Twitter, email and reader-driven plotlines. This project came hot on the heels of Penguin's crowdsourced wikinovel, *A Million Penguins* (2007).

Conspiracy for Good: Tim Kring, creator of the TV series *Heroes*, "wanted to create a narrative that spilled out into the streets". In 2010, with Nokia and The company P, he produced a social benefit storytelling experience "to take real-life action and create positive change in the world". Players became heroes and villains, literally running through the streets of five countries, and participating in fundraising drives to further the mission. The project has sent more than 10,000 books to libraries in Africa and supported 50 scholarships.

http://www.guardian.co.uk/technology/2011/aug/07/digital-media-storytelling-internet

Underwater Antarctic Volcanoes Discovered in the Southern Ocean



Sea-floor mapping technology reveals volcanoes beneath the sea surface. (Credit: Image courtesy of British Antarctic Survey)

ScienceDaily (July 11, 2011) — Scientists from British Antarctic Survey (BAS) have discovered previously unknown volcanoes in the ocean waters around the remote South Sandwich Islands.

Using ship-borne sea-floor mapping technology during research cruises onboard the RRS James Clark Ross, the scientists found 12 volcanoes beneath the sea surface -- some up to 3km high. They found 5km diameter craters left by collapsing volcanoes and 7 active volcanoes visible above the sea as a chain of islands.

The research is important also for understanding what happens when volcanoes erupt or collapse underwater and their potential for creating serious hazards such as tsunamis. Also this sub-sea landscape, with its waters warmed by volcanic activity creates a rich habitat for many species of wildlife and adds valuable new insight about life on earth.

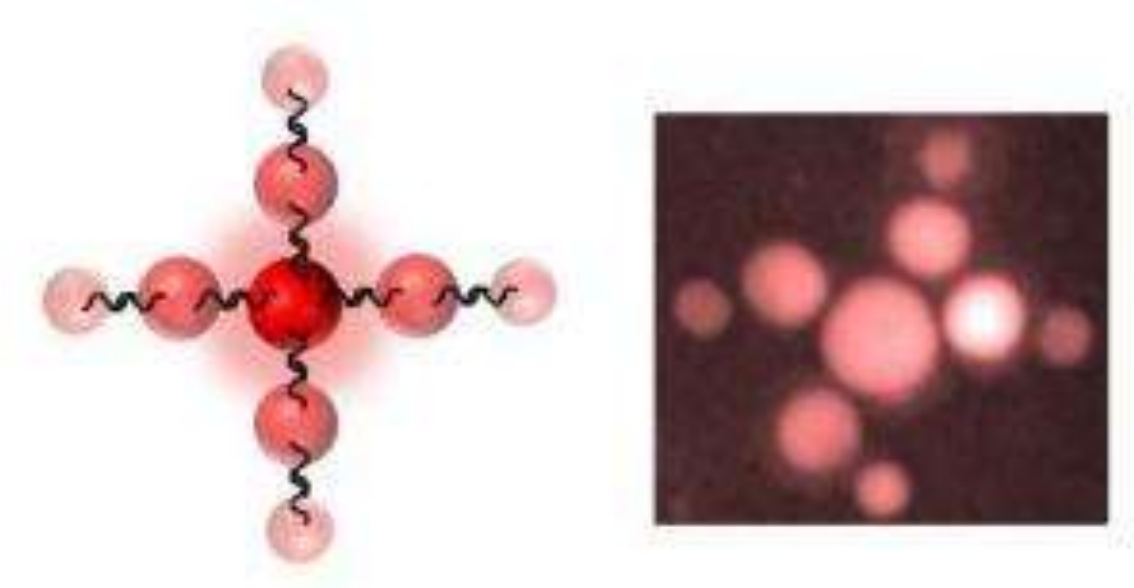
Speaking at the International Symposium on Antarctic Earth Sciences in Edinburgh Dr Phil Leat from British Antarctic Survey said, "There is so much that we don't understand about volcanic activity beneath the sea -- it's likely that volcanoes are erupting or collapsing all the time. The technologies that scientists can now use from ships not only give us an opportunity to piece together the story of the evolution of our earth, but they also help shed new light on the development of natural events that pose hazards for people living in more populated regions on the planet."

Story Source:

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

http://www.sciencedaily.com/releases/2011/07/110711104755.htm

Researchers Build an Antenna for Light



Left: Illustration of a nanoantenna complex. Right: Actual image of the complex as visualized by transmission electron microscopy. (Credit: Image courtesy of University of Toronto Faculty of Applied Science & Engineering)

ScienceDaily (July 11, 2011) — University of Toronto researchers have derived inspiration from the photosynthetic apparatus in plants to engineer a new generation of nanomaterials that control and direct the energy absorbed from light.

Their findings are reported in the journal *Nature Nanotechnology.*

The U of T researchers, led by Professors Shana Kelley and Ted Sargent, report the construction of what they term "artificial molecules."

"Nanotechnologists have for many years been captivated by quantum dots -- particles of semiconductor that can absorb and emit light efficiently, and at custom-chosen wavelengths," explained co-author Kelley, a Professor at the Leslie Dan Faculty of Pharmacy, the Department of Biochemistry in the Faculty of Medicine, and the Department of Chemistry in the Faculty of Arts & Science. "What the community has lacked -- until now -- is a strategy to build higher-order structures, or complexes, out of multiple different types of quantum dots. This discovery fills that gap."

The team combined its expertise in DNA and in semiconductors to invent a generalized strategy to bind certain classes of nanoparticles to one another.

"The credit for this remarkable result actually goes to DNA: its high degree of specificity -- its willingness to bind only to a complementary sequence -- enabled us to build rationally-engineered, designer structures out of nanomaterials," said Sargent, a Professor in The Edward S. Rogers Sr. Department of Electrical & Computer Engineering at the University of Toronto, who is also the Canada Research Chair in Nanotechnology. "The amazing thing is that our antennas built themselves -- we coated different classes of nanoparticles with selected sequences of DNA, combined the different families in one beaker, and nature took its course. The result is a beautiful new set of self-assembled materials with exciting properties."

Traditional antennas increase the amount of an electromagnetic wave -- such as a radio frequency -- that is absorbed, and then funnel that energy to a circuit. The U of T nanoantennas instead increased the amount of light that is absorbed and funneled it to a single site within their molecule-like complexes. This concept is already used in nature in light harvesting antennas, constituents of leaves that make photosynthesis efficient.

"Like the antennas in radios and mobile phones, our complexes captured dispersed energy and concentrated it

to a desired location. Like the light harvesting antennas in the leaves of a tree, our complexes do so using wavelengths found in sunlight," explained Sargent.

"Professors Kelley and Sargent have invented a novel class of materials with entirely new properties. Their insight and innovative research demonstrates why the University of Toronto leads in the field of nanotechnology," said Professor Henry Mann, Dean of the Leslie Dan Faculty of Pharmacy.

"This is a terrific piece of work that demonstrates our growing ability to assemble precise structures, to tailor their properties, and to build in the capability to control these properties using external stimuli," noted Paul S. Weiss, Fred Kavli Chair in NanoSystems Sciences at UCLA and Director of the California NanoSystems Institute.

Kelley explained that the concept published in the *Nature Nanotechnology* paper is a broad one that goes beyond light antennas alone.

"What this work shows is that our capacity to manipulate materials at the nanoscale is limited only by human imagination. If semiconductor quantum dots are artificial atoms, then we have rationally synthesized artificial molecules from these versatile building blocks."

Also contributing to the paper were researchers Sjoerd Hoogland and Armin Fischer of The Edward S. Rogers Sr. Department of Electrical & Computer Engineering, and Grigory Tikhomirov and P. E. Lee of the Leslie Dan Faculty of Pharmacy.

The publication was based in part on work supported by the Ontario Research Fund Research Excellence Program, the Natural Sciences and Engineering Research Council of Canada (NSERC), Canada Research Chairs program and the National Institutes of Health (NIH).

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Toronto Faculty of Applied Science & Engineering**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Grigory Tikhomirov, Sjoerd Hoogland, P. E. Lee, Armin Fischer, Edward H. Sargent, Shana O. Kelley. **DNA-based programming of quantum dot valency, self-assembly and luminescence**. *Nature Nanotechnology*, 2011; DOI: 10.1038/nnano.2011.100

http://www.sciencedaily.com/releases/2011/07/110710132830.htm

Climate Change Reducing Ocean's Carbon Dioxide Uptake, New Analysis Shows

A new analysis provides some of the first observational evidence that climate change is negatively impacting the ocean carbon sink. (Credit: © lunamarina / Fotolia)

ScienceDaily (July 11, 2011) — How deep is the ocean's capacity to buffer against climate change?

As one of the planet's largest single carbon absorbers, the ocean takes up roughly one-third of all human carbon emissions, reducing atmospheric carbon dioxide and its associated global changes.

But whether the ocean can continue mopping up human-produced carbon at the same rate is still up in the air. Previous studies on the topic have yielded conflicting results, says University of Wisconsin-Madison assistant professor Galen McKinley.

In a new analysis published online July 10 in *Nature Geoscience,* McKinley and her colleagues identify a likely source of many of those inconsistencies and provide some of the first observational evidence that climate change is negatively impacting the ocean carbon sink.

"The ocean is taking up less carbon because of the warming caused by the carbon in the atmosphere," says McKinley, an assistant professor of atmospheric and oceanic sciences and a member of the Center for Climatic Research in the Nelson Institute for Environmental Studies.

The analysis differs from previous studies in its scope across both time and space. One of the biggest challenges in asking how climate is affecting the ocean is simply a lack of data, McKinley says, with available information clustered along shipping lanes and other areas where scientists can take advantage of existing boat traffic. With a dearth of other sampling sites, many studies have simply extrapolated trends from limited areas to broader swaths of the ocean.

McKinley and colleagues at UW-Madison, the Lamont-Doherty Earth Observatory at Columbia University, and the Universite Pierre et Marie Curie in Paris expanded their analysis by combining existing data from a range of years (1981-2009), methodologies, and locations spanning most of the North Atlantic into a single

time series for each of three large regions called gyres, defined by distinct physical and biological characteristics.

They found a high degree of natural variability that often masked longer-term patterns of change and could explain why previous conclusions have disagreed. They discovered that apparent trends in ocean carbon uptake are highly dependent on exactly when and where you look -- on the 10- to 15-year time scale, even overlapping time intervals sometimes suggested opposite effects.

"Because the ocean is so variable, we need at least 25 years' worth of data to really see the effect of carbon accumulation in the atmosphere," she says. "This is a big issue in many branches of climate science -- what is natural variability, and what is climate change?"

Working with nearly three decades of data, the researchers were able to cut through the variability and identify underlying trends in the surface CO2 throughout the North Atlantic.

During the past three decades, increases in atmospheric carbon dioxide have largely been matched by corresponding increases in dissolved carbon dioxide in the seawater. The gases equilibrate across the air-water interface, influenced by how much carbon is in the atmosphere and the ocean and how much carbon dioxide the water is able to hold as determined by its water chemistry.

But the researchers found that rising temperatures are slowing the carbon absorption across a large portion of the subtropical North Atlantic. Warmer water cannot hold as much carbon dioxide, so the ocean's carbon capacity is decreasing as it warms.

In watching for effects of increasing atmospheric carbon on the ocean's uptake, many people have looked for indications that the carbon content of the ocean is rising faster than that of the atmosphere, McKinley says. However, their new results show that the ocean sink could be weakening even without that visible sign.

"More likely what we're going to see is that the ocean will keep its equilibration but it doesn't have to take up as much carbon to do it because it's getting warmer at the same time," she says. "We are already seeing this in the North Atlantic subtropical gyre, and this is some of the first evidence for climate damping the ocean's ability to take up carbon from the atmosphere."

She stresses the need to improve available datasets and expand this type of analysis to other oceans, which are relatively less-studied than the North Atlantic, to continue to refine carbon uptake trends in different ocean regions. This information will be critical for decision-making, since any decrease in ocean uptake may require greater human efforts to control carbon dioxide levels in the atmosphere.

McKinley's work on the project was supported by the National Aeronautics and Space Administration.

Story Source:

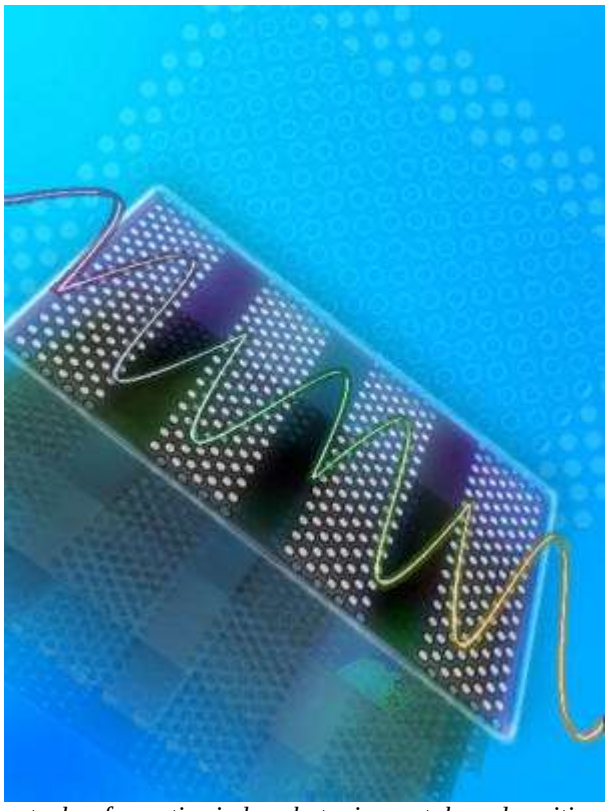
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Wisconsin-Madison**. The original article was written by Jill Sakai.

Journal Reference:

1. Galen A. McKinley, Amanda R. Fay, Taro Takahashi, Nicolas Metzl. **Convergence of atmospheric and North Atlantic carbon dioxide trends on multidecadal timescales**. *Nature Geoscience*, 2011; DOI: 10.1038/ngeo1193

http://www.sciencedaily.com/releases/2011/07/110710132816.htm

Light Propagation Controlled in Photonic Chips: Major Breakthrough in Telecommunications Field



The nanofabricated superlattices consist of alternating stacks of negative index photonic crystals and positive index homogeneous dielectric media have zero phase delay despite the varying physical path. (Credit: Designer: Nicoletta Barolini)

ScienceDaily (July 11, 2011) — Researchers at Columbia Engineering School have built optical nanostructures that enable them to engineer the index of refraction and fully control light dispersion. They have shown that it is possible for light (electromagnetic waves) to propagate from point A to point B without accumulating any phase, spreading through the artificial medium as if the medium is completely missing in space. This is the first time simultaneous phase and zero-index observations have been made on the chip-scale and at the infrared wavelength.

