Infoteca's E-Journal

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An Artist's Revelation in a Walking Canvas

By TAMMY LA GORCE

THE main show currently at the Visual Arts Center of New Jersey in Summit is called "Material Girls," and it presents the art of six contemporary-minded women who work with materials traditionally associated with their gender: lace, for example, and beads.

Amanda Yoakum, whose work is on display in a separate gallery during the exhibition, open through Sept. 3, is not one of them. Her medium is not traditional.

Ms. Yoakum, 26, paints on sneakers. And while customizers may produce simple designs or special color schemes on shoes for the collectors sometimes called sneakerheads, she sees herself as an artist.

Among her nine creations on view at the Visual Arts Center are a black pair called "Scissorhands," which feature Nike swooshes made of pieced-together bits of broken mirror next to a painted likeness of Johnny Depp as Edward Scissorhands (asking price: $1,500).

There is also "Takeout," a pair of high-tops whose front end is painted, colorfully, to resemble a dish of lo mein and whose back is configured as a white takeout carton, complete with wire handle and the word "Enjoy" painted in red Chinese-style lettering (asking price: $2,000).

To Ms. Yoakum, whose shoe show is being presented as "Art to Wear," the chance to display work for an audience not in stocking feet and ready to lace up is a somewhat surprising accomplishment, and an indication of her evolution.

"At first I didn't realize there was this entire culture of people obsessed with sneakers," said Ms. Yoakum, who started YoaKustoms, a custom "kicks" line, in April 2008 in her parents' Basking Ridge home, where she lives. It was her boyfriend, Eugene Holowacz, a student at Seton Hall University in South Orange, who indirectly indoctrinated her.

"It was his birthday and I thought, 'Oh, wow — it would be really cool to paint him shoes,' " said Ms. Yoakum, a 2006 graduate of Parsons the New School for Design in Manhattan, who estimates that Mr. Holowacz owns 80 pairs of sneakers. She investigated the subject on the Internet and discovered, "There's this entire world of sneakers, of sneaker people.' "

Mr. Holowacz took a picture of the first sneakers she painted, which were inspired by the Nintendo character Wario, and posted it at Solecollector .com, a Web site for sneakerheads. "And it just blew up," Ms. Yoakum said.

Since beginning her Internet-only business, Ms. Yoakum says, she has painted and shipped roughly 100 pairs of sneakers — mostly Nike Dunks, a style favored by collectors, and mostly for men. Each pair takes about a week to paint, she said, but reaching the painting stage can take weeks or months, while she and her clients refine the details of her intricate designs via e-mail.

That lengthy process, which culminates in either the client's sending the unpainted shoes through the mail to Ms. Yoakum or the artist's purchasing them herself, has helped her sort out where she wants to be on the fashion-fine art continuum.

"People have approached me about manufacturing deals, but I've had to explain that you could never really reproduce what I do, because at the end of the day it would cost too much," she said. "I would have to make more basic pieces, which isn't really who I am. I'm really passionate about the art side of it."

In December, Ms. Yoakum entered the art show "Clash of the Customizers" in Los Angeles, which attracted nearly 30 of her peers. She won. She was also one of around 30 artists recently selected by Vans Custom Culture to paint pairs of Vans canvas shoes, currently being displayed in flagship stores around the country. And she has taken orders from idiosyncratic sneaker wearers as far off as Saudi Arabia and Japan.

Ms. Yoakum also teaches fashion illustration to teenagers part-time at the Visual Arts Center, and in the fall she will teach a new sneaker-art class for teenagers and a workshop in the same subject for 9-to-12-year-olds. Teaching is an avocation for Ms. Yoakum, who eventually would also like to include boots and high heels among her canvases. But that is not to say she does not take it seriously.

"It's kind of an on-the-side thing for me, but I love it," she said. "The kids ask me questions, and I try to be as real with them as I can, because I always liked teachers who were real with me."

"Art to Wear" by Amanda Yoakum, along with "Material Girls," through Sept. 3 at the Visual Arts Center of New Jersey, 68 Elm Street, Summit; (908) 273-9121 or artcenternj.org.

http://www.nytimes.com/2010/08/15/nyregion/15artsnj.html?ref=design

Tale of Ansel Adams Negatives Grows Hazy

By REYHAN HARMANCI}

SAN FRANCISCO — It was a dream come true, straight out of "Antiques Roadshow." In 2000 Rick Norsigian, a painter in a school maintenance department, bought a box of photo negatives at a garage sale in Fresno, Calif., for $45. Last month, a decade later, he stood in a Beverly Hills art gallery to announce that a team of experts had concluded "beyond a reasonable doubt" that Ansel Adams had taken the pictures.

The gallery's owner, David W. Streets, appraised the value of the 65 images, which the experts called "the lost negatives," at $200 million, and the incident made news around the world.

But a fairy-tale ending is eluding Mr. Norsigian. A day after the announcement, Matthew Adams, a grandson of the photographer, disputed the finding, questioned the credentials of the experts and went so far as to call the whole business a "scam."

A few days after that, an Oakland woman, Marian Walton, announced that she had a photo that was identical to one of the negatives. It had been taken, she said, not by Adams, the famous outdoors photographer, but by an uncle of hers, Earl Brooks.

And now, in the latest complication, court records reveal that Mr. Streets, who set the value for the negatives and is handling the related sales, is a convicted felon with a criminal record for petty theft and fraud in Louisiana and Kentucky. Though he says on his Web site, davidstreetsbeverlyhills.com, that he has 25 years of fine-art appraisal experience, two of Mr. Streets's former employers say his true talent is in the embellishment of his credentials.

Doris Allen, who owns the Bryant Galleries in New Orleans, says that though Mr. Streets, 45, can be "very charming," he had said he had no appraisal experience when she hired him at her business in 2000. Now she is amazed to see him occupy an influential role in a national art debate. "How can he get up there and claim that those negatives are worth $200 million?" she said. "That is absurd."

The discussion of just who took the pictures is far from over, and Mr. Norsigian's lawyer, Arnold Peter, said Mr. Streets's past has little bearing on that question. But in a subjective field where credibility and expertise matter, it cannot help Mr. Norsigian that Mr. Streets's résumé appears to be tarnished.

For his part, Mr. Streets initially denied in an interview that he was the same David W. Streets who was convicted of passing bad checks, fraud and petty theft over a seven-year period that ended in 1998 when he was in his early 30s. But he later sent an e-mail in which he cited his extensive civic involvement in recent years, described the incidents as old, and attributed them to "untreated manic-depression" that he began to experience after his mother "committed suicide when I was 15, and my father died the following year."

"I took complete responsibility and learned from that experience," he said.

The art debate has its roots in Mr. Norsigian's purchase of the box of negatives, a rummage-sale find that took on a new light when he later noticed in an Adams biography that certain features of the plate-glass negatives he bought, which depict California landscape scenes from Carmel, Yosemite and around San Francisco, seemed to match events in in Adams's life. In particular, the plates showed evidence of fire damage, and in 1937 Adams lost negatives to a darkroom fire.

"The size, the fire damage, the locations and different stuff like that," Mr. Norsigian said. "I kept researching little pieces at a time."

He took his discovery to members of the Adams family, who disputed his claims. Adams had been notoriously protective of his negatives, locking them in a bank vault when he lived in San Francisco. Would he misplace a box of negatives?

"Ansel would never have done something like that," said William Turnage, managing trustee of the Ansel Adams Publishing Rights Trust, which owns the rights to Adams's name and work.

But in 2007 Mr. Norsigian and Mr. Peter, his lawyer, set about organizing an authentication team that included a former F.B.I. agent, a former United States attorney, two handwriting experts, a meteorologist (to track cloud patterns in the images), a landscape photographer and a former curator of European decorative arts and sculpture for the Museum of Fine Arts, Boston.

They concluded, without question, that the prints were of the sort made by Adams as a young photographer in the 1920s.

Mr. Peter said he decided to market the materials through Mr. Streets, whom he did not know but whose work as a dealer he was aware of. Mr. Streets, who moved to California from New Orleans in 2005, bills himself as "Los Angeles's leading appraiser of all genres of fine art and celebrity memorabilia."

Among clients listed on his Web site are three former presidents, including Bill Clinton, and numerous celebrities. It features photos of him with Hollywood stars and with Maria Shriver, the wife of Gov. Arnold Schwarzenegger of California. A spokesman for Mr. Clinton said he did not recognize the dealer's name.

Mr. Peter said it was Mr. Streets who came up with the $200 million figure the night before their July 27 news conference. "The $200 million represents several sources of revenue over an extended period of time — reprints, licensing, eventual sale of the negatives," Mr. Peter said.

But even a member of Mr. Norsigian's authentication team has expressed doubts about the estimate. Patrick Alt, a photographer, said that he believed that Adams did create the negatives but that he found Mr. Streets's appraisal estimate "outrageous."

It certainly will be difficult to support that value if the photos were taken by Mr. Brooks, Ms. Walton's uncle, now deceased, who dabbled in photography. Ms. Walton, 87, said, "I about fell off my sofa" when she saw Mr. Norsigian's announcement on television. The image on the screen looked exactly like a photo by her uncle that she had hung on her bathroom wall: a picture of the leaning Jeffrey pine in Yosemite that she had inherited from her father in 1981.

Two former Adams assistants, John Sexton and Alan Ross, have since agreed with her, saying tell-tale shadows and dust spots indicated that the two Yosemite pictures, Mr. Norsigian's and Ms. Walton's, were taken at the same time with the same camera.
Nothing about that development has dissuaded the Norsigian team from moving forward with sales, staged out of Mr. Streets's gallery.
Mr. Streets has become something of a fixture in some Beverly Hills circles. Last May the mayor there, Jimmy Delshad, read a proclamation at a party Mr. Streets held on the anniversary of his gallery's opening. But the mayor's office later said he did not declare it "David W. Streets Day," as it says on Mr. Streets's Web site.
Mr. Streets held a similarly high profile in New Orleans, even after his criminal convictions, for which he received probation and was, in one case, required to pay $19,000 restitution. As director of the Bryant Galleries branch there, he was a guest speaker at an art luncheon and regularly appeared in the society column.
Ms. Allen of Bryant Galleries said she did not know when she hired him that he had a criminal record, including a charge for pocketing a $600 deposit that a woman had made toward a couch at a furniture store where he had worked.
Ms. Allen, though, said she and her husband had a dispute with Mr. Streets and demoted him in 2004, after which he left and ended up working at at least one other gallery in New Orleans. She characterized his director's position as primarily a sales job.
After Hurricane Katrina in 2005, Mr. Streets moved to Los Angeles, where he has made his share of celebrity friends.
"I've known him for years," said Bryan Batt, an actor who plays Salvatore on "Mad Men." He described him as "a kind and generous man" who gave a party for Mr. Batt when his memoir was released last spring.
The continuing dispute has not shut down the sale of prints, which Mr. Norsigian has priced from $1,500 to $7,500; posters are going for $45. Mr. Peter declined to say how many have been sold or what percentage Mr. Streets is receiving as the dealer.
Copyright claims may well be brought by the Ansel Adams Publishing Rights Trust.
A solid outcome from the haze of the dispute has been the discovery of a new photographic star. This November a San Francisco gallery owner, Scott Nichols, will be hosting a show of work by Adams and his assistants and he has decided to include photos by Mr. Brooks too.
"Uncle Earl is a damned good photographer," Mr. Nichols said, "There's no doubt about it."
Reyhan Harmanci is a staff writer at The Bay Citizen, which produces a twice-weekly local section in Bay Area editions of The New York Times. Additional reporting was provided by Eve Abrams in New Orleans and Jackson Musker in Los Angeles.

http://www.nytimes.com/2010/08/14/arts/design/14photos.html?ref=design

Galaxies of Wire, Canvas and Velvety Soot

By KAREN ROSENBERG

One of the thrills of watching "Mad Men" is seeing the early 1960s as an alternating current of oppression and optimism: the cold war, the space race, the escalation of the Vietnam War, the sexual revolution. The art of Lee Bontecou, as it's presented in a one-room show at the Museum of Modern Art, delivers a similar jolt.

The exhibition, subtitled "All Freedom in Every Sense," is drawn entirely from the permanent collection and isn't as comprehensive as it sounds. But it samples Ms. Bontecou's most powerful works: her early wire-and-canvas reliefs and soot drawings, with their exhilarating and anxiety-inducing voids.

It's part of a larger, summerlong effort by MoMA to focus on the female artists in its collection. On the second floor you'll find the "Alternative Abstractions" of Yayoi Kusama, Louise Bourgeois and others; "Pictures by Women" fills the third-floor photography galleries.

The Bontecous are on the fourth floor, in a high-traffic area outside the permanent painting and sculpture galleries. Many of the three sculptures and a dozen or so prints and drawings have been on view recently, but it's nice to see them assembled here — just a sliding-glass door away from the museum's Mattas, Gorkys and Pollocks.

As with many collection shows, this one has gaps. You won't see any of Ms. Bontecou's vacuum-formed plastic sculptures of fish and flowers from the early 1970s, the creations she showed at the Castelli gallery shortly before embarking on a decadeslong hiatus from the art world. These pieces weren't popular at the time, but it's still surprising that MoMA, which has 57 works by Ms. Bontecou, doesn't own any.

The museum might argue that it has already dealt with that part of Ms. Bontecou's story, in her 2004 retrospective at the Museum of Modern Art, Queens.

The focus then was on Ms. Bontecou's self-imposed exile of the 1970s through the '90s. (Living with her husband and daughter in rural Pennsylvania, she made art but didn't show it.) That she had prioritized family over career rankled some female artists, even as her triumphant return inspired others.

In the current show biography recedes, allowing a clearer view of the larger cultural context and of the art itself: its sexual and spatial ambiguity, its contrast of rough materials and polished workmanship, its talismanic power.

These properties are seen and felt most intensely in two big relief sculptures, from 1959 and 1961 (both untitled, as Ms. Bontecou's work generally is). Both make use of soiled canvas from the laundry below Ms. Bontecou's East Village apartment, stretched over a steel armature and reinforced with twists of copper wire. The earlier piece is a lunar landscape that rises around a small, central crater. In the later and larger piece the crater, now accentuated with curved ridges, has become a yawning black hole of unfathomable depth.

The second sculpture, shown at MoMA in 1963, was made in 1961, which was the year of the Bay of Pigs, the deepening of our involvement in Vietnam, and the construction of the Berlin Wall. In her statement for that exhibition Ms. Bontecou wrote of "the fear, hope, ugliness, beauty and mystery that exists in us all and which hangs over all the young people today."

Also here are two mesmerizing precursors to the sculptures: drawings made with soot from Ms. Bontecou's welding torch. In one of these works, which looks like human or vegetable tissue seen under a microscope, she scraped away some of the velvety black ground with a razor blade.

In later drawings, she developed — and stuck to — a kind of botanical surrealism. (The examples here date from the late 1960s through the '90s.) Ringed orbs and Sputniklike satellites give way to venus flytraps and winged insects. Instead of creating voids, Ms. Bontecou displays symptoms of horror vacui — the fear of blank space — as she fills up more and more of the page.

The one late sculpture on view, a mobile suspended in the center of the room, is similarly involved: a miniature galaxy of porcelain and translucent mesh. Ms. Bontecou tinkered with it for 18 years, from 1980 to 1998. As in the drawings, it's clear that she was working without a sense of resistance — outside the pressure-cooker of the gallery system.

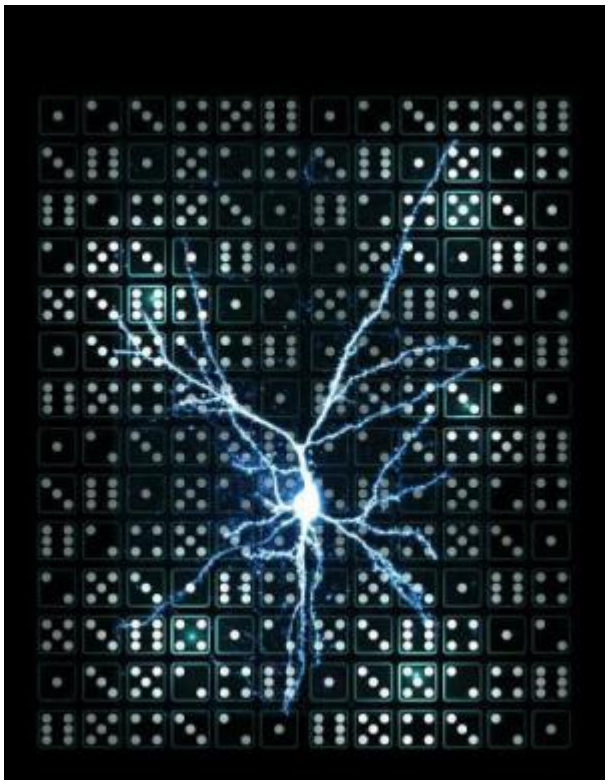
That's not to suggest that the later pieces aren't impressive, only that they're not as gripping as the early ones. At MoMA the mobile sculpture draws mothlike viewers into the space, but eventually — inevitably — they gravitate to the black holes.

Those works resonate for much the same reasons "Mad Men" does. As Donald Judd once wrote, Ms. Bontecou "linked something as social as war to something as private as sex, making one an aspect of the other."

"Lee Bontecou: All Freedom in Every Sense" continues through Sept. 6 at the Museum of Modern Art; (212) 708-9400, moma.org.

http://www.nytimes.com/2010/08/13/arts/design/13bontecou.html?ref=design

Single Neurons Can Detect Sequences



A neuron in the visual cortex of the mouse was filled with a fluorescent dye so that the dendrites could be visualised. A laser was targeted to small spots on single dendrites to activate groups of inputs in different orders. The electrical response of the neuron was recorded and was found to be be different for each of the input sequences. (Credit: Tiago Branco/Hausser Lab: UCL)

ScienceDaily (Aug. 13, 2010) — Single neurons in the brain are surprisingly good at distinguishing different sequences of incoming information according to new research by UCL neuroscientists.

The study, published August 12 in *Science* and carried out by researchers based at the Wolfson Institute for Biomedical Research at UCL, shows that single neurons, and indeed even single dendrites, the tiny receiving elements of neurons, can very effectively distinguish between different temporal sequences of incoming information.

This challenges the widely held view that this kind of processing in the brain requires large numbers of neurons working together, as well as demonstrating how the basic components of the brain are exceptionally powerful computing devices in their own right.

First author Tiago Branco said: "In everyday life, we constantly need to use information about sequences of events in order to understand the world around us. For example, language, a collection of different sequences of similar letters or sounds assembled into sentences, is only given meaning by the order in which these sounds or letters are assembled.

"The brain is remarkably good at processing sequences of information from the outside world. For example, modern computers will still struggle to decode a rapidly spoken sequence of words that a 5 year-old child will have no trouble understanding. How the brain does so well at distinguishing one sequence of events from another is not well understood but, until now, the general belief has been that this job is done by large numbers of neurons working in concert with each other."

Using a mouse model, the researchers studied neurons in areas of the brain which are responsible for processing sensory input from the eyes and the face. To probe how these neurons respond to variation in the order of a number of inputs, they used a laser to activate inputs on the dendrites in precisely defined patterns and recorded the resulting electrical responses of the neurons.

Surprisingly, they found that each sequence produced a different response, even when it was delivered to a single dendrite. Furthermore, using theoretical modelling, they were able to show that the likelihood that two sequences can be distinguished from each other is remarkably high.

Senior author Professor Michael Hausser commented: "This research indicates that single neurons are reliable decoders of temporal sequences of inputs, and that they can play a significant role in sorting and interpreting the enormous barrage of inputs received by the brain.

"This new property of neurons and dendrites adds an important new element to the "toolkit" for computation in the brain. This feature is likely to be widespread across many brain areas and indeed many different animal species, including humans."

Funding for this study was provided by the Gatsby Charitable Foundation and the Wellcome Trust.

Story Source:

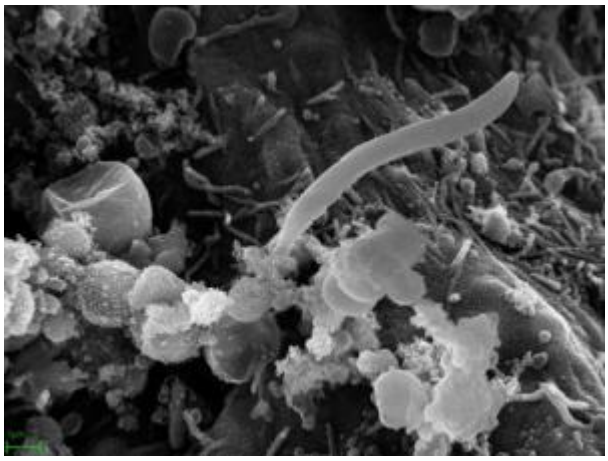
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University College London**.

Journal Reference:

1. Tiago Branco, Beverley A. Clark, and Michael Hausser. **Dendritic discrimination of temporal input sequences in cortical neurons**. *Science*, August 12 2010 DOI: 10.1126/science.1189664

http://www.sciencedaily.com/releases/2010/08/100812151632.htm

Antibiotics for the Prevention of Malaria



A Plasmodium sporozoite (infectious stage of the malaria parasite transmitted by mosquito bite) entering the first host cell in the human body, i.e. the liver cell. (Credit: Dr. Volker Brinkmann, Max Planck Institute for Infection Biology, Berlin.)

ScienceDaily (Aug. 13, 2010) — If mice are administered an antibiotic for three days and are simultaneously infected with malaria, no parasites appear in the blood and life-threatening disease is averted. In addition, the animals treated in this manner also develop robust, long-term immunity against subsequent infections.

This discovery was made by the team headed by Dr. Steffen Borrmann from the Department of Infectious Diseases at Heidelberg University Hospital in cooperation with Dr. Kai Matuschewski of the Max Planck Institute for Infection Biology in Berlin. The scientists think that safe and affordable prophylaxis with antibiotics in residents of areas with high malaria transmission has the potential to be used as a natural "needle-free" vaccination against malaria.

Malaria is still the most common and most dangerous vector-borne disease. The World Health Organization (WHO) estimates that a million people a year die of malaria, especially children in African countries. Globally, over three billion people are at risk of being infected with malaria. There is still no medicine that reliably protects people from infection and simultaneously promotes building up long-term immunity.

Mice in the model had full protection

The scientists developed the following immunization model on mice. Sporozoites (infectious stage of malaria parasites transmitted by mosquitoes) were injected directly into the animals' blood. At the same time, mice were treated with the antibiotics clindamycin or azithromycin. Normally, the sporozoites enter the liver, where they replicate massively and mature to the disease-causing blood stage forms (merozoites). The medication did not slow down the maturing of the merozoites in liver cells, but they prevented the red corpuscles in the blood from becoming infected. The typical disease symptoms such as fever and if left untreated, fatal malaria, which are caused solely by the blood stage forms of the parasite, did not occur. The parasites that accumulated in the liver gave the immune system sufficient stimulus to develop robust, long-term immunity. After 40 days, four months, and six months, the researchers again infected the mice with sporozoites, this time without adding antibiotics. All animals had complete protection against malaria.

Transferability to humans

This of course raises the question of whether these results can be transferred to humans. Under field conditions, mosquito bites confront the human body with frequent, but rather low concentrations of parasites. When mimicking this infection mode in the mouse model, 30 percent of the mice were still protected. For 85 percent of the mice that were still infected, the malaria did not affect the brain, indicating a favorable prognosis.

"The antibiotics used are reasonably priced medicines with few and self-limiting side effects. The periodic, prophylactic administration of antibiotics to people in malaria regions has the potential to be used as a "needle-free," natural vaccination. This would give us an additional powerful tool against malaria," says Dr. Steffen Borrmann. Dr. Kai Matuschewski adds, "A major motivation for our study was to test a simple concept that can also be realized in malaria regions. We are convinced that weakened parasites offer the best protection against a complex parasitical disease such as malaria."

New options for future medicines

The antibiotics administered target the apicoplast of the parasites. That is a small cellular organ of bacterial origin that the parasites need to penetrate other cells of the host organism. But since the medication blocking the apicoplast does not prevent the sporozoites from reproducing in the liver cell, the immune system is exposed to the full antigen load of a natural infection. This is not the case for previously developed vaccines with radiated or genetically modified malaria pathogens. "Even if our results cannot be confirmed in a field trial, the apicoplast is a promising target for future medication," explains Dr. Johannes Friesen of the Max Planck Institute for Infection Biology.

Story Source:

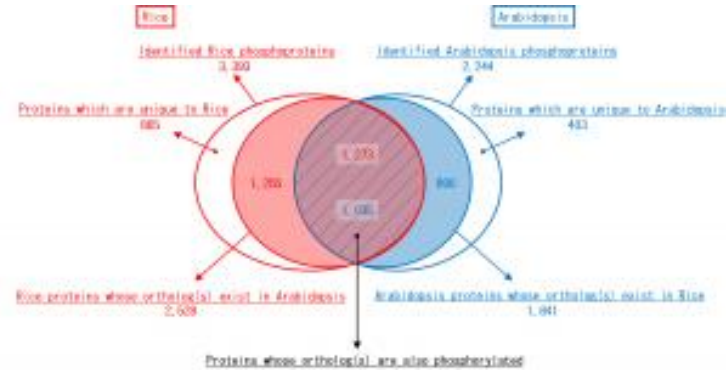
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University Hospital Heidelberg**.

Journal Reference:

1. Friesen et al. **Natural Immunization Against Malaria: Causal Prophylaxis with Antibiotics**. *Science Translational Medicine*, 2010; 2 (40): 40ra49 DOI: 10.1126/scitranslmed.3001058

http://www.sciencedaily.com/releases/2010/07/100720101347.htm

Shared Phosphoproteome Links Remote Plant Species



Overlap between rice and Arabidopsis phosphoproteomes. (Credit: Image courtesy of RIKEN)

ScienceDaily (Aug. 13, 2010) — Researchers at RIKEN and Keio University have shown that even the most widely-varying species of plants share remarkable similarities in the composition of proteins in them that undergo phosphorylation, a regulatory mechanism involved in various cellular phenomena. A database released by the group, with information on over three thousand phosphorylated proteins and phosphorylation sites in rice, opens new doors in the study and engineering of plants.

The addition of a phosphate group to a protein, known as phosphorylation, plays a vital role in regulating cellular phenomena and as a mediator of signaling pathways in the cell. The function of this process in regulating plant growth and development in particular makes it highly attractive for plant engineering, yet existing resources on phosphorylation are limited to model plants such as *Arabidopsis*, beyond which their applicability is unclear.

To expand the range of uses for these resources, the research group set out to determine the degree to which phosphorylation mechanisms are conserved across two very different plant species: *Arabidopsis*, from the family of flowering plants known as dicotyledons (dicots), and rice, from the family known as monocotyledons (monocots). Their large-scale analysis on rice, the first ever, identified a total of 3393 different types of proteins regulated by phosphorylation and their phosphorylation sites, of which more than half, they showed, are shared by *Arabidopsis*.

The surprising discovery that these two very different plants exhibit significant similarities in their mechanisms of phosphorylation suggests that information on the "phosphoproteome" of one species can be applied to others, greatly contributing to applications in plant engineering.

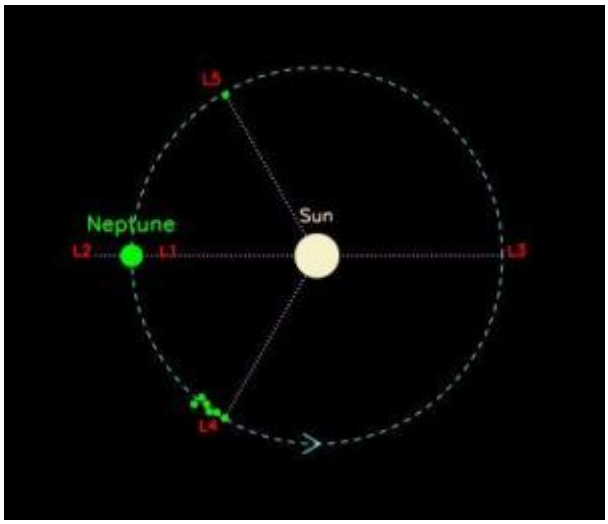
Data leading to the discovery has been made available to the public in an open-access database, the Plant Phosphoproteome Database, released online on May 12.

Story Source:

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

http://www.sciencedaily.com/releases/2010/07/100727065641.htm

Asteroid Found in Gravitational 'Dead Zone' Near Neptune



The five Lagrangian points of stability are shown at Neptune. (Credit: Scott Sheppard)

ScienceDaily (Aug. 13, 2010) — There are places in space where the gravitational tug between a planet and the Sun balance out, allowing other smaller bodies to remain stable. These places are called Lagrangian points. So-called Trojan asteroids have been found in some of these stable spots near Jupiter and Neptune. Trojans share their planet's orbit and help astronomers understand how the planets formed and how the solar system evolved. Now Scott Sheppard at the Carnegie Institution's Department of Terrestrial Magnetism and Chad Trujillo* have discovered the first Trojan asteroid, 2008 LC18, in a difficult-to-detect stability region at Neptune, called the Lagrangian L5 point.

They used the discovery to estimate the asteroid population there and find that it is similar to the asteroid population at Neptune's L4 point. The research is published in the August 12, 2010, online issue of *Science* Express.

Sheppard explained: "The L4 and L5 Neptune Trojan stability regions lie about 60 degrees ahead of and behind the planet, respectively. Unlike the other three Lagrangian points, these two areas are particularly stable, so dust and other objects tend to collect there. We found 3 of the 6 known Neptune Trojans in the L4 region in the last several years, but L5 is very difficult to observe because the line-of-sight of the region is near the bright center of our galaxy."

The scientists devised a unique observing strategy. Using images from the digitized all-sky survey they identified places in the stability regions where dust clouds in our galaxy blocked out the background starlight from the galaxy's plane, providing an observational window to the foreground asteroids. They discovered the L5 Neptune Trojan using the 8.2-meter Japanese Subaru telescope in Hawaii and determined its orbit with Carnegie's 6.5-meter Magellan telescopes at Las Campanas, Chile.

"We estimate that the new Neptune Trojan has a diameter of about 100 kilometers and that there are about 150 Neptune Trojans of similar size at L5," Sheppard said. "It matches the population estimates for the L4 Neptune stability region. This makes the Neptune Trojans more numerous than those bodies in the main

asteroid belt between Mars and Jupiter. There are fewer Neptune Trojans known simply because they are very faint since they are so far from the Earth and Sun."

The L5 Trojan has an orbit that is very tilted to the plane of the solar system, just like several in L4. This suggests they were captured into these stable regions during the very early solar system when Neptune was moving on a much different orbit than it is now. Capture was either through a slow, smooth planetary migration process or as the giant planets settled into their orbits, their gravitational attraction could have caught and "frozen" asteroids into these spots. The solar system was likely a much more chaotic place during that time with many bodies stirred up onto unusual orbits.

The region of space surveyed also included a volume through which the New Horizons spacecraft will pass after its encounter with Pluto in 2015.

The work was funded in part by the New Horizon's spacecraft mission to Pluto.

***** Co-author Chadwick Trujillo is with the Gemini Observatory.

Story Source:

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

Journal Reference:

1. Scott S. Sheppard and Chadwick A. Trujillo. **Detection of a Trailing (L5) Neptune Trojan**. *Science*, August 12 2010 DOI: 10.1126/science.1189666

http://www.sciencedaily.com/releases/2010/08/100812151628.htm

Scientists Test Australia's Moreton Bay as Coral 'Lifeboat'

A new landscape, massive corals such as these have only come to dominate Moreton Bay's reefs after European settlement. Branching corals, the major components of reefs worldwide, are no longer dominant in the Bay. (Credit: Photo courtesy of Matt Lybolt, ARC Centre of Excellence for Coral Reef Studies)

ScienceDaily (Aug. 13, 2010) — An international team of scientists has been exploring Moreton Bay, close to Brisbane, as a possible 'lifeboat' to save corals from the Great Barrier Reef at risk of extermination under climate change.

In a new research paper they say that corals have been able to survive and flourish in the Bay, which lies well to the south of the main GBR coral zones, during about half of the past 7000 years.

Corals only cover about 1 per cent of the Moreton Bay area currently, and have clearly been adversely affected by clearing of the surrounding catchments and human activities on land and sea, says lead author Matt Lybolt of the ARC Centre of Excellence for Coral Reef Studies and The University of Queensland.

"The demise of tropical coral reefs around the world is due mainly to overfishing, pollution and climate change. There is also plenty of historical evidence that coral reefs can move from one environment to another as the climate and other conditions change," Matt explains.

"In view of this, various places -- including Moreton Bay -- are being investigated as possible refuges in which coral systems can be preserved should they begin to die out in their natural settings. Indeed, some people have even talked of relocating and re-seeding corals in other locations that better suit their climatic needs."

The team's study of Moreton Bay reveals that it is not exactly ideal coral habitat, being cold in winter, lacking sufficient direct sunlight, subject to turbid freshwater inflows and -- more recently -- to a range of human impacts.