The study, to be published in *Nature Photonics*, was led by Chee Wei Wong, associate professor of mechanical engineering, and Serdar Kocaman, electrical engineering PhD candidate, both at Columbia Engineering, in collaboration with scientists at the University College of London, Brookhaven National Laboratory, and the Institute of Microelectronics of Singapore.

"We're very excited about this. We've engineered and observed a metamaterial with zero refractive index," said Kocaman. "What we've seen is that the light disperses through the material as if the entire space is missing. The oscillatory phase of the electromagnetic wave doesn't even advance such as in a vacuum -- this is what we term a zero-phase delay."

This exact control of optical phase is based on a unique combination of negative and positive refractive indices. All natural known materials have a positive refractive index. By sculpturing these artificial subwavelength nanostructures, the researchers were able to control the light dispersion so that a negative refractive index appeared in the medium. They then cascaded the negative index medium with a positive refractive index medium so that the complete nanostructure behaved as one with an index of refraction of zero.

"Phase control of photons is really important," said Wong. "This is a big step forward in figuring out how to carry information on photonic chips without losing control of the phase of the light."

"We can now control the flow of light, the fastest thing known to us," he continued. "This can enable self-focusing light beams, highly directive antennas, and even potentially an approach to cloak or hide objects, at least in the small-scale or a narrow band of frequencies currently."
This research was supported by grants from the National Science Foundation and the Defense Advanced Research Projects Agency.

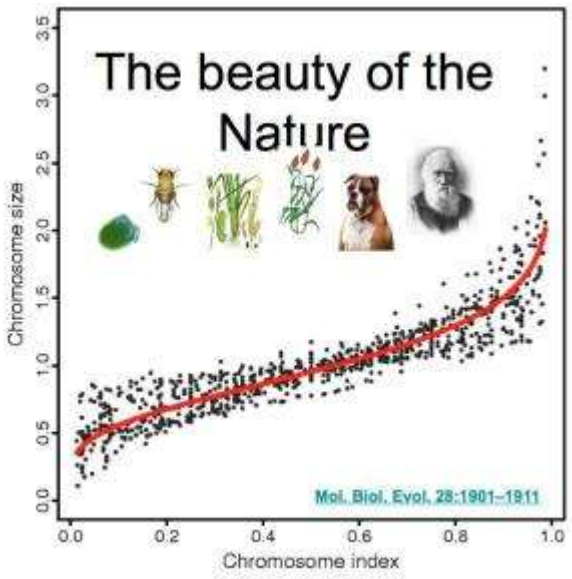
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Columbia University**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. S. Kocaman, M. S. Aras, P. Hsieh, J. F. McMillan, C. G. Biris, N. C. Panoiu, M. B. Yu, D. L. Kwong, A. Stein, C. W. Wong. **Zero phase delay in negative-refractive-index photonic crystal superlattices**. *Nature Photonics*, 2011; DOI: 10.1038/nphoton.2011.129

http://www.sciencedaily.com/releases/2011/07/110710132825.htm

Chromosomes' Big Picture: Similarities Found in Genomes Across Multiple Species; Platypus Still out of Place



In a new study, researchers found that the chromosome sizes within each eukaryotic species are actually similar rather than drastically different as previously believed. They also found that the chromosomes of these different organisms share a similar distribution pattern. (Credit: Image courtesy of Kansas State University)

ScienceDaily (July 11, 2011) — By mapping various genomes onto an X-Y axis, a team comprised mostly of Kansas State University researchers has found that Charles Darwin and a fruit fly -- among other organisms -- have a lot in common genetically.

Their discovery, "Chromosome Size in Diploid Eukaryotic Species Centers on the Average Length with a Conserved Boundary," was recently published in the journal *Molecular Biology and Evolution*. It details a project that compared 886 chromosomes in 68 random species of eukaryotes -- organisms whose cells contain a nucleus and are enclosed by cellular membranes. The researchers found that the chromosome sizes within each eukaryotic species are actually similar rather than drastically different as previously believed. They also found that the chromosomes of these different organisms share a similar distribution pattern.

Because chromosomes are the genetic building blocks for an organism and its traits, the information will be beneficial to understanding the core components of biological evolution -- especially in genetics and genome evolution, said Jianming Yu, associate professor of agronomy at Kansas State University. With this data, scientists can now better predict the evolutionary adaptations of an organism.

"Basically what this all means is that if the chromosome number of a species can be given, the relative sizes of all the chromosomes can instantly be known," Yu said. "Also, if you tell me the genome size in the chromosome base pair, I can tell you the base pair length of each chromosome."

According to Yu, the most surprising finding is the extremely consistent distribution pattern of the chromosomes, a result from comparing the full sets of chromosomes -- called genomes -- of the 68 random eukaryotes. The team found that nearly every genome perfectly formed an S-curve of ascending chromosomal lengths when placed on a standardized X-Y axis. That meant the genome from a species of rice expressed the same pattern as the genome from a species of maize, sorghum, fruit fly, dog, chimpanzee, etc.

In order to reach these findings, though, the team started by comparing various genomes of species from multiple organisms, looking for similarities. The genomes selected were from eukaryotes; prokaryotes -- organisms like bacteria that contain no cell nucleus; vertebrates -- organisms with a spine; invertebrates -- organisms without a spine, such as insects; vascular plants -- plants that can transport food and material throughout their tissue; and unicellular organisms.

From there the team looked specifically at the chromosomes of 68 random eukaryote genomes. This amounted to observing 886 chromosomes, 22 of which were human autosomes -- any chromosome other than

a sex chromosome. The sex chromosomes of each species were omitted because of their vastly different evolutionary history from other chromosomes, Yu said.
The researchers placed each fully sequenced eukaryote genome onto an X-Y axis, hoping to find similarities between the various organisms. To help generalize the vast amount of information, the X-Y axis graph was standardized with each species.
"It eliminated a scale effect and made it possible to compare a species with several dozen chromosomes to a species with much fewer chromosomes," said Xianran Li, research associate in agronomy.
That's when the team noticed the shockingly consistent distribution pattern.
"We could not believe this the first time the plot was generated," said Chengsong Zhu, research associate in agronomy.
The only genomes that deviated from forming an S-curve were that of the platypus -- an organism that contains characteristics of birds, reptiles, mammals, amphibians and fish -- and those of birds. Birds are unique because in addition to their usual chromosome sequences, they contain one additional set of minichromosome sequences, according to Zhongwei Lin, research associate in agronomy.
By finding normal distribution in nearly all of the genomes they used, geneticists can now say that if a species has a particular number of chromosomes, the chromosomes have to be distributed in this order because it's dictated by the laws of mitosis, meiosis and cell division, according to Guihua Bai, adjunct professor of agronomy at Kansas State University and research geneticist of the U.S. Department of Agriculture-Agricultural Research Service.
"The integration of biology and statistics holds enormous promises to gain insights from genomic data and life processes," said Min Zhang, associate professor of statistics from Purdue University and a co-author of the paper.
"We're in the genomic age, where sequencers and computers are constantly running and completing new genome sequences every day," Yu said. "We're expecting this information can help when it comes to finding similarities in those genomes. This type of broad analysis across species, taxonomic and disciplinary boundaries is really exciting in terms of discovering fundamental principles out of teeming genomic data."
The project was supported with funding from Kansas State University's Targeted Excellence Program, National Science Foundation, National Institutes of Health, U.S. Department of Defense and a seed grant through Purdue University's Discovery Park.
Other Kansas State University researchers include Yun Wu, research assistant in agronomy, and Weixing Song, assistant professor of statistics. Also collaborating on the study were four other biologists and statisticians from Purdue University, University of Minnesota and Cornell University.

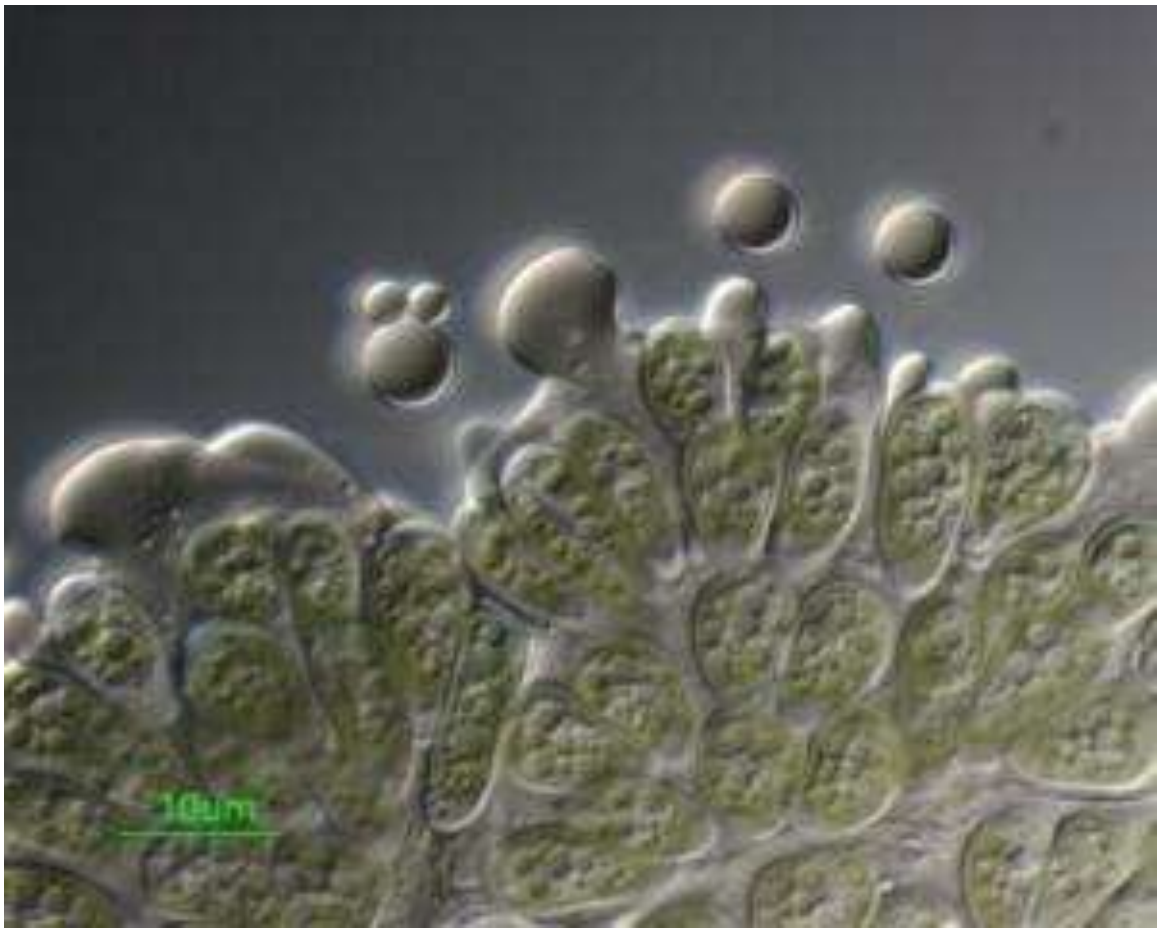
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Kansas State University**.

Journal Reference:

1. X. Li, C. Zhu, Z. Lin, Y. Wu, D. Zhang, G. Bai, W. Song, J. Ma, G. J. Muehlbauer, M. J. Scanlon, M. Zhang, J. Yu. **Chromosome Size in Diploid Eukaryotic Species Centers on the Average Length with a Conserved Boundary**. *Molecular Biology and Evolution*, 2011; DOI: 10.1093/molbev/msr011

http://www.sciencedaily.com/releases/2011/07/110706113450.htm

Ancient Algae: Genetically Engineering a Path to New Energy Sources?



Botryococcus braunii, Race B, is an ancient, colony-forming green alga that has attracted interest because it accumulates large amounts of high-value, petrochemical replacement oils. The oil oozing from the algal colony is evident in this picture. (Credit: Photograph courtesy of Taylor Weiss, Andreas Holzenburg, Stanislav Vitha and Timothy P. Devarenne at Texas A&M University)

ScienceDaily (July 11, 2011) — A team of researchers led by University of Kentucky College of Agriculture Professor Joe Chappell is making a connection between prehistoric times and the present -- ancient algae that can produce their own biofuel -- that could result in genetically creating a replacement for oil and coal shale deposits. Their discovery could have fundamental implications for the future of Earth's energy supplies.

Tom Niehaus, completing his doctorate in the Chappell laboratory; Shigeru Okada, a sabbatical professor from the aquatic biosciences department at the University of Tokyo; Tim Devarenne, a UK graduate and now professor of biochemistry and biophysics at Texas A&M University; and UK colleagues, Chappell, David Watt, professor of cellular and molecular biochemistry (College of Medicine) and his post-doctoral associate Vitaliy Sviripa report their latest research in the *Proceedings of the National Academy of Sciences (PNAS)*. Their findings go well beyond the basic science dealing with the origins of oil and coal.

While scientists previously established that oil and coal have their roots in the organisms that lived on the planet over 500 million years ago, one micro-organism directly contributed to these natural resources. That organism is a species of algae called *Botryococcus braunii*, which left behind its chemical fingerprints -- an oil that over geological time has turned into oil and coal shale deposits.

"Even more exciting is that this unique alga, *B. braunii*, still exists today and has been the target of studies from the large chemical and petrochemical industries," said Chappell.

B. braunii are very slow growing algae, so the organism is not necessarily a good source for biofuels. However, if scientists can capture its genetic blueprints for the biosynthesis of these high value oils, then these genes could be used to generate alternative production platforms.
This team of investigators isolated the necessary genes, characterized the biochemical traits encoded by these genes, and then genetically engineered yeast to produce this very high-value oil. This work has provided the first example of recreating a true direct replacement for oil and coal shale deposits.
Chappell said, "This represents the culmination of an outstanding effort to understand a fundamental process that has direct ramifications for a real-world problem -- how are we going to generate a truly renewable biofuel supply?"
Devarenne added, "This study identifies a very remarkable molecular mechanism for the production of hydrocarbons that, as far as we can tell, is not found in any other organism. Thus, it offers a unique insight into how hydrocarbons were produced hundreds of millions of years ago."

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Texas A&M AgriLife Communications**. The original article was written by Paul Schattenberg.

Journal Reference:

1. Tom D. Niehaus, Shigeru Okada, Timothy P. Devarenne, David S. Watt, Vitaliy Sviripa, Joe Chappell. **Identification of unique mechanisms for triterpene biosynthesis in Botryococcus braunii**. *Proceedings of the National Academy of Sciences*, 2011; DOI: 10.1073/pnas.1106222108

http://www.sciencedaily.com/releases/2011/07/110711164533.htm

Jewel Beetles, Obtained from Local People, Turn out to Be Four Species Unknown to Science

Philanthaxia jakli (left) and Philanthaxia chalcogenoides (right) are new species. (Credit: Svatopluk Bílý and Oto Nakládal)

ScienceDaily (July 10, 2011) — A team of researchers from the Czech University of Life Sciences discovered four new species of jewel beetles (Buprestidae) from South-eastern Asia. This family of beetles is named for their particularly beautiful body and fascinating, shiny colours.

"All new species belong to the genus *Philanthaxia*. Before the publication of this study, 61 species had been known from this genus. Currently, it comprises of 65 species, with a primarily Southeast-Asian distribution, except for two species extending to the Australasian region," said Oto Nakládal, a co-author of the study.

The new species *P. pseudoaenea* occurs in Thailand, while *P. jakli, P. chalcogenioides* and *P. lombokana* are distributed on some Indonesian islands (Sumatra, Borneo, Lombok). The biology of all these species is unknown, just as the host plants, because all specimens were obtained from the locals.

The specialists also described sexual dimorphism of *Philanthaxia iris*. This species had originally been described on the basis of a single female from Java, and male specimens had not been known so far. Due to the specimen from a local collector, also from Java, it was possible to describe a male.

Inventories of biodiversity "hot-spots," such as Southeast Asia, is extremely important because of the increasing extinction rates due to rapid changes of natural habitats. Several species become extinct before even known to science. "Mankind is not even able to evaluate the real losses associated with species extinction, because every individual species is, as a rule, a result of millions of years of evolution and adaptation and has therefore its unique role in the ecosystems" Nakládal added.

Story Source:

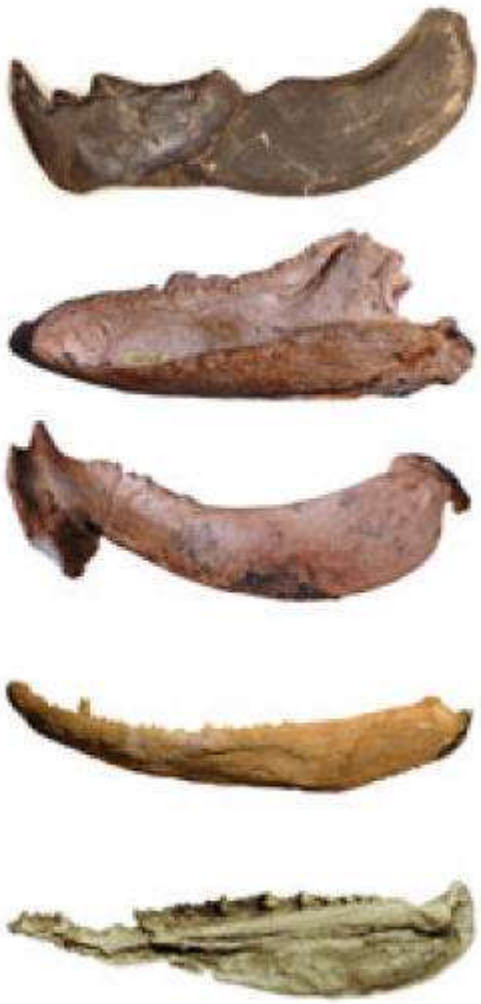
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Pensoft Publishers**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Oto Nakládal. **Four new species of the genus Philanthaxia Deyrolle, 1864 from Southeast Asia and comments on P. iris Obenberger, 1938 (Coleoptera, Buprestidae, Thomassetiini)**. *ZooKeys*, 2011; 116 (0): 37 DOI: 10.3897/zookeys.116.1403

http://www.sciencedaily.com/releases/2011/07/110707121933.htm

Vertebrate Jaw Design Locked Early: Study On Initial Diversification of Jaws Sheds Light On Early Vertebrate Feeding Ecology



A sample of lower jaw diversity from 400 million years ago which includes from top to bottom: a giant 8-metre apex predator, a lungfish with a duck-like snout, a reef-dwelling representative of a totally extinct group of vertebrates, a fish-like relative of land animals, and a shark-like cousin of bony fishes. Jaws are not to scale and all are oriented so their front end is to the left. (Credit: Image by Simon Powell)

ScienceDaily (July 10, 2011) — More than 99 per cent of modern vertebrates (animals with a backbone, including humans) have jaws, yet 420 million years ago, jawless, toothless armour-plated fishes dominated the seas, lakes, and rivers. There were no vertebrates yet on land and the recently evolved jawed fishes were minor players in this alien world, some sporting unusual jaw shapes and structures that bear little physical resemblance to modern animals.

The researchers, led by Dr Philip Anderson of Bristol's School of Earth Sciences, applied concepts from physics and engineering to unravel the potential feeding functions of these unusual, early vertebrate jaw designs, and compared this data to patterns of diversity in both jawed and jawless fishes. While it has long been assumed that jawed fishes were better adapted, and therefore directly out-competed and replaced their jawless neighbours during this tumultuous time, this assertion has never been tested.

Dr Anderson said: "Surprisingly, our results indicate that long-held assumptions concerning the replacement of jawless fishes by newly evolved jawed forms are likely wrong. The variety of feeding mechanisms in early jawed animals appears to have had little to no affect on the diversity of jawless fishes, which shared ecological space with the jawed fishes for at least 30 million years before beginning to notably decline. When the jawless fishes do decline, we see no indication that their jawed cousins took up new functional roles, calling into question old ideas of ecological replacement.

"Furthermore, jawed vertebrates achieved a stable diversity in their feeding apparatus early in their evolution, and maintained this diversity in the face of major environmental changes during the Devonian period. Previous studies have suggested that the rise of major jawed vertebrate ecological diversity is tied to a documented oxygenation event 400 million years ago, but our results place the first burst of diversification of jawed vertebrates well before that.

"The groups which comprise the majority of modern fish diversity (ray-finned fishes), as well as our own fish ancestors (early tetrapods), are restricted to only a few types of jaws and feeding ecologies, while bizarre, extinct groups (such as placoderms and a surprising number of extinct lungfishes) show a wide range of feeding ecologies that at the time dominated the jawed vertebrate world. It is interesting to speculate what modern jawed vertebrates might have looked like if these diverse groups hadn't been severely diminished (extinct in the case of the placoderms) after the Devonian."

The research group hopes that these new methods for assessing the variation in functional systems (such as feeding apparatus), will be applied to the study of other extinct groups during times of dramatic transitions, such as mass extinctions and evolutionary radiations.

Story Source:

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

Journal Reference:

1. Philip S. L. Anderson, Matt Friedman, Martin D. Brazeau, Emily J. Rayfield. **Initial radiation of jaws demonstrated stability despite faunal and environmental change**. *Nature*, 2011; DOI: 10.1038/nature10207

http://www.sciencedaily.com/releases/2011/07/110706134130.htm

Scientists Sequence Potato Genome

Different varieties of potatoes. (Credit: iStockphoto/Roberto A Sanchez)

ScienceDaily (July 10, 2011) — An international consortium that has successfully sequenced and analyzed the potato genome. The consortium's work, which is described in the current issue of *Nature*, turned up more than 39,000 genes and is expected to speed potato research and breeding projects around the globe.

At University of Wisconsin-Madison, the scientific team's contribution involved uncovering important information about the structure of potato's 12 chromosomes.

"The most important part of this project was actually finding the genes. That was the main goal," says UW-Madison plant geneticist Jiming Jiang, one of 20 principal investigators from 14 countries who worked on the project. "But the group still needed our expertise to help solve some of the puzzles."

Jiang is an expert in cytogenetics, the study of the structure and function of chromosomes. He and fellow UW scientists Marina Iovene and Giovana Torres used microscopic tools to reveal unique physical characteristics of each of the potato plant's 12 chromosomes, such as the location of gene-rich and gene-poor regions and -- particularly important -- where each chromosome begins and ends within the genome sequence.

"Through sequencing alone, it is difficult to reveal this kind of information. But cytogenetic analysis can help connect the sequence information to individual chromosomes. Cytogenetic mapping provides a bird's-eye view of the potato chromosomes," explains Jiang, who made similar contributions to international efforts to sequence the rice, corn (maize) and papaya genomes.

Potato is the world's most important non-grain food crop. Each year, more than 200 million tons are eaten worldwide. In Wisconsin potatoes are grown on more than 63,000 acres, making the state the third-largest producer in America.

Historically, potato has been notoriously difficult to work with. It is a tetraploid, meaning its cells contain four copies of each chromosome, which makes it difficult to breed. Despite decades of improvement work, the crop remains susceptible to pests, pathogens and inbreeding depression (where new potato lines are weaker than their parents). Sequencing of the potato genome should speed efforts to address these issues.

"It will take researchers awhile to use the genome information to improve its agronomic traits, such as improved quality, yield, drought tolerance and disease resistance. But our most recent research will accelerate efforts to improve potato varieties and help close the gap in bringing a better potato to the farmer," says Robin Buell, a plant biologist at Michigan State University, one of three co-leaders of the potato genome project.

Jiang says the availability of potato's genetic code will get him back in the game of hunting -- or cloning -- genes of value to the potato industry. He had sworn off such work in the early 2000s after an agonizingly slow

quest to find the gene responsible for a wild potato's resistance to late blight, the pathogen that caused the Irish Potato Famine. The effort was ultimately successful, but it took three postdoctoral researchers more than five years to accomplish.

"Back then I said I would never clone a potato gene again until the genome is sequenced, because without the sequence it was so difficult and time-consuming. We just lacked the resources to work with -- the markers, the maps," says Jiang. "Now that there's a reference genome, it's going to be so much easier for all future work -- identifying, cloning and characterizing potato genes."

Jiang plans to search for more disease-resistance genes, as well as genes that affect potato quality. Based on what happened after other crops were sequenced, he expects this will feel a bit like a gold rush among potato gene prospectors.

"Before the rice genome was sequenced, it was also very difficult to clone a gene in rice," he says. "After the publication of rice's genome sequence in 2005, you started to see paper after paper by people cloning all sorts of genes -- genes responsible for yield, abiotic stress -- and it was all because of the sequence."

The Potato Genome Sequencing Consortium, an international team of 39 scientists, began work on the potato genome project in 2006. The complete sequence is estimated to be 840 million base pairs, about one-quarter the size of the human genome. The draft sequence, which covers 95 percent of potato genes, is available at www.potatogenome.net.

Story Source:

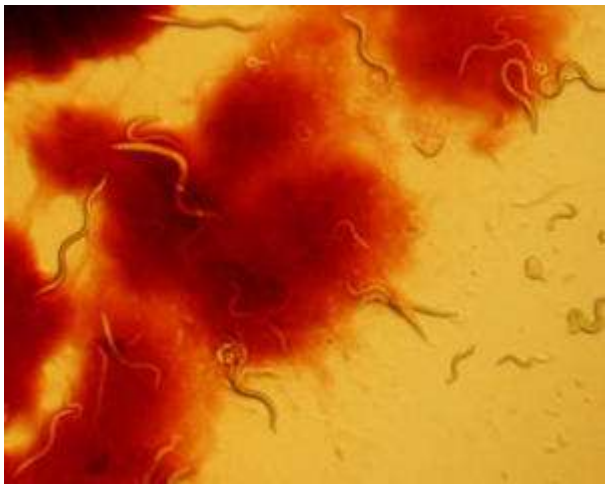
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Wisconsin-Madison**. The original article was written by Nicole Miller.

Journal Reference:

1. The Potato Genome Sequencing Consortium. **Genome sequence and analysis of the tuber crop potato**. *Nature*, 2011; DOI: 10.1038/nature10158

http://www.sciencedaily.com/releases/2011/07/110710132819.htm

Sex -- As We Know It -- Works Thanks to Ever-Evolving Host-Parasite Relationships, Biologists Find



The relationship between the roundworm Caenorhabditis elegans and the pathogenic bacteria Serratia marcescens, pictured here together in a Petri dish, is helping scientists understand why sexual reproduction occurs as it does. (Credit: Image courtesy of Indiana University)

ScienceDaily (July 9, 2011) — It seems we may have parasites to thank for the existence of sex as we know it. Indiana University biologists have found that, although sexual reproduction between two individuals is costly from an evolutionary perspective, it is favored over self-fertilization in the presence of coevolving parasites. Sex allows parents to produce offspring that are more resistant to the parasites, while self-fertilization dooms populations to extinction at the hands of their biological enemies.

The July 8 report in *Science*, "Running with the Red Queen: Host-Parasite Coevolution Selects for Biparental Sex," affirms the Red Queen hypothesis, an evolutionary theory who's name comes from Lewis Carroll's Alice in Wonderland text: "It takes all the running you can do, to keep in the same place." The idea is that sexual reproduction via cross-fertilization keeps host populations one evolutionary step ahead of the parasites, which are coevolving to infect them. It is within this coevolutionary context that both hosts and parasites are running (evolving) as fast as they can just to stay in the same place.

"The widespread existence of sex has been a major problem for evolutionary biology since the time of Charles Darwin," said lead author Levi T. Morran. Sex does not make evolutionary sense, because it often involves the production of males. This is very inefficient, because males don't directly produce any offspring. Self-fertilization is a far more efficient means of reproduction, and as such, evolutionary theory predicts that self-fertilization should be widespread in nature and sex should be rare. However, as we all know, this is not the case.

The Red Queen Hypothesis provides one possible explanation for the existence of sex.

"The Red Queen Hypothesis predicts that sex should allow hosts to evade infection from their parasites, whereas self-fertilization may increase the risk of infection," said co-author Curtis M. Lively.

By combining the DNA of two parents, sex allows parents to produce offspring that are genetically diverse and different from their parents. Parasites that have adapted to infect one generation may have difficulty infecting the next generation. However, offspring produced through self-fertilization inherit the DNA of their single parent, thus any parasites adapted to infect the parent should also be capable of infecting the offspring.

Morran, a post-doctoral researcher, and Lively, a distinguished professor of biology, both in the IU Bloomington College of Arts and Science's Department of Biology, authored the report with biology undergraduates Olivia G. Schmidt, Ian A. Gelarden and Raymond C. Parrish II.