"Even before European settlers came on the scene the Bay underwent phases in which corals grew prolifically -- and phases in which they died away almost completely. We understand what causes corals to die back, but we are less clear about what causes them to recover," Matt says.

"Broadly, the corals seemed to do well at times when the climate, sea levels and other factors were most benign and stable -- and to decline when El Nino and other disturbances made themselves felt."

The Moreton Bay corals have been in an expansionary phase during the last 400 years, initially dominated by the branching Acropora corals but, since the Bay's catchment was cleared and settled, these have died back leaving mainly slow-growing types of coral.

"Under climate change we expect winters to be warmer and sea levels to rise -- and both of these factors will tend to favour the expansion of corals in Moreton Bay," Matt says.

"However this expansion of corals may not occur unless we make a major effort to improve water quality in the Bay, by not allowing effluent, polluted runoff or sediment to enter it, and also by regrowing mangrove forests and seagrass beds within the Bay. "

The team concludes that Moreton Bay's potential as a good 'lifeboat' for corals is limited by four major factors:

- It is highly sensitive to what the 2 million residents of its catchment do that affects it
- It presently has very few branching corals left
- The area on which corals can grow is limited, both naturally and by human activity
- Finally, the historical record suggests the Bay is only a good coral refuge about half of the time.

Matt says that there is nevertheless scope for changes in the management of the Bay and its surrounding catchments that can improve its suitability as a coral environment. "The reefs of today don't look anything like they did in the past, so it's really a question of 'What sort of coral reef do you want?'," he says.

However there needs to be a clearer scientific understanding of the drivers that have caused corals to boom and bust within the Bay over the past seven millennia before we can be sure it is worthwhile attempting to make Moreton Bay a 'lifeboat' for the GBR, he cautions.

Matt noted that there are very few suitable coral habitats south of the southern end of the GBR to which corals can migrate, should the northern parts of the reef become untenable for corals due to the impact of global warming.

Their paper "Instability in a marginal coral reef: the shift from natural variability to a human-dominated seascape" by Matt Lybolt, David Neil, Jian-xin Zhao, Yue-xing Feng, Ke-Fu Yu and John Pandolfi appears in the latest issue of the journal *Frontiers in Ecology and Environment.*

Story Source:

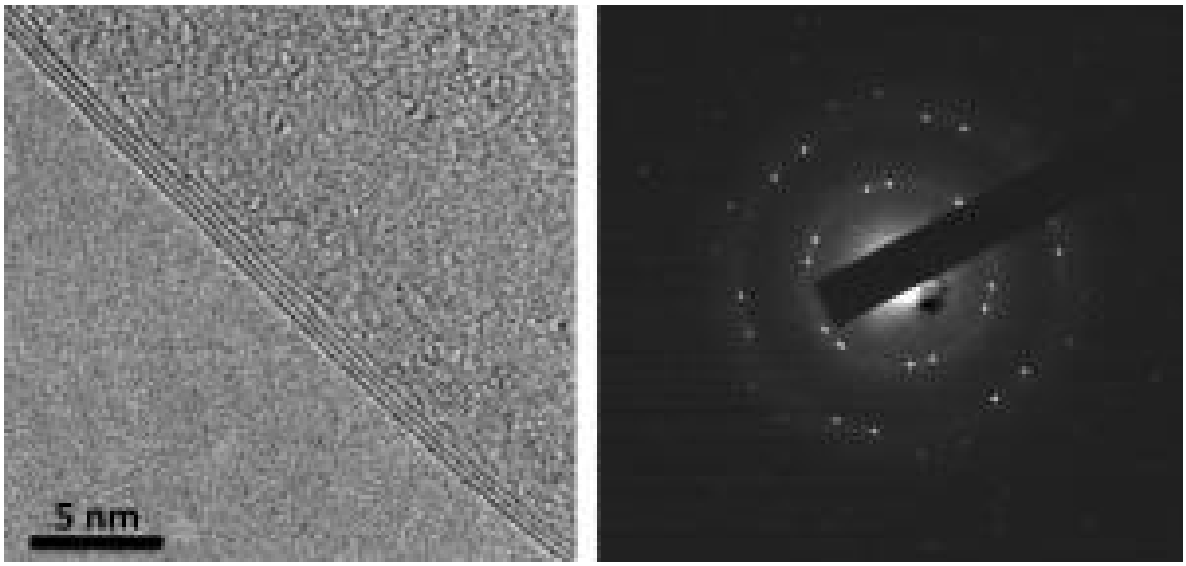
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **ARC Centre of Excellence in Coral Reef Studies**.

Journal Reference:

1. Lybolt et al. **Instability in a marginal coral reef: the shift from natural variability to a human-dominated seascape**. *Frontiers in Ecology and the Environment*, 2010; 100722074133007 DOI: 10.1890/090176

http://www.sciencedaily.com/releases/2010/07/100726094911.htm

Hexagonal Boron Nitride Sheets May Help Graphene Supplant Silicon



A transmission electron microscope image, left, shows one-atom-thick layers of hexagonal boron nitride edge-on. At right is a selected area electron diffraction of an h-BN layer. (Credit: Credit Li Song/Rice University)

ScienceDaily (Aug. 13, 2010) — What researchers might call "white graphene" may be the perfect sidekick for the real thing as a new era unfolds in nanoscale electronics.

But single-atom-thick layers of hexagonal boron nitride (h-BN), the material under intense study at Rice University's world-class Department of Mechanical Engineering and Materials Science, are likely to find some macro applications as well.

Researchers in the lab of Pulickel Ajayan, Rice's Benjamin M. and Mary Greenwood Anderson Professor in Mechanical Engineering and Materials Science and of chemistry, have figured out how to make sheets of h-BN, which could turn out to be the complementary apple to graphene's orange.

The results were reported last week in the online journal *Nano Letters*.

Graphene, touted as a possible successor to silicon in microelectronics applications, is the new darling of research labs that hope to take advantage of its superb electronic properties.

Hexagonal boron nitride, on the other hand, is an insulator. Earlier this year, Rice postdoctoral researchers in Ajayan's group found a way to implant islands of h-BN into sheets of graphene, a unique way to exert a level of control over the sheet's electronic character.

Now the team, led by primary author Li Song, has figured out how to deposit sheets of pure h-BN, which is naturally white in bulk form, anywhere from one to five atoms thick on a copper substrate. The material can then be transferred to other substrates.

They used a chemical vapor deposition process to grow the h-BN sheets on a 5-by-5 centimeter copper backing at temperatures around 1,000 degrees Celsius. The sheets could then be stripped from the copper and placed on a variety of substrates.

Ultimately, Song sees h-BN sheets finding wide use as a highly effective insulator in graphene-based electronics, another stride on the quick-step march toward the replacement of silicon with materials that could push beyond the boundaries of Moore's Law, which states the number of transistors that can be placed on an integrated circuit doubles about every two years.

He said it should be also possible to draw microscopic patterns of graphene and h-BN, which could be useful in creating nanoscale field-effect transistors, quantum capacitors or biosensors.

Strength tests using the tip of an atomic force microscope to push h-BN into holes in a silicon substrate showed it to be highly elastic and nearly as strong as graphene, the single-atom form of pure carbon.

Song said the size of h-BN sheets is limited only by the size of the copper foil and furnace used to grow it. The process should be adaptable to the same kind of roll-to-roll technique recently used to form 30-inch sheets of graphene. "If you have a huge furnace, you can go large," he said.

Co-authors of the paper with Song and Ajayan are Boris Yakobson, a professor in mechanical engineering and materials science and of chemistry; Jun Lou, an assistant professor in mechanical engineering and materials science; postdoctoral research associates Lijie Ci and Pavel Sorokin; and graduate student Hao Lu, all of Rice; Chuanhong Jin of the National Institute of Advanced Industrial Science and Technology in Tsukuba, Japan; visiting student Jie Ni of Tsinghua University, China; and Alexander Kvashnin and Dmitry Kvashnin of Siberian Federal University of Krasnoyarsk, Russia.

The research was funded by Rice University, the Office of Naval Research MURI program on graphene, the Basic Energy Science division of the Department of Energy, the National Science Foundation, the Welch Foundation, the International Balzan Foundation and the Chinese State Scholarship Fund.

Story Source:

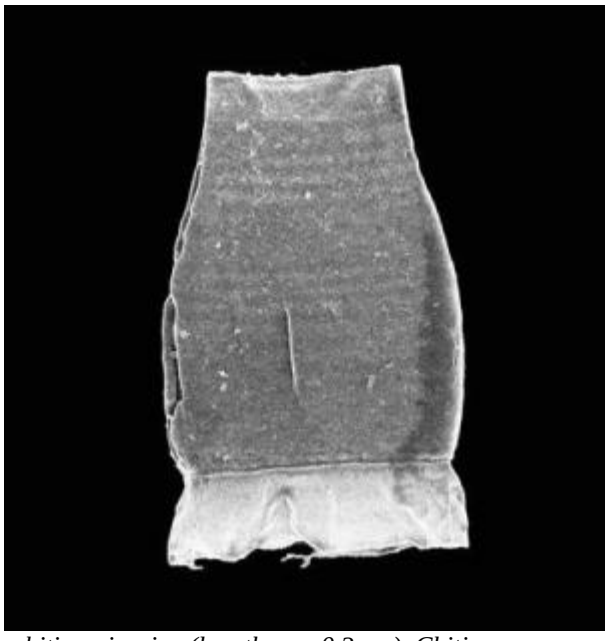
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Rice University**.

Journal Reference:

1. Li Song, Lijie Ci, Hao Lu, Pavel B. Sorokin, Chuanhong Jin, Jie Ni, Alexander G. Kvashnin, Dmitry G. Kvashnin, Jun Lou, Boris I. Yakobson and Pulickel M. Ajayan. **Large Scale Growth and Characterization of Atomic Hexagonal Boron Nitride Layers**. *Nano Letters*, 2010; 100722142755098 DOI: 10.1021/nl1022139

http://www.sciencedaily.com/releases/2010/07/100729122340.htm

An Ancient Earth Like Ours: Geologists Reconstruct Earth's Climate Belts Between 460 and 445 Million Years Ago



This is a specimen of the chitinozoan species Armoricochitina nigerica (length = c. 0.3mm). Chitinozoans are microfossils of marine zooplankton in the Ordovician. Their distribution allows to track climate belts in deep time, much in a way that zooplankton has been used for climate modeling in the Cenozoic. A. nigerica is an important component of the Polar Fauna during the late Ordovician Hirnantian glaciation. (Credit: University of Leicester)

ScienceDaily (Aug. 12, 2010) — An international team of scientists including Mark Williams and Jan Zalasiewicz of the Geology Department of the University of Leicester, and led by Dr. Thijs Vandenbroucke, formerly of Leicester and now at the University of Lille 1 (France), has reconstructed the Earth's climate belts of the late Ordovician Period, between 460 and 445 million years ago.

The findings have been published online in the *Proceedings of the National Academy of Sciences* -- and show that these ancient climate belts were surprisingly like those of the present.

The researchers state: "The world of the ancient past had been thought by scientists to differ from ours in many respects, including having carbon dioxide levels much higher -- over twenty times as high -- than those of the present. However, it is very hard to deduce carbon dioxide levels with any accuracy from such ancient rocks, and it was known that there was a paradox, for the late Ordovician was known to include a brief, intense glaciation -- something difficult to envisage in a world with high levels of greenhouse gases. "

The team of scientists looked at the global distribution of common, but mysterious fossils called chitinozoans -- probably the egg-cases of extinct planktonic animals -- before and during this Ordovician glaciation. They found a pattern that revealed the position of ancient climate belts, including such features as the polar front, which separates cold polar waters from more temperate ones at lower latitudes. The position of these climate belts changed as the Earth entered the Ordovician glaciation -- but in a pattern very similar to that which

happened in oceans much more recently, as they adjusted to the glacial and interglacial phases of our current (and ongoing) Ice Age.

This 'modern-looking' pattern suggests that those ancient carbon dioxide levels could not have been as high as previously thought, but were more modest, at about five times current levels (they would have had to be somewhat higher than today's, because the sun in those far-off times shone less brightly).

"These ancient, but modern-looking oceans emphasise the stability of Earth's atmosphere and climate through deep time -- and show the current man-made rise in greenhouse gas levels to be an even more striking phenomenon than was thought," the researchers conclude.

Story Source:

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

Journal Reference:

1. Vandenbroucke, T.R.A., Armstrong, H.A., Williams, M., Paris, F., Zalasiewicz, J.A., Sabbe, K., Nolvak, J., Challands, T.J., Verniers, J. & Servais, T. **Polar front shift and atmospheric CO_2 during the glacial maximum of the Early Paleozoic Icehouse**. *Proceedings of the National Academy of Sciences*, 2010; DOI: 10.1073/pnas.1003220107

http://www.sciencedaily.com/releases/2010/08/100809161228.htm

Neurological Process for the Recognition of Letters and Numbers Explained

Scientists from the Basque Research Center on Cognition, Brain and Language have analyzed the influence of context on the visual recognition of a written word regardless of the format in which these letters may be displayed. (Credit: Elebilab)

ScienceDaily (Aug. 12, 2010) — How does the brain link the visual basic traits of letters and numbers to abstract representations and to words? Scientists from the Basque Research Center on Cognition, Brain and Language have analyzed the influence of context on the visual recognition of a written word regardless of the format in which these letters may be displayed.

"We analyzed the influence of the context given by a word when linking the physical traits of its components to the abstract representations of letters," explains Nicola Molinaro, main author of the study and researcher of the Basque Research Center on Cognition, Brain and Language (BCBL).

The results, published in Neuropsychologia journal, show that the linguistic context given by a word impacts the way in which single abstract representations of the letters that make it up are accessed, and that such access is partially independent from the physical properties of the stimuli.

"Otherwise, it would not be possible to think that a number can activate the representation of a letter when it is inserted among a string of letters that make up a word (M4T3R14L)," says Molinaro.

"We used numbers that visually resemble letters (1-I, 5-S, 7-T), and we replaced them," states the expert. The words were presented to participants during tenths of milliseconds (imperceptible to consciousness). Then, the correct words where shown so that participants could read them (for example, M4T3R14L -- MATERIAL). Control strings including numbers explicitly different to letters (M9T6R26L- MATERIAL) and word identity (MATERIAL- MATERIAL) were also included.

The brain responds in three different ways

While participants read the words in silence, scientists recorded brain potentials associated to events (ERPs), which showed three main effects. The first one is that, over the 150 ms window, identical strings and strings including visually similar numbers, compared to control strings, caused a reduction in positivity, that is, in the ease of recognition.

"This effect shows that in the case of strings with letter-like numbers, the link between the visual physical representations of numbers and the abstract representations of correct letters is made automatically, given the visual overlapping among characters," points out the neuroscientist.

A second effect confirmed, at the 200 ms window, greater negativity for number conditions (M4T3R14L and M9T6R26L). "The brain recognizes that the elements that make up the strings presented unconsciously are in fact numbers, not letters, showing some specificity in the processing despite the initial visual overlapping found in the above component," he assures.

Lastly, 250 ms after the display of strings, the conditions of identity and visually letter-like numbers showed a very similar positive effect, clearly different from the effect caused by the strings with numbers that were visually different from letters (control).

"The global processing of words is very similar for strings that include letters that are properly written and for those including numbers that are visually similar to letters," concludes Molinaro.

Story Source:

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

Journal Reference:

1. Molinaro et al. **From numbers to letters: Feedback regularization in visual word recognition**. *Neuropsychologia*, 2010; 48 (5): 1343 DOI: 10.1016/j.neuropsychologia.2009.12.037

http://www.sciencedaily.com/releases/2010/07/100726085428.htm

Certain Vena Cava Filters May Fracture, Causing Potentially Life-Threatening Complications

ScienceDaily (Aug. 12, 2010) — Two specific types of vena cava filters, devices used to prevent blood clots from reaching the lungs, appear to have evidence of fracturing inside the body, with some fractured fragments traveling to the heart and causing potentially life-threatening complications, according to a report that will appear in the November 8 print issue of *Archives of Internal Medicine*.

Venous thromboembolism, or the formation of blood clots in the veins, occurs in more than 200,000 Americans per year, according to background information in the article. Anti-clotting medications are the standard therapy for patients with this condition. However, some patients cannot take these drugs and others may continue to develop clots despite taking medications. Vena cava filters, devices placed in the vena cava, the large vein returning blood to the heart from the lower body, are designed to trap clots before they travel to the lungs and have been used as an alternate therapy in these patients. Complications associated with these devices include erosion through the wall of the vena cava, along with migration, obstruction and additional clotting of the filter.

One such filter, the Bard Recovery filter, was developed as a device that could either be left in permanently or retrieved as needed and was commercially available from April 2003 through October 2005. The device consisted of two levels of six radially distributed "arms" and "legs" that anchor the filter to the vein and trap any clots, the authors note. However, these arms and legs reportedly have broken off in some patients. In September 2005, Bard modified the design of the filter to improve its resistance to fracture. The modified Bard G2 cava filter has been implanted in more than 65,000 patients since September 2005, according to information in the article.

Following one initial case of a fractured filter, William Nicholson, M.D., of York Hospital, York, Penn., and colleagues evaluated all 189 patients who received either a Bard Recovery or a Bard G2 vena cava filter at that institution between April 2004 and January 2009. Of these, one patient was pregnant, 35 had died and 10 had already had their filter removed. A total of 80 patients underwent fluoroscopy to assess the integrity of the filter, and those whose filter was fragmented also underwent echocardiography and cardiac computed tomography.

A total of 13 of 80 patients (16 percent) had at least one arm or strut fracture from their filter. This included seven of 28 (25 percent) filters that fractured and embolized (i.e., the fractured piece traveled within the vein) among patients with the first-generation Bard Recovery filter. In five of these seven cases (71 percent), at least one fragment traveled to the heart; three of these patients experienced life-threatening symptoms of rapid heartbeat or fluid buildup around the heart and one experienced sudden death at home.

"While the Bard G2 filter incorporated engineering modifications to reduce these occurrences, 12 percent of the implanted Bard G2 filters also fractured (six of 52)," the authors write. In two of these six cases, the fragment blocked blood flow, one in the vein leading from the liver and one in the lungs. In the other four, the fragments remained close to the filter.

"These data initially suggest that the fracture rate for the Bard G2 filter is approximately half that of the Bard Recovery filter. However, on further analysis, this conclusion may not be accurate," the authors write. The average time since filter implantation was about 50 months for patients with the Bard Recovery filter and 24 months for the Bard G2 filter. "The average time intervals in patients where fracture was observed in the Bard Recovery and Bard G2 groups were nearly identical to those of all patients in those respective groups."

"It is essential that patients and their treating physicians be educated about this previously underrecognized and potentially life-threatening complication of these devices," they conclude. "Armed with this knowledge, educated patients can be alert to the presence of pleuritic chest pain and other symptoms that should prompt immediate evaluation. Such early awareness and evaluation could certainly be life saving. In addition, the propensity for filter fragmentation may be directly related to the duration of implantation. Patients and their physicians should be educated about this fact so that they have the opportunity to consider having the filter removed."

Story Source:

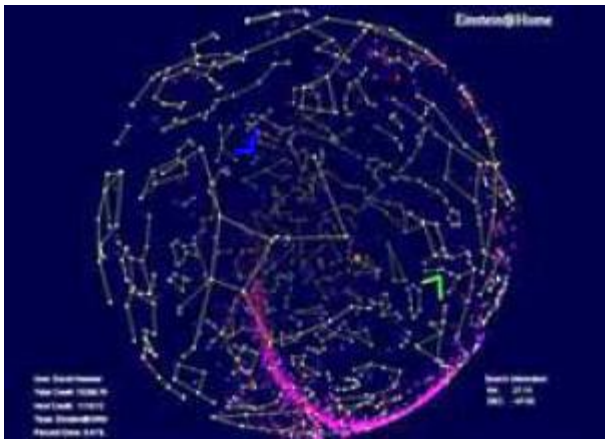
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **JAMA and Archives Journals**.

Journal Reference:

1. William Nicholson et al. **Prevalence of Fracture and Fragment Embolization of Bard Retrievable Vena Cava Filters and Clinical Implications Including Cardiac Perforation and Tamponade**. *Arch Intern Med.*, August 9, 2010 DOI: 10.1001/archinternmed.2010.316

http://www.sciencedaily.com/releases/2010/08/100809161124.htm

Citizen Scientists Discover Rotating Pulsar



Einstein@Home screen shot. About one-third of Einstein@Home's computing capacity is used to search Arecibo data. (Credit: Einstein@Home)

ScienceDaily (Aug. 12, 2010) — Idle computers are the astronomers' playground: Three citizen scientists--an American couple and a German--have discovered a new radio pulsar hidden in data gathered by the Arecibo Observatory. This is the first deep-space discovery by Einstein@Home, which uses donated time from the home and office computers of 250,000 volunteers from 192 different countries. This is the first genuine astronomical discovery by a public volunteer distributed computing project.

The details of their discovery and the process of getting there are revealed in a paper published in the Aug. 12 edition of *Science Express*.

The new pulsar--called PSR J2007+2722--is a neutron star that rotates 41 times per second. It is in the Milky Way, approximately 17,000 light years from Earth in the constellation Vulpecula. Unlike most pulsars that spin as quickly and steadily, PSR J2007+2722 sits alone in space, and has no orbiting companion star. Astronomers consider it especially interesting since it is likely a recycled pulsar that lost its companion. However they cannot rule out that it may be a young pulsar born with an lower-than-usual magnetic field.

Chris and Helen Colvin, of Ames, Iowa, and Daniel Gebhardt, of Universität Mainz, Musikinformatik, Germany, are credited with this discovery. Their computers, along with half a million others from around the world, are harnessed to analyze data for Einstein@Home (volunteers contribute about two computers each).

Einstein@Home--based at the Center for Gravitation and Cosmology at the University of Wisconsin-Milwaukee, and at the Max Planck Institute for Gravitational Physics, Albert Einstein Institute (AEI), Hannover, Germany--has been searching for gravitational waves in data from the U.S. based LIGO (Large Interferometer Gravitational Observatory) since 2005. Starting in March of 2009, Einstein@Home also began searching for signals from radio pulsars in astronomical observations from the Arecibo Observatory in Puerto Rico. Arecibo, a National Science Foundation (NSF) facility operated by Cornell University, is the world's largest and most sensitive radio telescope. About one-third of Einstein@Home's computing capacity is used to search Arecibo data.

"This is a thrilling moment for Einstein@Home and our volunteers. It proves that public participation can discover new things in our universe. I hope it inspires more people to join us to help find other secrets hidden in the data," said Bruce Allen, leader of the Einstein@Home project, Max Planck Institute director and adjunct professor of physics at the University of Wisconsin-Milwaukee.

The paper, "Pulsar Discovery by Global Volunteer Computing," is authored by Allen's graduate student, Benjamin Knispel from the AEI; Bruce Allen; James M. Cordes, Cornell professor of astronomy and chair of the Pulsar ALFA Consortium; and an international team of collaborators. It details the pulsar and announces the first genuine astronomical discovery by a public volunteer distributed computing project.

"No matter what else we find out about it, this pulsar is bound to be extremely interesting for understanding the basic physics of neutron stars and how they form. Its discovery has required a complex system that includes the Arecibo Telescope and computing resources at the Albert Einstein Institute, at the Cornell Center for Advanced Computing, and at the University of Wisconsin-Milwaukee to be able to send data out worldwide to Einstein@Home volunteers," Cordes said. The Arecibo Observatory is funded by the NSF, which collaborates with the Max Planck Gesellschaft to support Einstein@Home.

"This is an exciting development that highlights the importance of citizen science, as well as the partnerships and discoveries that arise when scientific data are shared," said Ed Seidel, assistant director for NSF's directorate for Mathematical and Physical Sciences. "Having previously led a research group at the AEI myself, I deeply understand the importance of international collaborations such as this," he added.

Story Source:

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

Journal Reference:

1. B. Knispel, B. Allen, J. M. Cordes, J. S. Deneva, D. Anderson, C. Aulbert, N. D. R. Bhat, O. Bock, S. Bogdanov, A. Brazier, F. Camilo, D. J. Champion, S. Chatterjee, F. Crawford, P. B. Demorest, H. Fehrmann, P. C. C. Freire, M. E. Gonzalez, D. Hammer, J. W. T. Hessels, F. A. Jenet, L. Kasian, V. M. Kaspi, M. Kramer, P. Lazarus, J. van Leeuwen, D. R. Lorimer, A. G. Lyne, B. Machenschalk, M. A. McLaughlin, C. Messenger, D. J. Nice, M. A. Papa, H. J. Pletsch, R. Prix, S. M. Ransom, X. Siemens, I. H. Stairs, B. W. Stappers, K. Stovall, and A. Venkataraman. **Pulsar Discovery by Global Volunteer Computing**. *Science*, 2010; DOI: 10.1126/science.1195253

http://www.sciencedaily.com/releases/2010/08/100812172059.htm

Scientists Outline a 20-Year Master Plan for the Global Renaissance of Nuclear Energy

Nuclear power plant. (Credit: iStockphoto/Björn Kindler)

ScienceDaily (Aug. 12, 2010) — Scientists outline a 20-year master plan for the global renaissance of nuclear energy that could see nuclear reactors with replaceable parts, portable mini-reactors, and ship-borne reactors supplying countries with clean energy, in research published August 12 in the journal *Science*.

The scientists, from Imperial College London and the University of Cambridge, suggest a two-stage plan in their review paper that could see countries with existing nuclear infrastructure replacing or extending the life of nuclear power stations, followed by a second phase of global expansion in the industry by the year 2030. The team say their roadmap could fill an energy gap as old nuclear, gas and coal fired plants around the world are decommissioned, while helping to reduce the planet's dependency on fossil fuels.

Professor Robin Grimes, from the Department of Materials at Imperial College London, says: "Our study explores the exciting opportunities that a renaissance in nuclear energy could bring to the world. Imagine portable nuclear power plants at the end of their working lives that can be safely shipped back by to the manufacturer for recycling, eliminating the need for countries to deal with radioactive waste. With the right investment, these new technologies could be feasible. Concerns about climate change, energy security and depleting fossil fuel reserves have spurred a revival of interest in nuclear power generation and our research sets out a strategy for growing the industry long-term, while processing and transporting nuclear waste in a safe and responsible way."

The researchers suggest in their study that based on how technologies are developing, new types of reactors could come online that are much more efficient than current reactors by 2030. At the moment, most countries have light water reactors, which only use a small percentage of the uranium for energy, which means that the uranium is used inefficiently. The team suggest that new 'fast reactors' could be developed that could use uranium approximately 15 times more efficiently, which would mean that uranium supplies could last longer, ensuring energy security for countries.

Another idea is to develop reactors with replaceable parts so that they can last in excess of 70 years, compared to 40 or 50 years that plants can currently operate at. Reactors are subjected to harsh conditions including extreme radiation and temperatures, meaning that parts degrade over time, affecting the life of the reactor. Making replaceable parts for reactors would make them more cost effective and safe to run over longer periods of time.

Flexible nuclear technologies could be an option for countries that do not have an established nuclear industry, suggest the scientists. One idea involves ship-borne civil power plants that could be moored offshore, generating electricity for nearby towns and cities. This could reduce the need for countries to build large electricity grid infrastructures, making it more cost effective for governments to introduce a nuclear industry from scratch.

The researchers also suggest building small, modular reactors that never require refuelling. These could be delivered to countries as sealed units, generating power for approximately 40 years. At the end of its life, the reactor would be returned to the manufacturer for decommissioning and disposal. Because fuel handling is avoided at the point of electricity generation, the team say radiation doses to workers would be reduced, meaning that the plants would be safer to operate.

The scientists believe the roll out of flexible technologies that could be returned to the manufacturer at their end of their shelf life could also play an important role in preventing the proliferation of nuclear armaments, because only the country of origin would have access to spent fuel, meaning that other countries could not reprocess the fuel for use in weapons.

In the immediate future, the researchers suggest the first stage of the renaissance will see countries with existing nuclear energy infrastructure extending the life of current nuclear power plants. The researchers suggest this could be made possible by further developing technologies for monitoring reactors, enabling them to last longer because engineers can continually assess the safety and performance of the power plants.

The researchers say new global strategies for dealing with spent fuel and radioactive components will have to be devised. Until now, countries have not developed a coordinated strategy for dealing with waste. One suggestion is to develop regional centres, where countries can send their waste for reprocessing, creating new industries in the process.

Professor Grimes adds: "In the past, there has been the perception in the community that nuclear technology has not been safe. However, what most people don't appreciate is just how much emphasis the nuclear industry places on safety. In fact, safety is at the very core of the industry. With continual improvements to reactor design, nuclear energy will further cement its position as an important part of our energy supply in the future."

However, the authors caution that governments around the world need to invest more in training the next generation of nuclear engineers. Otherwise, the nuclear industry may not have enough qualified personnel to make the renaissance a reality.

Dr William Nuttall, University Senior Lecturer in Technology Policy at Cambridge Judge Business School, University of Cambridge, concludes: "The second phase of the 'Two-Stage Nuclear Renaissance' is not inevitable, but we would be foolish if we did not provide such an option for those that must make key energy technology decisions in the decades ahead.

Too often, decisions shaping the direction of research and development in the nuclear sector are made as part of a strategy for eventual deployment. As such small research capacities can become confused with multi-billion dollar plans and stall as a result. Relatively modest research and development can, however, provide us with important options for the future. Such research and development capacities need to be developed now if they are to be ready when needed. While some good measures are already underway, the possible challenge ahead motivates even greater efforts."

Story Source:

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

Journal Reference:

1. Robin W. Grimes and William J. Nuttall. **Generating the option of a two-stage nuclear renaissance**. *Science*, 13 August 2010: 799-803. DOI: 10.1126/science.1188928

http://www.sciencedaily.com/releases/2010/08/100812151634.htm

Charcoal Takes Some Heat Off Global Warming: Biochar Can Offset 1.8 Billion Metric Tons of Carbon Emissions Annually

Biochar made from dairy manure pellets at the Department of Agriculture's Agricultural Research Station in Prosser, Wash. (Credit: Photo courtesy of USDA-ARS, Prosser, Wash)

ScienceDaily (Aug. 12, 2010) — As much as 12 percent of the world's human-caused greenhouse gas emissions could be sustainably offset by producing biochar, a charcoal-like substance made from plants and other organic materials. That's more than what could be offset if the same plants and materials were burned to generate energy, concludes a study published August 10 in the journal *Nature Communications*.

"These calculations show that biochar can play a significant role in the solution for the planet's climate change challenge," said study co-author Jim Amonette, a soil chemist at the Department of Energy's Pacific Northwest National Laboratory. "Biochar offers one of the few ways we can create power while decreasing carbon dioxide levels in the atmosphere. And it improves food production in the world's poorest regions by increasing soil fertility. It's an amazing tool."

The study is the most thorough and comprehensive analysis to date on the global potential of biochar. The carbon-packed substance was first suggested as a way to counteract climate change in 1993. Scientists and policymakers have given it increasing attention in the past few years. The study was conducted by Dominic Woolf and Alayne Street-Perrott of Swansea University in Wales, U.K., Johannes Lehmann of Cornell University in Ithaca, N.Y., Stephen Joseph of the University of New South Wales, Australia, and Amonette.

Biochar is made by decomposing biomass like plants, wood and other organic materials at high temperature in a process called slow pyrolysis. Normally, biomass breaks down and releases its carbon into the atmosphere within a decade or two. But biochar is more stable and can hold onto its carbon for hundreds or even thousands of years, keeping greenhouse gases like carbon dioxide out of the air longer. Other biochar benefits include: improving soils by increasing their ability to retain water and nutrients; decreasing nitrous oxide and methane emissions from the soil into which it is tilled; and, during the slow pyrolysis process, producing some bio-based gas and oil that can offset emissions from fossil fuels.

Making biochar sustainably requires heating mostly residual biomass with modern technologies that recover energy created during biochar's production and eliminate the emissions of methane and nitrous oxide, the study also noted.

Crunching numbers and biomass

For their study, the researchers looked to the world's sources of biomass that aren't already being used by humans as food. For example, they considered the world's supply of corn leaves and stalks, rice husks, livestock manure and yard trimmings, to name a few. The researchers then calculated the carbon content of that biomass and how much of each source could realistically be used for biochar production.

With this information, they developed a mathematical model that could account for three possible scenarios. In one, the maximum possible amount of biochar was made by using all sustainably available biomass. Another scenario involved a minimal amount of biomass being converted into biochar, while the third offered a middle course. The maximum scenario required significant changes to the way the entire planet manages biomass, while the minimal scenario limited biochar production to using biomass residues and wastes that are readily available with few changes to current practices.

Amonette and his colleagues found that the maximum scenario could offset up to the equivalent of 1.8 petagrams -- or 1.8 billion metric tons -- of carbon emissions annually and a total of 130 billion metric tons throughout in the first 100 years. Avoided emissions include the greenhouse gases carbon dioxide, methane and nitrous oxide. The estimated annual maximum offset is 12 percent of the 15.4 billion metric tons of greenhouse gas emissions that human activity adds to the atmosphere each year. Researchers also calculated that the minimal scenario could sequester just under 1 billion metric tons annually and 65 billion metric tons during the same period.

But to achieve any of these offsets is no small task, Amonette noted.

"This can't be accomplished with half-hearted measures," Amonette said. "Using biochar to reduce greenhouse gas emissions at these levels is an ambitious project that requires significant commitments from the general public and government. We will need to change the way we value the carbon in biomass."

Experiencing the full benefits of biochar will take time. The researchers' model shows it will take several decades to ramp up biochar production to its maximum possible level. Greenhouse gas offsets would continue past the century mark, but Amonette and colleagues just calculated for the first 100 years.

Biochar and bioenergy work together

Instead of making biochar, biomass can also be burned to produce bioenergy from heat. Researchers found that burning the same amount of biomass used in their maximum biochar scenario would offset 107 billion metric tons of carbon emissions during the first century. The bioenergy offset, while substantial, was 23 metric tons less than the offset from biochar. Researchers attributed this difference to a positive feedback from the addition of biochar to soils. By improving soil conditions, biochar increases plant growth and therefore creates more biomass for biochar productions. Adding biochar to soils can also decrease nitrous oxide and methane emissions that are naturally released from soil.

However, Amonette and his co-authors wrote that a flexible approach including the production of biochar in some areas and bioenergy in others would create optimal greenhouse gas offsets. Their study showed that biochar would be most beneficial if it were tilled into the planet's poorest soils, such as those in the tropics and the Southeastern United States.

Those soils, which have lost their ability to hold onto nutrients during thousands of years of weathering, would become more fertile with the extra water and nutrients the biochar would help retain. Richer soils would increase the crop and biomass growth -- and future biochar sources -- in those areas. Adding biochar to the most infertile cropland would offset greenhouse gases by 60 percent more than if bioenergy were made using the same amount of biomass from that location, the researchers found.

On the other hand, the authors wrote that bioenergy production could be better suited for areas that already have rich soils -- such as the Midwest -- and that also rely on coal for energy. Their analysis showed that bioenergy production on fertile soils would offset the greenhouse gas emissions of coal-fired power plants by 16 to 22 percent more than biochar in the same situation.

Plantations need not apply

The study also shows how sustainable practices can make the biochar that creates these offsets."The scientific community has been split on biochar," Amonette acknowledged. "Some think it'll ruin biodiversity and require large biomass plantations. But our research shows that won't be the case if the right approach is taken."

The authors' estimates of avoided emissions were developed by assuming no agricultural or previously unmanaged lands will be converted for biomass crop production. Other sustainability criteria included leaving enough biomass residue on the soil to prevent erosion, not using crop residues currently eaten by livestock, not adding biochar made from treated building materials to agricultural soils and requiring that only modern pyrolysis technologies -- those that fully recover energy released during the process and eliminate soot, methane and nitrous oxide emissions -- be used for biochar production.

"Roughly half of biochar's climate-mitigation potential is due to its carbon storage abilities," Amonette said. "The rest depends on the efficient recovery of the energy created during pyrolysis and the positive feedback achieved when biochar is added to soil. All of these are needed for biochar to reach its full sustainable potential.

The study was funded by the Department of Energy's Office of Science, DOE's Office of Fossil Energy, the Cooperative State Research Service of the Department of Agriculture, the New York State Energy Research and Development Authority, the United Kingdom's Natural Environment Research Council (NERC) and Economic and Social Research Council (ESRC), and VenEarth Group LLC.

Story Source:

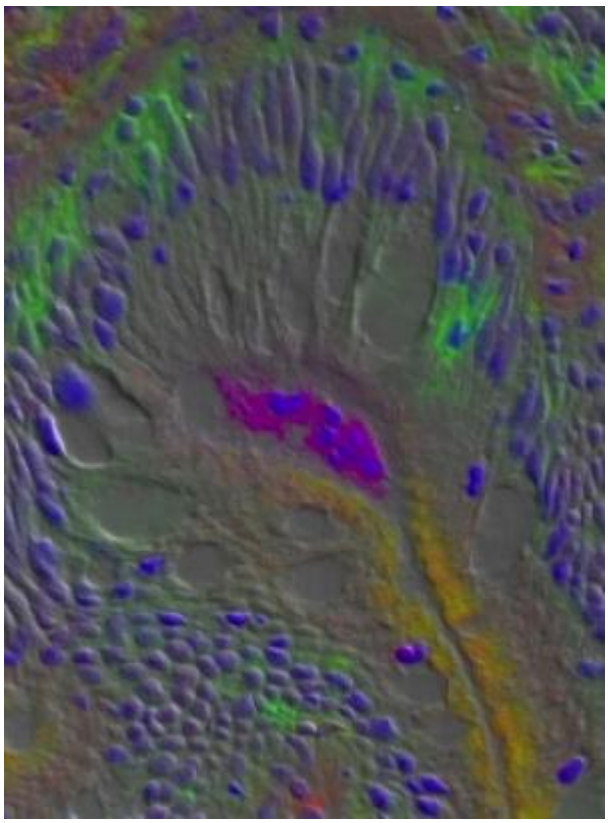
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **DOE/Pacific Northwest National Laboratory**.

Journal Reference:

1. Dominic Woolf, James E. Amonette, F. Alayne Street-Perrott, Johannes Lehmann, Stephen Joseph. **Sustainable biochar to mitigate global climate change**. *Nature Communications*, Aug. 10, 2010

http://www.sciencedaily.com/releases/2010/08/100810122030.htm

Research Reveals Similarities Between Fish and Humans



Gut section from an infected fish showing the presence of IgT+ B cells (green) in the epithelium. Parasite C. shasta (magenta). (Credit: Image courtesy of University of Pennsylvania)

ScienceDaily (Aug. 12, 2010) — A study at the University of Pennsylvania School of Veterinary Medicine has identified the function of one of the earliest antibodies in the animal kingdom, an ancient immunoglobulin that helps explain the evolution of human intestinal immune responses. It was discovered to play a predominant role in the guts of fish and paves the way for a better understanding of human gut immunity as well as for safer, healthier approaches to keeping fish from pathogen infections.

The findings appear in the online version of *Nature Immunology* and will be featured on the cover of the September issue.

The study identified unique aspects of the structure and function of a fish antibody, IgT, and points to this molecule as the most ancient vertebrate immunoglobulin specialized in mucosal immunity. The findings challenge the present paradigm that specialization of immunoglobulin isotypes into different body areas, i.e., intestine and blood, arose during the evolution of four-legged creatures, or tetrapods. While IgT was discovered five years ago, its structure and function remained an enigma.

In addition to characterizing the protein structure of IgT, the study provides direct evidence for the existence of a novel B cell lineage uniquely producing IgT. In the gut, IgT+ B cells represent the predominant B cell subset. More critically, the study showed that responses of rainbow trout IgT to an intestinal parasite were only detected in the gut, whereas IgM responses were confined to plasma. Supporting further the role of IgT in mucosal immunity, the researchers found that a majority of trout intestinal bacteria were coated with IgT. The research team concluded that the specialization of immunoglobulin isotypes into different body compartments is a universal feature of all jawed vertebrate immune systems, a feature required for health maintenance in environmentally different exposed body areas that require different immune needs.

"Immunoglobulins like IgA, IgX and the newly discovered IgT are evolutionarily distant," said Oriol Sunyer, associate professor in the Department of Pathobiology at Penn Vet. "Their specialization into mucosal compartments must have occurred independently by a process of convergent evolution driven by similar selective pressures operating on the gut environment of fish, amphibians and mammals."

Significantly, the study shows that fish IgT and human IgA systems appear to utilize similar solutions to maintain healthy intestines, therefore Sunyer indicated that "future studies on IgT will further unravel structural and functional aspects of human mucosal immunoglobulins that are key to their role in keeping our intestines free of pathogens."

With aquaculture being the fastest growing animal food sector in the United States, as well as in the global marketplace, the findings should also impact fish health and vaccinology. In that regard, all prior studies carried out in teleost fish during the last few decades have missed the specific contribution of IgT in protecting fish from pathogens. Sunyer's studies establish that teleost fish contain not one, as originally believed, but at least two functional immunoglobulins, IgM and IgT, that respond to pathogenic challenge in different body areas. Thus, the new capability of measuring not only IgM but also IgT responses will greatly facilitate the evaluation and understanding of fish immune responses as well as the protective effects of fish vaccines.

"The design of future fish vaccines is likely to be more effective, stimulating not only systemic but also mucosal immunity as we are now able to measure IgT-induced responses," Sunyer said.

"Dr. Sunyer's work will change how we look at disease prevention in fish, and his breakthrough will have a profound impact on the future of the aquaculture industry," said Roger Beachy, director of the National Institute of Food and Agriculture. "I am proud that the USDA supports such innovative research."

Immunoglobulins first emerged in vertebrates around 400 million years ago along with the appearance of the jawed fish, the most ancient living vertebrate species with jaws. Throughout evolutionary time, immunoglobulins diversified into several isotypes with specialized roles in innate and adaptive immunity in different parts of the body, according to the study's author, who says the study of immunoglobulins from fish and other animal species will continue providing new insights that are fundamental for understanding the role of these molecules in protecting us against pathogens.

The research was funded by the National Science Foundation, the National Institutes of Health and the United States Department of Agriculture.

Story Source:

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

Journal Reference:

1. Yong-An Zhang, Irene Salinas, Jun Li, David Parra, Sarah Bjork, Zhen Xu, Scott E LaPatra, Jerri Bartholomew, J Oriol Sunyer. **IgT, a primitive immunoglobulin class specialized in mucosal immunity**. *Nature Immunology*, 2010; DOI: 10.1038/ni.1913

http://www.sciencedaily.com/releases/2010/08/100810094613.htm

Switchgrass Lessens Soil Nitrate Loss Into Waterways, Researchers Find

Nitrates that leach into the soil can affect Iowa communities that depend on the rivers for clean drinking water. They can leach into the soil and are carried downstream. These nitrates are believed to contribute to a dead zone in the Gulf of Mexico where few plants or animals survive. (Credit: ISU photo by Bob Elbert)

ScienceDaily (Aug. 12, 2010) — By planting switchgrass and using certain agronomic practices, farmers can significantly reduce the amount of nitrogen and nitrates that leach into the soil, according to Iowa State University research.

Matt Helmers, associate professor of agricultural and biosystems engineering, and Antonio Mallarino, professor of agronomy, have been studying the amount of nitrates that pass through soil into tiling systems from several different types of crops and fertilizer treatments for the past three summers.

The research is funded by the Iowa Department of Agriculture and Land Stewardship and Iowa State's Leopold Center for Sustainable Agriculture.

They found that certain practices can minimize the amount of nitrogen and nitrates that leach from the field into the drainage tiles.

"One of the biggest things we found is that when alternative biomass sources like switchgrass are grown, even when they use fertilizer, we see dramatically lower nitrate concentrations (in the drainage water)," said Helmers.

The research compared fields that were planted with continuous corn while harvesting just the grain; continuous corn taking the grain and stover; and planting continuous corn taking all possible biomass from the fields. Half of those fields were treated with fertilizer and the other half with manure.

Other fields tested systems that rotate corn and soybeans, and others looked at switchgrass plots that received nitrogen fertilizer.

The results showed that fields planted in continuous corn and treated with fertilizer had the most amount of nitrates leach below the crop root zone into the tile system.

The fields with the least amount of nitrates that leached through the soil were planted in switchgrass and treated with fertilizer or manure.

Helmers says that while switchgrass allows less nitrogen to leach into the soil, farmers need reason plant it.

"Right now, there is not necessarily an economic market for (switchgrass)," said Helmers.

"What we're trying to do is evaluate what might be the environmental benefits of that type of land use," he said. "I think that may be able to inform future policy.

"If we pursue a strategy for additional biofuels from various biomass feedstocks, we need to know what the environmental impacts of those different feedstocks are, because that may play into federal policy," Helmers said.

"If there is enough societal benefit and water quality benefit from growing switchgrass on these soils, there may be potential incentives for producers to grow (switchgrass)," he said.

Helmers estimates that at least a third and possibly as much as half of all farmland in Iowa use tile systems to drain excess water from the fields.

Nitrates that leach into the soil can affect Iowa communities that depend on the rivers for clean drinking water, Helmers says.

Nitrates that leach into the soil and are carried downstream are believed to contribute to a dead zone in the Gulf of Mexico where few plants or animals survive.

Overall, there is need for additional information on how biomass feedstock production systems impact nitrate leaching, said Helmers.

"We do frequently get questions about what is the nitrate level leaching from grassland systems compared to corn and soybean," said Helmers.

Story Source:

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

http://www.sciencedaily.com/releases/2010/08/100810122208.htm

Free Statins With Fast Food Could Neutralize Heart Risk, Scientists Say

Hamburger and french fries. (Credit: iStockphoto)

ScienceDaily (Aug. 12, 2010) — Fast food outlets could provide statin drugs free of charge so that customers can neutralise the heart disease dangers of fatty food, researchers at Imperial College London suggest in a new study.

Statins reduce the amount of unhealthy "LDL" cholesterol in the blood. A wealth of trial data has proven them to be highly effective at lowering a person's heart attack risk.

In a paper published in the *American Journal of Cardiology*, Dr Darrel Francis and colleagues calculate that the reduction in cardiovascular risk offered by a statin is enough to offset the increase in heart attack risk from eating a cheeseburger and a milkshake.

Dr Francis, from the National Heart and Lung Institute at Imperial College London, who is the senior author of the study, said: "Statins don't cut out all of the unhealthy effects of burgers and fries. It's better to avoid fatty food altogether. But we've worked out that in terms of your likelihood of having a heart attack, taking a statin can reduce your risk to more or less the same degree as a fast food meal increases it."

One statin, simvastatin, is already available in low doses (10mg) over the counter at pharmacies without a prescription. Other statins are so far only prescribed by doctors, and limited by cost to patients at particular risk of heart attack or stroke. However, the cost of the tablets has fallen sharply in recent years (from ~£40/month to ~£1.50/month), such that the cost to the NHS of seeing a doctor is much greater than the cost of the tablet.

"It's ironic that people are free to take as many unhealthy condiments in fast food outlets as they like, but statins, which are beneficial to heart health, have to be prescribed," Dr Francis said.

Statins have among the best safety profiles of any medication. A very small proportion of regular statin users experience significant side effects, with problems in the liver and kidneys reported in between 1 in 1,000 and 1 in 10,000 people.

"Everybody knows that fast food is bad for you, but people continue to eat it because it tastes good. We're genetically programmed to prefer high-calorie foods, and sadly fast food chains will continue to sell unhealthy foods because it earns them a living.

"It makes sense to make risk-reducing supplements available just as easily as the unhealthy condiments that are provided free of charge. It would cost less than 5p per customer -- not much different to a sachet of ketchup.

"When people engage in risky behaviours like driving or smoking, they're encouraged to take measures that minimise their risk, like wearing a seatbelt or choosing cigarettes with filters. Taking a statin is a rational way of lowering some of the risks of eating a fatty meal."

Studies have shown a clear link between total fat intake and blood cholesterol, which is strongly linked to heart disease. Recent evidence suggests that trans fats, which are found in high levels in fast food, are the component of the Western diet that is most dangerous in terms of heart disease risk.

Dr Francis and his colleagues used data from a previous large cohort study to quantify how a person's heart attack risk increases with their daily intake of total fat and trans fat. He compared this with the decrease in risk from various statins, based on a meta-analysis of seven randomised controlled trials.

The results showed that most statin regimes are able to compensate for the relative risk increase from eating a cheeseburger and a small milkshake.

The researchers note that studies should be conducted to assess the potential risks of allowing people to take statins freely, without medical supervision. They suggest that a warning on the packet should emphasise that no tablet can substitute for a healthy diet, and advise people to consult their doctor for more advice.

Story Source:

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

Journal Reference:

1. Emily A. Ferenczi, Perviz Asaria, Alun D. Hughes, Nishi Chaturvedi, Darrel P. Francis. **Can a Statin Neutralize the Cardiovascular Risk of Unhealthy Dietary Choices?** *The American Journal of Cardiology*, 2010; 106 (4): 587 DOI: 10.1016/j.amjcard.2010.03.077

http://www.sciencedaily.com/releases/2010/08/100812083608.htm

Ambitious Survey Spots Stellar Nurseries

** This VISTA image shows the spectacular 30 Doradus star-forming region, also called the Tarantula Nebula. At its core is a large cluster of stars known as R 136, in which some of the most massive stars known are located. This infrared image, made with ESO's VISTA survey telescope, is from the VISTA Magellanic Cloud Survey. The project will scan a vast area -- 184 square degrees of the sky (corresponding to almost one thousand times the apparent area of the full Moon), including our nearby neighbouring galaxies, the Large and Small Magellanic Clouds. The end result will be a detailed study of the star formation history and three-dimensional geometry of the Magellanic system. (Credit: ESO/M.-R. Cioni/VISTA Magellanic Cloud survey. Acknowledgment: Cambridge Astronomical Survey Unit)*

ScienceDaily (Aug. 12, 2010) — Astronomers scanning the skies as part of ESO's VISTA Magellanic Cloud survey have now obtained a spectacular picture of the Tarantula Nebula in our neighbouring galaxy, the Large Magellanic Cloud. This panoramic near-infrared view captures the nebula itself in great detail as well as the rich surrounding area of sky. The image was obtained at the start of a very ambitious survey of our neighbouring galaxies, the Magellanic Clouds, and their environment.

The leader of the survey team, Maria-Rosa Cioni (University of Hertfordshire, UK) explains: "This view is of one of the most important regions of star formation in the local Universe -- the spectacular 30 Doradus star-forming region, also called the Tarantula Nebula. At its core is a large cluster of stars called RMC 136, in which some of the most massive stars known are located."

ESO's VISTA telescope is a new survey telescope at the Paranal Observatory in Chile. VISTA is equipped with a huge camera that detects light in the near-infrared part of the spectrum, revealing a wealth of detail about astronomical objects that gives us insight into the inner workings of astronomical phenomena. Near-infrared light has a longer wavelength than visible light and so we cannot see it directly for ourselves, but it can pass through much of the dust that would normally obscure our view. This makes it particularly useful for studying objects such as young stars that are still enshrouded in the gas and dust clouds from which they formed. Another powerful aspect of VISTA is the large area of the sky that its camera can capture in each shot.

This image is the latest view from the VISTA Magellanic Cloud Survey (VMC). The project will scan a vast area -- 184 square degrees of the sky (corresponding to almost one thousand times the apparent area of the full Moon) including our neighbouring galaxies the Large and Small Magellanic Clouds. The end result will be a detailed study of the star formation history and three-dimensional geometry of the Magellanic system.

Chris Evans from the VMC team adds: "The VISTA images will allow us to extend our studies beyond the inner regions of the Tarantula into the multitude of smaller stellar nurseries nearby, which also harbour a rich population of young and massive stars. Armed with the new, exquisite infrared images, we will be able to probe the cocoons in which massive stars are still forming today, while also looking at their interaction with older stars in the wider region."

The wide-field image shows a host of different objects. The bright area above the centre is the Tarantula Nebula itself, with the RMC 136 cluster of massive stars in its core. To the left is the NGC 2100 star cluster. To the right is the tiny remnant of the supernova SN1987A. Below the centre are a series of star-forming regions including NGC 2080 -- nicknamed the "Ghost Head Nebula" -- and the NGC 2083 star cluster.

The VISTA Magellanic Cloud Survey is one of six huge near-infrared surveys of the southern sky that will take up most of the first five years of operations of VISTA.

Story Source:

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

http://www.sciencedaily.com/releases/2010/08/100811085230.htm

For Infant Sleep, Receptiveness More Important Than Routine

Parents had the most success with their children's sleep when they responded appropriately to their children's cues. (Credit: iStockphoto/Nathan Schepker)

ScienceDaily (Aug. 12, 2010) — Parents understand the challenge of getting infants to sleep through the night, and now Penn State researchers show that being emotionally receptive can reduce sleep disruptions and help infants and toddlers sleep better.

"Bed time can be a very emotional time. It heralds the longest separation of the day for most infants," said Douglas Teti, professor of human development and family studies. "It struck me that going to sleep, and sleeping well, is much easier for some young children than others, and I wanted to assess what factored into this, and what parents and children contribute to sleep patterns."

In the study, which examined mothers' behaviors during infants' bedtimes, parents had the most success with their children's sleep when they responded appropriately to their children's cues. These include showing disinterest in an activity or simply glancing inquisitively at a parent. For example, one mother in the study talked quietly and gently to her 6-month-old infant while breastfeeding.

"She continuously gazed at the infant's face and, whenever the infant vocalized, she responded promptly (e.g., 'It's OK.')," the authors report in a recent issue of the *Journal of Family Psychology*.

In contrast, a different mother in the study "used stern directives with her 24-month-old during book-reading whenever the child got up out of bed," and "continually attempted to engage the child in the book despite clear signs that the child was losing interest (e.g., child was fidgety and continually turned his attention elsewhere)," the authors note. The result: "the child got up and left the room four times before he eventually fell asleep."

When parents provide reassurance through emotional communication, Teti and his colleagues believe that it lets children know they are in a safe environment.

"Emotions are the most basic form of communication between babies and parents," Teti said.

His findings pose new challenges to parents because they suggest that being emotionally available -- paying attention to cues and responding to children appropriately -- is more effective than a specific bedtime behavior in promoting better sleep.

The researchers found no significant relation between sleep disruptions and the amount of time parents spent in close contact with infants or involved in quiet activities before bedtime. This contradicts past research, which had suggested that prolonged close physical contact with a parent undermines babies' ability to sleep on their own.

This study was one of the first to use direct observation of infant sleep patterns, and is the first to use multiple video cameras in the infants' and parents' bedrooms to capture parent-infant interactions at night.

"Sleep is a context about which we know little," said Teti. "It can be a very emotionally charged period for parents and babies. Looking at parent-child interactions in this context could be more telling for childhood outcomes than what you see in a more structured daytime play session." Many existing studies of parenting have focused on controlled play environments, in which researchers have studied parent-child interactions and emotions.

Teti's study, SIESTA I (Study of Infants' Emergent Sleep TrAjectories) looked at data from 35 families, and he sees very similar results in an ongoing longitudinal study, SIESTA II, which is a more in-depth analysis of factors promoting infant sleep as infants age, from 1 to 24 months. SIESTA II is funded by the National Institute of Child Health and Human Development.

One of the next steps will be to examine links between infants' temperamental styles, parenting at bedtime and during the night, sleep disruptions, and development, according to Teti.

Other authors on the paper include Bo-Ram Kim, Gail Mayer and Molly Countermine, all Human Development and Family Studies graduate students at Penn State at the time of the research.

Story Source:

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

Journal Reference:

1. Teti et al. **Maternal emotional availability at bedtime predicts infant sleep quality.**. *Journal of Family Psychology*, 2010; 24 (3): 307 DOI: 10.1037/a0019306

http://www.sciencedaily.com/releases/2010/08/100810101726.htm

Arctic Rocks Offer New Glimpse of Primitive Earth

An island in Frobisher Bay in Canada's Arctic. (Credit: iStockphoto/Ryerson Clark)

ScienceDaily (Aug. 12, 2010) — Scientists have discovered a new window into the Earth's violent past. Geochemical evidence from volcanic rocks collected on Baffin Island in the Canadian Arctic suggests that beneath it lies a region of the Earth's mantle that has largely escaped the billions of years of melting and geological churning that has affected the rest of the planet. Researchers believe the discovery offers clues to the early chemical evolution of the Earth.

The newly identified mantle "reservoir," as it is called, dates from just a few tens of million years after the Earth was first assembled from the collisions of smaller bodies. This reservoir likely represents the composition of the mantle shortly after formation of the core, but before the 4.5 billion years of crust formation and recycling modified the composition of most of the rest of Earth's interior.

"This was a key phase in the evolution of the Earth," says co-author Richard Carlson of the Carnegie Institution's Department of Terrestrial Magnetism. "It set the stage for everything that came after. Primitive mantle such as that we have identified would have been the ultimate source of all the magmas and all the different rock types we see on Earth today."

Carlson and lead author Matthew Jackson (a former Carnegie postdoctoral fellow, now at Boston University), with colleagues, using samples collected by coauthor Don Francis of McGill University, targeted the Baffin Island rocks, which are the earliest expression of the mantle hotspot now feeding volcanic eruptions on Iceland, because previous study of helium isotopes in these rocks showed them to have anomalously high ratios of helium-3 to helium-4. Helium-3 is generally extremely rare within the Earth; most of the mantle's supply has been outgassed by volcanic eruptions and lost to space over the planet's long geological history. In contrast, helium-4 has been constantly replenished within the Earth by the decay of radioactive uranium and thorium. The high proportion of helium-3 suggests that the Baffin Island lavas came from a reservoir in the

mantle that had never previously outgassed its original helium-3, implying that it had not been subjected to the extensive chemical differentiation experienced by most of the mantle.

The researchers confirmed this conclusion by analyzing the lead isotopes in the lava samples, which date the reservoir to between 4.55 and 4.45 billion years old. This age is only slightly younger than the Earth itself. The early age of the mantle reservoir implies that it existed before melting of the mantle began to create the magmas that rose to form Earth's crust and before plate tectonics allowed that crust to be mixed back into the mantle.

Many researchers have assumed that before continental crust formed the mantle's chemistry was similar to that of meteorites called chondrites, but that the formation of continents altered its chemistry, causing it to become depleted in the elements, called incompatible elements, that are extracted with the magma when melting occurs in the mantle. "Our results question this assumption," says Carlson. "They suggest that before continent extraction, the mantle already was depleted in incompatible elements compared to chondrites, perhaps because of an even earlier Earth differentiation event, or perhaps because the Earth originally formed from building blocks depleted in these elements."

Of the two possibilities, Carlson favors the early differentiation model, which would involve a global magma ocean on the newly-formed Earth. This magma ocean produced a crust that predated the crust that exists today. "In our model, the original crust that formed by the solidification of the magma ocean was buoyantly unstable at Earth's surface because it was rich in iron," he says. "This instability caused it to sink to the base of the mantle, taking the incompatible elements with it, where it remains today."

Some of this deep material may have remained liquid despite the high pressures, and Carlson points out that seismological studies of the deep mantle reveal certain areas, one beneath the southern Pacific and another beneath Africa, that appear to be molten and possibly chemically different from the rest of the mantle. "I'm holding out hope that these seismically imaged areas might be the compositional complement to the "depleted" primitive mantle that we sample in the Baffin Island lavas," he says.

The paper is published in the August 12 issue of *Nature*.

Story Source:

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

Journal Reference:

1. Jackson et al. **Evidence for the survival of the oldest terrestrial mantle reservoir**. *Nature*, 2010; 466 (7308): 853 DOI: 10.1038/nature09287

http://www.sciencedaily.com/releases/2010/08/100811135033.htm

Learn More in Kindergarten, Earn More as an Adult

Students who learn more in kindergarten earn more as adults. They are also more successful overall. (Credit: iStockphoto/Catherine Yeulet)

ScienceDaily (Aug. 12, 2010) — There isn't a lot of research that links early childhood test scores to earnings as an adult. But new research reveals a surprising finding: Students who learn more in kindergarten earn more as adults. They are also more successful overall.

Harvard University economist John Friedman says he and a group of colleagues found that students who progress during their kindergarten year from attaining an average score on the Stanford Achievement Test to attaining a score in the 60th percentile can expect to make about $1,000 more a year at age 27 than students whose scores remain average.

Taking into account all variation across kindergarten classes, including class size, individuals who learn more--as measured by an above-average score on the Stanford Achievement Test--and are in smaller classes earn about $2,000 more per year at age 27.

Moreover, students who learn more in kindergarten are more likely to go to college than students with similar backgrounds. Those who learn more in kindergarten are also less likely to become single parents, more likely to own a home by age 28 and more likely to save for retirement earlier in their work lives.

"Kindergarten interventions matter a great deal for long-term outcomes," said Friedman. "For instance, being in a smaller class for two years increases the probability of attending college by 2 percent.

"We find that both smaller class sizes and teachers with more experience improve long-term outcomes," he said. "We believe that other teacher characteristics, as well as various characteristics of a student's peers, also have significant impacts on later life outcomes, but the data did not allow us to measure those effects well."

Friedman and colleagues from Harvard, Northwestern University and University of California, Berkeley, used a well-known education experiment conducted in Tennessee as a starting point to measure adult outcomes of early childhood learning. In the mid-1980s, the Student/Teacher Achievement Ratio (STAR) project placed students in classes of different size to determine how class size affects student learning. Results showed that students in small classes learn more and have greater academic success.

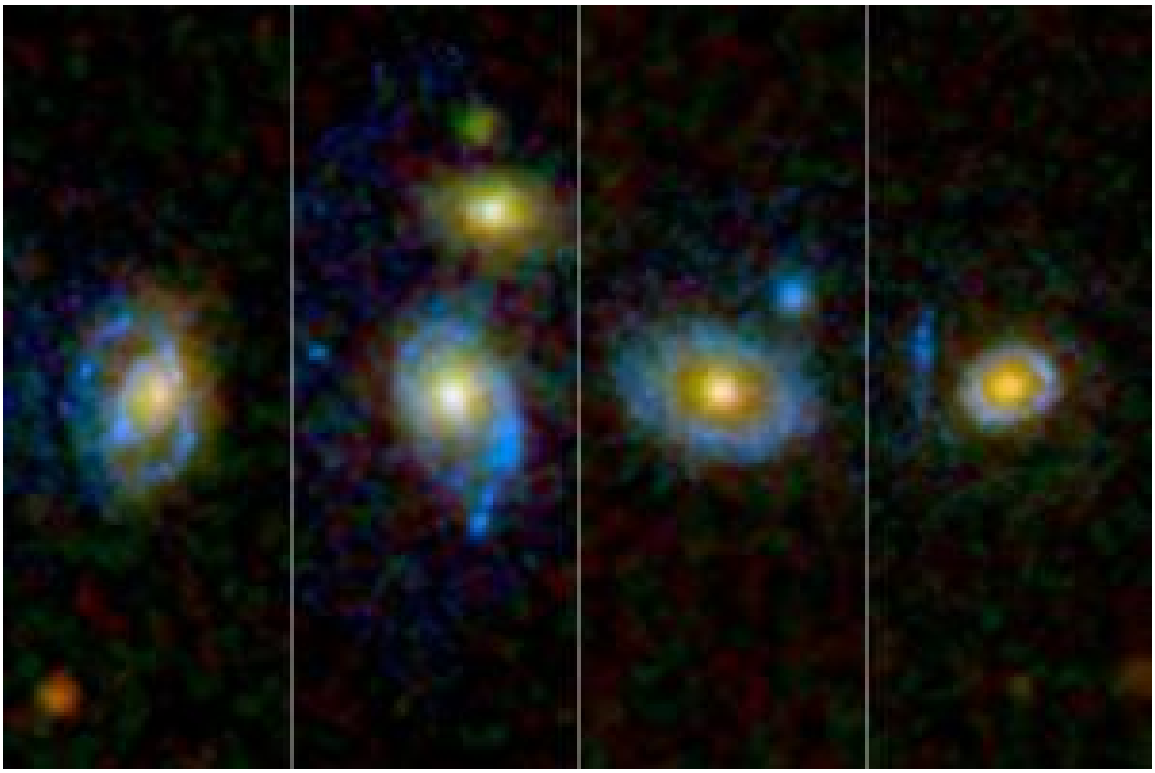
This new study, funded by the National Science Foundation's Division of Social and Economic Sciences, examined adult outcomes of nearly 12,000 students who took part in the original study and who are now 30 years old. It allowed the research team to go beyond what children learned during their year in the STAR project to see how their kindergarten learning experiences affected their lives. Researchers recently presented results of the new study, which has yet to be peer-reviewed, at an academic conference in Cambridge, Mass.

Story Source:

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

http://www.sciencedaily.com/releases/2010/08/100811085412.htm

Giant Ultraviolet Rings Found in Resurrected Galaxies



Astronomers have found unexpected rings and arcs of ultraviolet light around a selection of galaxies, four of which are shown here as viewed by NASA's and the European Space Agency's Hubble Space Telescope. (Credit: NASA/ESA /JPL-Caltech/STScI/UCLA)

ScienceDaily (Aug. 12, 2010) — Astronomers have found mysterious, giant loops of ultraviolet light in aged, massive galaxies, which seem to have a second lease on life. Somehow these "over-the-hill galaxies" have been infused with fresh gas to form new stars that power these truly gargantuan rings, some of which could encircle several Milky Way galaxies.

The discovery of these rings implies that bloated galaxies presumed "dead" and devoid of star-making can be reignited with star birth, and that galaxy evolution does not proceed straight from the cradle to the grave.

"In a galaxy's lifetime, it must make the transition from an active, star-forming galaxy to a quiescent galaxy that does not form stars," said Samir Salim, lead author of a recent study and a research scientist in the department of astronomy at Indiana University, Bloomington. "But it is possible this process goes the other way, too, and that old galaxies can be rejuvenated."