The team used the microscopic roundworm *Caenorhabditis elegans* as a host and the pathogenic bacteria *Serratia marcescens* to generate a host-parasite coevolutionary system in a controlled environment, allowing them to conduct more than 70 evolution experiments testing the Red Queen Hypothesis. They genetically manipulated the mating system of *C. elegans*, causing populations to mate either sexually, by self-fertilization, or a mixture of both within the same population. Then they exposed those populations to the *S.*

marcescens parasite. The parasites were either allowed to coevolve with *C. elegans* or were prevented from evolving. The researchers then determined which mating system gave populations an evolutionary advantage. "We found that the self-fertilizing populations of *C. elegans* were rapidly driven extinct by the coevolving parasites, a result consistent with the Red Queen Hypothesis," Morran said. On the other hand, sex allowed populations to keep pace with their parasites. "Sex helped populations adapt to their coevolving parasites, allowing parents to produce offspring that were resistant to infection and ultimately avoid extinction," he noted.

In host populations where either sex or self-fertilization were possible, the evolutionary state of the parasite determined the most effective reproductive strategy. When the parasite did not coevolve, self-fertilization evolved as the dominant form of host reproduction. However, when the parasite was allowed to coevolve with the hosts, then sex became the favored reproductive strategy.

"Coevolution with the pathogen not only favored sex over self-fertilization, but also allowed sex to be maintained throughout the experiment," Morran said.

These results are consistent with the Red Queen Hypothesis and may go a long way toward explaining the widespread existence of sex.

"Coevolving parasites seem to be very common in nature," said Lively. "The experiment shows that coevolution with parasites, but not the presence of parasites per se, selects for higher levels of outcrossing. Thus the coevolutionary struggle between hosts and their parasites could explain the existence of males."

Story Source:

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

Journal Reference:

1. Levi T. Morran, Olivia G. Schmidt, Ian A. Gelarden, Raymond C. Parrish II, Curtis M. Lively. **Running with the Red Queen: Host-Parasite Coevolution Selects for Biparental Sex**. *Science*, 2011; 333 (6039): 216-218 DOI: 10.1126/science.1206360

http://www.sciencedaily.com/releases/2011/07/110707141158.htm

The War on Web Anonymity

By Marcel Rosenbach and Hilmar Schmundt

The Internet has always been a refuge of anonymity. Anyone could hide behind the cloak of namelessness and express the most offensive views. Now politicians and companies -- including Google and Facebook -- want to change that.

The Avenue de l'Opéra in Paris is a respectable address, surrounded by banks, boutiques and cafés. The tenants listed on door plaques include a language school and an airline. But the name of the building's most famous tenant is not listed: Google. The global corporation values privacy -- its own privacy, at least.

"We take data protection seriously," says Peter Fleischer, Google's Global Privacy Counsel. "We don't know our users by name," he insists. "We just store anonymous identifiers, but no personal data." This is an important distinction for Fleischer, who says that Google's primary goal is to improve the accuracy of targeted advertising. According to Fleischer, the identities of the people behind the numbers are irrelevant. "We don't even want to know the names of users," he says.

These statements were made only three years ago, and yet they seem to be from a different era. In the past, the Internet was a sea of anonymity dotted with username islands, but now the relationship is being reversed. Anonymity is being declared the exception -- and a problem.

In June, Google launched a frontal attack on competitor Facebook and began testing its own social network: Google+. Suddenly Google is asking for precisely what Fleischer so vehemently declared was of no interest to the company in 2008 -- real names.

The company has repeatedly blocked the accounts of users who refuse to provide their real names instead of a pseudonym, because this is a violation of its "community standards." Those rules stipulate the following: "To help fight spam and prevent fake profiles, use the name your friends, family or co-workers usually call you."

Free Speech vs. Attribution

Today Google is no longer satisfied with pseudonyms, and it isn't alone. Politicians and law enforcement agencies have also declared war on anonymity, a fundamental characteristic of the Internet.

For some, anonymity is among one of the biggest strengths of the Internet, a guarantee of free speech and privacy. Others voice concerns over the "attribution problem" and see it as a key issue in the digital world that must be eliminated.

Particularly in the wake of attacks in Oslo and on Utøya Island, there is growing interest in tearing the masks off the faces of those who author radical right-wing hate blogs. Critics are calling for stronger online surveillance, an alarm button for reporting dangerous content and the reintroduction of data retention. But what use are surveillance and warning mechanisms if the authors of violent messages cannot ultimately be identified?

Last week the anti-Islamic treatises by the blogger "Fjordman," whom the Norwegian killer Anders Behring Breivik has described as his "favorite writer," made international headlines. But of course he isn't the only one hiding behind a pseudonym. Jihadist forums using crude code names seek to incite hatred and violence against "infidels," while right-wing extremists use the protection of anonymity to publish the names and addresses of members of the *Antifa*, or anti-fascist movement, who employ the same tactic.

Feelings of public outrage run high when it comes to issues like cyber-bullying, hate mail and insults, as was recently the case with iShareGossip, a German site where students could anonymously insult their fellow students. Some time ago, a site called Rotten Neighbor triggered similar feelings of outrage. It enabled people to take their neighborhood disputes online. Of course, those who unloaded their vicious remarks on the site remained anonymous, while the victims of their abusive language were clearly identified.

Limiting Anonymity

Last autumn Axel Fischer, a member of Germany's conservative Christian Democratic Union (CDU) and the chairman of the parliamentary commission on "Internet and Digital Society," called for a "ban on disguises" in the virtual world, at least for forums with political voting options, as he clarified after a storm of protest from the online community. Then Interior Minister Thomas de Maizière (CDU) also addressed the issue several times, saying that "limitless anonymity" should not exist on the Internet, where the authorities must be able to identity people who break the law.

De Maizière also launched two projects intended to facilitate secure identification on the Internet -- albeit on a voluntary basis at first -- the supposedly tamper-proof digital mail system "De-Mail" and the new identity card.

But in the anarchic world of the Internet is it even possible to implement a large-scale, binding identification requirement? A look at events in South Korea offers some answers to this question.

Ironically, this journey has led to more surveillance in the Asian country, where the Internet euphoria is among the most rampant in the world. In 2008, the 39-year-old Korean actress Choi Jin-sil was bombarded with hateful tirades online. No longer able to bear the attacks, she hung herself.

The nation was shocked. The conservative government reacted with the broader application of a law originally created only for election campaigns. Under the "Real Name Verification Law" anyone who wishes to post comments or videos online must identify themselves with their "resident registration number," a 13-digit unique identifier issued by the government.

A Civilizing Effect

Currently the law applies only to websites with more than 100,000 users per day. Some website operators are probably quite pleased with the regulation, because the real names of customers are extremely valuable in the advertising industry.

Media researcher Daegon Cho of the US-based Carnegie Mellon University wanted to know what lessons could be learned from the Korean experiment. Does the constraint of having to reveal one's true identity online have a moderating effect on the Internet community?

It does, as Cho discovered. The Identification Law has a civilizing effect on the Internet's verbal offenders -- though only in moderation. Those who rarely post comments online were especially likely to temper their emotions. In this group, the number of comments containing "swear words and anti-normative expressions" fell from 27 to 20 percent. Nevertheless, the majority of troublemakers continued to swear without restraint under their real names. Besides, instructions for circumventing identification requirements have been available online for some time, and when in doubt, troublemakers can always use foreign servers.

Instead of an identification requirement, the online community is placing its faith in the self-regulating forces of the Internet. Twenty years of experience with the World Wide Web have shown that it does not necessarily lead to moral decline. In fact, the figures from South Korea suggest that the Internet even civilizes some users with time. Experienced contributors to forums write offensive comments about six times less frequently than those who rarely write comments.

The discussion culture is often tended with sophisticated filter mechanisms and evaluation systems, and many administrators act as blog monitors, taking action against rude comments. Reputation systems reward popular discussion participants, whether or not they are anonymous. The content is what counts.

But what about extremists and criminals who use anonymity to evade law enforcement?

No Match For Law Enforcement

It appears that if there is sufficient pressure from investigators, the much-touted principle of anonymity quickly evaporates. The arrests of many presumed members of the hacker groups "Anonymous," "LulzSec" and Germany's "No-Name Crew" prove this.

The "unmasking" of about 20 "Anonymous" activists speaks volumes. Apparently neither masks nor virtual precautions could protect the net anarchists from being apprehended. Ironically, both the real names and, in some cases, the photos of these previously faceless net activists are now publicly available.

In a chat with SPIEGEL, German hacker "Darkhammer," accused of having hacked into and disclosed customs data, boasted that he wasn't afraid of the authorities, and that only stupid people let themselves be caught. He was arrested a few days later.

There is also ample evidence to suggest that political pressure isn't necessary to force the use of real names online because users will take that step on their own. Nothing has accelerated the trend more than the success of social networking sites like Facebook, where users voluntarily reveal not only their names, but often photos, birthdays and sometimes even intimate details of their lives.

These services have turned into something resembling a digital civil registration office -- the antithesis of anonymity. This is slowly undermining a quality that also has many proven advantages, particularly for dissidents in countries with oppressive regimes. A report by the respected American Association for the Advancement of Science even concludes: "Anonymous communication should be regarded as a strong human right."

The example of media education shows what a double-edged sword the call for identification on the Internet can be, though. In one respect, Germany's Ministry of Consumer Protection, parents and data privacy advocates are in rare agreement. To protect themselves against fraud, stalking and abuse, young people should never use their real names online, they say.

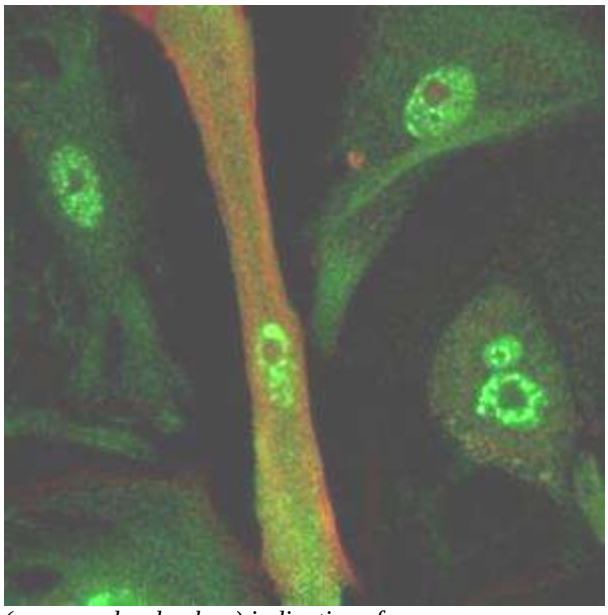
It isn't easy to explain why this valuable anonymity suddenly becomes a problem after their 18th birthday.

Translated from the German by Christopher Sultan

URL:

- http://www.spiegel.de/international/spiegel/0,1518,778138,00.html

A Change of Heart: Researchers Reprogram Brain Cells to Become Heart Cells



Cardiomyocyte (center), showing protein distribution (green and red colors) indicative of a young cardiomyocyte. (Credit: Tae Kyung Kim, PhD, Perelman School of Medicine, University of Pennsylvania)

ScienceDaily (July 9, 2011) — For the past decade, researchers have tried to reprogram the identity of all kinds of cell types. Heart cells are one of the most sought-after cells in regenerative medicine because researchers anticipate that they may help to repair injured hearts by replacing lost tissue. Now, researchers at the Perelman School of Medicine at the University of Pennsylvania are the first to demonstrate the direct conversion of a non-heart cell type into a heart cell by RNA transfer.

Working on the idea that the signature of a cell is defined by molecules called messenger RNAs (mRNAs), which contain the chemical blueprint for how to make a protein, the investigators changed two different cell types, an astrocyte (a star-shaped brain cell) and a fibroblast (a skin cell), into a heart cell, using mRNAs. James Eberwine, PhD, the Elmer Holmes Bobst Professor of Pharmacology, Tae Kyung Kim, PhD, post-doctoral fellow, and colleagues report their findings online in the *Proceedings of the National Academy of Sciences.* This approach offers the possibility for cell-based therapy for cardiovascular diseases.

"What's new about this approach for heart-cell generation is that we directly converted one cell type to another using RNA, without an intermediate step," explains Eberwine. The scientists put an excess of heart cell mRNAs into either astrocytes or fibroblasts using lipid-mediated transfection, and the host cell does the rest. These RNA populations (through translation or by modulation of the expression of other RNAs) direct DNA in the host nucleus to change the cell's RNA populations to that of the destination cell type (heart cell, or tCardiomyocyte), which in turn changes the phenotype of the host cell into the destination cell.

The method the group used, called Transcriptome Induced Phenotype Remodeling, or TIPeR, is distinct from the induced pluripotent stem cell (iPS) approach used by many labs in that host cells do not have to be dedifferentiated to a pluripotent state and then redifferentiated with growth factors to the destination cell type. TIPeR is more similar to prior nuclear transfer work in which the nucleus of one cell is transferred into another cell where upon the transferred nucleus then directs the cell to change its phenotype based upon the RNAs that are made. The tCardiomyocyte work follows directly from earlier work from the Eberwine lab, where neurons were converted into tAstrocytes using the TIPeR process.

The team first extracted mRNA from a heart cell, then put it into host cells. Because there are now so many more heart-cell mRNAs versus astrocyte or fibroblast mRNAs, they take over the indigenous RNA population. The heart-cell mRNAs are translated into heart-cell proteins in the cell cytoplasm. These heart-cell proteins then influence gene expression in the host nucleus so that heart-cell genes are turned on and heart-cell-enriched proteins are made.

To track the change from an astrocyte to heart cell, the team looked at the new cells' RNA profile using single cell microarray analysis; cell shape; and immunological and electrical properties. While TIPeR-generated tCardiomyocytes are of significant use in fundamental science it is easy to envision their potential use to screen for heart cell therapeutics, say the study authors. What's more, creation of tCardiomyoctes from patients would permit personalized screening for efficacy of drug treatments; screening of new drugs; and potentially as a cellular therapeutic.

These studies were enabled through the collaboration of a number of investigators spanning multiple disciplines including Vickas Patel, MD and Nataliya Peternko from the Division of Cardiovascular Medicine, Miler Lee, PhD and Junhyong Kim, PhD from the Department of Biology and Jai-Yoon Sul, PhD and Jae Hee Lee, PhD also from the Department of Pharmacology, all from Penn. This work was funded by grants from the W. M. Keck Foundation, the National Institutes of Health Director's Office, and the Commonwealth of Pennsylvania.