A One-Two Observational Punch

The findings come courtesy of the combined power of two orbiting observatories, NASA's Galaxy Evolution Explorer and Hubble Space Telescope. First, the Galaxy Evolution Explorer surveyed a vast region of the sky

in ultraviolet light. The satellite picked out 30 elliptical and lens-shaped "early" galaxies with puzzlingly strong ultraviolet emissions but no signs of visible star formation. Early-type galaxies, so the scientists' thinking goes, have already made their stars and now lack the cold gas necessary to build new ones.

The Galaxy Evolution Explorer could not discern the fine details of these large, rounded galaxies gleaming in the ultraviolet, so to get a closer look, researchers turned to the Hubble Space Telescope. What they saw shocked them: three-quarters of the galaxies were spanned by great, shining rings of ultraviolet light, with some ripples stretching 250,000 light-years. A few galaxies even had spiral-shaped ultraviolet features.

"We haven't seen anything quite like these rings before," said Michael Rich, co-author of the paper and a research astronomer at UCLA. "These beautiful and very unusual objects might be telling us something very important about the evolution of galaxies."

Colors of the Ages

Astronomers can tell a galaxy's approximate age just by the color of its collective starlight. Lively, young galaxies look bluish to our eyes due to the energetic starlight of their new, massive stars. Elderly galaxies instead glow in the reddish hues of their ancient stars, appearing "old, red and dead," as astronomers bluntly say. Gauging by the redness of their constituent stars, the galaxies seen by the Galaxy Evolution Explorer and Hubble are geezers, with most stars around 10 billion years old.

But relying on the spectrum of light visible to the human eye can be deceiving, as some of us have found out after spending a day under the sun's invisible ultraviolet rays and getting a sunburn. Sure enough, when viewed in the ultraviolet part of the spectrum, these galaxies clearly have more going on than meets the eye.

Some ultraviolet starlight in a few of the observed galaxies might just be left over from an initial burst of star formation. But in most cases, new episodes of star birth must be behind the resplendent rings, meaning that fresh gas has somehow been introduced to these apparently ancient galaxies. Other telltale signs of ongoing star formation, such as blazing hydrogen gas clouds, might be on the scene as well, but have so far escaped detection.

The Lord of the Ultraviolet Rings

Just where the gas for this galactic resurrection came from and how it has created rings remains somewhat perplexing. A merging with a smaller galaxy would bring in fresh gas to spawn hordes of new stars, and could in rare instances give rise to the ring structures as well.

But the researchers have their doubts about this origin scenario. "To create a density shock wave that forms rings like those we've seen, a small galaxy has to hit a larger galaxy pretty much straight in the center," said Salim. "You have to have a dead-on collision, and that's very uncommon."

Rather, the rejuvenating spark more likely came from a gradual sopping-up of the gas in the so-called intergalactic medium, the thin soup of material between galaxies. This external gas could generate these rings, especially in the presence of bar-like structures that span some galaxies' centers.

Ultimately, more observations will be needed to show how these galaxies began growing younger and lit up with humongous halos. Salim and Rich plan to search for more evidence of bars, as well as faint structures

that might be the remnants of stellar blooms that occurred in the galaxies' pasts. Rather like recurring seasons, it may be that galaxies stirred from winter can breed stars again and then bask in another vibrant, ultraviolet-soaked summer.

The study detailing the findings appeared in the April 21 issue of the *Astrophysical Journal*.

The California Institute of Technology in Pasadena leads the Galaxy Evolution Explorer mission and is responsible for science operations and data analysis. NASA's Jet Propulsion Laboratory, also in Pasadena, manages the mission and built the science instrument. The mission was developed under NASA's Explorers Program managed by the Goddard Space Flight Center, Greenbelt, Md. Researchers sponsored by Yonsei University in South Korea and the Centre National d'Etudes Spatiales (CNES) in France collaborated on this mission.

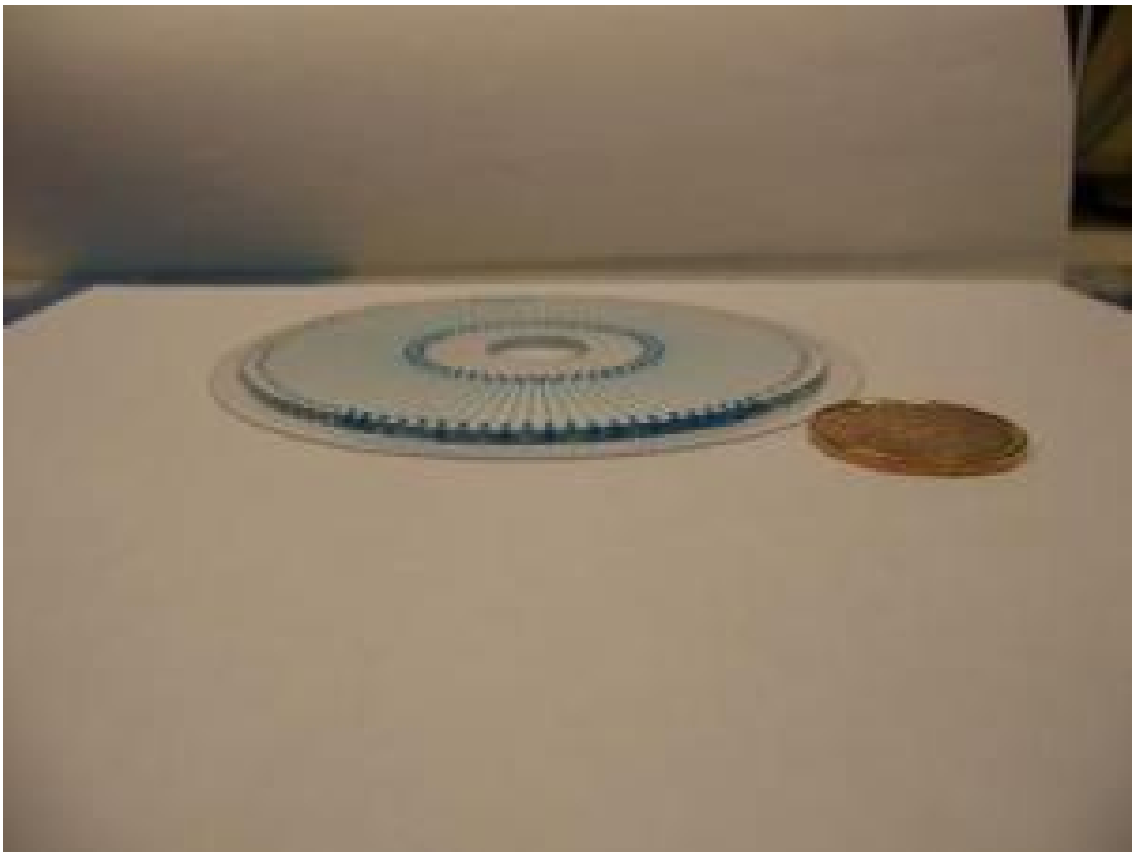
Graphics and additional information about the Galaxy Evolution Explorer are online at http://www.nasa.gov/galex/ and http://www.galex.caltech.edu.

Story Source:

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

http://www.sciencedaily.com/releases/2010/08/100811170136.htm

Faster DNA Analysis at Room Temperature



A palm-sized biochip for room temperature DNA detection developed by Paul Li at Simon Fraser University near Vancouver, Canada. The 4" diameter chip is roughly the same thickness as the Canadian one dollar coin, the Loonie (shown in the picture for scale). (Credit: American Institute of Physics)

ScienceDaily (Aug. 12, 2010) — DNA microarrays are one of the most powerful tools in molecular biology today. The devices, which can be used to probe biological samples and detect particular genes or genetic sequences, are employed in everything from forensic analysis to disease detection to drug development.

Now Paul Li and colleagues at Simon Fraser University in Burnaby, Canada have combined DNA microarrays with microfluidic devices, which are used for the precise control of liquids at the nanoscale. In an upcoming issue of the journal *Biomicrofluidics*, which is published by the American Institute of Physics (AIP), Li and his colleagues describe how the first combined device can be used for probing and detecting DNA.

The key to Li's result: gold nanoparticles. Suspended in liquid and mixed with DNA, the nanometer-scale spheres of gold act as mini magnets that adhere to each of the DNA's twin strands. When the DNA is heated, the two strands separate, and the gold nanoparticles keep them apart, which allows the single strands to be probed with other pieces of DNA that are engineered to recognize particular sequences.

Li, whose work is funded by the Natural Sciences and Engineering Research Council of Canada, is applying for a patent for his technique. He sees a host of benefits from the combination of DNA microarrays and microfluidics.

"It's faster and requires a relatively small sample," he says, adding in his paper that "the whole procedure is accomplished at room temperature in an hour and apparatus for high temperature… is not required"

Story Source:

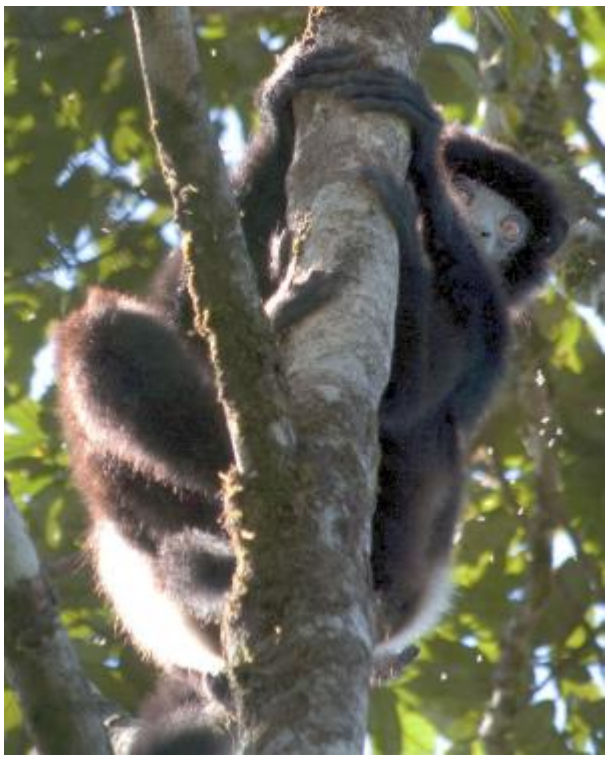
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **American Institute of Physics**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Lin Wang and Paul C. Li. **Gold nanoparticle-assisted single base-pair mismatch discrimination on a microfluidic microarray device**. *Biomicrofluidics*, 2010; (in press) [link]

http://www.sciencedaily.com/releases/2010/08/100803175017.htm

Biodiversity Hot Spots More Vulnerable to Global Warming Than Thought



Scientists detailed for the first time a direct correlation between the frequency of El Niño and a threat to life in Madagascar, a tropical island that acts as a refuge for many unique species that exist nowhere else in the world. In this case, the lemur plays the role of the canary in the coal mine. (Credit: Image courtesy of Rice University)

ScienceDaily (Aug. 12, 2010) — Global warming may present a threat to animal and plant life even in biodiversity hot spots once thought less likely to suffer from climate change, according to a new study from Rice University.

Research by Amy Dunham, a Rice assistant professor of ecology and evolutionary biology, detailed for the first time a direct correlation between the frequency of El Niño and a threat to life in Madagascar, a tropical island that acts as a refuge for many unique species that exist nowhere else in the world. In this case, the lemur plays the role of the canary in the coal mine.

The study in the journal *Global Change Biology* is currently available online and will be included in an upcoming print issue.

Dunham said most studies of global warming focus on temperate zones. "We all know about the polar bears and their melting sea ice," she said. "But tropical regions are often thought of as refuges during past climate events, so they haven't been given as much attention until recently.

"We're starting to realize that not only are these hot spots of biodiversity facing habitat degradation and other anthropogenic effects, but they're also being affected by the same changes we feel in the temperate zones."

Dunham's interest in lemurs, which began as an undergraduate student at Connecticut College, resulted in a groundbreaking study last year that provided new insight into a long-standing mystery: Why male and female lemurs are the same size.

This time, she set out to learn how El Niño patterns impact rainfall in southeastern Madagascar and how El Niño and cyclones affect the reproductive patterns of the Milne-Edwards' Sifaka lemur.

The lemur's mating habits are well-defined, which makes the animal a good candidate for such a study. Female lemurs are sexually responsive to males for only one day a year in the austral summer months of December or January and give birth six months later.

Dunham's co-authors -- Elizabeth Erhart and Patricia Wright -- have done behavioral studies of lemurs in Ranomafana, a national park in the southeastern rainforest of Madagascar, for 20 years. Erhart is an associate professor and assistant chair of the Department of Anthropology at Texas State University-San Marcos, and Wright is a professor of anthropology at Stony Brook University and director of the Institute for the Conservation of Tropical Environments.

"There aren't many species that have such long-term demographic data that enable us to look at these kinds of questions," Dunham said. "So this was a unique opportunity."

The warming of global sea temperatures may "enhance" El Niño cycles, according to the National Oceanic and Atmospheric Administration. Dunham found that in Ranomafana, contrary to expectations, El Niño makes wet seasons wetter. "When it rains heavily, lemurs are not active. They sit there and wait for the rain to stop, huddling for warmth," Dunham said. Anecdotal evidence suggested heavy rains knock fruit off the trees when lactating lemurs need it most, and may even kill trees outright.

Dunham learned from the data that cyclones making landfall have a direct negative effect on the fecundity -- or potential reproductive capacity -- of lemurs. The team also discovered that fecundity "was negatively affected when El Niño occurred in the period before conception, perhaps altering ovulation, or during the second six months of life, possibly reducing infant survival during weaning," they wrote.

"Madagascar's biodiversity is an ecological treasure," Dunham said. "But its flora and fauna already face extinction from rapid deforestation and exploitation of natural resources. The additional negative effects of climate change make conservation concerns even more urgent."

The research was funded by the David and Lucile Packard Foundation, the Douroucouli Foundation, the Wenner-Gren Foundation, the John D. and Catherine T. MacArthur Foundation, the National Geographic Society, the National Science Foundation, the Earthwatch Institute, Conservation International, the Margot Marsh Biodiversity Foundation, Stony Brook University and Rice University.

Story Source:

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

Journal Reference:

1. Amy E. Dunham, Elizabeth M. Erhart, Patricia C. Wright. **Global climate cycles and cyclones: consequences for rainfall patterns and lemur reproduction in southeastern Madagascar**. *Global Change Biology*, 2010; DOI: 10.1111/j.1365-2486.2010.02205.x

http://www.sciencedaily.com/releases/2010/06/100607165746.htm

Women Feel More Pain Than Men

Women experience more chronic pain and they're less tolerant of the pain than men, according to a new review of research.

By Emily Sohn | Thu Aug 12, 2010 03:00 PM ET

"Globally, women have more chronic pain than men, more recurrent pain, they are more likely to have multiple sources of pain, and they are definitely neglected as it relates to treatment," said Jennifer Kelly, an independent psychologist in Atlanta.

Kelly presented a review of research on gender and pain today at a meeting of the American Psychological Association.

Along with findings that a combination of genes, hormones, emotions and even social roles influence the experience of pain, accumulating evidence suggests that doctors might some day personalize the management of pain, based on the genders of their patients. For now, scientists are still struggling to understand the nuances of chronic pain, which is notoriously hard to treat.

"What I learned from all of my research is that you should treat women differently than men," Kelly said. "We have to get women to see this as something they can manage instead of it having some kind of power over them."

For years, studies have suggested that women and men differ in how they experience pain. As Kelly pulled together the literature, she found that those differences to be both real and dramatic.

A variety of chronic and painful conditions, for example, are far more common in women, including migraines, rheumatoid arthritis, irritable bowel syndrome, and fibromyalgia -- which affects at least four times more women than men. Women are less tolerant of pain. Their pain lasts longer. And they are more likely to become disabled by it.

"What's interesting is that there are gender differences across a lot of different measures of pain," said Beverly Thorn, a psychologist at the University of Alabama in Tuscaloosa. "It holds for acute pain, experimental pain, recurrent pain like migraines, and chronic pain like in the lower back."

Hormones play a part, as many symptoms worsen around that time of the month. Other biological differences come into play, too. Certain painkillers work better in males, at least in animal studies. And women experience more side effects from pain medicines.

But a significant portion of the gender imbalance may come from social and psychological factors. Multiple studies have found that women are more likely to get depressed as a result of chronic pain, and they have a higher tendency to catastrophize, Thorn said.

They think, "Oh my God, this is the most terrible pain I've ever had. I can't stop thinking about it and there's nothing I can do," she said. "There is helplessness, magnification and rumination."

In experiments that challenged people to hold their hands in ice-cold water, one of Thorn's students found that people who tolerated the pain longer were less likely to have catastrophic thoughts and less likely to have emotionally vulnerable personalities. Emotional vulnerability is a traditionally feminine trait, Thorn said, and even women who play traditionally masculine sex roles have higher levels of pain tolerance and feel pain less intensely.

What was particularly interesting about the ice-water experiments, Thorn said, was that the men, who tended to be more pain-resistant, actually had higher levels of stress hormones and higher spikes in blood pressure.

At first, the researchers thought this meant that the men were acting more macho -- feeling more stress internally but defying it outwardly. But then other research linked higher blood pressure with lower responsiveness to pain, suggesting that physically, the men's experience really was different.

"I say that to point out," Thorn said, "that this is a really intricate collaboration among biological, social and psychological factors."

Acting macho, she added, is not going to help women cope with pain like men do. Instead, they need to accept the pain and learn how to think about it as something they can live with instead of something they're trying to defeat. Multidisciplinary therapy can make a big difference.

"At the end of their treatments," Thorn said, "my patients say, 'I still have the pain. But the pain doesn't have me.'"

http://news.discovery.com/human/women-men-pain.html

Are We Underestimating Mt. Vesuvius?

By Zahra Hirji | Sun Aug 15, 2010 03:51 PM ET

We all know the infamous story of the eruption of Mt. Vesuvius in 79 A.D. that buried the city of Pompeii and killed thousands of people.

What we don't know is how exactly they died. There is only one historical witness account of what happened in 79 A.D. on August 24. From afar, Pliny the Younger reported watching his uncle succumb to a cloud of ash and smoke.

Historians interpreted this to mean that the victims from Pompeii, Herculaneum, and Oplontis who were not crushed from flying rocks or buried underneath collapsing building, but that they died from suffocation due to a lethal cocktail of ash and volcanic gas. And until now, no one had bothered to challenge that interpretation.

A new study, led by vulcanologist Giuseppe Mastrolorenzo from the Naples Observatory in Italy, shows that the residents killed in Pompeii and the neighboring towns located on the slopes of the volcano died from an extreme heat surge produced by the volcano, not suffocation.

"Everything that has been written in the guides, and the texts, and that has been re-told to tourists is false," Mastrolorenzo told GlobalPost.

Mastrolorenzo points to the piles of human remains as his leading evidence.

Hundreds of bodies were recovered from the three main cities devastated by the eruption. Around three quarters of the remains reflect people who were killed instantaneously, their bodies suspended in action.

Victims of suffocation, in contrast, are generally found in floppy or sleepy positions, crumpled on the floor.

The researchers tested their theory by exposing a set of recent animals and human bones to different levels of heat, ranging from 100 to 800 degrees Fahrenheit.

Based on the coloration of the experimental bones, they concluded that the bodies in Pompeii, 6.2 miles from the volcano, were likely exposed to temperatures of between 250 and 300 degrees Fahrenheit. Bodies recovered from towns closer to the eruption were exposed to much higher temperatures, probably 450 to 500 degrees Fahrenheit, according to the team's study, which appeared recently in the journal *PLoS One*.

Using this information, the team modeled temperature gradients of the six major flows of hot ash columns that plowed down the side of the mountain during the eruption. The results suggest a much wider area around the volcano can be subjected to lethal temperatures than previously thought.

Mastrolorenzo believes the victims of Pompeii were killed during a single heat surge from the fourth pyroclastic surge. A few seconds' exposure to the intense heat was enough to kill the villagers immediately. Being inside provided no shelter.

The blazing heat wave could have traveled up to 12.4 miles from the volcano. Taking this into account, the current plan to evacuate a five-mile radius around in the event of another eruption seems entirely insufficient. The city of Naples sits outside this zone, for example, but it is only 6.2 miles away.

Potentially more than 3 million people are at risk if Mount Vesuvius explodes in a similar fashion to the one that wiped out Pompeii.

http://news.discovery.com/earth/are-we-underestimating-mt-vesuvius.html

'Callao Man' Could Redraw Filipino History

A foot bone from a human that lived 67,000 years ago suggests settlers first arrived earlier than once thought.

Tue Aug 3, 2010 11:15 AM ET | content provided by Cecil Morella, AFP

Archaeologists have found a foot bone that could prove the Philippines was first settled by humans 67,000 years ago, thousands of years earlier than previously thought, the National Museum said Tuesday.

The bone, found in an extensive cave network, predates the 47,000-year-old Tabon Man that is previously known as the first human to have lived in the country, said Taj Vitales, a researcher with the museum's archaeology section.

"This would make it the oldest human remains ever found in the Philippines," Vitales told AFP.

Archaeologists from the University of the Philippines and the National Museum dug up the third metatarsal bone of the right foot in 2007 in the Callao caves near Penablanca, about 335 kilometers (210 miles) north of Manila.

Their report on "Callao Man" was released in the latest edition of the *Journal of Human Evolution* after tests in France established the fossil's age, said professor Armand Mijares, the expedition leader.

"It broke the barriers," Mijares said, explaining that previous evidence put the first human settlements in the Philippines and nearby islands around Tabon Man. "It pushed that back to nearly 70,000 years."

Cut marks on bones of deer and wild boar found around it suggest Callao Man could have hunted and was skilled with tools, although no cutting or other implements were found during the dig, according to Mijares.

"This individual was small-bodied. It's difficult to say whether he was male or female," he said.

Mijares stressed the finding that Callao Man belongs to *Homo sapiens* was still only provisional. Some of the bone's features were similar to *Homo habilis* and *Homo floresiensis* -- which are distinct species from humans.

Existing evidence suggests that *Homo sapiens*, modern man, first appeared in Africa about 200,000 years ago.

Homo habilis is considered a predecessor to *Homo sapiens* while *Homo floresiensis* is thought to be a short, human-like species that once existed on an Indonesian island in the Late Pleistocene stage.

To determine whether Callao Man was human, Mijares said his team planned to secure permits to pursue further excavations in the Callao caves and hopefully find other parts of the skeleton, tools, or fossils of other potential humans.

Mijares said Callao Man also shared some features of today's Aetas, a short, curly-haired and dark-skinned people who are thought to be directly descended from the first inhabitants of the Philippines.

The discovery also suggests that raft- or boat-building crafts would have been around at that time.

"The hypothesis is that the Philippines, which is surrounded by bodies of water, was first reached by humans aboard rafts," Vitales said.

But he said there was no consensus on whether the first settlers came from mainland Asia, neighboring Southeast Asian islands or elsewhere.

Archaeologists have been exploring the Callao caves system since the 1970s. "Generally caves are used as habitations and burial sites," Vitales said.

Tabon Man, the fossilized fragments of a skull and jawbone from three individuals, was discovered along with stone flake tools by a National Museum team in a cave on the western Philippine island of Palawan in May 1962.

http://news.discovery.com/archaeology/callao-man-philippines.html

Pre-Inca Remains Found in Peru

Peruvian researchers uncovered bones of a tribal leader and a child that date back more than 1,200 years.

Wed Jul 21, 2010 12:29 PM ET | content provided by AFP

Peruvian archaeologists have found remains from a person believed to be a leader of a key pre-Inca civilization that is more than 1,200 years old, one of the researchers said.

Carlos Elera told AFP the remains from the northern region of Lambayeque are from what some call the Sican culture that flourished in the area between around 700 and 1375 AD.

He said among the remains found two weeks ago in the archaeological complex Las Ventanas is a type of sarcophagus for an adult with a headdress and a feathered eye mask, which are "characteristic of the nobles of the Sican culture."

The researcher also said that objects found included a ceremonial knife, ceramics, textiles with copper plates.

Elera reported that since April when the research began at Las Ventanas, the remains of about 20 people have been found in good condition.

Among them were remains of a child of three to four years old believed to be from between 1100 and 1150 AD.

Sican culture emerged around the years 700-750 AD and remained in force until 1375, recording its apogee stage between 900 and 1100.

Researchers believe the culture flourished for around 200 years under seven to eight "lords of Sican" and then vanished after the Chimu conquest of the Lambayeque region around 1375 AD, a group that also preceded the Incas.

http://news.discovery.com/archaeology/pre-inca-remains-discovered-peru.html

Only Children Make Just as Many Friends

Despite common beliefs that only children may grow up maladjusted, new research finds they're just fine.

By Emily Sohn | Mon Aug 16, 2010 12:18 PM ET

Whether they're only children or one of five, teens and pre-teens make plenty of friends, new research concludes.

The new study should offer comfort to parents that their kids will grow up to be just fine, no matter how many they decide to have. It may be a growing concern: With women having kids later in life and pocketbooks tightening against the economic downturn, the number of families with only children has nearly doubled -- to about 20 percent -- since the 1960s, according to the National Center for Health Statistics.

"People are having smaller families and more children are growing up with fewer siblings," said Donna Bobbitt-Zeher, a sociologist at Ohio State University in Columbus. "What this study suggests is that there really isn't a need to worry for parents who have only children in terms of their social development."

The stereotype of a lonely, spoiled, bossy and maladjusted only child dates back to 1896, when an American psychologist named Granville Stanley Hall did a research paper on the subject. Despite major flaws in his study and fundamental changes to the structure of family life since then (like a shift from isolated farms to urban daycares for 3-month olds), the stereotype has generally stuck around -- even as families have been getting smaller.

To analyze how demographic shifts might be influencing the latest generation of kids, scientists have focused mostly on educational outcomes and test scores. On those measures, studies have shown no advantage for kids with siblings.

In fact, the more brothers and sisters a kid has, the worse he tends to do in school. And kids who are onlies have a slight advantage in their motivation to achieve, said social psychologist Susan Newman, author of "Parenting an Only Child: The Joys and Challenges of Raising Your One and Only."

More recently, researchers have been looking at how family size might affect social skills -- with some evidence that onlies are at a disadvantage, at least early on. A study of kindergarteners, published in 2004 in

the *Journal of Marriage and Family*, found that teachers rated sibling-less children lower on a variety of social skills, including self-control and interpersonal skills.

To find out how that difference panned out as kids got older, Bobbitt-Zeher and colleague Douglas Downey (one of the authors of the kindergarten study) analyzed data from a long-term study of adolescents. The data set included lists made by each student when asked to name five male friends and five female friends.

The study, which involved nearly 13,500 kids in grades 7 through 12, found that only children were listed just as often on friendship lists as were kids with siblings. The number of siblings they had made no difference, Bobbitt-Zeher reported today at a meeting of the American Sociological Association. Neither did the gender of their siblings.

"It's a huge finding," Newman said, "and a positive one, because one of the concerns parents have when deciding how many children to have is, 'What's going to be the outcome of my child?'"

Plenty of other studies in plenty of countries have scrutinized each aspect of the only-child stereotype and failed to find evidence for any of it, Newman added. Other research, she added, suggests that parents of only children are actually happier than parents with more than one kid.

"I think the numbers are offering comfort," she said. "The reality is essentially that you don't have to live with a norm that doesn't work anymore -- the norm being a mom, a dad and two children."

Of course, having siblings can still be a positive experience, said Laura Padilla-Walker, a Brigham Young University researcher who studies sibling relationships. She recently found that having affectionate siblings helped kids, ages 10 to 14, feel less lonely and depressed and act more generously, especially if their siblings were sisters.

"Siblings provide the training grounds for essential skills that can be learned," Padilla-Walker said. "If parents only have one child, they will just have to work a little harder to give children those opportunities."

http://news.discovery.com/human/only-children-friends.html

London's Strata tower wins Carbuncle Cup as Britain's ugliest new building

The 42-storey building in Elephant & Castle was nominated for its 'plain visual grotesqueness' and 'Philishave stylings'

The Strata building in Elephant & Castle, south London. Photograph: Sarah Lee for the Guardian

It was hailed a breakthrough in urban wind power: a 42-storey tower with built-in turbines to deliver 8% of its electricity needs. But today the Strata tower in south London found itself becalmed when it was named Britain's ugliest new building, pipping a rival that the judges said resembled a giant pair of buttocks and a bus station that looked like a jelly mould.

Justin Black, the director of the developer Brookfield had already admitted: "It's what I term Marmite architecture – you either love it or you hate it." And sure enough the judges of the Carbuncle Cup, architecture's least sought after prize, opted for the latter.

"Decked out with Philishave stylings, this is a building that appears to be auditioning for a supporting role in a James Bond title sequence," said Ellis Woodman of Building Design, the trade newspaper which organised the prize.

The building was nominated by The Georgian Group for its "plain visual grotesqueness". Adam Jones, another nominator, said: "I used to live in south London and moved partly because — and I'm not joking — the Strata tower made me feel ill and I had to see it every day."

The dubious honour, now in its fifth year, is intended as an antidote to the Royal Institute of British Architect's Stirling Prize for the best building and has attracted growing levels of interest. Design critic Stephen Bayley said it "attracts a far higher level of intelligent participation than the Stirling prize".

Thirty-one buildings were nominated by readers "united in their often poetic expressions of outrage", said Woodman. The shortlisted Cube office development in Birmingham was described by its nominator as like "a lumpy beige ornament your father buys your mother for her birthday because he thinks it's classy, whereas she can see it for the tat it is".

For the winner, there was the difficult question of how to react. Robert Torday, the marketing director of the apparently unamused architects of the scheme, BFLS, declined to comment.

And not everyone is sure the award is a good thing.

"Labelling one architect with having produced the worst building of the year without mention of the client, developer or contractor means giving the architect a massive kicking when they are very rarely the sole author of the project," said Charles Holland, director of FAT Architecture. "Nothing wrong with robust criticism, but laughing at other people's mistakes is never an edifying spectacle."

http://www.guardian.co.uk/artanddesign/2010/aug/12/strata-tower-britains-ugliest-building

Moscow's architectural heritage is crumbling under capitalism

The city's avant-garde masterpieces are falling into ruin. It seems only the oligarchs' wives can save them

- **Justin McGuirk**
- guardian.co.uk, Tuesday 10 August 2010 15.40 BST
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Gagarin's portrait is covered so that he won't have to look at the decrepitude of the 1966 Space Pavilion. Photograph: Justin McGuirk

From the pedestrian bridge that crosses the Moskva river towards the Cathedral of Christ the Saviour you normally have a clear view of the Kremlin. But for several days last week its fairytale towers had disappeared behind an acrid grey pall. With the thermometer stuck at a record-shattering 40C and the smog hidden by smoke from the burning marshes outside the city, this was a hellish Moscow that none of its residents had ever seen before.

I was in the city to give a talk at a new school, the Strelka Institute of Architecture, Media and Design. Located just across the river from the cathedral, the Strelka occupies the garages of the former Red October chocolate factory, which until two years ago had been producing chocolate on that site since the late 19th century. The school only opened earlier this summer but already it's one of the liveliest nightspots in the city, with film screenings, clubs and a restaurant frequented by Moscow's glamorous media set. If you're thinking that this doesn't sound much like a school, then you'd have a point, but we'll address that later. In all other senses the sight of a former industrial complex being turned into a cultural hotspot is one that we've been accustomed to in Europe and the US for several decades. In Russia, however, it's a more recent phenomenon.

One reason is that the gradual switch from an industrial to a services economy didn't begin until the Yeltsin years. And it was only around the turn of the millennium that developers started to speculate on factories (the more unscrupulous ones earned the description "raiders"). The other factor in the slow speed of the post-industrial project is that the Russians appear to value new things more than old ones.

Any sightseers embarking on a tour of Moscow's avant-garde architecture from the early 20th century had better brace themselves for a catalogue of degradation. The more hallowed the building in the architectural history books, the greater its decrepitude. Take the Narkomfin building, designed by Moisei Ginzburg with Ignaty Milnis in 1928 to house the workers of the commissariat of finance. This radical apartment block, which spearheaded the idea of collective living, is one of the most important surviving constructivist buildings. And it is literally crumbling – indeed it's in such a sorry state that I was amazed to find that people still live in it. Then there is another constructivist masterpiece, Konstantin Melnikov's Rusakov workers' club of 1929, with its muscular geometric profile. It's still as dramatic as ever but empty now except for an Azerbaijani restaurant that has attached its own folksy timber entrance (with lurid neon signage) to the unforgettable facade.

But it is not just the early modernist heritage of Moscow that is unloved. Even the pride of a more recent Soviet past is going to seed. The All-Russia Exhibition Centre (VDNKh), the expo site in the north of the city that was a town-sized advertisement of Soviet achievements, is today a rather seedy theme park. None of its grandiose pavilions still contain anything worth seeing. The grandest, announced by a Tupolev rocket in the forecourt, is the 1966 Space Pavilion. It now houses a garden centre that would embarrass your average parish hall, let alone this vaulted cathedral to the Soviet space programme. Under the dome, the giant portrait of Yuri Gagarin has a sheet draped over it. I asked a local why and he answered simply: "Shame." It would dishonour the legendary cosmonaut to look out over this mess.

This is the climate in which the Russian post-industrial project is taking shape. Preservation is not a major preoccupation here, which is ironic considering that much of the post-communist architecture has been built to look old (it's known unofficially as the "Luzhkov style", after Moscow's long-serving mayor). And yet one fifth of Moscow is made up of industrial sites – think of the impact that Tate Modern had on London's cultural scene and then imagine how much potential Moscow has. But destroy-and-rebuild is the model favoured here, with over 1,000 historical buildings knocked down in the last decade. There's no pressure from heritage bodies and no incentives to convert industrial buildings. Indeed, there tend to be disincentives, such as the regulation that only new buildings can qualify for class A office status. It's no wonder that developers have been either demolishing the factories to build luxury apartment blocks or turning them into business parks.

In the last few years, however, things have started to change. For one thing, the recession has put the brakes on developers, allowing nimbler entrepreneurs to slip in. The Red October factory, for instance, was meant to be turned into a luxury residential zone called Golden Island, with buildings by Norman Foster (much beloved of Russia) and Jean Nouvel. Only the credit crunch enabled the Strelka's founders to lease their site. But there is also a new player on the Moscow property scene: the oligarch's wife, who knows only too well from the international circuit how to turn defunct industry into cultural prestige. One such is Dasha Zhukova, Roman Abramovich's wife, who two years ago turned Melnikov's temple-like Bakhmetevsky bus garage of 1927 into an art centre called Garage. Last week it was holding a Rothko retrospective, the kind of show that normally only major museums can handle.

On a grander scale, though less refined architecturally, are the cultural developments in the Kursky industrial area. Here there is Winzavod, a red-brick wine factory built in the 1860s. It was bought by Roman Trotsenko to turn into offices but again his wife, Sofia, saw the potential for a cultural centre. Today it's full of galleries,

showrooms and creative studio spaces. And right next door to it is what used to be the Arma gasworks, which supplied the gas for Moscow's streetlights. Now its four brick gasometers are home to a clutch of nightclubs, creative agencies and publishing houses. In a strange hangover from Soviet bureaucracy, you have to show your passport to enter and you're not allowed to take photographs, which somehow is not quite in the spirit of the place.

Here's the question: is it to be left to the oligarchs' wives to deliver on all this potential cultural programming? One Muscovite I met referred to Garage and Vinzavod rather dismissively as "toys for rich people". "Still," he added, "they could just be buying more yachts."

Perhaps the Strelka offers a different model. The founders of this postgraduate design school, with a curriculum designed by Rem Koolhaas, are at least using their wealth to invest in the next generation. And one way that they are making the school's name (while recouping some funds) is as a social hotspot. In fact, the Strelka is the kind of hybrid that could probably only exist in the turbo-capitalist experiment of Moscow: one part ideology, one part philanthropy (the education will be free) and one part the place to be seen. If the school succeeds, then while Russia may have come late to the post-industrial party, it will have contributed something new to the rather predictable formats we know so well in Europe. Meanwhile, locals are paying it a classic Muscovite compliment: "It's so not like Moscow."

http://www.guardian.co.uk/artanddesign/2010/aug/10/moscow-architecture-strelka

A Deadly Heat Wave and a Roosevelt's Rise

By SAM ROBERTS

HOT enough for you? In 1896, a blazing 10-day heat wave killed nearly 1,500 New Yorkers and, arguably, burnished the progressive and populist credentials of a young police commissioner named Theodore Roosevelt.

Edward P. Kohn, a historian, brings that forgotten natural disaster to light in **"Hot Time in the Old Town: The Great Heat Wave of 1896 and the Making of Theodore Roosevelt"** (Basic Books, $27.95). While Roosevelt was elevated by having the streets hosed and delivering ice to the poor, Professor Kohn argues, the presidential ambitions of William Jennings Bryan, who came to town to accept the Democratic nomination, evaporated. Nearly 10,000 fans braved the heat to hear him in Madison Square Garden; by the time he finished, fewer than half remained.

"The average victim of the heat wave was a workingman, probably Irish, living in the most impoverished and squalid of conditions," Professor Kohn writes. "As he and his brethren died, the philanthropists of the Progressive Era called for reform on all levels: of working conditions and work hours, of housing conditions, of sanitary conditions, of government conditions that allowed corruption and of economic conditions that had made New Yorkers of August 1896 so susceptible to death and disease in the first place."

"Such changes would take decades," he concludes, "but a natural disaster occurring during such an age of reform created a potent catalyst for change."

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"As American society continues to become more virtual, less hands-on," Jessica DuLong writes, "I'm a salmon swimming upstream." Ms. DuLong did her figurative swimming as a licensed engineer on a decommissioned 130-foot-long fireboat on the Hudson and as part of the crew that served at ground zero.

She delivers an engaging narrative of maritime history and her own hands-on perceptions in **"My River Chronicles: Rediscovering the Work That Built America: A Personal and Historical Journey"** (Trade paperback, $16).

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"Unequal Fortunes: Snapshots From the South Bronx" (Teachers College Press, $24.95) lives up to its title. Arthur Levine and his contemporaries living near Creston Avenue in the 1960s did not share the same opportunities, but the level of inequality among them pales compared with the gap between youngsters 40 years ago and those who live in the same neighborhood today.

In this part-memoir, part-meditation — embellished by reporting — Mr. Levine, a former president of Teachers College at Columbia, and Laura Scheiber, a doctoral student at the college, revisit his old neighborhood to explore why some students never even visualize the American dream, much less achieve it, while others overcome the odds.

These snapshots of a young man who is shot dead in front of the building where Mr. Levine was raised and of two others who graduate from college provide a moving picture of corrosive urban inequities.

The authors pair their glimmer of hope with sound prescriptions, citing the programs I Have a Dream, Harlem Children's Zone and Say Yes to Education.

http://www.nytimes.com/2010/08/15/nyregion/15book.html?ref=books

Julian Assange: The end of secrets?

- 16 August 2010 by **David Cohen**
- Magazine issue 2773.

Julian Assange at New Media Days 09 in Copenhagen (Image: New Media Days / Peter Erichsen Creative Commons Attribution-Share Alike 2.0 License)

Lifting the lid on the whistle-blowing website WikiLeaks and its enigmatic hacker-turned-activist founder

"QUICK, you've got to come now or you'll miss him," says the press officer. I'm being ushered down a corridor in the back of the Randolph hotel, Oxford, UK, to meet Julian Assange, an Australian hacker and the founder of the whistle-blower's website WikiLeaks.

I find Assange sitting on a red leather armchair surrounded by journalists and holding a makeshift press conference. He looks wary, like a man on the run, and speaks in a hushed, deep tone- his voice barely audible above the general hubbub- carefully choosing every word. He seems ill at ease, and I can't work out whether he dislikes the press attention, is genuinely scared for his life, or is just a bit socially awkward.

Assange was thrust into the limelight in April after WikiLeaks posted a video of US forces killing civilians in Iraq in 2007. For three years the news agency Reuters had tried, fruitlessly, to get hold of the classified official documents and video describing these events using the US Freedom of Information Act. WikiLeaks- a tiny ad hoc organisation headed by Assange and run by an undisclosed

number of volunteers- scored a coup, striking a goal for citizen journalism and invoking the US government's ire in the process.

"Is there a threat to your security coming from the United States?" one journalist asks.

"There have been unreasonable statements made in private by certain officials in the US administration," Assange replies.

"How would you define 'unreasonable'?"

"Statements which suggest that they may not follow the rule of law."

Assange says he hasn't had any direct physical threats, but adds that he cancelled a recent trip to the US on the advice of an investigative journalist. It is classic cloak-and-dagger stuff, and it gets more so by the day.

Ten days after I met Assange at the press conference in July, his fame mushroomed overnight with the publication of the Afghan War Diary. This collection of over 91,000 documents chronicled virtually every battle and skirmish in the war in Afghanistan. Around 75,000 of them were released on WikiLeaks (the remainder were withheld for security reasons), with simultaneous coverage in *The Guardian, Der Spiegel* and *The New York Times*. Assange agreed to give all three newspapers access to the documents six weeks in advance of publication on his website, a new tactic for the previously little-known organisation. This advance access has proved to be a shrewd move, bringing Assange and WikiLeaks fame on an international scale. Then came the backlash, with several front-page stories in other newspapers echoing US government criticism that the leaks potentially endanger the lives of Afghans working with NATO forces.

Though the War Diary held crucial details about the war in Afghanistan, it didn't alter our understanding of it. The real story revolved around the way the material had been leaked. Something fundamental about how information reaches the public arena has changed. "WikiLeaks underlines to government that simply stamping something as secret isn't a solution, because it will come out," says Ross Anderson, a computer security researcher at the University of Cambridge.

Simply stamping something as secret isn't a solution, because it will come out

What, exactly, has changed? Whistle-blowers may always have chosen what to leak, but the big difference here is that WikiLeaks is able to publish and promote this information to a global audience on a system that makes correction, or post hoc removal, virtually impossible. How did such a system come about?

Assange founded WikiLeaks in 2006. It offers a way for whistle-blowers to anonymously reveal sensitive material to the public. "WikiLeaks is a combined technical, legal and political tool," he says. Since its inception it has published several high-profile leaks, including revelations of corruption in the Kenyan government, the membership list of the British National Party, and the operating procedures manual for Guantanamo Bay prison. But the leaks this year have truly marked its coming of age.

Assange was born in Australia 39 years ago, in Townsville, Queensland. He reportedly moved 37 times by the age of 14, and his schooling was largely done at home. In his teens he developed an interest in computers and became a keen hacker, breaking into several government and corporate servers. Australian police eventually caught up with him, and in his early 20s he stood trial for hacking. Around that time his marriage fell apart, and after a lengthy custody case over his son was concluded he made a trip through Vietnam. When he returned to Australia he wound up studying physics at the University of Melbourne. There his nascent interest in activism developed and the seeds for WikiLeaks were sown.

The site is hosted by Swedish internet provider PRQ. Sweden was seen as the ideal jurisdiction for WikiLeaks because of the country's stringent laws protecting whistle-blowers. The content is mirrored on several other web servers around the globe, and on peer-to-peer networks- where content is virtually impossible to censor. To protect the identity of its sources, it uses a computer network based on a system called Tor. Tor is a successor to Onion Routing, developed by US naval intelligence as a way for its field operatives to communicate anonymously over the internet. All messages in the network are encrypted, so covert communications cannot be distinguished from ordinary messages. "It's a delicious irony that a system first developed by the US government has now come back to haunt them," says Anderson.

Once WikiLeaks receives a submission, Assange says there is a rigorous process to check that the information is genuine. This can involve contacting the subject of the leak, and- as in the case of the Iraq video footage- sending people to verify details on the ground. "As far as we know, we've never released false information," he says.

What is less clear is who decides what information is released and when. In fact, Assange has refused to answer any questions about how his organisation works (it is yet another irony that the mission of such a secretive organisation is to enforce openness on others). However, someone I contacted via the WikiLeaks webserver, who claimed to be a WikiLeaks volunteer, told me that a core of five staff coordinate the analysis of content on the site, and that "to an extent" Assange has editorial veto over what gets published.

As *New Scientist* went to press, another twist emerged. A 1.4-gigabyte encrypted file labelled "insurance" appeared on WikiLeaks, prompting speculation that it contained the full, unedited War Diary, and that the pass code to access the files would be released if any action were taken against the site by US authorities. If true, Assange has dramatically upped the ante. Whether this helps in his mission to make the world a more transparent place remains to be seen.

Background

WikiLeaks, founded in 2006 by Australian hacker and activist Julian Assange, is a web-based service designed to protect the identity of individuals who want to make sensitive information public. Its mission is to promote transparency in government to reduce corruption and promote democracy

http://www.newscientist.com/article/mg20727731.200-julian-assange-the-end-of-secrets.html

X-ray security scans go interactive

- 16 August 2010 by **Duncan Graham-Rowe**
- Magazine issue 2773.

They can see right through you (Image: SIPA PRESS/Rex Features)

AIRPORT security staff can spend their entire day staring at two-dimensional, static X-ray scans. Soon, however, they may be able to interact with these images, rotating a scanned object on the screen and even analysing its chemical composition.

It can be difficult to identify objects from the 2D images generated by X-ray scanners, says Paul Evans, head of the Imaging Science Group at Nottingham Trent University, UK. And while the latest X-ray scanners can glean information about the atomic or molecular weight of a substance, and so help distinguish between materials, the results are crude. The best they can manage is to show metal objects in one colour, organic materials in another and everything else in a third colour.

On an X-ray image, a lump of gorgonzola cheese inside a suitcase "looks identical to TNT", says Keith Rogers of Cranfield University in Shrivenham, Wiltshire, UK. With funding from the US Department

of Homeland Security and the British Home Office, he, Evans and Anthony Dicken, also at Cranfield, have been developing ways to get around these limitations.

One established approach is to capture X-ray scans that give a sense of depth. 3DX-Ray, a company based in Loughborough, UK, has been selling stereoscopic X-ray machines for the past decade. To use them, security staff wear polarised spectacles, similar to those used in 3D movie screenings, which help the brain interpret two scans captured from slightly different viewpoints as a single 3D image. Tests by the US Transport Security Administration (TSA) have shown that even the limited depth information available from these scans significantly increases the probability of identifying a suspect object.

Evans says he can extract much more depth information as an object passes through a security scanner. His technique - called kinetic depth effect X-ray imaging, or KDEX - builds up a 3D image of the object which can be rotated and viewed from a wide range of angles.

In a regular airport security scanner, the X-ray source sits beneath the conveyor belt, with a line of detectors above. KDEX uses six or seven sets of these detectors. "We take snapshots of the object at different relative angles," says Evans, each shot contributing towards a 3D image. Importantly, the technique still requires only one X-ray source - which helps to keep its cost down.

Nick Fox, chief technical officer of 3DX-Ray, says KDEX offers some clear advantages. "It's a very powerful way of getting 3D information," he says. A gun or knife might be identifiable from any angle, he adds, but improvised explosive devices are trickier to recognise, so any extra visual information is welcome.

Explosive devices can be harder to recognise in a scan, so any extra depth information helps

But while KDEX may help in recognising objects, it does not ease the task of detecting or distinguishing between materials. Yet, as Rogers points out, X-rays are routinely used for this kind of analysis. The standard technique is X-ray crystallography, which relies on the diffraction pattern produced when an X-ray beam scatters off a crystalline substance. Comparing the pattern against reference images for known materials allows a range of substances to be identified.

At first sight the technique appears to have little in common with security scanners, which build up an image by measuring how X-rays are absorbed by an object. But Rogers and Dicken have used KDEX to do both tasks simultaneously. Because only one set of detectors is measuring absorption data at any one time, the other detectors can be used to detect diffraction patterns instead.

Presenting their findings at the annual Denver X-ray Conference in Colorado last week, the team showed that they could detect aluminium and aluminium oxide and tell which was which. That's just a start, says Rogers. Because each material has a unique diffraction signature, the technique could be used by customs inspectors to detect consignments of fake pharmaceuticals.

Fox says that people have long been trying to deploy X-ray diffraction in security tasks, but their efforts have been stymied by the costs involved, the slowness of the machines and by the fact that the diffraction signals are weak and hard to capture. At the Denver conference Rogers and his team

presented a new way to tackle this last problem without increasing the intensity of the X-rays or resorting to the large, expensive X-ray sources commonly used in diffraction analysis.

Dubbed focal construct geometry, their technique involves sending the source beam through an opaque mask with holes in a ring pattern, so generating hundreds of narrow X-ray beams. Each beam will produce a conical pattern when it scatters off the material of interest. With hundreds of these beams hitting the target, the scattered cones will intersect. Arranging the beams so that these crossover points coincide with the detectors will effectively boost the signal (*Journal of Applied Crystallography*, vol 43, p 264).

Evans is hopeful that the new techniques, though still in development, are the breakthrough that the security industry has been waiting for. They require no complicated moving beams or detectors and involve doing nothing to a bag beyond putting it on a regular conveyor belt, he says.

It remains to be seen whether airports will be enthusiastic. Despite the favourable TSA tests, no airport has yet adopted the 10-year-old 3DX-Ray technology. Its only use has been in situations where an exceptional level of security is required, such as checks on people entering VIP areas at the Beijing Olympics. "Security in airports is a very price-sensitive issue," says Fox. To be successful, new technology must be available at a price that the airports are willing to pay.

Evans is optimistic. Two US companies have started building KDEX prototypes, which could help drive down the cost of next-generation X-ray security equipment.

http://www.newscientist.com/article/mg20727735.200-xray-security-scans-go-interactive.html

Laser sets quail embryos' hearts racing

- 18:00 15 August 2010 by **Jeff Hecht**

What makes your pulse quicken? For the millimetre-size hearts quail embryos, a laser does the trick. Experiments show that an infrared laser can control the pace of the tiny hearts – the first time that a laser has been shown to affect a whole heart in a living organism.We already knew that light can stimulate nerve activity, and two years ago Nicholas Smith at Osaka University, Japan, showed that 8-millisecond bursts of 80-femtosecond laser pulses could synchronise the pulsing of heart cells in culture. But now a team led by Andrew Rollins at Case Western Reserve University in Cleveland, Ohio, has used a different type of laser to trigger beats across an entire vertebrate heart – albeit a tiny one – in a living organism.

Rollins's group piped millisecond-long pulses of infrared laser light with a wavelength of 1.87 micrometres through an optical fibre, which ended just 500 micrometres from the embryo. Before they switched on the laser, the heart beat once every 1.5 seconds, but firing the laser twice a second quickened the heartbeat to match the laser rate as long as the laser fired (see video, above)."It worked beautifully: the heart rate was in lockstep with the laser pulse rate," says Duco Jansen of Vanderbilt University in Nashville, Tennessee, who collaborated with Rollins on the experiments. The team saw no sign of laser damage after hours of experiments – although prepping the heart for the experiment involved opening the egg, which ultimately killed the embryo.

Jansen picked the 1.87-micrometre wavelength because water partly absorbs such light, warming cells but not cooking them. Somehow the temperature gradient triggers the changes in membrane potential that make the heart beat.

Electricity off

Early applications of the technique will be in studying the developing heart to illuminate cardiac disease – particularly in probing embryonic hearts that are too small to have electrodes inserted into them. "This is an alternative to electrical stimulation with higher spatial resolution," says Jansen. "And since we're stimulating in a domain different than the electrical domain in which we're recording data, it avoids interference."He adds that better understanding of the excitation mechanisms will be critical in building devices for use in clinical applications, which could include optical pacemakers.

Smith, who was not involved in the research, is impressed, calling it "a significant advance in optical pacing and in using light to modify and control living systems that would not be thought to respond to light". He hopes to see more work on heating and optical damage, and on optical control of other biological functions.

Journal reference: *Nature Photonics*, DOI: 10.1038/nphoton.2010.166

http://www.newscientist.com/article/dn19310-laser-sets-quail-embryos-hearts-racing.html

Reinventing urban wind power

- 16:49 06 August 2010 by **Duncan Graham-Rowe**

Good for urban wind? (Image: Glyn Thomas/Superstock)

With the environmental movement gathering momentum, many are thinking of installing wind turbines to generate their own electricity. Unfortunately, wind speeds in urban areas are usually too slow and turbulent to make micro wind generation cost-effective.

So while the strict planning regulations that have prevented homeowners from erecting domestic turbines in the UK are expected to be relaxed next month, city-dwellers may find manufacturers reluctant to sell them their turbines for fear that poor performance will reflect badly on a young and vulnerable industry.

However, researchers at Cornell University in Ithaca, New York, believe that the problem is not with the low wind speeds after all, but with the methods used to harvest wind power. Cities have plenty of wind energy we can use, they say, but to harness it requires a different tack. It's time to reinvent the urban wind turbine.

Moving away from traditional electromagnetic generators and turbines may seem like a radical step, but on a small scale and with low wind speeds, piezoelectric generation looks like an attractive option.

Ephrahim Garcia, a mechanical engineer at Cornell, attached a flexible aerofoil to the end of a pole made out of a piezoelectric material. When air passes over the aerofoil it flutters, causing the pole to flex and generate a small alternating current. "The inspiration came from fish tails," Garcia says.

Garcia and colleague Matthew Bryant tested aerofoils that were 13 centimetres long in a wind tunnel, and found that they generated power in the milliwatt range from wind speeds of just 2 metres per second. With many devices operating in parallel, the amount of power generated could quickly add up, they say.

Leaf out of nature's book

Hod Lipson, also at Cornell, and Shuguang Li, now at the Northwestern Polytechnical University in Xi'an, China, have been working on the same principle. Taking a leaf out of nature's book, they have devised a tree-like configuration that uses lots of flapping leaves as generators.

The leaves are attached to vertically hanging piezoelectric branches by a hinge. As air flows over the leaves, instabilities create turbulent vortices first on one side and then on the other, causing it to flap.

To make the technology as cost-effective as possible, Lipson and Li built their branches from a piezoelectric material called polyvinylidene fluoride, or PVDF. However, while this is cheap it is relatively insensitive, "so we had to find ways to make it shake more vigorously", says Lipson. For this reason the leaves are designed to twist as well as bend the branch, increasing the strain acting on it.

Each leaf can generate nearly 0.3 milliwatts of power, the team say. Although considerably less than Garcia's arrangement, at just a few centimetres long they are smaller and potentially cheaper, says Lipson.

Another solution is to increase the wind speed. Borrowing a trick from the world of concentrated solar power, Kevin Pratt and Francis Charles Moon, both at Cornell, have designed honeycomb-like arrays of funnels designed to accelerate wind as it passes over fluttering piezoelectric strips just a few centimetres across.

Like a lens

"The amount of energy contained within moving wind is determined by the amount of air and its speed," says Pratt. So by forcing the same volume of air through a smaller aperture you can increase the speed. "It's the wind equivalent of a lens," he says.

Computer simulations have shown that some concentrator designs should be able to increase the wind speed by more than 50 per cent. The pair are now building the first prototype for wind tunnel tests. They envisage the final product containing arrays of 30-centimetre-wide concentrators, each housing several dozen piezoelectric strips.

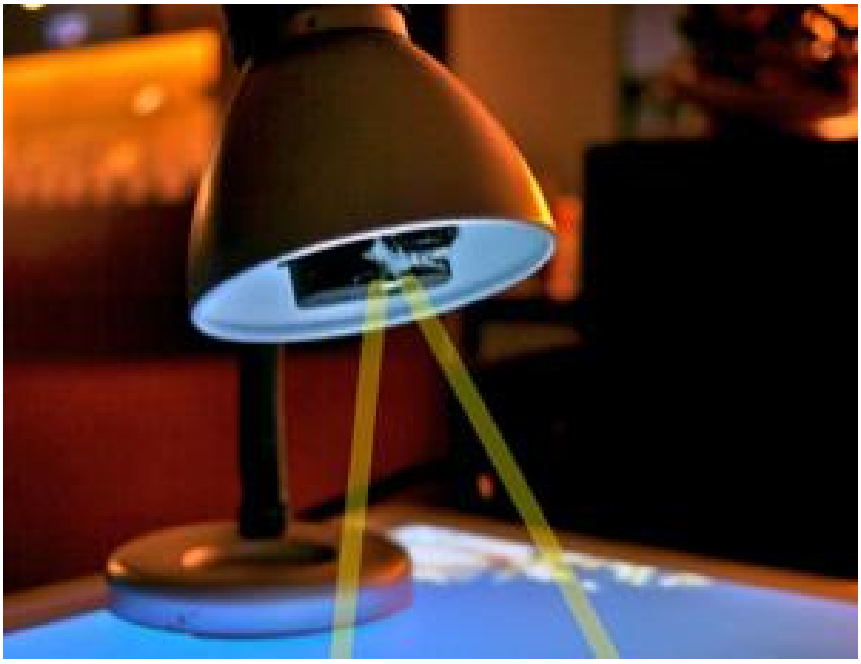
Wind concentrators are not a new idea, but have proved impractical for standard turbines because of their large size. By shrinking the technology the researchers hope to achieve an output power of 5 watts per square metre, roughly one-third of that created by solar power. So if they can be made for a third of the price of solar panels, then the technology could be competitive.

Journal references: Garcia and Bryant's work is published in the *Proceedings of SPIE*, DOI: 10.1117/12.815785; Lipson and Li's work is published in the *Proceedings of the ASME 2009 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*

http://www.newscientist.com/article/dn19274-innovation-reinventing-urban-wind-power.html

Desk lamp turns table top into 3D

- 14:28 13 August 2010 by **Catherine de Lange**



Lighting the way (Image: Liwei Chan)

Switching on a lamp is all it takes to turn a table-top into an interactive map with this clever display, on show at the SIGGRAPH computer graphics and animation conference in Los Angeles.

Multi-touch table-top displays project content through glass and respond to touch – imagine a table-sized smartphone screen.

But Li-Wei Chan from the National Taiwan University in Taipei wanted to make these types of screens more appealing for multiple users. The idea is that several people could look at the same images, and get more information about the areas that interest them, using moveable objects. "I came up with the idea of using a lamp as the interface to provide source of high-resolution projection when one day I saw the famous lamp in Pixar movies."

Users viewing an image such as a map projected onto a table-top display can zoom in on specific areas – seeing street names for example – simply by positioning the "lamp" device over them.

"We combine an infrared projector and a standard colour projector to simultaneously project visible content and invisible markers on the table surface," says Chan. The "lamp" is fitted with infrared

cameras and can use the hidden markers to compute its position in three dimensions. It then uses this information to control the projection of high-res images onto the correct place on the table-top.

Window on 3D

The team have also created a tablet computer which lets viewers see a two-dimensional scene in 3D. If you hold the computer over the area of the map you are interested in, a 3D view of that area will appear on the screen.

The "lamp" also comes in a handheld flashlight design, which Chan thinks could be used with high-res scans of paintings in museums, for example, so that people could zoom in to see more detail of things that have caught their eye.

Using the tablet computer to show up areas of a 3D map would allow several users, each with their own tablet, to examine and discuss the map at once, says Chan. This could be useful for the military, when examining a map of unfamiliar territory and discussing strategy, for example.

http://www.newscientist.com/article/dn19249-future-on-display-desk-lamp-turns-table-top-into-3d.html

Antibacterial socks may boost greenhouse emissions

- 13 August 2010 by **Helen Knight**
- Magazine issue 2773.

They're not green (Image: Domani/Stock.XCHNG)

ANTIBACTERIAL nanoparticles may have more of an impact on the environment than we thought, including potentially raising levels of greenhouse gases.

Silver nanoparticles are used as an antibacterial agent in a wide range of products, from odour-free socks to wound-healing bandages (see diagram). They can find their way into waste water, and have been shown to reduce the activity of bacteria used to remove ammonia when the water is treated.

So far most of the research on the environmental impact of nanoparticles has been carried out on single microbe or plant species within the laboratory. To try to pin down their action in a more realistic setting, Benjamin Colman, a chemist at Duke University in Durham, North Carolina, and colleagues added a high dose of silver nanoparticles - 1.25 milligrams per gram of water - to microbes in a sample of stream water and soil kept within their laboratory. They also set up two outdoor tubs of plants. Treated sludge known to be free of nanoparticles was added to the soil in both tubs, while one tub was also dosed with 55 micrograms of silver nanoparticles per gram of sludge, a concentration similar to levels often found in waste water.

"We are trying to find out what happens when these silver nanoparticles get into the real environment," says Colman. "These particles are developed with the express purpose of killing things."

Silver nanoparticles are developed with the express purpose of killing things

Two months on, the microbial population in the outdoor tub containing silver had significantly declined relative to the lab sample measured after one week. What's more, the activity of the enzymes they produce to break down organic matter was 34 per cent lower in the tub that had been dosed with nanoparticles than in the tub to which only sludge had been added.

Given that the outdoor tub containing nanoparticles had a much lower concentration of silver than the lab samples, the drop in its microbial activity is so large that it suggests the lab samples are not a good guide to real-world behaviour, Colman says.

The team also used a gas chromatograph to measure the gases produced by the microbes. They found that the level of nitrous oxide, a greenhouse gas, given off in the tub containing nanoparticles was four times that in the tub in which only sludge was used. Colman presented the research at the annual meeting of the Ecological Society of America in Pittsburgh, Pennsylvania, last week.

Donald Wuebbles, an atmospheric scientist at the University of Illinois at Urbana-Champaign, says that if the results were replicated on a large scale, it could "further contribute to concerns about global changes in climate". He points out that nitrous oxide can also damage the ozone layer if it gets into the stratosphere.

The team is now planning further experiments, including the setting up of a complete wetland ecosystem to measure how it might be affected by waste water containing silver nanoparticles.

http://www.newscientist.com/article/mg20727735.300-antibacterial-socks-may-boost-greenhouse-emissions.html

The next best thing to oil

- 19:00 12 August 2010 by **Helen Knight**

A renewable carbon economy? Surely that's a pipe dream? Perhaps not, now that solar power facilities are cropping up in deserts across California, Spain and North Africa. The idea is to use the sun to power chemical plants able to split carbon dioxide. Combine the resulting carbon monoxide with hydrogen and you have the beginnings of a solar fuel that could one day replace oil.

Since 2008, a European consortium led by Athanasios Konstandopoulos at the Centre for Research and Technology Hellas, Thessaloníki, Greece, has been operating a 100-kilowatt pilot plant that generates hydrogen from a combination of sunlight and steam. The plant is sited at a concentrating solar power tower – the Plataforma Solar de Almería, in Almería, Spain – which houses a series of mirrors to concentrate the sun's rays onto solar panels beneath.

The same technology can also be used to split CO_2 – the resulting CO can be combined with the hydrogen to form hydrocarbon fuel, they say.

The pilot plant contains a ceramic reactor riddled with a honeycomb network of channels coated in a mixed iron and cerium oxide. Concentrated solar energy heats the reactor to around 1200 °C, releasing oxygen gas, which is pumped away. The reactor is then cooled to around 800 °C before steam is fed through the honeycomb – the depleted material steals back oxygen and in the process converts the steam into hydrogen gas.

Pilot plant

The team has run the pilot plant in several week-long bursts since its launch as part of the European Commission-funded Hydrosol II project. They claim that it is possible to convert up to 30 per cent of the steam into hydrogen.

Now, Konstandopoulos and colleagues have successfully used the same reactor technology and process to split carbon dioxide into carbon monoxide in the lab. Two reactors running simultaneously could generate hydrogen and carbon monoxide, which could be combined into synthetic fuel using one of two established chemical processes, says Konstandopoulos.

In the Sabatier process the two gases are heated at high pressure in the presence of a nickel catalyst to produce methane or methanol, while in the Fischer-Tropsch process an iron-based catalyst is used to generate liquid hydrocarbon fuels.

The process would help to make better use of the CO_2 captured from power plants, which otherwise might simply be buried underground. Konstandopoulos says it could also solve the problem of storing and transporting hydrogen once it is produced – a problem that could prevent the development of a hydrogen economy.

Nature's choice

"Hydrocarbons are the best energy carriers that we have available – nature has already proven that," he says. "We just have to find a way not to use them as our primary energy source."

Generating hydrocarbons this way would also mean few changes are needed to cars and existing fuel infrastructure, he says.

Other teams are investigating different reactor designs for producing solar fuel, including rotating rings of cerium oxide. A team led by Aldo Steinfeld at the Swiss Federal Institute of Technology, Zurich, has built a 10-kilowatt plant in which steam and carbon dioxide are reacted with zinc oxide to produce synthetic gas in one step. They plan to test a 100-kilowatt version next year.

Konstandopoulos and colleagues are now working to scale up their technology and build a 1 megawatt hydrogen-producing plant, in a project known as Hydrosol 3D.

Journal reference: *Science*, DOI: 10.1126/science.1191137

http://www.newscientist.com/article/dn19308-the-next-best-thing-to-oil.html

Long-lasting images save on power

- 17:29 12 August 2010 by **Colin Barras**

Don't step on my green light boots (Image: Daniel Saakes et al/MIT Media Lab)

Sometimes life is in the slow lane has its advantages. Eschewing the fashion for screens that can refresh hundreds of times a second, Daniel Saakes, Kevin Chiu and Tyler Hutchison from the Camera Culture group at the Massachusetts Institute of Technology, and Naoya Koizumi from the Graduate School of Media Design at Keio University in Tokyo, Japan, have built displays that changes only every few hours. The benefit, they say is unparalleled energy efficiency.

The group's Slow Display uses less than 2 watts of power to display an image on a screen with a diagonal dimension of 3.2 metres – a standard LCD screen with a diagonal dimension of just 1.3 metres can use 100 to 200 watts. Although there are alternative low-power display technologies such as electronic ink or cholesteric liquid crystal displays, they are difficult to scale without simply tiling a large number of smaller displays, says Saakes's team. Consequently, their technology is better suited for the slow-changing, always-on digital displays used in advertising or to inform road drivers about driving conditions.