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. T. K. Kim, J.-Y. Sul, N. B. Peternko, J. H. Lee, M. Lee, V. V. Patel, J. Kim, J. H. Eberwine. **Transcriptome transfer provides a model for understanding the phenotype of cardiomyocytes**. *Proceedings of the National Academy of Sciences*, 2011; DOI: 10.1073/pnas.1101223108

http://www.sciencedaily.com/releases/2011/07/110708160346.htm

'Safe Planet' Uses the Arts to Explain Chemical Threat

The U.N. enlists the arts to bring home the arcane but vital necessity of reducing the phalanx of chemicals saturating our bodies.

By Trish Riley

Safe Planet, a U.N. initiative designed to engage the public through art about the dangers of chemicals, contaminants and epigenetics, distributed placemats at the 54th Venice Biennale in Italy that were printed with paintings inspired by satellite maps developed by University of Hawaii scientists. (Barbara Benish/Safe Planet)

Telling someone they've been poisoned in ways that could reshape their DNA and be carried on to their descendants — possibly causing cancer, neurological illness, mental deficiency, birth defects, brain damage and death — isn't easy. But that's Michael Stanley-Jones' job.

As public information officer for the United Nations Environment Programme, he's tasked with engaging the public with initiatives established during the Basel, Stockholm and Rotterdam conventions. While not exactly breakfast-table topics, those gatherings saw world leaders convene to address the dangers of synthetic petrochemicals that saturate our air, soil and water, including the meat and plants we eat.

The World Health Organization reported last year that more than 5 million deaths from chemical exposure occur annually — more than 8 percent of all deaths — and most are among children 15 and younger. The United Nations Environment Programme is charged by the conventions with achieving sound management of chemicals and reducing child mortality.

The challenge in bringing those weighty and complex topics to life for an often-apathetic world is to make the information delivery memorable without frightening people.

"It's a strange feeling that we're there to bring good news about solutions to very difficult problems," Stanley-Jones said, "but some in the audience are first having to absorb the harsh news before they can understand the good news. It's important we not leave them with a sense of shock and despair. We're all about mobilizing solutions and eliminating the worst substances from mankind."

So he and his colleagues conceived the Safe Planet campaign. "I don't want to paint over problems," he said, "but the record of how we've been able to deal with chemical challenges historically, such as lead and brominated flame retardants which have been taken off the market, is very encouraging. Safe Planet contributes through awareness-raising of the risk and solutions to protect people and the environment from exposure to hazardous chemicals and wastes."

In an effort to move from the tediously bureaucratic and slow-to-move talks among nations, Safe Planet showcases the films *Silent Snow*, *Submission* (or *Underkastelsen* in its original Swedish) and *Body Burden*, all of which detail the degree to which unnatural chemicals are accumulating inside us. In *Body Burden*, for example, organizers recruited celebrities such as actor Ed Begley Jr. and Olympic gold medal skier Stine Hattestad to undergo blood analysis and share their results and personal reactions.

The method seems to pay off. "People stood rapt," Stanley-Jones said of a crowd gathered to watch *Submission* when it screened in conjunction with June's Fifth Conference of the Parties of the Rotterdam Convention in Geneva. "Some were just amazed; they hadn't realized the extent to which [persistent organic pollutants] and organic chemicals are building up in the body and didn't know about the transference from mother to child."

Reining in these chemicals will require public support, and the public needs to understand the problem and potential solutions before they'll be motivated to push industry and government regulators to implement protective measures.

How Conventional

Michael Stanley-Jones is tasked with bringing the work of three conventions to life. What is a "convention" and what did these three – Basel, Rotterdam and Stockholm – do?

A convention, in this case, is really a treaty where much of the language is hammered out in a series of meetings that take place in the city that ultimately gives the document its name. After reams of data, most of it scientific or economic, is presented, negotiations begin and countries essentially sign contracts outlining what they agree to do about the convention's subject issue. As nations start signing on, the convention bureaucracy tends to live on as a clearinghouse for pertinent information and for ensuring countries live up to their promises. As Safe Planet demonstrates, because the three conventions cover similar ground, much of their work is done jointly.

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, or the Basel Convention, was signed in 1989 and became effective in 1992. Its roots lie in the "toxic trading" of the 1980s, when developed countries sent their toxic waste to less-developed nations. The convention currently has 73 participating countries; the United States has signed the treaty but the U.S. Senate has not ratified it.

The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, or the Rotterdam Convention, was signed in 1998 and went into effect in 2004. It regulates the international trade in hazardous chemicals. The convention currently has 51 participating countries.

The Stockholm Convention on Persistent Organic Pollutants, or Stockholm Convention, controls "chemical substances that persist in the environment, bio-accumulate through the food web, and pose a risk of causing adverse effects to human health and the environment," as the UN Environmental Programme explains. The convention was signed in 2001 and went into effect in 2004. One hundred fifty nations are participating; the United States has signed the convention but not ratified it.

One leg of sustainability calls for industry to take greater responsibility for the health and safety of products. Changing the mindset of big business that requires sacrificing potential profits is a challenge. As Stanley-Jones points out, some positive movement is happening, as chemical companies explore green chemistry solutions and governments tighten regulations.

Europe instituted Registration, Evaluation, Authorization and Restriction of Chemicals regulation in 2007, which takes a tough stance on production and use of dangerous chemicals by applying the precautionary principle, requiring that chemicals be proven safe before they're allowed to be used. In the U.S., the rule is the opposite; chemicals are allowed into production until they are proven unsafe, which can be a long and litigious process, even when anecdotal evidence seems clear, although the U.S. Environmental Protection Agency is taking a stronger stance toward regulation under the Obama administration.

Safe Planet has held more than 40 events worldwide since it launched a year and a half ago. The team uses social media to reach high-school and college students, offering film screenings, art contests and other events that appeal to cultural interests.

"Art has given the campaign a new vocabulary for expressing the challenges we face globally from toxic chemicals and wastes. Some of our material is produced by students, and we rely on younger members of our staff, and even on some of their children, to keep us informed about what's meaningful for young people," said Jacqueline Alvarez, UN programme officer with the secretariat of the Stockholm Convention. "They are the leaders of tomorrow, and tomorrow is right around the corner."

Alvarez says she's talked with many young women after the film screenings who want to know what they can do to protect themselves and their ability to have healthy children. "It can be disturbing to learn about chemicals being passed down from mother to child in the womb," she said. "Hazardous chemicals and wastes threaten all that we hold dear to us, both as humans and in the environment: living long, healthy lives, human achievement, performance and intelligence and the right to know what is good for us and what is harmful.

"By measuring chemical body burden, the loading of hazardous chemicals building up in our bodies, and making this information more widely known, we help people understand the risks and actions they can take — lifestyle choices and political ones — which will protect our futures."

Part of the art revolves around how to frame these messages. "Should we be talking about 50 million possible deaths from chemical exposure over the next 10 years or about 2.5 million children's lives saved over the next five years?" Stanley-Jones asks. "I argue for lives saved; I want this to be made quantifiable and translated into a lives-saved metric."

Safe Planet wants to leave behind working partners who will continue to reach out to their communities, spreading information and mobilizing support for reforms in chemical policy and practice.

"People care about their own health and the health of their families," Alvarez said. "Many care about the health of the planet, and work hard to preserve endangered species and protect animals from harm. Hopefully, we will live with less and less exposure to hazardous chemicals, lead healthier lives, cut the incidence of child mortality and morbidity caused by toxic exposures, encourage a greener economy with more sustainable forms of production and consumption, and sound management of what we leave behind for the next generation.

"Most of all, we need strong voices and people who will share their stories, stand up and speak out. Safe Planet is a campaign of people who want to make a difference. We rely on them to step forward and demand we all take responsibility: individuals, communities, governments, industry … everyone."

http://www.miller-mccune.com/environment/safe-planet-uses-the-arts-to-explain-chemical-threat-34789/

Teaching Kids How to Break Up Nicely

By BENOIT DENIZET-LEWIS

Brad DeCecco for The New York Times

The pin asks teenagers to show some maturity when ending a relationship

Late last month, 200 teenagers from Boston-area schools gathered to discuss the minutia of Facebook breakup etiquette. Should you delete pictures of your ex after splitting up? Is it O.K. to unfriend your last girlfriend if you can't stop looking at her profile? And is it ever ethically defensible to change your relationship status to single without first notifying the person whose heart you're crushing?

These pressing adolescent questions were part of a one-day conference on "healthy breakups" sponsored by the Boston Public Health Commission. "No one talks to young people about this aspect of relationships," Nicole Daley, one of the conference organizers, told me between breakout sessions as teenagers swarmed a nearby cotton-candy stand. "We're here to change that."

Minutes later, 15 high-school students on a sugar high convened for a session on "creating online boundaries." The girls outnumbered the boys, and they didn't hesitate to gang up on a charming — and, until then, immensely well liked — 17-year-old named Roberto, who proclaimed with a bit too much gusto that "racing to update your relationship status after a breakup" is a healthy behavior. That was just one of a handful of scenarios the teenagers debated and placed into "healthy" or "unhealthy" categories: others included "posting mean/embarrassing statuses about your ex" (unhealthy) and "rushing into a new 'Facebook official' relationship" (understandable, but still not healthy).

"Roberto, you're really going to run all the way to your house after school to change your status?" a 16-year-old named Lazangie asked, shaking her head. She knows a thing or two about Facebook-related breakups: her last relationship ended, she said, because her ex-boyfriend couldn't handle her male friends posting niceties on her wall.

"When I'm done with a relationship, I'm not going to wait a day, an hour or even 10 minutes to update my status," Roberto told the group. "When it's over, it's over. I'm done with you."

"The key word here is 'racing,' " another girl replied with all the condescension she could muster. "Is that really healthy? Breaking up shouldn't be a competition!"

The group's adult facilitator — who wore a blue "Face It, Don't Facebook It" pin, in a reference to the apparently troubling trend of young people breaking up with one another via social media — nodded in agreement and suggested that Roberto consider taking a "technology timeout" the next time he felt compelled to race home and publicly declare his singlehood. Roberto reluctantly agreed to consider it.

Throughout the one-day meeting, organizers did their best to make the teenagers forget they were about to learn something. They were encouraged to freely use their cellphones ("We're not" — the kind of adults — "who tell you not to use them!" an organizer boasted during the day's opening session), and breakup-themed songs, like Kelly Clarkson's "Since U Been Gone," blasted from the main conference room's speakers. The pandering worked: I saw only one teen roll her eyes all day.

To help the youngsters envision what a healthy split might look like, pictures and videos of several celebrity couples who managed amicable breakups were projected onto a big screen. Justin Timberlake and Cameron Diaz, for example, were heralded as healthy because "they're still friends and were able to co-star in a movie together." Their parting was juxtaposed with those of Kanye West and Amber Rose (West wrote a mean song about her) and Sammi and Ronnie from "Jersey Shore" (Sammi supposedly defriended Ronnie's friends on her Facebook page), who each exhibited the kind of "unhealthy" breakup behavior that the Boston Health Commission hopes Massachusetts young people will rise above.

In that pursuit, organizers encouraged the crowd to eschew parting ways over text message or Facebook, the most common teen breakup methods. (A bisexual 15-year-old confessed in a morning session that she learned that her girlfriend of two years had dumped her only when she changed her relationship status to single.) Attendees were advised — with mixed results — to bravely confront the awkwardness of face-to-face breakups. When the facilitator in a session titled "Breakups 101" suggested that teenagers meet with "and come to an agreement or mutual understanding" with a soon-to-be ex, a skeptical 19-year-old nearly leapt out of her chair in protest. "So, you're telling me that you're crying at night, you're not sleeping, you're eating all this food to make you feel better, and you're supposed to just *come to an agreement*?"

That sounded like wishful thinking to at least one teenager, who insisted that dating in high school is for suckers. "Who needs the drama?" she said, adding that many peers choose friendships or casual sexual relationships over formal romantic ones. "I've got enough problems without some stupid boy breaking up with me on Facebook."

http://www.nytimes.com/2011/08/07/magazine/teaching-kids-how-to-break-up-nicely.html?_r=1&ref=magazine

Holes in Fossil Bones Reveal Dinosaur Activity

The femur of Centrosaurus apertus, a ceratopsian dinosaur, and (inset) the foramen. (Credit: Photo by Dr Donald Henderson, Curator of Dinosaurs, Royal Tyrrell Museum, Alberta, Canada.)

ScienceDaily (July 8, 2011) — New research from the University of Adelaide has added to the debate about whether dinosaurs were cold-blooded and sluggish or warm-blooded and active.

Professor Roger Seymour from the University's School of Earth & Environmental Sciences has applied the latest theories of human and animal anatomy and physiology to provide insight into the lives of dinosaurs. The results will be published this month in *Proceedings B*, the *Proceedings of the Royal Society B* (Biological Sciences).

Human thigh bones have tiny holes -- known as the 'nutrient foramen' -- on the shaft that supply blood to living bone cells inside. New research has shown that the size of those holes is related to the maximum rate that a person can be active during aerobic exercise. Professor Seymour has used this principle to evaluate the activity levels of dinosaurs.

"Far from being lifeless, bone cells have a relatively high metabolic rate and they therefore require a large blood supply to deliver oxygen. On the inside of the bone, the blood supply comes usually from a single artery and vein that pass through a hole on the shaft -- the nutrient foramen," he says.

Professor Seymour wondered whether the size of the nutrient foramen might indicate how much blood was necessary to keep the bones in good repair. For example, highly active animals might cause more bone 'microfractures', requiring more frequent repairs by the bone cells and therefore a greater blood supply.

"My aim was to see whether we could use fossil bones of dinosaurs to indicate the level of bone metabolic rate and possibly extend it to the whole body's metabolic rate," he says. "One of the big controversies among paleobiologists is whether dinosaurs were cold-blooded and sluggish or warm-blooded and active. Could the size of the foramen be a possible gauge for dinosaur metabolic rate?"

Comparisons were made with the sizes of the holes in living mammals and reptiles, and their metabolic rates. Measuring mammals ranging from mice to elephants, and reptiles from lizards to crocodiles, one of Professor Seymour's Honours students, Sarah Smith, combed the collections of Australian museums, photographing and measuring hundreds of tiny holes in thigh bones.

"The results were unequivocal. The sizes of the holes were related closely to the maximum metabolic rates during peak movement in mammals and reptiles," Professor Seymour says. "The holes found in mammals were about 10 times larger than those in reptiles."