The screen is coated with a light-sensitive paint that undergoes a reversible photochemical reaction when exposed to ultraviolet light, changing colour in the process. A second coat of phosphorescent paint that glows when exposed to UV light ensures the screen can be used both day and night.

The image is projected onto the display via a UV laser projector, which activates the materials coating the display. The resulting image remains legible for an hour or more after the laser is shut off. It fades away as the photochemical reaction reverses.

Fade away

To prevent the image being degraded by the UV in sunlight, a filter can be fitted to the front of the screen. The image then has to be projected from a laser mounted behind the screen.

The fading of the image is not controlled, and the team recognises that that means ghosts of old images may remain the image has been refreshed. They are investigating photosensitive compounds which react to different wavelengths of light, with the aim of creating a coating that can be turned off as well as on.

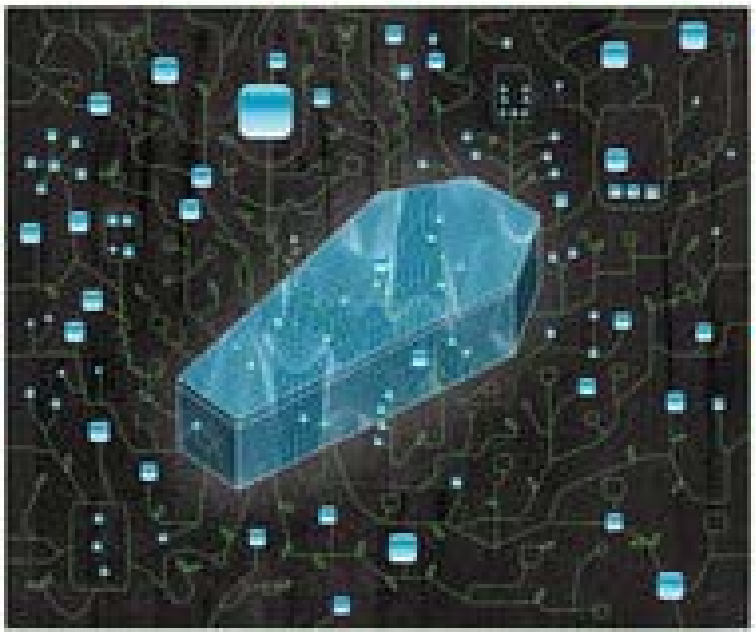
Because it is the materials coating the display surface that form the image, the technology can be applied to 3D objects. This could be put to use in an engineer's model, for example, to display virtual decals or logos.

But Saakes' team points out any such image may be short lived as it is more difficult to protect the image on a 3D object from oversaturation using a UV filter.

http://www.newscientist.com/article/dn19259-future-on-display-longlasting-images-save-on-power.html

Now Playing: Night of the Living Tech

By STEVE LOHR



Life in the media and communications terrarium, it seems, is getting increasingly perilous. The predictions of demise are piling up. Phone calls, e-mail, blogs and Facebook, according to digerati pundits recently, are speeding toward the grave. Last week, Wired magazine proclaimed, "The Web Is Dead."

Yet evolution — not extinction — has always been the primary rule of media ecology. New media predators rise up, but other media species typically adapt rather than perish. That is the message of both history and leading media theorists, like Marshall McLuhan and Neil Postman. Television, for example, was seen as a threat to radio and movies, though both evolved and survived.

Still, if the evolutionary pattern remains intact, there are some fundamental differences in today's media ecology, experts say.

Strip away the headline hyperbole of the "death of" predictions, they note, and what remains is mainly commentary on the impact of the accelerated pace of change and accumulated innovations in the Internet-era media and communications environment. A result has been a proliferation of digital media forms and fast-shifting patterns of media consumption.

So the evolutionary engine runs faster than ever before, opening the door to new and often unforeseen possibilities. "Change has changed qualitatively," says Janet Sternberg, an assistant professor at Fordham University and president of the Media Ecology Association, a research organization.

Up, for example, sprout social networks — Facebook, Twitter, Tumblr, Foursquare and others — that are hybrids of communication, media distribution and unvarnished self-expression. New versatile digital devices

— whether iPhone or Android smartphones, iPod players and iPad tablets — nurture more innovation and experimentation.

Adaptations follow. College freshman don't wear watches — cellphones are their timepieces — and seldom use e-mail, notes the Beloit College Mindset List, which was released last week. (The yearly list, created by two faculty members in 1998, is intended as a glimpse at the attitudes and behavior of new college students.) Instead of e-mail, young people prefer to communicate through social networks, or instant-messaging or cellphone text messages, to which their friends are more likely to reply quickly.

Americans are talking less on their cellphones. When they do talk, the conversations are shorter, according to industry data. Partly, this reflects the shift in use of cellphones more as mobile computers that communicate via written messages. But this also reflects a subtle shift in etiquette, experts say. People increasingly use text messages and e-mail to arrange telephone calls, which are reserved for more important, complicated dialogues. An unscheduled call from people other than family members, they say, is often regarded as a rude intrusion.

Broad swaths of the blogosphere lie fallow, abandoned. But again, this is a sign of adaptive behavior. Much of the communication on personal blogs, where people wrote and posted pictures of themselves, their children and their pets, was about "sociability" and has shifted to social networks like Facebook, says John Kelly, lead scientist at Morningside Analytics, a research firm. But professional blogs, meant for public consumption, and focused on subjects like politics, economics and news, are thriving, Mr. Kelly notes.

The spread of mobile media devices, whether smartphones or iPads or Nooks, has led to tailored software applications that make reading text and watching video easier on screens smaller than those on personal computers. So people are not viewing this mobile media through a Web browser like Internet Explorer or Firefox, a central point in the Wired "Web Is Dead" article. But the books, magazines and movies viewed on an iPad, for example, are downloaded over the Internet. Indeed, Wired added the headline declaration, "Long Live the Internet." Similarly, the case for Facebook's fall someday is that it is a cluttered Web creation when mobile devices demand sleek, simple designs.

Adaptive innovation and experimentation, experts say, is the rule in a period of rapid change that can be seen as the digital-age equivalent of the ferment after the introduction of the printing press. "We're experiencing the biggest media petri dish in four centuries," observes Paul Saffo, a visiting scholar at Stanford University who specializes in technology's effect on society.

Media evolution, of course, does claim casualties. But most often, these are means of distribution or storage, especially physical ones that can be transformed into digital bits. Photographic film is supplanted, but people take more pictures than ever. CD's no longer dominate, as music is more and more distributed online. "Books, magazines and newspapers are next," predicts Nicholas Negroponte, founder of the M.I.T. Media Lab. "Text is not going away, nor is reading. Paper is going away."

Technology is by no means the only agent of change. Cultural tastes have a big influence, sometimes bringing quirky turns in the evolutionary dance. Record turntables and vinyl records did appear all but extinct — only to be revived by audiophiles, including D.J.'s who created new sounds and rhythms — the art of turntablism. Today, the analog devices are often linked to computers for editing and adding sound tracks, and many people mix tracks at home. Turntables have made a niche revival, and vinyl record sales have increased 62 percent over the last decade to 2.4 million last year, reports Nielsen, a market research firm.

"No one would have predicted that — the unexpected happens," says Lisa Gitelman, a media historian at New York University. "When we look at how media evolves, it is clear there is no single arrow forward."

Radio is a classic evolutionary survivor. In the 1930s and 1940s, radio was the entertainment hearth of American households, as depicted in the Woody Allen film "Radio Days." By the 1950s, television wrested that role from radio. But the older media adapted by moving to shorter programming formats and becoming the background music and chat while people ride in cars and do other things at home. Later, digital satellite distribution breathed new life and diversity into radio offerings, by allowing almost unlimited channels.

"Radio is a supple and durable technology that has outlived quite a few predictions of its demise," says John Staudenmaier, editor of the journal Technology and Culture, who regards podcasts as the long-lived medium's latest incarnation. "It's the country cousin of radio, still the transmission of audio only," he says.

Movies, too, have proved remarkably resilient. The television threat in the 1950s set off Hollywood's early, brief foray into 3-D (only recently revived). Movies like "Bwana Devil," "House of Wax" and even Alfred Hitchcock's 1954 "Dial M for Murder" were shot in 3-D, though the latter played in most theaters as a conventional film. Yet the ultimate solution for Hollywood back then was not a technical gimmick, but a richer art form, though one assisted by wide-screen, vivid-color technologies like Cinerama and CinemaScope. Studios began turning out fewer films, but ones intended to give viewers a more vibrant, immersive experience than television could offer — movies like "Ben-Hur" in 1959 and "How the West Was Won" in 1962.

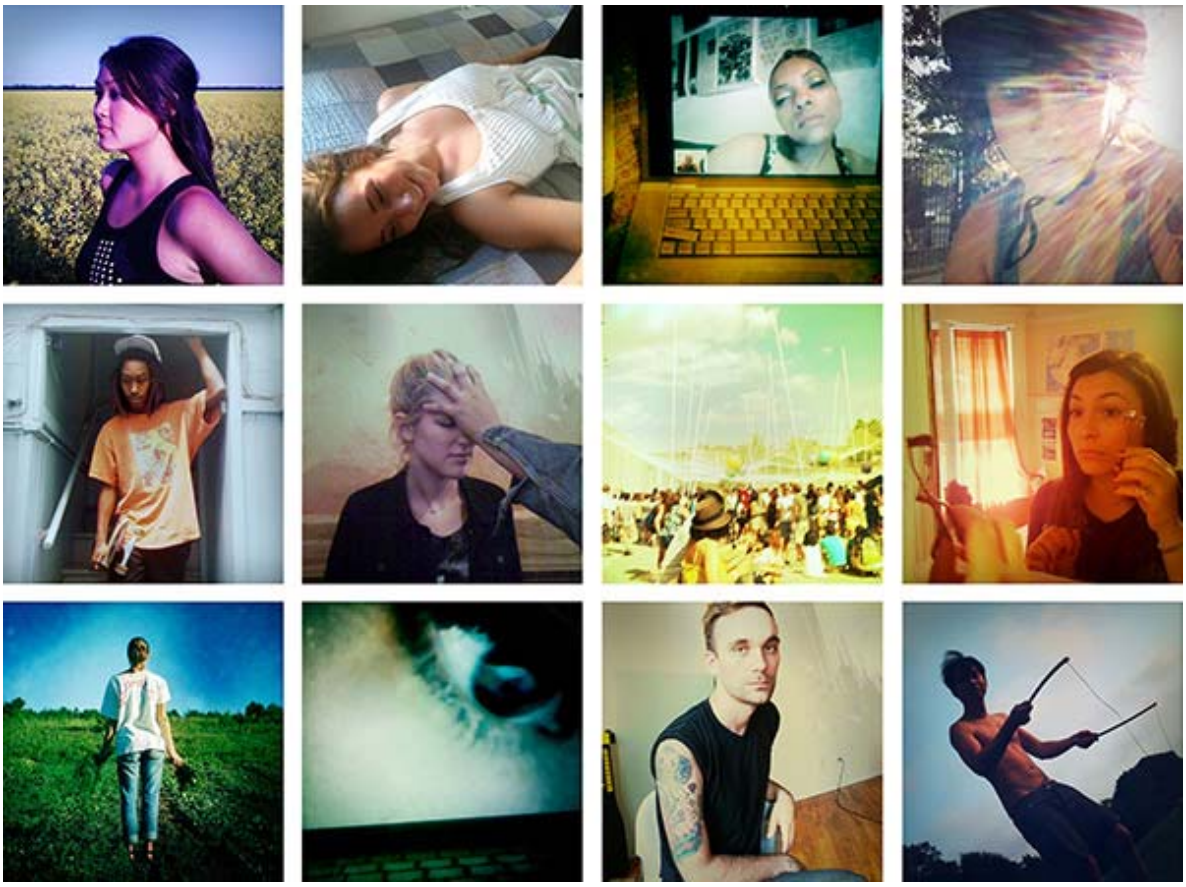
Today, traditional media companies face the adaptive challenge posed by the Internet. That challenge is not just the technology itself, but how it has altered people's habits of media consumption. Multitasking, in the sense of truly being able to focus on more than one cognitively taxing task at a time, may well be a myth, experts say. But it does seem to be an accurate description of people's behavior — watching television, while surfing the Internet or answering text messages. "Consumers are getting much more adept at engaging two or three forms of media at a time," says Steve Hasker, head of Nielsen's media unit.

Attention spans evolve and shorten, as even the most skilled media jugglers can attest. "I love the iPad," admits Mr. Negroponte, "but my ability to read any long-form narrative has more or less disappeared, as I am constantly tempted to check e-mail, look up words or click through." And people, every bit as much as technology, shape the churning media ecology.

http://www.nytimes.com/2010/08/22/weekinreview/22lohr.html?_r=1&ref=technology

What Is It About 20-Somethings?

By ROBIN MARANTZ HENIG



Why are so many people in their 20s taking so long to grow up?

This question pops up everywhere, underlying concerns about "failure to launch" and "boomerang kids." Two new sitcoms feature grown children moving back in with their parents — "$#*! My Dad Says," starring William Shatner as a divorced curmudgeon whose 20-something son can't make it on his own as a blogger, and "Big Lake," in which a financial whiz kid loses his Wall Street job and moves back home to rural Pennsylvania. A cover of The New Yorker last spring picked up on the zeitgeist: a young man hangs up his new Ph.D. in his boyhood bedroom, the cardboard box at his feet signaling his plans to move back home now that he's officially overqualified for a job. In the doorway stand his parents, their expressions a mix of resignation, worry, annoyance and perplexity: how exactly did this happen?

It's happening all over, in all sorts of families, not just young people moving back home but also young people taking longer to reach adulthood overall. It's a development that predates the current economic doldrums, and no one knows yet what the impact will be — on the prospects of the young men and women; on the parents on whom so many of them depend; on society, built on the expectation of an orderly progression in which kids finish school, grow up, start careers, make a family and eventually retire to live on

pensions supported by the next crop of kids who finish school, grow up, start careers, make a family and on and on. The traditional cycle seems to have gone off course, as young people remain untethered to romantic partners or to permanent homes, going back to school for lack of better options, traveling, avoiding commitments, competing ferociously for unpaid internships or temporary (and often grueling) Teach for America jobs, forestalling the beginning of adult life.

The 20s are a black box, and there is a lot of churning in there. One-third of people in their 20s move to a new residence every year. Forty percent move back home with their parents at least once. They go through an average of seven jobs in their 20s, more job changes than in any other stretch. Two-thirds spend at least some time living with a romantic partner without being married. And marriage occurs later than ever. The median age at first marriage in the early 1970s, when the baby boomers were young, was 21 for women and 23 for men; by 2009 it had climbed to 26 for women and 28 for men, five years in a little more than a generation.

We're in the thick of what one sociologist calls "the changing timetable for adulthood." Sociologists traditionally define the "transition to adulthood" as marked by five milestones: completing school, leaving home, becoming financially independent, marrying and having a child. In 1960, 77 percent of women and 65 percent of men had, by the time they reached 30, passed all five milestones. Among 30-year-olds in 2000, according to data from the United States Census Bureau, fewer than half of the women and one-third of the men had done so. A Canadian study reported that a typical 30-year-old in 2001 had completed the same number of milestones as a 25-year-old in the early '70s.

The whole idea of milestones, of course, is something of an anachronism; it implies a lockstep march toward adulthood that is rare these days. Kids don't shuffle along in unison on the road to maturity. They slouch toward adulthood at an uneven, highly individual pace. Some never achieve all five milestones, including those who are single or childless by choice, or unable to marry even if they wanted to because they're gay. Others reach the milestones completely out of order, advancing professionally before committing to a monogamous relationship, having children young and marrying later, leaving school to go to work and returning to school long after becoming financially secure.

Even if some traditional milestones are never reached, one thing is clear: Getting to what we would generally call adulthood is happening later than ever. But why? That's the subject of lively debate among policy makers and academics. To some, what we're seeing is a transient epiphenomenon, the byproduct of cultural and economic forces. To others, the longer road to adulthood signifies something deep, durable and maybe better-suited to our neurological hard-wiring. What we're seeing, they insist, is the dawning of a new life stage — a stage that all of us need to adjust to.

JEFFREY JENSEN ARNETT, a psychology professor at Clark University in Worcester, Mass., is leading the movement to view the 20s as a distinct life stage, which he calls "emerging adulthood." He says what is happening now is analogous to what happened a century ago, when social and economic changes helped create adolescence — a stage we take for granted but one that had to be recognized by psychologists, accepted by society and accommodated by institutions that served the young. Similar changes at the turn of the 21st century have laid the groundwork for another new stage, Arnett says, between the age of 18 and the late 20s. Among the cultural changes he points to that have led to "emerging adulthood" are the need for more education to survive in an information-based economy; fewer entry-level jobs even after all that schooling; young people feeling less rush to marry because of the general acceptance of premarital sex, cohabitation and birth control; and young women feeling less rush to have babies given their wide range of career options and their access to assisted reproductive technology if they delay pregnancy beyond their most fertile years.

Just as adolescence has its particular psychological profile, Arnett says, so does emerging adulthood: identity exploration, instability, self-focus, feeling in-between and a rather poetic characteristic he calls "a sense of possibilities." A few of these, especially identity exploration, are part of adolescence too, but they take on new depth and urgency in the 20s. The stakes are higher when people are approaching the age when options tend to close off and lifelong commitments must be made. Arnett calls it "the age 30 deadline."

The issue of whether emerging adulthood is a new stage is being debated most forcefully among scholars, in particular psychologists and sociologists. But its resolution has broader implications. Just look at what happened for teenagers. It took some effort, a century ago, for psychologists to make the case that adolescence was a new developmental stage. Once that happened, social institutions were forced to adapt: education, health care, social services and the law all changed to address the particular needs of 12- to 18-year-olds. An understanding of the developmental profile of adolescence led, for instance, to the creation of junior high schools in the early 1900s, separating seventh and eighth graders from the younger children in what used to be called primary school. And it led to the recognition that teenagers between 14 and 18, even though they were legally minors, were mature enough to make their own choice of legal guardian in the event of their parents' deaths. If emerging adulthood is an analogous stage, analogous changes are in the wings.

But what would it look like to extend some of the special status of adolescents to young people in their 20s? Our uncertainty about this question is reflected in our scattershot approach to markers of adulthood. People can vote at 18, but in some states they don't age out of foster care until 21. They can join the military at 18, but they can't drink until 21. They can drive at 16, but they can't rent a car until 25 without some hefty surcharges. If they are full-time students, the Internal Revenue Service considers them dependents until 24; those without health insurance will soon be able to stay on their parents' plans even if they're not in school until age 26, or up to 30 in some states. Parents have no access to their child's college records if the child is over 18, but parents' income is taken into account when the child applies for financial aid up to age 24. We seem unable to agree when someone is old enough to take on adult responsibilities. But we're pretty sure it's not simply a matter of age.

If society decides to protect these young people or treat them differently from fully grown adults, how can we do this without becoming all the things that grown children resist — controlling, moralizing, paternalistic? Young people spend their lives lumped into age-related clusters — that's the basis of K-12 schooling — but as they move through their 20s, they diverge. Some 25-year-olds are married homeowners with good jobs and a couple of kids; others are still living with their parents and working at transient jobs, or not working at all. Does that mean we extend some of the protections and special status of adolescence to all people in their 20s? To some of them? Which ones? Decisions like this matter, because failing to protect and support vulnerable young people can lead them down the wrong path at a critical moment, the one that can determine all subsequent paths. But overprotecting and oversupporting them can sometimes make matters worse, turning the "changing timetable of adulthood" into a self-fulfilling prophecy.

The more profound question behind the scholarly intrigue is the one that really captivates parents: whether the prolongation of this unsettled time of life is a good thing or a bad thing. With life spans stretching into the ninth decade, is it better for young people to experiment in their 20s before making choices they'll have to live with for more than half a century? Or is adulthood now so malleable, with marriage and employment options constantly being reassessed, that young people would be better off just getting started on something, or else they'll never catch up, consigned to remain always a few steps behind the early bloomers? Is emerging adulthood a rich and varied period for self-discovery, as Arnett says it is? Or is it just another term for self-indulgence?

THE DISCOVERY OF adolescence is generally dated to 1904, with the publication of the massive study "Adolescence," by G. Stanley Hall, a prominent psychologist and first president of the American Psychological Association. Hall attributed the new stage to social changes at the turn of the 20th century. Child-labor laws kept children under 16 out of the work force, and universal education laws kept them in secondary school, thus prolonging the period of dependence — a dependence that allowed them to address psychological tasks they might have ignored when they took on adult roles straight out of childhood. Hall, the first president of Clark University — the same place, interestingly enough, where Arnett now teaches — described adolescence as a time of "storm and stress," filled with emotional upheaval, sorrow and rebelliousness. He cited the "curve of despondency" that "starts at 11, rises steadily and rapidly till 15 . . . then falls steadily till 23," and described other characteristics of adolescence, including an increase in sensation seeking, greater susceptibility to media influences (which in 1904 mostly meant "flash literature" and "penny dreadfuls") and overreliance on peer relationships. Hall's book was flawed, but it marked the beginning of the scientific study of adolescence and helped lead to its eventual acceptance as a distinct stage with its own challenges, behaviors and biological profile.

In the 1990s, Arnett began to suspect that something similar was taking place with young people in their late teens and early 20s. He was teaching human development and family studies at the University of Missouri, studying college-age students, both at the university and in the community around Columbia, Mo. He asked them questions about their lives and their expectations like, "Do you feel you have reached adulthood?"

"I was in my early- to mid-30s myself, and I remember thinking, They're not a thing like me," Arnett told me when we met last spring in Worcester. "I realized that there was something special going on." The young people he spoke to weren't experiencing the upending physical changes that accompany adolescence, but as an age cohort they did seem to have a psychological makeup different from that of people just a little bit younger or a little bit older. This was not how most psychologists were thinking about development at the time, when the eight-stage model of the psychologist Erik Erikson was in vogue. Erikson, one of the first to focus on psychological development past childhood, divided adulthood into three stages — young (roughly ages 20 to 45), middle (about ages 45 to 65) and late (all the rest) — and defined them by the challenges that individuals in a particular stage encounter and must resolve before moving on to the next stage. In young adulthood, according to his model, the primary psychological challenge is "intimacy versus isolation," by which Erikson meant deciding whether to commit to a lifelong intimate relationship and choosing the person to commit to.

But Arnett said "young adulthood" was too broad a term to apply to a 25-year span that included both him and his college students. The 20s are something different from the 30s and 40s, he remembered thinking. And while he agreed that the struggle for intimacy was one task of this period, he said there were other critical tasks as well.

Arnett and I were discussing the evolution of his thinking over lunch at BABA Sushi, a quiet restaurant near his office where he goes so often he knows the sushi chefs by name. He is 53, very tall and wiry, with clipped steel-gray hair and ice-blue eyes, an intense, serious man. He describes himself as a late bloomer, a onetime emerging adult before anyone had given it a name. After graduating from Michigan State University in 1980, he spent two years playing guitar in bars and restaurants and experimented with girlfriends, drugs and general recklessness before going for his doctorate in developmental psychology at the University of Virginia. By 1986 he had his first academic job at Oglethorpe University, a small college in Atlanta. There he met his wife, Lene Jensen, the school's smartest psych major, who stunned Arnett when she came to his office one day in 1989, shortly after she graduated, and asked him out on a date. Jensen earned a doctorate in psychology, too, and she also teaches at Clark. She and Arnett have 10-year-old twins, a boy and a girl.

Arnett spent time at Northwestern University and the University of Chicago before moving to the University of Missouri in 1992, beginning his study of young men and women in the college town of Columbia, gradually broadening his sample to include New Orleans, Los Angeles and San Francisco. He deliberately included working-class young people as well as those who were well off, those who had never gone to college as well as those who were still in school, those who were supporting themselves as well as those whose bills were being paid by their parents. A little more than half of his sample was white, 18 percent African-American, 16 percent Asian-American and 14 percent Latino.

More than 300 interviews and 250 survey responses persuaded Arnett that he was onto something new. This was the era of the Gen X slacker, but Arnett felt that his findings applied beyond one generation. He wrote them up in 2000 in American Psychologist, the first time he laid out his theory of "emerging adulthood." According to Google Scholar, which keeps track of such things, the article has been cited in professional books and journals roughly 1,700 times. This makes it, in the world of academia, practically viral. At the very least, the citations indicate that Arnett had come up with a useful term for describing a particular cohort; at best, that he offered a whole new way of thinking about them.

DURING THE PERIOD he calls emerging adulthood, Arnett says that young men and women are more self-focused than at any other time of life, less certain about the future and yet also more optimistic, no matter what their economic background. This is where the "sense of possibilities" comes in, he says; they have not yet tempered their idealistic visions of what awaits. "The dreary, dead-end jobs, the bitter divorces, the disappointing and disrespectful children . . . none of them imagine that this is what the future holds for them," he wrote. Ask them if they agree with the statement "I am very sure that someday I will get to where I want to be in life," and 96 percent of them will say yes. But despite elements that are exciting, even exhilarating, about being this age, there is a downside, too: dread, frustration, uncertainty, a sense of not quite understanding the rules of the game. More than positive or negative feelings, what Arnett heard most often was ambivalence — beginning with his finding that 60 percent of his subjects told him they felt like both grown-ups and not-quite-grown-ups.

Some scientists would argue that this ambivalence reflects what is going on in the brain, which is also both grown-up and not-quite-grown-up. Neuroscientists once thought the brain stops growing shortly after puberty, but now they know it keeps maturing well into the 20s. This new understanding comes largely from a longitudinal study of brain development sponsored by the National Institute of Mental Health, which started following nearly 5,000 children at ages 3 to 16 (the average age at enrollment was about 10). The scientists found the children's brains were not fully mature until at least 25. "In retrospect I wouldn't call it shocking, but it was at the time," Jay Giedd, the director of the study, told me. "The only people who got this right were the car-rental companies."

When the N.I.M.H. study began in 1991, Giedd said he and his colleagues expected to stop when the subjects turned 16. "We figured that by 16 their bodies were pretty big physically," he said. But every time the children returned, their brains were found still to be changing. The scientists extended the end date of the study to age 18, then 20, then 22. The subjects' brains were still changing even then. Tellingly, the most significant changes took place in the prefrontal cortex and cerebellum, the regions involved in emotional control and higher-order cognitive function.

As the brain matures, one thing that happens is the pruning of the synapses. Synaptic pruning does not occur willy-nilly; it depends largely on how any one brain pathway is used. By cutting off unused pathways, the brain eventually settles into a structure that's most efficient for the owner of that brain, creating well-worn grooves for the pathways that person uses most. Synaptic pruning intensifies after rapid brain-cell

proliferation during childhood and again in the period that encompasses adolescence and the 20s. It is the mechanism of "use it or lose it": the brains we have are shaped largely in response to the demands made of them.

We have come to accept the idea that environmental influences in the first three years of life have long-term consequences for cognition, emotional control, attention and the like. Is it time to place a similar emphasis, with hopes for a similar outcome, on enriching the cognitive environment of people in their 20s?

N.I.M.H. scientists also found a time lag between the growth of the limbic system, where emotions originate, and of the prefrontal cortex, which manages those emotions. The limbic system explodes during puberty, but the prefrontal cortex keeps maturing for another 10 years. Giedd said it is logical to suppose — and for now, neuroscientists have to make a lot of logical suppositions — that when the limbic system is fully active but the cortex is still being built, emotions might outweigh rationality. "The prefrontal part is the part that allows you to control your impulses, come up with a long-range strategy, answer the question 'What am I going to do with my life?' " he told me. "That weighing of the future keeps changing into the 20s and 30s."

Among study subjects who enrolled as children, M.R.I. scans have been done so far only to age 25, so scientists have to make another logical supposition about what happens to the brain in the late 20s, the 30s and beyond. Is it possible that the brain just keeps changing and pruning, for years and years? "Guessing from the shape of the growth curves we have," Giedd's colleague Philip Shaw wrote in an e-mail message, "it does seem that much of the gray matter," where synaptic pruning takes place, "seems to have completed its most dramatic structural change" by age 25. For white matter, where insulation that helps impulses travel faster continues to form, "it does look as if the curves are still going up, suggesting continued growth" after age 25, he wrote, though at a slower rate than before.

None of this is new, of course; the brains of young people have always been works in progress, even when we didn't have sophisticated scanning machinery to chart it precisely. Why, then, is the youthful brain only now arising as an explanation for why people in their 20s are seeming a bit unfinished? Maybe there's an analogy to be found in the hierarchy of needs, a theory put forth in the 1940s by the psychologist Abraham Maslow. According to Maslow, people can pursue more elevated goals only after their basic needs of food, shelter and sex have been met. What if the brain has its own hierarchy of needs? When people are forced to adopt adult responsibilities early, maybe they just do what they have to do, whether or not their brains are ready. Maybe it's only now, when young people are allowed to forestall adult obligations without fear of public censure, that the rate of societal maturation can finally fall into better sync with the maturation of the brain.

Cultural expectations might also reinforce the delay. The "changing timetable for adulthood" has, in many ways, become internalized by 20-somethings and their parents alike. Today young people don't expect to marry until their late 20s, don't expect to start a family until their 30s, don't expect to be on track for a rewarding career until much later than their parents were. So they make decisions about their futures that reflect this wider time horizon. Many of them would not be ready to take on the trappings of adulthood any earlier even if the opportunity arose; they haven't braced themselves for it.

Nor do parents expect their children to grow up right away — and they might not even want them to. Parents might regret having themselves jumped into marriage or a career and hope for more considered choices for their children. Or they might want to hold on to a reassuring connection with their children as the kids leave home. If they were "helicopter parents" — a term that describes heavily invested parents who hover over their children, swooping down to take charge and solve problems at a moment's notice — they might keep hovering and problem-solving long past the time when their children should be solving problems on their

own. This might, in a strange way, be part of what keeps their grown children in the limbo between adolescence and adulthood. It can be hard sometimes to tease out to what extent a child doesn't quite want to grow up and to what extent a parent doesn't quite want to let go.

IT IS A BIG DEAL IN developmental psychology to declare the existence of a new stage of life, and Arnett has devoted the past 10 years to making his case. Shortly after his American Psychologist article appeared in 2000, he and Jennifer Lynn Tanner, a developmental psychologist at Rutgers University, convened the first conference of what they later called the Society for the Study of Emerging Adulthood. It was held in 2003 at Harvard with an attendance of 75; there have been three more since then, and last year's conference, in Atlanta, had more than 270 attendees. In 2004 Arnett published a book, "Emerging Adulthood: The Winding Road From the Late Teens Through the Twenties," which is still in print and selling well. In 2006 he and Tanner published an edited volume, "Emerging Adults in America: Coming of Age in the 21st Century," aimed at professionals and academics. Arnett's college textbook, "Adolescence and Emerging Adulthood: A Cultural Approach," has been in print since 2000 and is now in its fourth edition. Next year he says he hopes to publish another book, this one for the parents of 20-somethings.

If all Arnett's talk about emerging adulthood sounds vaguely familiar . . . well, it should. Forty years ago, an article appeared in The American Scholar that declared "a new stage of life" for the period between adolescence and young adulthood. This was 1970, when the oldest members of the baby boom generation — the parents of today's 20-somethings — were 24. Young people of the day "can't seem to 'settle down,' " wrote the Yale psychologist Kenneth Keniston. He called the new stage of life "youth."

Keniston's description of "youth" presages Arnett's description of "emerging adulthood" a generation later. In the late '60s, Keniston wrote that there was "a growing minority of post-adolescents [who] have not settled the questions whose answers once defined adulthood: questions of relationship to the existing society, questions of vocation, questions of social role and lifestyle." Whereas once, such aimlessness was seen only in the "unusually creative or unusually disturbed," he wrote, it was becoming more common and more ordinary in the baby boomers of 1970. Among the salient characteristics of "youth," Keniston wrote, were "pervasive ambivalence toward self and society," "the feeling of absolute freedom, of living in a world of pure possibilities" and "the enormous value placed upon change, transformation and movement" — all characteristics that Arnett now ascribes to "emerging adults."

Arnett readily acknowledges his debt to Keniston; he mentions him in almost everything he has written about emerging adulthood. But he considers the '60s a unique moment, when young people were rebellious and alienated in a way they've never been before or since. And Keniston's views never quite took off, Arnett says, because "youth" wasn't a very good name for it. He has called the label "ambiguous and confusing," not nearly as catchy as his own "emerging adulthood."

For whatever reason Keniston's terminology faded away, it's revealing to read his old article and hear echoes of what's going on with kids today. He was describing the parents of today's young people when they themselves were young — and amazingly, they weren't all that different from their own children now. Keniston's article seems a lovely demonstration of the eternal cycle of life, the perennial conflict between the generations, the gradual resolution of those conflicts. It's reassuring, actually, to think of it as recursive, to imagine that there must always be a cohort of 20-somethings who take their time settling down, just as there must always be a cohort of 50-somethings who worry about it.

KENISTON CALLED IT youth, Arnett calls it emerging adulthood; whatever it's called, the delayed transition has been observed for years. But it can be in fullest flower only when the young person has some

other, nontraditional means of support — which would seem to make the delay something of a luxury item. That's the impression you get reading Arnett's case histories in his books and articles, or the essays in "20 Something Manifesto," an anthology edited by a Los Angeles writer named Christine Hassler. "It's somewhat terrifying," writes a 25-year-old named Jennifer, "to think about all the things I'm supposed to be doing in order to 'get somewhere' successful: 'Follow your passions, live your dreams, take risks, network with the right people, find mentors, be financially responsible, volunteer, work, think about or go to grad school, fall in love and maintain personal well-being, mental health and nutrition.' When is there time to just be and enjoy?" Adds a 24-year-old from Virginia: "There is pressure to make decisions that will form the foundation for the rest of your life in your 20s. It's almost as if having a range of limited options would be easier."

While the complaints of these young people are heartfelt, they are also the complaints of the privileged. Julie, a 23-year-old New Yorker and contributor to "20 Something Manifesto," is apparently aware of this. She was coddled her whole life, treated to French horn lessons and summer camp, told she could do anything. "It is a double-edged sword," she writes, "because on the one hand I am so blessed with my experiences and endless options, but on the other hand, I still feel like a child. I feel like my job isn't real because I am not where my parents were at my age. Walking home, in the shoes my father bought me, I still feel I have yet to grow up."

Despite these impressions, Arnett insists that emerging adulthood is not limited to young persons of privilege and that it is not simply a period of self-indulgence. He takes pains in "Emerging Adulthood" to describe some case histories of young men and women from hard-luck backgrounds who use the self-focus and identity exploration of their 20s to transform their lives.

One of these is the case history of Nicole, a 25-year-old African-American who grew up in a housing project in Oakland, Calif. At age 6, Nicole, the eldest, was forced to take control of the household after her mother's mental collapse. By 8, she was sweeping stores and baby-sitting for money to help keep her three siblings fed and housed. "I made a couple bucks and helped my mother out, helped my family out," she told Arnett. She managed to graduate from high school, but with low grades, and got a job as a receptionist at a dermatology clinic. She moved into her own apartment, took night classes at community college and started to excel. "I needed to experience living out of my mother's home in order to study," she said.

In his book, Arnett presents Nicole as a symbol of all the young people from impoverished backgrounds for whom "emerging adulthood represents an opportunity — maybe a last opportunity — to turn one's life around." This is the stage where someone like Nicole can escape an abusive or dysfunctional family and finally pursue her own dreams. Nicole's dreams are powerful — one course away from an associate degree, she plans to go on for a bachelor's and then a Ph.D. in psychology — but she has not really left her family behind; few people do. She is still supporting her mother and siblings, which is why she works full time even though her progress through school would be quicker if she found a part-time job. Is it only a grim pessimist like me who sees how many roadblocks there will be on the way to achieving those dreams and who wonders what kind of freewheeling emerging adulthood she is supposed to be having?

Of course, Nicole's case is not representative of society as a whole. And many parents — including those who can't really afford it — continue to help their kids financially long past the time they expected to. Two years ago Karen Fingerman, a developmental psychologist at Purdue University, asked parents of grown children whether they provided significant assistance to their sons or daughters. Assistance included giving their children money or help with everyday tasks (practical assistance) as well as advice, companionship and an attentive ear. Eighty-six percent said they had provided advice in the previous month; less than half had done so in 1988. Two out of three parents had given a son or daughter practical assistance in the previous month; in 1988, only one in three had.

Fingerman took solace in her findings; she said it showed that parents stay connected to their grown children, and she suspects that both parties get something out of it. The survey questions, after all, referred not only to dispensing money but also to offering advice, comfort and friendship. And another of Fingerman's studies suggests that parents' sense of well-being depends largely on how close they are to their grown children and how their children are faring — objective support for the adage that you're only as happy as your unhappiest child. But the expectation that young men and women won't quite be able to make ends meet on their own, and that parents should be the ones to help bridge the gap, places a terrible burden on parents who might be worrying about their own job security, trying to care for their aging parents or grieving as their retirement plans become more and more of a pipe dream.

This dependence on Mom and Dad also means that during the 20s the rift between rich and poor becomes entrenched. According to data gathered by the Network on Transitions to Adulthood, a research consortium supported by the John D. and Catherine T. MacArthur Foundation, American parents give an average of 10 percent of their income to their 18- to 21-year-old children. This percentage is basically the same no matter the family's total income, meaning that upper-class kids tend to get more than working-class ones. And wealthier kids have other, less obvious, advantages. When they go to four-year colleges or universities, they get supervised dormitory housing, health care and alumni networks not available at community colleges. And they often get a leg up on their careers by using parents' contacts to help land an entry-level job — or by using parents as a financial backup when they want to take an interesting internship that doesn't pay.

"You get on a pathway, and pathways have momentum," Jennifer Lynn Tanner of Rutgers told me. "In emerging adulthood, if you spend this time exploring and you get yourself on a pathway that really fits you, then there's going to be this snowball effect of finding the right fit, the right partner, the right job, the right place to live. The less you have at first, the less you're going to get this positive effect compounded over time. You're not going to have the same acceleration."

EVEN ARNETT ADMITS that not every young person goes through a period of "emerging adulthood." It's rare in the developing world, he says, where people have to grow up fast, and it's often skipped in the industrialized world by the people who marry early, by teenage mothers forced to grow up, by young men or women who go straight from high school to whatever job is available without a chance to dabble until they find the perfect fit. Indeed, the majority of humankind would seem to not go through it at all. The fact that emerging adulthood is not universal is one of the strongest arguments against Arnett's claim that it is a new developmental stage. If emerging adulthood is so important, why is it even possible to skip it?

"The core idea of classical stage theory is that all people — underscore 'all' — pass through a series of qualitatively different periods in an invariant and universal sequence in stages that can't be skipped or reordered," Richard Lerner, Bergstrom chairman in applied developmental science at Tufts University, told me. Lerner is a close personal friend of Arnett's; he and his wife, Jacqueline, who is also a psychologist, live 20 miles from Worcester, and they have dinner with Arnett and his wife on a regular basis.

"I think the world of Jeff Arnett," Lerner said. "I think he is a smart, passionate person who is doing great work — not only a smart and productive scholar, but one of the nicest people I ever met in my life."

No matter how much he likes and admires Arnett, however, Lerner says his friend has ignored some of the basic tenets of developmental psychology. According to classical stage theory, he told me, "you must develop what you're supposed to develop when you're supposed to develop it or you'll never adequately develop it."

When I asked Arnett what happens to people who don't have an emerging adulthood, he said it wasn't necessarily a big deal. They might face its developmental tasks — identity exploration, self-focus, experimentation in love, work and worldview — at a later time, maybe as a midlife crisis, or they might never face them at all, he said. It depends partly on why they missed emerging adulthood in the first place, whether it was by circumstance or by choice.

No, said Lerner, that's not the way it works. To qualify as a developmental stage, emerging adulthood must be both universal and essential. "If you don't develop a skill at the right stage, you'll be working the rest of your life to develop it when you should be moving on," he said. "The rest of your development will be unfavorably altered." The fact that Arnett can be so casual about the heterogeneity of emerging adulthood and its existence in some cultures but not in others — indeed, even in some people but not in their neighbors or friends — is what undermines, for many scholars, his insistence that it's a new life stage.

Why does it matter? Because if the delay in achieving adulthood is just a temporary aberration caused by passing social mores and economic gloom, it's something to struggle through for now, maybe feeling a little sorry for the young people who had the misfortune to come of age in a recession. But if it's a true life stage, we need to start rethinking our definition of normal development and to create systems of education, health care and social supports that take the new stage into account.

The Network on Transitions to Adulthood has been issuing reports about young people since it was formed in 1999 and often ends up recommending more support for 20-somethings. But more of what, exactly? There aren't institutions set up to serve people in this specific age range; social services from a developmental perspective tend to disappear after adolescence. But it's possible to envision some that might address the restlessness and mobility that Arnett says are typical at this stage and that might make the experimentation of "emerging adulthood" available to more young people. How about expanding programs like City Year, in which 17- to 24-year-olds from diverse backgrounds spend a year mentoring inner-city children in exchange for a stipend, health insurance, child care, cellphone service and a $5,350 education award? Or a federal program in which a government-sponsored savings account is created for every newborn, to be cashed in at age 21 to support a year's worth of travel, education or volunteer work — a version of the "baby bonds" program that Hillary Clinton mentioned during her 2008 primary campaign? Maybe we can encourage a kind of socially sanctioned "rumspringa," the temporary moratorium from social responsibilities some Amish offer their young people to allow them to experiment before settling down. It requires only a bit of ingenuity — as well as some societal forbearance and financial commitment — to think of ways to expand some of the programs that now work so well for the elite, like the Fulbright fellowship or the Peace Corps, to make the chance for temporary service and self-examination available to a wider range of young people.

A century ago, it was helpful to start thinking of adolescents as engaged in the work of growing up rather than as merely lazy or rebellious. Only then could society recognize that the educational, medical, mental-health and social-service needs of this group were unique and that investing in them would have a payoff in the future. Twenty-somethings are engaged in work, too, even if it looks as if they are aimless or failing to pull their weight, Arnett says. But it's a reflection of our collective attitude toward this period that we devote so few resources to keeping them solvent and granting them some measure of security.

THE KIND OF SERVICES that might be created if emerging adulthood is accepted as a life stage can be seen during a visit to Yellowbrick, a residential program in Evanston, Ill., that calls itself the only psychiatric treatment facility for emerging adults. "Emerging adults really do have unique developmental tasks to focus on," said Jesse Viner, Yellowbrick's executive medical director. Viner started Yellowbrick in 2005, when he was working in a group psychiatric practice in Chicago and saw the need for a different way to treat this

cohort. He is a soft-spoken man who looks like an accountant and sounds like a New Age prophet, peppering his conversation with phrases like "helping to empower their agency."

"Agency" is a tricky concept when parents are paying the full cost of Yellowbrick's comprehensive residential program, which comes to $21,000 a month and is not always covered by insurance. Staff members are aware of the paradox of encouraging a child to separate from Mommy and Daddy when it's on their dime. They address it with a concept they call connected autonomy, which they define as knowing when to stand alone and when to accept help.

Patients come to Yellowbrick with a variety of problems: substance abuse, eating disorders, depression, anxiety or one of the more severe mental illnesses, like schizophrenia or bipolar disorder, that tend to appear in the late teens or early 20s. The demands of imminent independence can worsen mental-health problems or can create new ones for people who have managed up to that point to perform all the expected roles — son or daughter, boyfriend or girlfriend, student, teammate, friend — but get lost when schooling ends and expected roles disappear. That's what happened to one patient who had done well at a top Ivy League college until the last class of the last semester of his last year, when he finished his final paper and could not bring himself to turn it in.

The Yellowbrick philosophy is that young people must meet these challenges without coddling or rescue. Up to 16 patients at a time are housed in the Yellowbrick residence, a four-story apartment building Viner owns. They live in the apartments — which are large, sunny and lavishly furnished — in groups of three or four, with staff members always on hand to teach the basics of shopping, cooking, cleaning, scheduling, making commitments and showing up.

Viner let me sit in on daily clinical rounds, scheduled that day for C., a young woman who had been at Yellowbrick for three months. Rounds are like the world's most grueling job interview: the patient sits in front alongside her clinician "advocate," and a dozen or so staff members are arrayed on couches and armchairs around the room, firing questions. C. seemed nervous but pleased with herself, frequently flashing a huge white smile. She is 22, tall and skinny, and she wore tiny denim shorts and a big T-shirt and vest. She started to fall apart during her junior year at college, plagued by binge drinking and anorexia, and in her first weeks at Yellowbrick her alcohol abuse continued. Most psychiatric facilities would have kicked her out after the first relapse, said Dale Monroe-Cook, Yellowbrick's vice president of clinical operations. "We're doing the opposite: we want the behavior to unfold, and we want to be there in that critical moment, to work with that behavior and help the emerging adult transition to greater independence."

The Yellowbrick staff let C. face her demons and decide how to deal with them. After five relapses, C. asked the staff to take away her ID so she couldn't buy alcohol. Eventually she decided to start going to meetings of Alcoholics Anonymous.

At her rounds in June, C. was able to report that she had been alcohol-free for 30 days. Jesse Viner's wife, Laura Viner, who is a psychologist on staff, started to clap for her, but no one else joined in. "We're on eggshells here," Gary Zurawski, a clinical social worker specializing in substance abuse, confessed to C. "We don't know if we should congratulate you too much." The staff was sensitive about taking away the young woman's motivation to improve her life for her own sake, not for the sake of getting praise from someone else.

C. took the discussion about the applause in stride and told the staff she had more good news: in two days she was going to graduate. On time.

THE 20S ARE LIKE the stem cell of human development, the pluripotent moment when any of several outcomes is possible. Decisions and actions during this time have lasting ramifications. The 20s are when most people accumulate almost all of their formal education; when most people meet their future spouses and the friends they will keep; when most people start on the careers that they will stay with for many years. This is when adventures, experiments, travels, relationships are embarked on with an abandon that probably will not happen again.

Does that mean it's a good thing to let 20-somethings meander — or even to encourage them to meander — before they settle down? That's the question that plagues so many of their parents. It's easy to see the advantages to the delay. There is time enough for adulthood and its attendant obligations; maybe if kids take longer to choose their mates and their careers, they'll make fewer mistakes and live happier lives. But it's just as easy to see the drawbacks. As the settling-down sputters along for the "emerging adults," things can get precarious for the rest of us. Parents are helping pay bills they never counted on paying, and social institutions are missing out on young people contributing to productivity and growth. Of course, the recession complicates things, and even if every 20-something were ready to skip the "emerging" moratorium and act like a grown-up, there wouldn't necessarily be jobs for them all. So we're caught in a weird moment, unsure whether to allow young people to keep exploring and questioning or to cut them off and tell them just to find something, anything, to put food on the table and get on with their lives.

Arnett would like to see us choose a middle course. "To be a young American today is to experience both excitement and uncertainty, wide-open possibility and confusion, new freedoms and new fears," he writes in "Emerging Adulthood." During the timeout they are granted from nonstop, often tedious and dispiriting responsibilities, "emerging adults develop skills for daily living, gain a better understanding of who they are and what they want from life and begin to build a foundation for their adult lives." If it really works that way, if this longer road to adulthood really leads to more insight and better choices, then Arnett's vision of an insightful, sensitive, thoughtful, content, well-honed, self-actualizing crop of grown-ups would indeed be something worth waiting for.

Robin Marantz Henig is a contributing writer. Her last article for the magazine was about anxiety.

http://www.nytimes.com/2010/08/22/magazine/22Adulthood-t.html?ref=magazine

In New Approach to Titanic, an Exhibitor Aids Scientists

By IAN AUSTEN

In the 23 years since divers first reached the wreckage of the Titanic, commercial efforts to salvage artifacts from the doomed ocean liner have aroused as much scientific dispute as public curiosity.

Many archaeologists and others — including Robert D. Ballard of the Woods Hole Oceanographic Institution, who led an American-French team that discovered the remains 25 years ago — wanted the site left untouched as a memorial. Some of them compared salvage efforts to grave robbing.

Now, R.M.S. Titanic, the American company that has removed about 4,650 artifacts from the Titanic, will try to mend fences with the scientific community by sponsoring two voyages, the first of which sets sail on Sunday from St. John's, Newfoundland.

Instead of stripping the wreckage, these trips will include archeologists who will carefully document and map the site for the first time as a step toward creating a long-term archaeological management plan for it.

"This is a very different approach for my company," said Chris Davino, the president of Premier Exhibitions, the parent firm of R.M.S. Titanic. "There was some skepticism among a number of groups given the record Premier and R.M.S. Titanic have had with the broad archaeological community. And that skepticism was warranted."

Other than a few samples from the hull that researchers will use to study the bacteria that are slowly consuming the ocean liner, nothing will be removed from the wreckage, which sits about 2.5 miles below the sea. Instead, the research group plans to carefully document the area, hoping that precise measurements will create a baseline for calculating the rate at which is it succumbing to the bacterial feasting.

While images of the wreckage on the ocean floor have become common over the past two decades, David Gallo, director of special projects at Woods Hole, said that beyond the stern and bow much of it remains unrecorded.

"In fact, only about 40 percent of the site has been looked at," Mr. Gallo said by telephone while traveling to Newfoundland on Friday. "Some of the images that stick in most people's minds are not real photographs but paintings."

Advances in digital photography, sonar and computer imaging software over the last two decades will obviously aid the documentation. But P. H. Nargeolet, director of Underwater Research for R.M.S. Titanic, said that improvements in robotic submarines would be the single most important factor.

Those submarines, which carry two different kinds of high resolution sonar, have guidance systems that enable them to precisely trace a detailed grid measuring about two by three miles, Mr. Nargeolet said. Software can then convert that into a 3-D, digital map of the wreckage.

Using that map for guidance, cameras on other submarines will then take about 80,000 photographs. Finally, those images will be digitally pasted onto the sonar map to create a 3-D photo.

Mr. Nargeolet acknowledged that the imaging would show damage not only from the sinking but also from earlier salvage trips (including the floating of a 15-ton portion of the hull in 1998). Some critics of his company have said that the salvage efforts have also left the site littered with debris.

The voyage was prompted by a change of management at R.M.S. Titanic, which has been arguing in court for 17 years to be granted ownership of the artifacts it collected after 1987 or to be compensated for salvaging them. Rather than battle the archaeologists, the company's new management met with a group of them over a year ago and learned that carefully mapping the wreckage site was the scientific community's priority.

"A lot of decisions in the past have been decided by a court saying you need to go and pick up things in order to maintain sovereign possession," said James P. Delgado, the president and chief executive of the Institute of Nautical Archaeology, a former critic of the company whose group is participating in this trip. "The level of intervention in the site in the future needs to be dictated by hard science."

http://www.nytimes.com/2010/08/22/world/22titanic.html?ref=science

Australia Steps Up Renewable Energy Efforts

By MICHAEL PERRY

SYDNEY — Australia has plans to build the biggest wind farm in the southern hemisphere by 2013, part of its scramble to fight climate change and harness its abundance of clean energy sources — wind, solar, waves, geothermal energy and bioenergy.

Renewable energy now supplies just 6 percent of power in Australia because the country has historically lacked the political and commercial will to pursue big renewable energy projects. And the very sources of Australia's clean energy — its vast outback and nearly 60,000 kilometers, or 37,000 miles, of coast — are major obstacles to linking new, remote power sources into the grid.

"It's a blessing and a curse," said Matthew Warren, head of the Clean Energy Council, which represents more than 350 companies in renewable energy and energy efficiency fields.

"Australia is really at the top of the list, in the scale of the economy and the quality and scale of renewable resources," Mr. Warren said. "But the grid issues are significant because we run a very, very large, long and thin grid," he said.

"It's like running a grid from Paris to Moscow with sparsely distributed energy demand through that grid."

But Australia has begun to tackle the problem. Revised renewable energy targets passed in June earmarked 20 billion Australian dollars, or nearly $18 billion, for clean energy technologies by 2020 and are expected to create 28,000 new jobs.

On Aug. 12, the largest energy retailer in Australia, A.G.L. Energy, and New Zealand's state-owned Meridian Energy announced that they would build a billion-dollar wind farm in Macarthur, in Victoria State. Its 140 wind turbines would make it the largest wind farm in the Southern Hemisphere, generating enough power for 220,000 homes and abating 1.7 million tons of greenhouse gases annually, which is equivalent to taking 420,000 cars off the road. And wind generation is cheaper than other forms of renewable energy destined to feed a grid, says Tim Lusk, chief executive of Meridian.

Australia has set a renewable energy target of 20 percent by 2020, which the Clean Energy Council believes can be met despite the fact Australia has not put a price on carbon emissions. While campaigning for elections on Saturday (Page 1), the governing Labor Party and the conservative opposition appeared divided over whether to set such a "carbon price," which would force coal power operators to invest in cleaner technology and make renewable energy more competitive.

Not having a carbon price could cost the Australian economy and consumers an extra 2 billion dollars by 2020 because of investment in less energy efficient power plants, the Climate Institute in Australia estimates.

"It would be better in the long run if we had a carbon price," said Mr. Warren of the Clean Energy Council. "It's the economic tool of choice, because it's seen as being the most efficient and most effective."

He added: "Once introduced, it creates a core signal to business to change their investment patterns. Without it we are in a second-best market. We encourage a more cooperative approach to a carbon scheme as quickly as possible."

But the bipartisan agreement that helped pass the laws on renewable energy in June does not exist on carbon. To get the renewable energy legislation passed in the Senate, Australia had to separate its renewable energy plans from its carbon trading program, just as President Barack Obama had to cut his clean energy initiatives from sweeping climate change legislation to appease the U.S. Congress.

Prime Minister Julia Gillard has said that she is still in favor of a market-based carbon program to tackle climate change but has deferred a decision until 2012. Tony Abbott, the opposition leader, is opposed to a carbon price.

Worldwide, investment in renewable energies has boomed in recent years, with some $190 billion worth of new clean energy in 2008, according to the Renewables Global Status Report for 2009. The number of large solar plants tripled to 1,800 between 2007 and 2008, with the majority of new plants in Spain, the Czech Republic, France, Germany, Italy, South Korea and Portugal. The United States, the world's biggest source of wind energy, installed five times Australia's total wind energy capacity in 2008 alone.

One of the problems in Australia is that the country has too many energy resources, and too much cheap coal. The country is the leading exporter of coal in the world, and it generates about 80 percent of its electricity through coal-fired power stations.

Australia does not have energy security issues like Europe — which depends on Russia for natural gas — or the United States, which is trying to reduce its use of imported oil, said Mr. Warren of the Clean Energy Council. Such positions give those countries a greater incentive to take a more aggressive approach to renewable energy.

Australia did have an opportunity in the 1980s and 1990s to develop large-scale renewable energy, but it let it slip. Back then, Australian scientists were in the vanguard of renewable energy technology, most notably Shi Zhengrong, who became known as the "Sun King" after leaving Australia to produce solar cells in China. Suntech Power, Mr. Shi's company, is now one of the world's leading makers of photovoltaic solar panels.

While Australian scientists still work at the cutting edge of renewable technology, there are not enough market drivers to expand the country's renewable industry, says Iain MacGill, of the Center for Energy and Environmental Markets at the University of New South Wales in Sydney.

"We did have early leads, we were one of the world's larger PV manufacturers and deployers back in the '80s," Mr. MacGill said, referring to photovoltaics. "The competition steepened, and it would have taken significant investment and risk to have stayed in the game. But we withdrew from the race, and that's a shame."

Still, Australia could completely switch to renewable energy in 10 years by building 12 huge solar thermal power stations and 23 large-scale wind farms, according to the "Zero Carbon Australia Stationary Energy Plan" released this month by Melbourne University, the Beyond Zero Emissions group and Sinclair Knight Merz engineers.

The solar plants would generate 60 percent of the country's power by using Australian technology to store heat in molten salt, which allows them to operate 24 hours a day. The rest would come from 6,500 wind turbines dotted mainly around the coast. The network would generate an estimated 325 terawatts per hour of power a year, according to the plan.

This ambitious clean energy network would cost 370 billion dollars over 10 years, but the cost to each household is estimated at a mere 8 dollars a week.

"Our long-term global goal is to very substantially reduce our emissions, a goal that will require almost all of our stationary energy to be produced from zero or near-zero emission sources. This report demonstrates we could already be technologically ready to do that," said Malcolm Turnbull, a former Australian environment minister.

For now, though, Australia has the highest average solar radiation of any continent but has barely tapped into solar power. Its largest solar thermal plant produces only 1.5 megawatts of power, and wind provides only 16 percent of Australia's renewable energy today.

But the government's 1.5-billion-dollar Solar Flagship Program aims to develop the sector by helping to finance the building and development of large 1,000-megawatt solar power stations. It has also pledged 100 million dollars in renewable energy venture capital.

The small Greens party has also proposed loan guarantees worth 5 billion dollars and a feed-in tariff for large-scale renewable energy developments, similar to the U.S. model, which provides a 100 percent guarantee.

"In the context of the global financial crisis, loan guarantees are essential to help renewable energy developers access the finance they need to build baseload power stations," said Christine Milne, a Greens senator.

Michael Perry is a Reuters correspondent.

http://www.nytimes.com/2010/08/23/business/energy-environment/23green.html?ref=science

Technology Leads More Park Visitors Into Trouble

By LESLIE KAUFMAN

Cathy Hayes was cracking jokes as she recorded a close encounter with a buffalo on her camera in a recent visit to Yellowstone National Park.

"Watch Donald get gored," she said as her companion hustled toward a grazing one-ton beast for a closer shot with his own camera.

Seconds later, as if on cue, the buffalo lowered its head, pawed the ground and charged, injuring, as it turns out, Ms. Hayes.

"We were about 30, 35 feet, and I zoomed in on him, but that wasn't far enough, because they are fast," she recounted later in a YouTube video displaying her bruised and cut legs.

The national parks' history is full of examples of misguided visitors feeding bears, putting children on buffalos for photos and dipping into geysers despite signs warning of scalding temperatures.

But today, as an ever more wired and interconnected public visits the parks in rising numbers — July was a record month for visitors at Yellowstone — rangers say that technology often figures into such mishaps.

People with cellphones call rangers from mountaintops to request refreshments or a guide; in Jackson Hole, Wyo., one lost hiker even asked for hot chocolate.

A French teenager was injured after plunging 75 feet this month from the South Rim of the Grand Canyon when he backed up while taking pictures. And last fall, a group of hikers in the canyon called in rescue helicopters three times by pressing the emergency button on their satellite location device. When rangers arrived the second time, the hikers explained that their water supply "tasted salty."

"Because of having that electronic device, people have an expectation that they can do something stupid and be rescued," said Jackie Skaggs, spokeswoman for Grand Teton National Park in Wyoming.

"Every once in a while we get a call from someone who has gone to the top of a peak, the weather has turned and they are confused about how to get down and they want someone to personally escort them," Ms. Skaggs said. "The answer is that you are up there for the night."

The National Park Service does not keep track of what percentage of its search and rescue missions, which have been climbing for the last five years and topped 3,500 in 2009, are technology related. But in an effort to home in on "contributing factors" to park accidents, the service recently felt compelled to add "inattention to surroundings" to more old-fashioned causes like "darkness" and "animals."

The service acknowledges that the new technologies have benefits as well. They can and do save lives when calls come from people who really are in trouble.

The park service itself has put technology to good use in countering the occasional unruliness of visitors. Last summer, several men who thought they had managed to urinate undetected into the Old Faithful geyser in Yellowstone were surprised to be confronted by rangers shortly after their stunt. It turns out that the park had installed a 24-hour camera so people could experience Old Faithful's majesty online. Viewers spotted the men in action and called to alert the park.

In an era when most people experience the wild mostly through television shows that may push the boundaries of appropriateness for entertainment, rangers say people can wildly miscalculate the risks of their antics.

In an extreme instance in April, two young men from Las Vegas were killed in Zion National Park in Utah while trying to float a hand-built log raft down the Virgin River. A park investigation found that the men "did not have whitewater rafting experience, and had limited camping experience, little food and no overnight gear."

"They told their father that they intended to record their entire trip on video camera as an entry into the 'Man vs. Wild' competition" on television, investigators wrote.

Far more common but no less perilous, park workers say, are visitors who arrive with cellphones or GPS devices and little else — sometimes not even water — and find themselves in trouble. Such visitors often acknowledge that they have pushed themselves too far because they believe that in a bind, the technology can save them.

It does not always work out that way. "We have seen people who have solely relied on GPS technology but were not using common sense or maps and compasses, and it leads them astray," said Kyle Patterson, a spokesman for Rocky Mountain National Park, just outside Denver.

Like a lot of other national parks, Rocky Mountain does not allow cellphone towers, so service that visitors may take for granted is spotty at best. “Sometimes when they call 911, it goes to a communications center in Nebraska or Wyoming,” Mr. Patterson said. “And that can take a long time to sort out.”

One of the most frustrating new technologies for the parks to deal with, rangers say, are the personal satellite messaging devices that can send out an emergency signal but are not capable of two-way communication. (Globalstar Inc., the manufacturer of SPOT brand devices, says new models allow owners to send a message with the help request.)

In some cases, said Keith Lober, the ranger in charge of search and rescue at Yosemite National Park in California, the calls “come from people who don’t need the 911 service, but they take the SPOT and at the first sign of trouble, they hit the panic button.”

But without two-way communication, the rangers cannot evaluate the seriousness of the call, so they respond as if it were an emergency.

Last fall, two men with teenage sons pressed the help button on a device they were carrying as they hiked the challenging backcountry of Grand Canyon National Park. Search and rescue sent a helicopter, but the men declined to board, saying they had activated the device because they were short on water.

The group’s leader had hiked the Grand Canyon once before, but the other man had little backpacking experience. Rangers reported that the leader told them that without the device, “we would have never attempted this hike.”

The group activated the device again the next evening. Darkness prevented a park helicopter from flying in, but the Arizona Department of Public Safety sent in a helicopter whose crew could use night vision equipment.

The hikers were found and again refused rescue. They said they had been afraid of dehydration because the local water “tasted salty.” They were provided with water.

Helicopter trips into the park can cost as much as $3,400 an hour, said Maureen Oltrogge, a spokeswoman for Grand Canyon National Park.

So perhaps it is no surprise that when the hikers pressed the button again the following morning, park personnel gave them no choice but to return home. The leader was issued a citation for creating hazardous conditions in the parks.

http://www.nytimes.com/2010/08/22/science/earth/22parks.html?ref=science

A Republic of Letters

By ROBERT DARNTON

COMMON AS AIR

Revolution, Art, and Ownership

By Lewis Hyde

306 pp. Farrar, Straus & Giroux. $26.

Intellectual property has become such a hot topic that it needs to be doused with some history. Strange as it may sound, this is an argument developed convincingly in Lewis Hyde's "Common as Air," an eloquent and erudite plea for protecting our cultural patrimony from appropriation by commercial interests.

The history that Hyde invokes goes back to the Middle Ages, when villagers enjoyed collective rights to common lands, but for the most part it is situated in the era of the founding fathers. Hyde invokes the founders in order to warn us against a new enclosure movement, one that would fence off large sectors of the public domain — in science, the arts, literature, and the entire world of knowledge — in order to exploit monopolies.

He cites plenty of examples from Hollywood, the pharmaceutical industry, agribusiness, and the swarm of lobbyists who transform public knowledge into private preserves by manipulating laws for the protection of intellectual property. Then he draws on Franklin, Adams, Jefferson and Madison for arguments against such privatization.

On the face of it, this way of defending the cultural commons might seem dubious, because the kind of knowledge that led to the Human Genome Project and the Internet was not dreamt of in the philosophies of the founders. To argue against Jack Valenti and the Motion Picture Association of America by leaping across two centuries could be wildly anachronistic.

To be sure, the founders built up a stockpile of quotable chunks of wisdom. Jefferson: "The field of knowledge is the common property of mankind." Franklin: "That as we enjoy great advantages from the inventions of others, we should be glad of an opportunity to serve others by any invention of ours, and this we should do freely and generously." The United States Constitution, Article I, Section 8, Clause 8, providing for

copyrights and patents "to promote the progress of science and the useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." But the devil can quote Jefferson, and lawyers can construe the Constitution in ways that restrict knowledge rather than promote it.

Hyde, the author of "The Gift" (1983), a defense of the noncommercial aspects of art, does not merely cull the works of the founding fathers for quotations. He pitches his argument at a level where historians and political philosophers have contributed most to our understanding of intellectual history. Instead of treating the ideas of the founders as self-contained units of meaning, he explores their interconnections and shows how they shared a common conceptual frame. Not that he pretends to have uncovered anything unknown to the authorities he cites, notably the historian J. G. A. Pocock, whose studies of civic republicanism reveal how early modern philosophers drew on a current of thought about the nature of citizenship that goes back to ancient Greece and Rome. Hyde builds his argument by telling stories, and he tells them well. His book brims with vignettes, which may be familiar but complement one other in ways that produce original insights.

Thus Hyde's account of Franklin and the lightning rod. He shows that Franklin did not tame lightning in Promethean fashion, all alone, by directing his solitary genius at the heavens. Franklin actually collaborated with three other experimenters in a common laboratory set up in the Pennsylvania State House. He also applied information derived from earlier theorists and experimenters, including William Harvey, Isaac Newton, the inventors of the Leyden jar, and many wits who had noticed the similarity between electric sparks and lightning.

Franklin's famous kite experiment did indeed express original insight about the nature of electricity as a single "fluid" with positive and negative charges; but when Franklin reported it in The Pennsylvania Gazette, he did not mention that he was the experimenter and did not attach his name to the article. When publishing instructions on how to make a lightning rod in Poor Richard's Almanac, he also refrained from noting that he was the inventor. And he never sought a patent for it, because he had drawn on a common stock of knowledge and felt committed to "produce something for the common benefit."