These holes were compared to those of fossil dinosaurs. Dr Don Henderson, Curator of Dinosaurs from the Royal Tyrrell Museum in Alberta, Canada, and Daniela Schwarz-Wings from the Museum für Naturkunde and Humboldt University Berlin, Germany, measured the holes in 10 species of dinosaur from five different groups, including bipedal and quadrupedal carnivores and herbivores, weighing 50kg to 20,000kg.
"On a relative comparison to eliminate the differences in body size, all of the dinosaurs had holes in their thigh bones larger than those of mammals," Professor Seymour says.
"The dinosaurs appeared to be even more active than the mammals. We certainly didn't expect to see that. These results provide additional weight to theories that dinosaurs were warm-blooded and highly active creatures, rather than cold-blooded and sluggish."
Professor Seymour says following the results of this study, it's likely that a simple measurement of foramen size could be used to evaluate maximum activity levels in other vertebrate animal groups, both living and fossils.

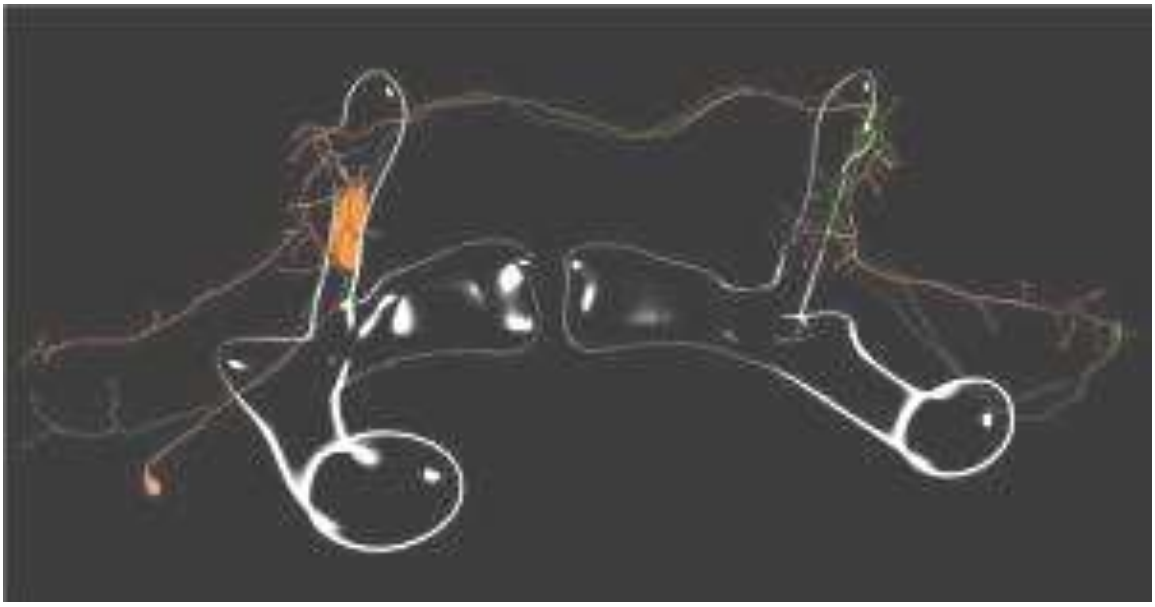
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Adelaide**.

Journal Reference:

1. R. S. Seymour, S. L. Smith, C. R. White, D. M. Henderson, D. Schwarz-Wings. **Blood flow to long bones indicates activity metabolism in mammals, reptiles and dinosaurs**. *Proceedings of the Royal Society B: Biological Sciences*, 2011; DOI: 10.1098/rspb.2011.0968

http://www.sciencedaily.com/releases/2011/07/110708124348.htm

How Memory Is Read out in the Fly Brain: MB-V2 Nerve Cells Enable the Read-Out of Associative Memories



3D-reconstruction of two MB-V2 nerve cells in the fruit fly brain. The cells receive information from the mushroom body (white) and relay them the lateral horn in return. (Credit: MPI of Neurobiology/Foerstner)

ScienceDaily (July 8, 2011) — What happens if you cannot recall your memory correctly? You are able to associate and store the name and face of a person, yet you might be unable to remember them when you meet that person. In this example, the recall of the information is temporarily impaired. How such associative memories are "read out" in the brain remains one of the great mysteries of modern neurobiology.

Now, scientists from the Max Planck Institute of Neurobiology in Martinsried and from the Ecole Supérieure de Physique et de Chimie Industrielles in Paris, with an international team of colleagues, took the first step to unravel this mechanism.

Fruit flies have the ability to remember. The brain of these minute animals can store different pieces of information and associations and can recall these for a long time. In comparison to the human brain, which boasts about 100 billion cells, the brain of the fruit fly is, of course, a lot smaller. However, many of the basic principles are the same in both species. Thus, the straightforward structure of the fly brain, with its modest hundred thousand cells, enables the scientists to decode processes at their point of origin: in other words, on the individual cell level.

Nerve cells with read-out function

In their experiments, the neurobiologists conditioned the fruit flies to associate a certain odor with a mild electrical stimulus. After repeating this classical conditioning experiment only once, the flies had already got the message and turned away from the pertaining odor. The key in this experiment was that the scientists could temporarily deactivate specific nerve cells. This was done by a combination of special genetic techniques which allowed certain nerve cells to be deactivated through a change of ambient temperature. In this way, the scientists could show that the behavior of the flies was not altered, when certain nerve cells were deactivated only while the flies recalled the associated memory. The responsible nerve cells, known as MB-V2 cells, had to be intact in order for the flies to fully retrieve the associative memory. These cells were, however, not important for the flies' ability to associate odor and electrical stimulus or to stabilize the formed memory. The results thus indicated that MB-V2 cells are involved in a memory 'read-out' pathway.

Alternative pathways of memory processing

Prior to this experiment, it was known that olfactory information is processed in the lateral horn of the fly's brain. As a result of such processing, certain behavior, such as innate odor avoidance or approach, can be released. In contrast, the mushroom body is the site in the fly brain, where a positive or negative value is given to the odor information. Here, the neutral odor is associated with the negative sensation of the electric

stimulus to form an aversive odor memory. The neurobiologists' results, which were now published in Nature Neuroscience, showed that MB-V2 cells receive information from the mushroom body and that they, in turn, relay to the nerve cells in the lateral horn.
"For the first time, we demonstrated the function of this alternative pathway via which a learned odor directs avoidance behavior for the memory recall," Hiromu Tanimoto, one of the two leaders of the study, explains. Instinctive behavior, such as the avoidance of certain odors, operates directly via the lateral horn and, as such, remains unperturbed by deactivation of the MB-V2 cells.
"The identification of these cells and the role they play in recalling the contents of the memory are significant milestones on the way to gaining an understanding of how memory guides animal behavior," Tanimoto explains. Perhaps one day, science will thus be able to explain why our brains sometimes get stuck, when trying to call up certain pieces of information. Such knowledge would, for example, be an important prerequisite in the development of drugs to combat certain memory deficiencies.

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Max-Planck-Gesellschaft**.

Journal Reference:

1. Julien Séjourné, Pierre-Yves Plaçais, Yoshinori Aso, Igor Siwanowicz, Séverine Trannoy, Vladimiros Thoma, Stevanus R Tedjakumala, Gerald M Rubin, Paul Tchénio, Kei Ito, Guillaume Isabel, Hiromu Tanimoto, Thomas Preat. **Mushroom body efferent neurons responsible for aversive olfactory memory retrieval in Drosophila**. *Nature Neuroscience*, 2011; 14 (7): 903 DOI: 10.1038/nn.2846

http://www.sciencedaily.com/releases/2011/07/110708123935.htm

Power from the Air: Device Captures Ambient Electromagnetic Energy to Drive Small Electronic Devices

Georgia Tech School of Electrical and Computer Engineering professor Manos Tentzeris holds a sensor (left) and an ultra-broadband spiral antenna for wearable energy-scavenging applications. Both were printed on paper using inkjet technology. (Credit: Georgia Tech Photo: Gary Meek)

ScienceDaily (July 8, 2011) — Researchers have discovered a way to capture and harness energy transmitted by such sources as radio and television transmitters, cell phone networks and satellite communications systems. By scavenging this ambient energy from the air around us, the technique could provide a new way to power networks of wireless sensors, microprocessors and communications chips.

"There is a large amount of electromagnetic energy all around us, but nobody has been able to tap into it," said Manos Tentzeris, a professor in the Georgia Tech School of Electrical and Computer Engineering who is leading the research. "We are using an ultra-wideband antenna that lets us exploit a variety of signals in different frequency ranges, giving us greatly increased power-gathering capability."

Tentzeris and his team are using inkjet printers to combine sensors, antennas and energy scavenging capabilities on paper or flexible polymers. The resulting self powered wireless sensors could be used for chemical, biological, heat and stress sensing for defense and industry; radio frequency identification (RFID) tagging for manufacturing and shipping, and monitoring tasks in many fields including communications and power usage.

A presentation on this energy scavenging technology was given July 6 at the IEEE Antennas and Propagation Symposium in Spokane, Wash. The discovery is based on research supported by multiple sponsors, including the National Science Foundation, the Federal Highway Administration and Japan's New Energy and Industrial Technology Development Organization (NEDO).

Communications devices transmit energy in many different frequency ranges, or bands. The team's scavenging devices can capture this energy, convert it from AC to DC, and then store it in capacitors and batteries. The scavenging technology can take advantage presently of frequencies from FM radio to radar, a range spanning 100 megahertz (MHz) to 15 gigahertz (GHz) or higher.

Scavenging experiments utilizing TV bands have already yielded power amounting to hundreds of microwatts, and multi-band systems are expected to generate one milliwatt or more. That amount of power is enough to operate many small electronic devices, including a variety of sensors and microprocessors.

And by combining energy scavenging technology with supercapacitors and cycled operation, the Georgia Tech team expects to power devices requiring above 50 milliwatts. In this approach, energy builds up in a battery-like supercapacitor and is utilized when the required power level is reached.

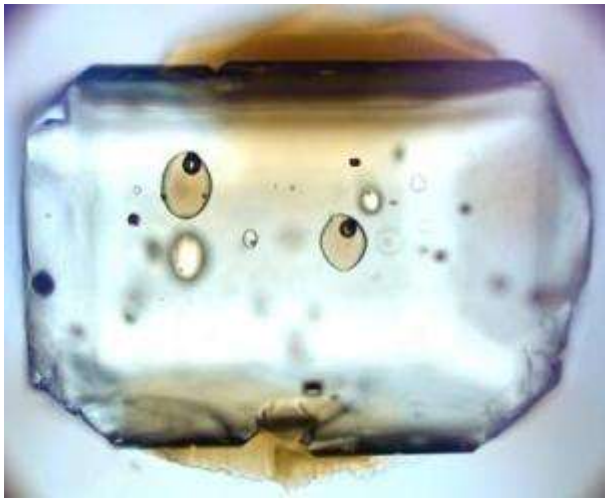
The researchers have already successfully operated a temperature sensor using electromagnetic energy captured from a television station that was half a kilometer distant. They are preparing another demonstration in which a microprocessor-based microcontroller would be activated simply by holding it in the air.
Exploiting a range of electromagnetic bands increases the dependability of energy scavenging devices, explained Tentzeris, who is also a faculty researcher in the Georgia Electronic Design Center at Georgia Tech. If one frequency range fades temporarily due to usage variations, the system can still exploit other frequencies.
The scavenging device could be used by itself or in tandem with other generating technologies. For example, scavenged energy could assist a solar element to charge a battery during the day. At night, when solar cells don't provide power, scavenged energy would continue to increase the battery charge or would prevent discharging.
Utilizing ambient electromagnetic energy could also provide a form of system backup. If a battery or a solar-collector/battery package failed completely, scavenged energy could allow the system to transmit a wireless distress signal while also potentially maintaining critical functionalities.
The researchers are utilizing inkjet technology to print these energy scavenging devices on paper or flexible paper-like polymers -- a technique they already using to produce sensors and antennas. The result would be paper-based wireless sensors that are self powered, low cost and able to function independently almost anywhere.
To print electrical components and circuits, the Georgia Tech researchers use a standard materials inkjet printer. However, they add what Tentzeris calls "a unique in house recipe" containing silver nanoparticles and/or other nanoparticles in an emulsion. This approach enables the team to print not only RF components and circuits, but also novel sensing devices based on such nanomaterials as carbon nanotubes.
When Tentzeris and his research group began inkjet printing of antennas in 2006, the paper-based circuits only functioned at frequencies of 100 or 200 MHz, recalled Rushi Vyas, a graduate student who is working with Tentzeris and graduate student Vasileios Lakafosis on several projects.
"We can now print circuits that are capable of functioning at up to 15 GHz -- 60 GHz if we print on a polymer," Vyas said. "So we have seen a frequency operation improvement of two orders of magnitude."
The researchers believe that self-powered, wireless paper-based sensors will soon be widely available at very low cost. The resulting proliferation of autonomous, inexpensive sensors could be used for applications that include:

- Airport security: Airports have both multiple security concerns and vast amounts of available ambient energy from radar and communications sources. These dual factors make them a natural environment for large numbers of wireless sensors capable of detecting potential threats such as explosives or smuggled nuclear material.
- Energy savings: Self-powered wireless sensing devices placed throughout a home could provide continuous monitoring of temperature and humidity conditions, leading to highly significant savings on heating and air conditioning costs. And unlike many of today's sensing devices, environmentally friendly paper-based sensors would degrade quickly in landfills.
- Structural integrity: Paper or polymer-based sensors could be placed throughout various types of structures to monitor stress. Self powered sensors on buildings, bridges or aircraft could quietly watch for problems, perhaps for many years, and then transmit a signal when they detected an unusual condition.
- Food and perishable material storage and quality monitoring: Inexpensive sensors on foods could scan for chemicals that indicate spoilage and send out an early warning if they encountered problems.
- Wearable bio-monitoring devices: This emerging wireless technology could become widely used for autonomous observation of patient medical issues.

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

http://www.sciencedaily.com/releases/2011/07/110707131545.htm

Deep Recycling in Earth Faster Than Thought



These are olivine crystals from Mauna Loa volcano, Hawaii, with a width of less than 1 mm. The brown ovals are solidified, glassy inclusions trapped as droplets of melt by the growing olivine crystal. They contain strontium isotope ratios which are inherited from 500-million-year-old seawater. (Credit: Sobolev, Max Planck Institute for Chemistry.)

ScienceDaily (Aug. 10, 2011) — The recycling of Earth's crust in volcanoes happens much faster than scientists have previously assumed. Rock of the oceanic crust, which sinks deep into the earth due to the movement of tectonic plates, reemerges through volcanic eruptions after around 500 million years. Researchers from the Max Planck Institute for Chemistry in Mainz obtained this result using volcanic rock samples. Previously, geologists thought this process would take about two billion years.

Virtually all of the ocean islands are volcanoes. Several of them, such as Hawaii, originate from the lowest part of the mantle. This geological process is similar to the movement of coloured liquids in a lava lamp: hot rock rises in cylindrical columns, the so-called mantle plumes, from a depth of nearly 3000 kilometres. Near the surface, it melts, because the pressure is reduced, and forms volcanoes. The plume originates from former ocean crust which early in Earth's history sank to the bottom of the mantle. Previously, scientists had assumed that this recycling took about two billion years.

The chemical analysis of tiny glassy inclusions in olivine crystals from basaltic lava on Mauna Loa volcano in Hawaii has now surprised geologists: the entire recycling process requires at most half a billion years, four times faster than previously thought.

The microscopically small inclusions in the volcanic rock contain trace elements originally dissolved in seawater, and this allows the recycling process to be dated. Before the old ocean crust sinks into the mantle, it soaks up seawater, which leaves tell-tale trace elements in the rock. The age is revealed by the isotopic ratio of strontium which changes with time. Strontium is a chemical element, which occurs in trace amounts in sea water. The isotopes of chemical elements have the same number of protons but different numbers of neutrons. Mainz scientists developed a special laser mass spectrometry method which allowed the detection of isotopes of strontium in extremely small quantities.

To their surprise, the Max Planck researchers found residues of sea water with an unexpected strontium isotope ratio in the samples, which suggested an age of less than 500 million years for the inclusions. Therefore the rock material forming the Hawaiian basalts must be younger.

"Apparently strontium from sea water has reached deep in the Earth's mantle, and reemerged after only half a billion years, in Hawaiian volcano lavas," says Klaus Peter Jochum, co-author of the publication. "This discovery was a huge surprise for us."

Another surprise for the scientists was the tremendous variation of strontium isotope ratios found in the melt inclusions in olivine from the single lava sample. "This variation is much larger than the known range for all Hawaiian lavas," says Alexander Sobolev. "This finding suggests that the mantle is far more chemically heterogeneous on a small spatial scale than we thought before." This heterogeneity is preserved only by melt inclusions but is completely obliterated in the lavas because of their complete mixing.

Sobolev, Jochum and their colleagues expect to obtain similar results for other volcanoes and therefore be able to determine the recycling age the ocean crust more precisely.

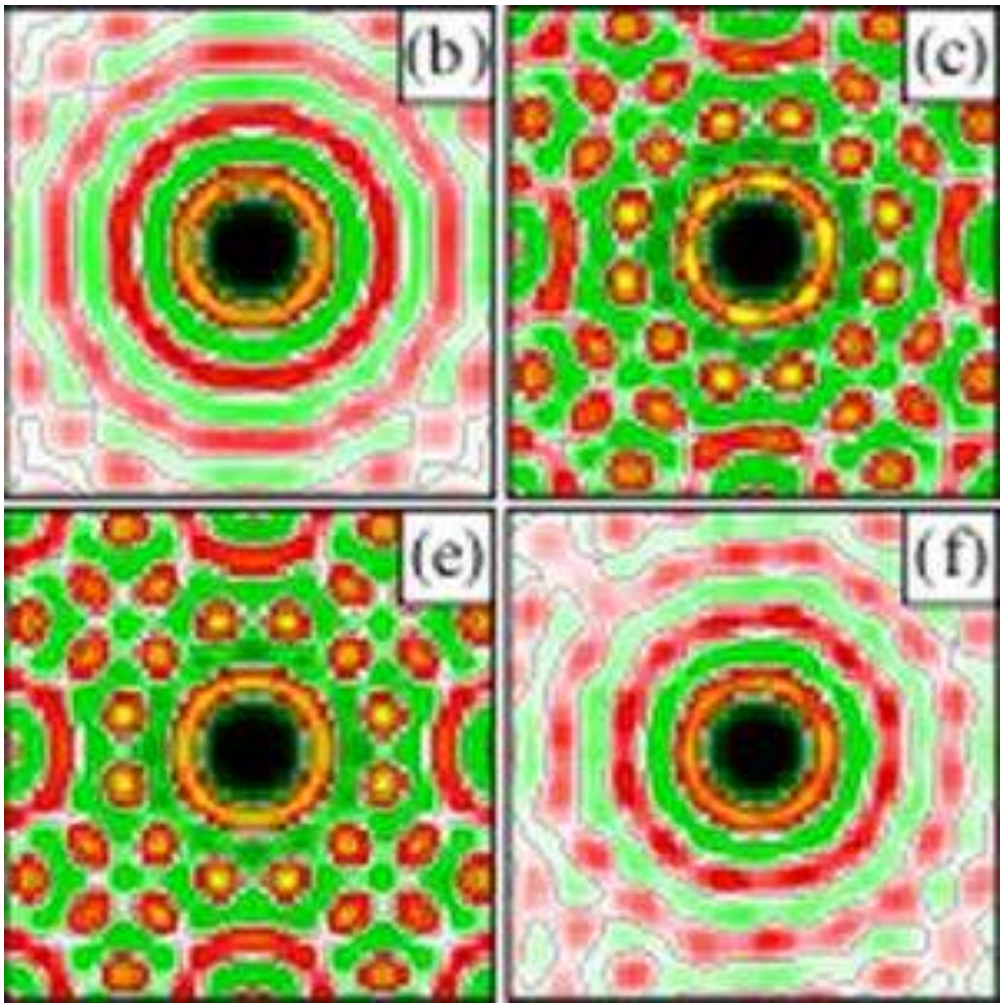
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Max-Planck-Gesellschaft**.

Journal Reference:

1. Alexander V. Sobolev, Albrecht W. Hofmann, Klaus Peter Jochum, Dmitry V. Kuzmin, Brigitte Stoll. **A young source for the Hawaiian plume**. *Nature*, 2011; DOI: 10.1038/nature10321

http://www.sciencedaily.com/releases/2011/08/110810132903.htm

Exotic Quantum Crystal Discovered: Researchers Discover Novel State of Crystal Matter



Density distribution of the quantum particles (excitons) in the plane of the quantum well. Yellow color corresponds to high density, red to lower, green to zero. From top left to bottom right the density is increased at constant temperature. (Credit: Michael Bonitz, ITAP, CAU Kiel)

ScienceDaily (Aug. 10, 2011) — Nature knows two opposite types of solids: one that emerges upon compression from a liquid and a second that appears if the pressure on a liquid is reduced. While the former is typical for substances in our everyday life the latter occurs for example in a dense quantum liquid of electrons (such as in metals) or ions (in exotic white dwarf or neutron stars).

Now it has been shown that there exists yet a third form of matter that inherits both of these properties. This unusual behaviour has been predicted to exist in crystals of excitons -- hydrogen atom-like bound states of electrons and holes -- in a semiconductor quantum well placed in a strong electric field.

A team from Kiel University (Germany) consisting of Dr. Jens Bönning, Privatdozent Alexei Filinov and Prof. Michael Bonitz has performed extensive accurate computer simulations that shed light on the mysterious properties of this material.

The results appear in the current issue of *Physical Review B*. There the authors present a simple explanation for the coexistence of the two seemingly contradicting melting behaviours.

The secret lies in the character of the forces acting between two excitons: at low pressure excitons repel each other via a dipole force and form a quantum liquid. Upon compression this fluid freezes into an exciton crystal. Further compression brings two excitons so close together that the quantum wave nature of their constituents (electrons and holes) starts to weaken the forces. As a consequence, further compression leads to an increasing overlap of the exciton quantum waves that is no longer balanced by the inter-exciton repulsion, and the crystal melts again.

The researchers have made precise predictions where to search for this exotic crystal of excitons (particularly well suited are zinc selenide or gallium arsenide quantum wells) -- it is now up to the experimentalists to find this new state of matter.

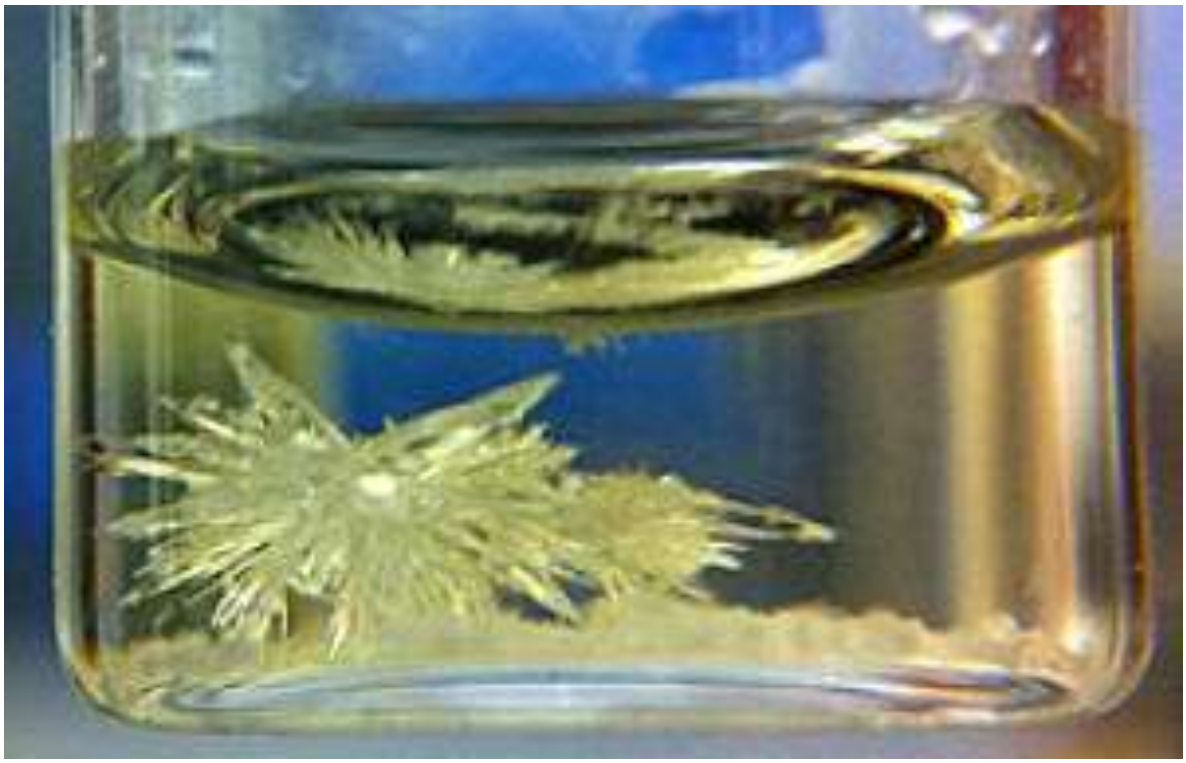
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Kiel University**.

Journal Reference:

1. J. Böning, A. Filinov, M. Bonitz. **Crystallization of an exciton superfluid**. *Physical Review B*, 2011; 84 (7) DOI: 10.1103/PhysRevB.84.075130

http://www.sciencedaily.com/releases/2011/08/110810085501.htm

Study Builds On Plausible Scenario for Origin of Life On Earth



The natural enantiomer of the RNA precursor molecules formed a crystal structure visible to the naked eye. (Credit: Image courtesy of University of California - Merced)

ScienceDaily (Aug. 10, 2011) — A relatively simple combination of naturally occurring sugars and amino acids offers a plausible route to the building blocks of life, according to a paper published in *Nature Chemistry*.

The study shows how the precursors to RNA could have formed on Earth before any life existed. It was authored by Jason E. Hein, Eric Tse and Donna G. Blackmond, a team of researchers with the Scripps Research Institute. Hein is now a chemistry professor with University of California, Merced.

Biological molecules, such as RNA and proteins, can exist in either a natural or unnatural form, called enantiomers. By studying the chemical reactions carefully, the research team found that it was possible to generate only the natural form of the necessary RNA precursors by including simple amino acids.

"These amino acids changed how the reactions work and allowed only the naturally occurring RNA precursors to be generated in a stable form," said Hein. "In the end, we showed that an amazingly simple result emerged from some very complex and interconnected chemistry."

The natural enantiomer of the RNA precursor molecules formed a crystal structure visible to the naked eye. The crystals are stable and avoid normal chemical breakdown. They can exist until the conditions are right for them to change into RNA.

The study was led by Blackmond and builds on the work of John D. Sutherland and Matthew W. Powner published in 2009 and covered by outlets such as The New York Times and Wired. Sutherland is a chemist

with Cambridge's Medical Research Council Laboratory of Molecular Biology. Powner is a post-doctoral scholar with Harvard University.

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of California - Merced**.

Journal Reference:

1. Jason E. Hein, Eric Tse, Donna G. Blackmond. **A route to enantiopure RNA precursors from nearly racemic starting materials**. *Nature Chemistry*, 2011; DOI: 10.1038/NCHEM.1108

http://www.sciencedaily.com/releases/2011/08/110809144517.htm

New Eruption Discovered at Undersea Volcano, After Successfully Forecasting the Event

The manipulator arm of the ROV Jason prepares to sample the new lava flow that erupted in April 2011 at Axial Seamount, located off the Oregon coast. (Credit: Photo courtesy of Bill Chadwick, Oregon State University; Copyright Woods Hole Oceanographic Institution)

ScienceDaily (Aug. 9, 2011) — A team of scientists just discovered a new eruption of Axial Seamount, an undersea volcano located about 250 miles off the Oregon coast -- and one of the most active and intensely studied seamounts in the world.

What makes the event so intriguing is that the scientists had forecast the eruption starting five years ago -- the first successful forecast of an undersea volcano.

Bill Chadwick, an Oregon State University geologist, and Scott Nooner, of Columbia University, have been monitoring Axial Seamount for more than a decade, and in 2006 published a paper in the Journal of Volcanology and Geothermal Research in which they forecast that Axial would erupt before the year 2014. Their forecast was based on a series of seafloor pressure measurements that indicated the volcano was inflating.

"Volcanoes are notoriously difficult to forecast and much less is known about undersea volcanoes than those on land, so the ability to monitor Axial Seamount, and determine that it was on a path toward an impending eruption is pretty exciting," said Chadwick, who was chief scientist on the recent expedition, which was jointly funded by the National Oceanic and Atmospheric Administration and the National Science Foundation.

Axial last erupted in 1998 and Chadwick, Nooner and colleagues have monitored it ever since. They used precise bottom pressure sensors -- the same instruments used to detect tsunamis in the deep ocean -- to measure vertical movements of the floor of the caldera much like scientists would use GPS on land to

measure movements of the ground. They discovered that the volcano was gradually inflating at the rate of 15 centimeters (six inches) a year, indicating that magma was rising and accumulating under the volcano summit.

When Axial erupted in 1998, the floor of the caldera suddenly subsided or deflated by 3.2 meters (10.5 feet) as magma was removed from underground to erupt at the surface. The scientists estimated that the volcano would be ready to erupt again when re-inflation pushed the caldera floor back up to its 1998 level.

"Forecasting the eruption of most land volcanoes is normally very difficult at best and the behavior of most is complex and variable," said Nooner, who is affiliated with the Lamont-Doherty Earth Observatory. "We now have evidence, however, that Axial Seamount behaves in a more predictable way than many other volcanoes -- likely due to its robust magma supply coupled with its thin crust, and its location on a mid-ocean ridge spreading center.

"It is now the only volcano on the seafloor whose surface deformation has been continuously monitored throughout an entire eruption cycle," Nooner added.

The discovery of the new eruption came on July 28, when Chadwick, Nooner and University of Washington colleagues Dave Butterfield and Marvin Lilley led an expedition to Axial aboard the R/V Atlantis, operated by the Woods Hole Oceanographic Institution. Using Jason, a remotely operated robotic vehicle (ROV), they discovered a new lava flow on the seafloor that was not present a year ago.

"It's funny," Chadwick said. "When we first arrived on the seafloor, we thought we were in the wrong place because it looked so completely different. We couldn't find our markers or monitoring instruments or other distinctive features on the bottom. Once we figured out that an eruption had happened, we were pretty excited.

"When eruptions like this occur, a huge amount of heat comes out of the seafloor, the chemistry of seafloor hot springs is changed, and pre-existing vent biological communities are destroyed and new ones form," Chadwick added. "Some species are only found right after eruptions, so it is a unique opportunity to study them."

The first Jason ROV dive of the expedition targeted a field of "black smoker" hot springs on the western side of the caldera, beyond the reach of the new lava flows. Butterfield has been tracking the chemistry and microbiology of hot springs around the caldera since the 1998 eruption.

"The hot springs on the west side did not appear to be significantly disturbed, but the seawater within the caldera was much murkier than usual," Butterfield said, "and that meant something unusual was happening. When we saw the 'Snowblower' vents blasting out huge volumes of white floc and cloudy water on the next ROV dive, it was clear that the after-effects of the eruption were still going strong. This increased output seems to be associated with cooling of the lava flows and may last for a few months or up to a year."

The scientists will examine the chemistry of the vent water and work with Julie Huber of the Marine Biological Laboratory to analyze DNA and RNA of the microbes in the samples.

The scientists recovered seafloor instruments, including two bottom pressure recorders and two ocean-bottom hydrophones, which showed that the eruption took place on April 6 of this year. A third hydrophone was found buried in the new lava flows.

"So far, it is hard to tell the full scope of the eruption because we discovered it near the end of the expedition," said Chadwick, who works out of OSU's Hatfield Marine Science Center in Newport. "But it looks like it might be at least three times bigger than the 1998 eruption."

The lava flow from the 2011 eruptions was at least two kilometers (1.2 miles) wide, the scientists noted.

"Five years ago, these scientists forecast this eruption, which has resulted in millions of square meters of new lava flows on the seafloor," said Barbara Ransom, program director in the National Science Foundation's Division of Ocean Sciences. "The technological advances that allow this research to happen will lead to a new understanding of submarine volcanoes, and of any related hazards."

The bottom-anchored instruments documented hundreds of tiny earthquakes during the volcanic eruption, but land-based seismic monitors and the Sound Surveillance System (SOSUS) hydrophone array operated by the U.S. Navy only detected a handful of them on the day of the eruption because many components of the hydrophone system are offline.

"Because the earthquakes detected back in April at a distance from the volcano were so few and relatively small, we did not believe there was an eruption," said Bob Dziak, an OSU marine geologist who monitors the SOSUS array. "That is why discovering the eruption at sea last week was such a surprise." Both Dziak and Chadwick are affiliated with the Cooperative Institute for Marine Resource Studies -- a joint NOAA/Oregon State University institute.

This latest Axial eruption caused the caldera floor to subside by more than two meters (six feet). The scientists will be measuring the rate of magma inflation over the next few years to see if they can successfully forecast the next event.

"The acid test in science -- whether or not you understand a process in nature -- is to try to predict what will happen based on your observations," Chadwick said. "We have done this and it is extremely satisfying that we were successful. Now we can build on that knowledge and look to apply it to other undersea volcanoes -- and perhaps even volcanoes on land."

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Oregon State University**.

Journal Reference:

1. W Chadwick Jr, S Nooner, M Zumberge, R Embley, C Fox. **Vertical deformation monitoring at Axial Seamount since its 1998 eruption using deep-sea pressure sensors**. *Journal of Volcanology and Geothermal Research*, 2006; 150 (1-3): 313 DOI: 10.1016/j.jvolgeores.2005.07.006

http://www.sciencedaily.com/releases/2011/08/110809132234.htm

Polar Dinosaur Tracks Open New Trail to Past

Photo of the tracks. (Credit: Anthony Martin)

ScienceDaily (Aug. 10, 2011) — Paleontologists have discovered a group of more than 20 polar dinosaur tracks on the coast of Victoria, Australia, offering a rare glimpse into animal behavior during the last period of pronounced global warming, about 105 million years ago.

The discovery, reported in the journal *Alcheringa*, is the largest and best collection of polar dinosaur tracks ever found in the Southern Hemisphere.

"These tracks provide us with a direct indicator of how these dinosaurs were interacting with the polar ecosystems, during an important time in geological history," says Emory paleontologist Anthony Martin, who led the research. Martin is an expert in trace fossils, which include tracks, trails, burrows, cocoons and nests.

The three-toed tracks are preserved on two sandstone blocks from the Early Cretaceous Period. They appear to belong to three different sizes of small theropods -- a group of bipedal, mostly carnivorous dinosaurs whose descendants include modern birds. Photos of the tracks, above and below, by Anthony Martin.

The research team also included Thomas Rich, from the Museum Victoria; Michael Hall and Patricia Vickers-Rich, both from the School of Geosciences at Monash University in Victoria; and Gonzalo Vazquez-Prokopec, an ecologist and expert in spatial analysis from Emory's Department of Environmental Studies.

The tracks were found on the rocky shoreline of remote Milanesia Beach, in Otways National Park. This area, west of Melbourne, is known for energetic surf and rugged coastal cliffs, consisting of layers of sediment accumulated over millions of years. Riddled with fractures and pounded by waves and wind, the cliffs occasionally shed large chunks of rock, such as those containing the dinosaur tracks.

One sandstone block has about 15 tracks, including three consecutive footprints made by the smallest of the theropods, estimated to be the size of a chicken. Martin spotted this first known dinosaur trackway of Victoria last June 14, around noon. He was on the lookout, since he had earlier noticed ripple marks and trace fossils of what looked like insect burrows in piles of fallen rock.

"The ripples and burrows indicate a floodplain, which is the most likely area to find polar dinosaur tracks," Martin explains. The second block containing tracks was spotted about three hours later by Greg Denney, a

local volunteer who accompanied Martin and Rich on that day's expedition. That block had similar characteristics to the first one, and included eight tracks. The tracks show what appear to be theropods ranging in size from a chicken to a large crane.

"We believe that the two blocks were from the same rock layer, and the same surface, that the dinosaurs were walking on," Martin says.

The small, medium and large tracks may have been made by three different species, Martin says. "They could also belong to two genders and a juvenile of one species -- a little dinosaur family -- but that's purely speculative," he adds.

The Victoria Coast marks the seam where Australia was once joined to Antarctica. During that era, about 115-105 million years ago, the dinosaurs roamed in prolonged polar darkness. Earth's average temperature was 68 degrees Fahrenheit -- just 10 degrees warmer than today -- and the spring thaws would cause torrential flooding in the river valleys.

The dinosaur tracks were probably made during the summer, Martin says. "The ground would have been frozen in the winter, and in order for the waters to subside so that animals could walk across the floodplain, it would have to be later in the season," he explains.

Lower Cretaceous strata of Victoria have yielded the best-documented assemblage of polar dinosaur bones in the world. Few dinosaur tracks, however, have been found.

In the February 2006, Martin found the first known carnivorous dinosaur track in Victoria, at a coastal site known as Dinosaur Dreaming.

In May 2006, during a hike to another remote site near Milanesia Beach, he discovered the first trace fossil of a dinosaur burrow in Australia. That find came on the heels of Martin's co-discovery of the first known dinosaur burrow and burrowing dinosaur, in Montana. The two discoveries suggest that burrowing behaviors were shared by dinosaurs of different species, in different hemispheres, and spanned millions of years during the Cretaceous Period.

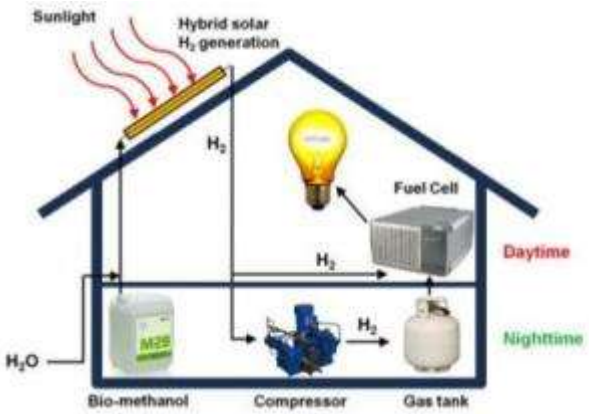
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Emory University**. The original article was written by Carol Clark.

Journal Reference:

1. Anthony J. Martin, Thomas H. Rich, Michael Hall, Patricia Vickers-Rich, Gonzalo Vazquez-Prokopec. **A polar dinosaur-track assemblage from the Eumeralla Formation (Albian), Victoria, Australia**. *Alcheringa: An Australasian Journal of Palaeontology*, 2011; DOI: 10.1080/03115518.2011.597564

http://www.sciencedaily.com/releases/2011/08/110809104301.htm

Hybrid Solar System Makes Rooftop Hydrogen



This is the hybrid system schematic. (Credit: Nico Hotz)

ScienceDaily (Aug. 10, 2011) — While roofs across the world sport photovoltaic solar panels to convert sunlight into electricity, a Duke University engineer believes a novel hybrid system can wring even more useful energy out of the sun's rays.

Instead of systems based on standard solar panels, Duke engineer Nico Hotz proposes a hybrid option in which sunlight heats a combination of water and methanol in a maze of glass tubes on a rooftop. After two catalytic reactions, the system produces hydrogen much more efficiently than current technology without significant impurities. The resulting hydrogen can be stored and used on demand in fuel cells.

For his analysis, Hotz compared the hybrid system to three different technologies in terms of their exergetic performance. Exergy is a way of describing how much of a given quantity of energy can theoretically be converted to useful work.

"The hybrid system achieved exergetic efficiencies of 28.5 percent in the summer and 18.5 percent in the winter, compared to 5 to 15 percent for the conventional systems in the summer, and 2.5 to 5 percent in the winter," said Hotz, assistant professor of mechanical engineering and materials science at Duke's Pratt School of Engineering.

The paper describing the results of Hotz's analysis was named the top paper during the ASME Energy Sustainability Fuel Cell 2011 conference in Washington, D.C. Hotz recently joined the Duke faculty after completing post-graduate work at the University of California-Berkeley, where he analyzed a model of the new system. He is currently constructing one of the systems at Duke to test whether or not the theoretical efficiencies are born out experimentally.

Hotz's comparisons took place during the months of July and February in order to measure each system's performance during summer and winter months.

Like other solar-based systems, the hybrid system begins with the collection of sunlight. Then things get different. While the hybrid device might look like a traditional solar collector from the distance, it is actually a series of copper tubes coated with a thin layer of aluminum and aluminum oxide and partly filled with

catalytic nanoparticles. A combination of water and methanol flows through the tubes, which are sealed in a vacuum.

"This set-up allows up to 95 percent of the sunlight to be absorbed with very little being lost as heat to the surroundings," Hotz said. "This is crucial because it permits us to achieve temperatures of well over 200 degrees Celsius within the tubes. By comparison, a standard solar collector can only heat water between 60 and 70 degrees Celsius."

Once the evaporated liquid achieves these higher temperatures, tiny amounts of a catalyst are added, which produces hydrogen. This combination of high temperature and added catalysts produces hydrogen very efficiently, Hotz said. The resulting hydrogen can then be immediately directed to a fuel cell to provide electricity to a building during the day, or compressed and stored in a tank to provide power later.

The three systems examined in the analysis were the standard photovoltaic cell which converts sunlight directly into electricity to then split water electrolytically into hydrogen and oxygen; a photocatalytic system producing hydrogen similar to Hotz's system, but simpler and not mature yet; and a system in which photovoltaic cells turn sunlight into electricity which is then stored in different types of batteries (with lithium ion being the most efficient).

"We performed a cost analysis and found that the hybrid solar-methanol is the least expensive solution, considering the total installation costs of $7,900 if designed to fulfill the requirements in summer, although this is still much more expensive than a conventional fossil fuel-fed generator," Hotz said.

Costs and efficiencies of systems can vary widely depending on location -- since the roof-mounted collectors that could provide all the building's needs in summer might not be enough for winter. A rooftop system large enough to supply all of a winter's electrical needs would produce more energy than needed in summer, so the owner could decide to shut down portions of the rooftop structure or, if possible, sell excess energy back to the grid.

"The installation costs per year including the fuel costs, and the price per amount of electricity produced, however showed that the (hybrid) solar scenarios can compete with the fossil fuel-based system to some degree," Hotz said. 'In summer, the first and third scenarios, as well as the hybrid system, are cheaper than a propane- or diesel-combusting generator."

This could be an important consideration, especially if a structure is to be located in a remote area where traditional forms of energy would be too difficult or expensive to obtain.

Hotz's research was supported by the Swiss National Science Fund. Joining him in the study were UC-Berkeley's Heng Pan and Costas Grigoropoulos, as well as Seung H. Ko of the Korea Advanced Institute of Science and Technology, Daejon.

Story Source:

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