The same attitude lay behind Jefferson's description of knowledge as "common property." It pervaded the entire Enlightenment, when men discussed experiments and ideas in correspondence networks and a chain of academies that extended from St. Petersburg to Philadelphia. Above all, they communicated their thoughts through print. Letters, learned societies and the printed word came together in the creation of a Republic of Letters, an egalitarian world of knowledge open to everyone — at least in principle, although in practice it was restricted to a literate elite.

The ideal of a Republic of Letters may sound archaic, but it is still alive. Hyde also evokes it with another name, the "cultural commons," which summons up associations with current projects for sharing knowledge like Creative Commons, the Public Library of Science, Wikipedia and the Internet Archive. He contrasts it with efforts to close off sectors of knowledge so as to exploit them for private profit, as in the case of companies that attempt to use the understanding of the human genome in order to gain control of DNA segments related to diabetes and breast cancer.

The history of copyright provides the most revealing version of the enclosure movement that is now threatening creativity in all the arts and sciences. Jefferson wondered whether copyright ought to exist at all. In a famous letter to Isaac McPherson, he noted a peculiarity of communication by print: "He who receives an idea from me, receives instruction himself without lessening mine; as he who lights his taper at mine, receives light without darkening me."

In the end, Jefferson was persuaded by Madison that a strictly limited copyright would indeed "promote the progress of science and the useful arts," as the Constitution was to proclaim. By enjoying a short-term monopoly on the publication of their writings, authors would be encouraged to share their ideas in print. How short should the term be? The copyright act of 1790 set it at 14 years, renewable once. The founders took this limit from British precedents, which went back through a series of court cases to the original copyright act of 1710. Along the way, some experts argued that copyright should be perpetual, because intellectual property was like ownership of land — absolute until alienated by sale. But that view was overridden by the notion that knowledge belonged to everyone and should revert to the public domain, where everyone can make use of it.

Today, however, copyright lasts for the life of the author plus 70 years — or even longer in some cases. The Copyright Term Extension Act of 1998 (known as the Mickey Mouse Protection Act, because the monopoly on Mickey was about to expire) now prevents most 20th-century literature from being available in the public domain. When asked how long he thought copyrights should last, Jack Valenti, the lobbyist for Hollywood, quipped, "Forever, minus a day." Valenti has won, Jefferson has lost.

What can be done to protect the cultural commons from further enclosure? Hyde praises projects like General Public Licenses, which channel intellectual property into the public domain, and the Distributed Annotation System, which prevents the monopolization of genomic knowledge. But he does not propose a program for action, nor does he dispute the need for limited commercial applications of new knowledge. Instead, he tells stories with a moral. If we reassessed our history, he teaches, we would reassert our citizenship in a Republic of Letters that was crucial to the creation of the American Republic — and that is more important than ever in the age of the Internet.

Robert Darnton is Carl H. Pforzheimer University Professor and director of the Harvard University Library. His most recent book is "The Case for Books: Past, Present, and Future."

http://www.nytimes.com/2010/08/22/books/review/Darnton-t.html?ref=science

Reanimated 'Junk' DNA Is Found to Cause Disease

By GINA KOLATA

The human genome is riddled with dead genes, fossils of a sort, dating back hundreds of thousands of years — the genome's equivalent of an attic full of broken and useless junk.

Some of those genes, surprised geneticists reported Thursday, can rise from the dead like zombies, waking up to cause one of the most common forms of muscular dystrophy. This is the first time, geneticists say, that they have seen a dead gene come back to life and cause a disease.

"If we were thinking of a collection of the genome's greatest hits, this would go on the list," said Dr. Francis Collins, a human geneticist and director of the National Institutes of Health.

The disease, facioscapulohumeral muscular dystrophy, known as FSHD, is one of the most common forms of muscular dystrophy. It was known to be inherited in a simple pattern. But before this paper, published online Thursday in Science by a group of researchers, its cause was poorly understood.

The culprit gene is part of what has been called junk DNA, regions whose function, if any, is largely unknown. In this case, the dead genes had seemed permanently disabled. But, said Dr. Collins, "the first law of the genome is that anything that can go wrong, will." David Housman, a geneticist at M.I.T., said scientists will now be looking for other diseases with similar causes, and they expect to find them.

"As soon as you understand something that was staring you in the face and leaving you clueless, the first thing you ask is, 'Where else is this happening?' " Dr. Housman said.

But, he added, in a way FSHD was the easy case — it is a disease that affects every single person who inherits the genetic defect. Other diseases are more subtle, affecting some people more than others, causing a range of symptoms. The trick, he said, is to be "astute enough to pick out the patterns that connect you to the DNA."

FSHD affects about 1 in 20,000 people, causing a progressive weakening of muscles in the upper arms, around the shoulder blades and in the face — people who have the disease cannot smile. It is a dominant genetic disease. If a parent has the gene mutation that causes it, each child has a 50 percent chance of getting it too. And anyone who inherits the gene is absolutely certain to get the disease.

About two decades ago, geneticists zeroed in on the region of the genome that seemed to be the culprit: the tip of the longer arm of chromosome 4, which was made up of a long chain of repeated copies of a dead gene. The dead gene was also repeated on chromosome 10, but that area of repeats seemed innocuous, unrelated to the disease. Only chromosome 4 was a problem.

"It was a repeated element," said Dr. Kenneth Fischbeck, chief of the neurogenetics branch at the National Institute of Neurological Disorders and Stroke. "An ancient gene stuck on the tip of chromosome 4. It was a dead gene; there was no evidence that it was expressed."

And the more they looked at that region of chromosome 4, the more puzzling it was. No one whose dead gene was repeated more than 10 times ever got FSHD. But only some people with fewer than 10 copies got the disease.

A group of researchers in the Netherlands and the United States had a meeting about five years ago to try to figure it out, and began collaborating. “We kept meeting here, year after year,” said Dr. Stephen J. Tapscott, a neurology professor at the University of Washington.

As they studied the repeated, but dead, gene, Dr. Tapscott and his colleagues realized that it was not completely inactive. It is always transcribed — copied by the cell as a first step to making a protein. But the transcriptions were faulty, disintegrating right away. They were missing a crucial section, called a poly (A) sequence, needed to stabilize them.

When the dead gene had this sequence, it came back to life. “It’s an if and only if,” Dr. Housman said. “You have to have 10 copies or fewer. And you have to have poly (A). Either one is not enough.”

But why would people be protected if they have more than 10 copies of the dead gene? Researchers say that those extra copies change the chromosome’s structure, shutting off the whole region so it cannot be used.

Why the reactivated gene affects only muscles of the face, shoulders and arms remains a mystery. The only clue is that the gene is similar to ones that are important in development.

In the meantime, says Dr. Housman, who was not involved in the research but is chairman of the scientific advisory board of the FSHD Society, an advocacy group led by patients, the work reveals a way to search for treatments.

“It has made it clear what the target is,” he said. “Turning off that dead gene. I am certain you can hit it.”

The bigger lesson, Dr. Collins said, is that diseases can arise in very complicated ways. Scientists used to think the genetic basis for medical disorders, like dominantly inherited diseases, would be straightforward. Only complex diseases, like diabetes, would have complex genetic origins.

“Well, my gosh,” Dr. Collins said. “Here’s a simple disease with an incredibly elaborate mechanism.”

“To come up with this sort of mechanism for a disease to arise — I don’t think we expected that,” Dr. Collins said.

http://www.nytimes.com/2010/08/20/science/20gene.html?ref=science

Over a Billion Years, Scientists Find, the Moon Went Through a Shrinking Phase

By KENNETH CHANG

The Moon is shrinking.

In making the announcement, scientists were quick to add that the Moon has not shrunk by much, that the shrinking may have occurred over a billion years, and that the Moon will not shrink out of view in the future.

"The kind of radius change and shrinking we're describing here is so small that you would never notice it," said Thomas R. Watters of the Center for Earth and Planetary Studies at the Smithsonian's National Air and Space Museum, during a NASA-sponsored telephone news conference on Thursday.

Dr. Watters and his colleagues deduced the Moon's diminishing size from cracks on the surface seen in images taken by the National Aeronautics and Space Administration's Lunar Reconnaissance Orbiter.

As the Moon's core has cooled and contracted, the outer crust fractured into faults, forming ridges as one side of the fracture slid on top of the other. The same cooling and shrinking occurs within all planetary bodies; NASA's Messenger spacecraft recently observed similar — and much larger — fractures on the planet Mercury.

The largest of the Moon ridges is about 300 feet high and stretches for several miles, and some had been seen during the Apollo Moon missions. During Apollo 17, Eugene Cernan and Harrison Schmidt even drove to one in their lunar rover.

But most of the ridges are much smaller and shorter, only tens of yards high, which is why they had escaped notice until the Lunar Reconnaissance Orbiter and its sharp-eyed camera arrived in orbit last year.

Over the eons, the shrinkage for the Moon was only about 200 yards, the length of two football fields, out of a diameter of 2,160 miles.

The scientists believe that the ridges are young — for planetary geologists, a billion years old is young compared with the 4.5-billion-year age of the solar system — because the ridges cut across small, young craters, but no large craters appear on top of any of the ridges. Large impacts are much rarer and likely to be much more ancient. The ridges also look freshly carved in the moonscape.

Some ridges could be much younger than a billion years, Dr. Watters said, and the shrinking and cracking could be still occurring today.

In the 1970s, four seismometers deployed by the Apollo astronauts detected about 30 shallow moonquakes. Dr. Watters said the scientists were looking into the possibility that those moonquakes might have emanated from the newly discovered faults.

Michael Wargo, the chief lunar scientist at NASA headquarters, said the findings, which appear in Friday's issue of the journal Science, were more evidence that the Moon was much livelier than its reputation as a cold, unchanging world. "We're now talking about the Moon in a completely different way," Dr. Wargo said.

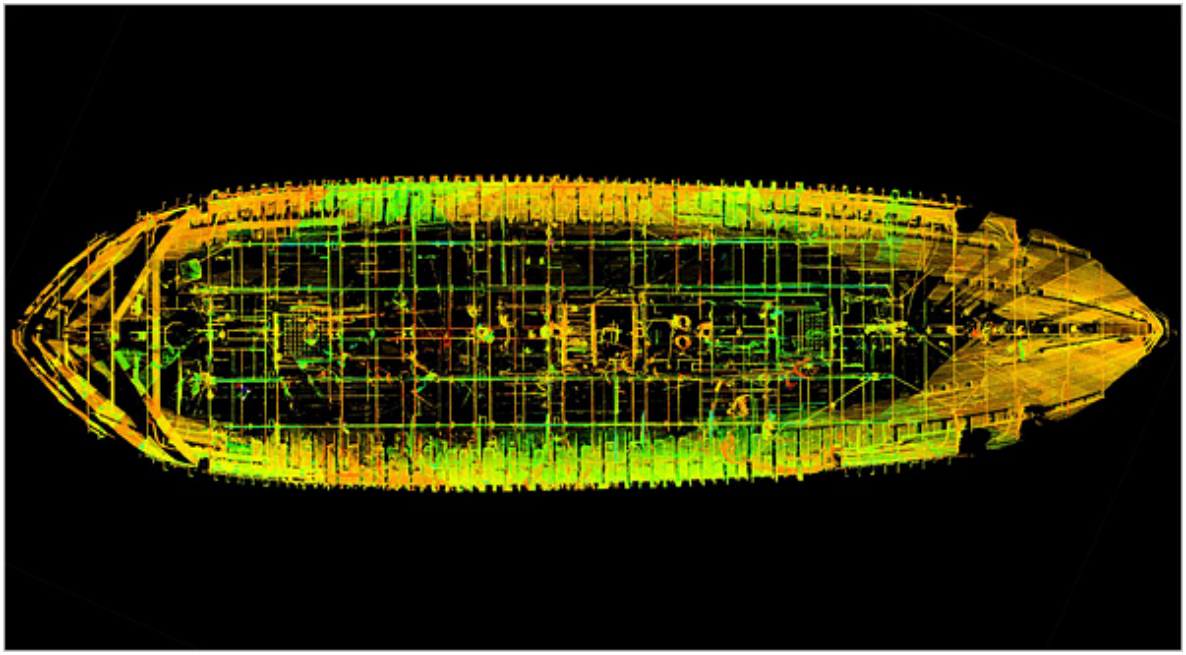
A curious lack of older, larger shrinkage cracks may put constraints on current ideas for the origin of the Moon, that it coalesced out of molten wreckage left behind when a Mars-size object slammed into the Earth.

Dr. Watters said the observations did not argue against the impact theory, but "our results are really much more consistent with a cooler initial starting temperature for the Moon, a starting temperature that did not allow the entire Moon to melt."

http://www.nytimes.com/2010/08/20/science/space/20nasa.html?ref=science

A Quest to Make the Morgan Seaworthy

By WILLIAM J. BROAD



MYSTIC, Conn. — The shipbuilders are long dead, their knowledge gone. The shipyard no longer exists. No blueprints survive, nor ship's models. But the Charles W. Morgan is still here — the world's last surviving wooden whaling vessel, built in 1841. And restorers are spending $10 million to turn the museum piece into a working ship able to ply the unruly sea. They plan to sail the ship on its first voyage in nearly a century, opening a new chapter in its long career.

Built in New Bedford, Mass., a bustling port known as the whaling capital of the world, the Morgan sailed the globe for eight decades in pursuit of leviathans, escaping fire and cannibals, Confederate raiders and Arctic ice. She brought home thousands of barrels of whale oil that lighted homes and cities. She also delivered tons of baleen, the horny material from the mouths of certain whales that was made into buggy whips and corset stays. In 1941, its centenary, the Morgan was towed to Mystic Seaport for museum display and in 1966 was named a national historic landmark. To learn as much as possible about the old ship and ensure its successful restoration, the specialists here are turning to the art and science of imaging.

They are deploying lasers and portable X-ray machines, laptops and forensic specialists, cameras and recorders, historians and graphic artists to tease out hidden details of the ship's construction and condition. The project, begun in 2008, is producing a revealing portrait. It shows the exact placement and status of many thousands of planks, ribs, beams, nails, reinforcing pins, wooden pegs and other vital parts of the Morgan, giving shipwrights a high-tech guide for the rebuilding of the historic vessel. "When we're done, she'll be as strong or stronger as the last time she went to sea," Quentin Snediker, director of the shipyard here, said during a restoration tour. "So why not sail her?"

Minutes later, a specialist was firing X-rays through the ship's keel — a massive oak spine composed of several timbers, its length more than 90 feet. He was hunting for the large bronze pins that hold the keel together. The restorers want to assess the so-called drift pins 169 years after their installation and plan to replace or reinforce those that show deterioration. The pins are between one and two feet long. In a more sweeping assessment, specialists have sent laser beams racing across the Morgan, inside and out, seeking to record inconspicuous details and form a digital archive of exact measurements. The laser scans can track details as small as an eighth of an inch and have swept the entire ship across its 114-foot length and 28-foot width — once a cramped home to a crew of 35.

The scans have produced "millions of points of information" and a wealth of three-dimensional images, said Kane Borden, research coordinator of the restoration. "The results are pretty spectacular to look at." Historians here say the restoration, for all its high-tech sophistication, is fundamentally about remembering and honoring the past. The Morgan is the last representative of a fleet of 2,700 American whaling vessels that put the young country on the map and nourished its growing economy. The industry was so important that the whaling life became a distinctive part of the American experience.

"The scope and scale of it is something that people have no idea of today," said Matthew Stackpole, a Mystic Seaport official. "It was the first time the U.S. presence was felt around the world."

The Morgan was built in the shipyard of Jethro and Zachariah Hillman and named after Charles Waln Morgan, a Philadelphia Quaker who was its first main owner. The year of its inaugural voyage, 1841, also marked the departure from New Bedford of another ship, carrying an aspiring author by the name of Herman Melville. His whaling experience resulted in "Moby Dick," and his realistic portrayals of the industry gave it new visibility and status.

The Morgan completed 37 voyages from her home ports of New Bedford and San Francisco and sailed farther than any other American whaler, according to historians. Near a remote Pacific isle, the crew took up firearms to fend off canoes full of cannibals.

Captains could bring along their wives, and two of them served as expert navigators. The logs of Charlotte Church, the wife of Capt. Charles S. Church, who sailed on the Morgan from 1909 to 1913, recorded not only latitude, longitude, heading, distance and barometric pressure but the death of a pet cat.

Dry humor marked her entries. "We have two live pigs, one rooster, four cats and almost twenty canary bird — no fear of starving for a while."

The ship's great luck in escaping from serious threats translated into bad luck for whales. Over the decades, the ship's harpooners took in more than 2,500 of the behemoths to dismember their carcasses and boil their blubber down into more than 50,000 barrels of oil. Whales were the petroleum wells of the day.

"We're not apologizing for the past," Mr. Stackpole, the seaport official, said of the hunt. "But we have to understand what happened and do better," especially in protecting whales threatened with extinction because of the long decades of concentrated whaling.

On a beautiful day in late July, the restoration shipyard here was alive with specialists. Some cut wood in the sawmill. The tons of replacement timbers include some carved from colossal hunks of live oak salvaged after Hurricane Katrina in 2005 uprooted many trees along the Gulf Coast.

The Morgan rested high and dry on supporting beams, stripped of masts and most gear. Experts scrutinized her for construction details to add to the growing library.

Bill Movalson, an official with Allpro Imaging, a company in Melville, N.Y., that makes portable X-ray machines, took aim at the thick keel.

“Stand back,” he advised.

The X-ray source, mounted on a tripod and looking like a large video camera, emitted a series of beeps and then a continuous hum.

Mr. Movalson stepped behind the keel to retrieve the exposed plate, which he fed into a small machine. It read the plate by a method known as computed radiography, using lasers and electronics rather than chemicals to uncover the invisible. In a few seconds, a ghostly image appeared on his laptop screen.

“We got it,” Mr. Movalson said, pointing to the image of a bronze drift pin. “Look, it’s all eaten away right at the seam.” Decades of exposure to seawater had corroded the pin at the area where it connected the keel to a protective timber known as the false keel.

“This is what we’d expect,” Mr. Snediker, the shipyard director, said while examining the image. He added that the discovery of the corrosion “validates the technique,” showing that the X-ray exposures are sensitive enough to distinguish faulty drift pins from those that show no deterioration.

Mr. Snediker said the project was seeking to harness every conceivable tool and method “to learn as much as we can.” The restorers are even recording the comments of shipwrights who dismantle old wooden structures in an effort to capture subtle insights into ship construction.

“We get layer upon layer of information,” he said. The least technical of the methods centers on a group of young artists who are sketching the various stages of the Morgan’s disassembly and repair. “It’s great to see it through their eyes,” Mr. Snediker said.

Nearby was the project’s headquarters, lodged in ramshackle offices full of files, papers and computers. At his desk, Mr. Borden, the research coordinator, showed how a computer served as the library for the accumulated information. A blueprint-style image of the Morgan glowed on his computer screen, as did a series of X-ray icons.

“You can zoom in,” Mr. Borden said, clicking on one. The underlying image revealed a central joint. If all goes as planned, the refurbished Morgan will be outfitted with new rigging in late 2012.

And the next year, in early summer, if the weather proves fair, the whaler will pull away from the granite pier at the seaport and once again sail with the wind at her back, rocking though the waves, making history. The goal is to visit places along the New England Coast of special significance to whaling, like New Bedford.

“She’s the last of her kind,” Mr. Stackpole said of the Morgan. “We want her to be a living issue rather than a dusty old artifact,” her voyages a new page in the story of American whaling.

http://www.nytimes.com/2010/08/17/science/17ship.html

Step 1: Post Elusive Proof. Step 2: Watch Fireworks.

By JOHN MARKOFF

The potential of Internet-based collaboration was vividly demonstrated this month when complexity theorists used blogs and wikis to pounce on a claimed proof for one of the most profound and difficult problems facing mathematicians and computer scientists.

Vinay Deolalikar, a mathematician and electrical engineer at Hewlett-Packard, posted a proposed proof of what is known as the "P versus NP" problem on a Web site, and quietly notified a number of the key researchers in a field of study that focuses on problems that are solvable only with the application of immense amounts of computing power.

The researcher asserted that he had demonstrated that P (the set of problems that can be easily solved) does not equal NP (those problems for which solutions can be verified relatively quickly). As with earlier grand math challenges — for example, Fermat's last theorem — there is a lot at stake, not the least of which is a $1 million prize.

In 2000 the Clay Mathematics Institute picked seven of the greatest unsolved problems in the field, named them "Millennium Problems" and offered $1 million for the solution of each of them. P versus NP is one of those problems. (In March, the first prize was awarded to a reclusive Russian mathematician, Grigory Perelman, for the solution to the century-old Poincaré conjecture. A few months later he refused the prize.)

P versus NP has enormous practical and economic importance, because modern cryptography is based on the assumption, which is workable so far, that P does not equal NP. In other words, there are problems that are impossible for computers to solve, but for which the solutions are easily recognizable. If these problems were shown to be solvable, that could undermine modern cryptography, which could paralyze electronic commerce and digital privacy because transactions would no longer be secure.

In a note sent to a small group of researchers on Aug. 6, Dr. Deolalikar wrote: "The proof required the piecing together of principles from multiple areas within mathematics. The major effort in constructing this proof was uncovering a chain of conceptual links between various fields and viewing them through a common lens."

An outsider to the insular field, Dr. Deolalikar set off shock waves because his work appeared to be a concerted and substantial challenge to a problem that has attracted intense scrutiny since it was first posed in 1971 by Stephen Cook, a mathematician and computer scientist who teaches at the University of Toronto.

"The reason there was such excitement is there have been many alleged proofs," said Moshe Vardi, a professor of computer science at Rice University and the editor in chief of The Communications of the Association for Computing Machinery. "This looks like a serious paper. In particular what he has done is bring forward a new idea that is worth exploring."

In this case, however, the significant breakthrough may not be in the science, but rather in the way science is practiced. By the middle of last week, although Dr. Deolalikar had not backed away from his claim, a consensus had emerged among complexity theorists that the proposed proof had several significant shortcomings.

"At this point the consensus is that there are large holes in the alleged proof — in fact, large enough that people do not consider the alleged proof to be a proof," Dr. Vardi said. "I think Deolalikar got his 15 minutes of fame, but at this point the excitement has subsided and the skepticism is turning into negative conviction."

What was highly significant, however, was the pace of discussion and analysis, carried out in real time on blogs and a wiki that had been quickly set up for the purpose of collectively analyzing the paper. This kind of collaboration has emerged only in recent years in the math and computer science communities. In the past, intense discussions like the one that surrounded the proof of the Poincaré conjecture were carried about via private e-mail and distribution lists as well as in the pages of traditional paper-based science journals.

Several of the researchers said that until now such proofs had been hashed out in colloquiums that required participants to be physically present at an appointed time. Now, with the emergence of Web-connected software programs it is possible for such collaborative undertakings to harness the brainpower of the world's best thinkers on a continuous basis.

In his recently published book "Cognitive Surplus: Creativity and Generosity in a Connected Age" (Penguin Press), Clay Shirky, a professor of interactive telecommunications at New York University, argues that the emergence of these new collaborative tools is paving the way for a second scientific revolution in the same way the printing press created a demarcation between the age of alchemy and the age of chemistry.

"The difference between the alchemists and the chemists was that the printing press was used to coordinate peer review," he said. "The printing press didn't cause the scientific revolution, but it wouldn't have been possible without it."

Now, he says, the new tools are likely to set off a similar transformation.

"It's not just, 'Hey, everybody, look at this,' " he said, "but rather a new set of norms is emerging about what it means to do mathematics, assuming coordinated participation."

The computer science community has long been an innovator in the design of science-collaboration tools. Indeed, the ARPAnet, the forerunner of the Internet, was initially created in 1969 to make one of the first computerized collaboration tools, Douglas Engelbart's oNLine System, or NLS, available from remote

locations. During the 1980s physicists at the physics research center CERN near Geneva created the World Wide Web to facilitate the sharing of scientific research.

In 2009, a Cambridge mathematician, Timothy Gowers, created the Polymath Project, a blog and wiki-oriented collaboration tool that used the comments section of a blog to pursue mathematics collaboratively. Related efforts like the Web site Mathoverflow help attack unsolved mathematical problems by using new Internet tools to help stimulate collaboration.

In the case of the P versus NP paper, most of the action has taken place in several blogs maintained by researchers in the field, like a computer scientist, Richard Lipton, at Georgia Tech and a theoretical physicist, Dave Bacon, at the University of Washington, as well as in a wiki by a quantum theoretician, Michael Nielsen.

Passions have run high. A computer scientist at the Massachusetts Institute of Technology, Scott Aaronson, literally bet his house last week — $200,000 — that the Deolalikar paper would be proved incorrect: "If Vinay Deolalikar is awarded the $1,000,000 Clay Millennium Prize for his proof of P-NP, then I, Scott Aaronson, will personally supplement his prize by the amount of $200,000."

Despite his skepticism, he acknowledged that this was, to date, one of the most impressive attempts to settle the question.

"So far this is not your typical P versus NP crank solution, which I hear about once a week," he said.

http://www.nytimes.com/2010/08/17/science/17proof.html?ref=science

Looking This Way and That, and Learning to Adapt to the World

By CHARLES Q. CHOI

The infants and toddlers resemble cyborgs as they waddle and crawl around the playroom with backpacks carrying wireless transmitters and cameras strapped to their heads. Each has one camera aimed at the right eye and another at the field of view, and both send video to monitors nearby. When the video feeds are combined, the result is a recording in which red cross hairs mark the target of a child's gaze.

Scientists are using the eye-tracking setup to learn how children look at the world as they figure out how to interact with it. In the lab, children 5 months and older crawl and walk up, down and over an obstacle course of adjustable wooden slopes, cliffs, gaps and steps. And to add to the challenge, the subjects are sometimes outfitted with Teflon-coated shoes or lead-weighted vests.

It may seem like the set for a new reality television show, but there are no prizes, except perhaps for the researchers. They hope to understand what prompts one child to respond to another, how infants coordinate their gaze with their hands and feet to navigate around obstructions or handle objects, and how these very young children adapt to changes, like those brought on by slippery footwear.

The findings provided by these eye-trackers so far (the first light enough for children to wear) suggest that infants may be more capable of understanding and acting on what they see than had been thought. "Quick gazes at obstacles in front of them or at their mothers' faces may be all they need to get the information they want. They seem to be surprisingly efficient," said John Franchak, a doctoral candidate in developmental psychology at New York University.

Although vision might largely seem effortless to us, in reality we actively choose what we look at, making about two to four eye movements every second for some 150,000 motions daily, said Karen Adolph, also a

developmental psychologist at N.Y.U. “Vision is not passive,” she said. “We actively coordinate our eye movements with the motions of our hands and bodies.”

Eye-tracking studies have existed for more than a century, but the instruments involved were typically desk machines. The wearable eye-trackers that Dr. Adolph, Mr. Franchak and their colleagues use are based on devices developed over the last decade by Positive Science, a New York company, with money from the United States Naval Research Laboratory. They were designed to help scientists discover things like how combatants spot camouflaged targets in the field. Eye-trackers are currently being used in studies to learn the differences in how amateur and professional geologists scan landscapes and how people examine signs when looking for exits during emergencies.

To adapt the eye-trackers for children, whose noses and ears are too small for the eyeglass-mounted versions employed with adults, the founder of Positive Science, Jason Babcock, used padded headbands, spandex caps and Velcro tabs to keep the cameras in place. The headgear weighs just 1.6 ounces, about as much as a pocketful of change. Since infants often fall headfirst, spotters hold straps attached to vests the children wear to prevent them from injuring themselves with the cameras, but the children are otherwise free to move.

The scientists recruit parents and children for their work from maternity wards. Although a few toddlers could not be coaxed into donning the eye-trackers, so far the researchers have tested about 70 children with the devices. “The beauty of this is how it helps capture what infants are thinking about during natural behavior. Since what they are looking at is related to their ongoing actions, tracking eye movements allows a pretty direct readout of what might be going on in their heads,” said Mary Hayhoe, a perceptual psychologist at the University of Texas at Austin, who did not take part in the research.

In studies of six 14-month-olds allowed to roam a playroom in Dr. Adolph’s lab cluttered with colorful balls, plush dolls and toy cars, the researchers found that in roughly a quarter of all encounters with obstacles, the infants could navigate past without centering their gaze on them. “Adults only fixate on obstacles about a third of the time, and 4- to 8-year-old children fixate on obstacles about 60 percent of the time, but it’s remarkable that infants can even navigate without looking,” Mr. Franchak said. The researchers also found that during the studies infants looked at their mothers just 16 percent of the time. That is surprisingly low, Dr. Adolph said, given the importance a large body of past research has placed on children watching the faces of adults as they name objects to learn languages.

“These findings suggest children may not have to look very long to get the information they need, either from people or objects,” said Jeffrey Lockman, a developmental psychologist at Tulane University, who did not participate in the studies. “This gives new insights into how much information they need, or how quickly children might process this information.” These preliminary experiments only scratch the surface of what scientists might find out about children with the eye-trackers. For instance, Dr. Hayhoe said, learning at what age infants start to look at the ground when someone drops a ball could shed light on when children are able to predict the likely consequences of actions, an important step in cognitive development.

Studies on what visual cues draw the attention of children with autism or on how children with motor disabilities interact with the world could be useful in tracking their progress or developing therapeutic interventions, Dr. Lockman said. “This is a whole new way of asking questions that’s limited only by your imagination,” Dr. Adolph said.

http://www.nytimes.com/2010/08/17/science/17gaze.html?ref=science

High in the Andes, Keeping an Incan Mystery Alive

By SIMON ROMERO

SAN CRISTÓBAL DE RAPAZ, Peru — The route to this village 13,000 feet above sea level runs from the desert coast up hairpin bends, delivering the mix of exhilaration and terror that Andean roads often provide. Condors soar above mist-shrouded crags. Quechua-speaking herders squint at strangers who arrive gasping in the thin air.

Rapaz's isolation has allowed it to guard an enduring archaeological mystery: a collection of khipus, the cryptic woven knots that may explain how the Incas — in contrast to contemporaries in the Ottoman Empire and China's Ming dynasty — ruled a vast, administratively complex empire without a written language.

Archaeologists say the Incas, brought down by the Spanish conquest, used khipus — strands of woolen cords made from the hair of animals like llamas or alpacas — as an alternative to writing. The practice may have allowed them to share information from what is now southern Colombia to northern Chile.

Few of the world's so-called lost writings have proved as daunting to decipher as khipus, scholars say, with chroniclers from the outset of colonial rule bewildered by their inability to crack the code. Researchers at Harvard have been using databases and mathematical models in recent efforts to understand the khipu (pronounced KEE-poo), which means knot in Quechua, the Inca language still spoken by millions in the Andes.

Only about 600 khipus are thought to survive. Collectors spirited many away from Peru decades ago, including a mother lode of about 300 held at Berlin's Ethnological Museum. Most were thought to have been destroyed after Spanish officials decreed them to be idolatrous in 1583.

But Rapaz, home to about 500 people who subsist by herding llamas and cattle and farming crops like rye, offers a rare glimpse into the role of khipus during the Inca Empire and long afterward. The village houses one of the last known khipu collections still in ritual use.

"I feel my ancestors talking to me when I look at our khipu," said Marcelina Gallardo, 48, a herder who lives with her children here in the puna, the Andean region above the tree line where temperatures drop below freezing at night and carnivores like the puma prey on herds.

Outside her stone hut one recent morning, Ms. Gallardo nodded toward the stomach lining and skull of a newly butchered llama drying in the sun. She shared a shred of llama charqui, or jerky. "The khipu is a jewel of our life in this place," she said.

Even here, no one claims to understand the knowledge encoded in the village's khipus, which are guarded in a ceremonial house called a Kaha Wayi. The khipus' intricate braids are decorated with knots and tiny figurines, some of which hold even tinier bags filled with coca leaves.

The ability of Rapacinos, as the villagers are called, to decipher their khipus seems to have faded with elders who died long ago, though scholars say the village's use of khipus may have continued into the 19th century. Testing tends to show dates for Rapaz's khipus that are well beyond the vanquishing of the Incas, and experts say they differ greatly from Inca-designed khipus.

Even now, Rapacinos conduct rituals in the Kaha Wayi beside their khipus, as described by Frank Salomon, an anthropologist at the University of Wisconsin who led a recent project to help Rapaz protect its khipus in an earthquake-resistant casing.

One tradition requires the villagers to murmur invocations during the bone-chilling night to the deified mountains surrounding Rapaz, asking for the clouds to let forth rain. Then they peer into burning llama fat and read how its sparks fly, before sacrificing a guinea pig and nestling it in a hole with flowers and coca.

The survival of such rituals, and of Rapaz's khipus, testifies to the village's resilience after centuries of hardship. Fading murals on the walls of Rapaz's colonial church depict devils pulling Indians into the flames of hell for their sins. Feudal landholding families forced the ancestors of many here into coerced labor.

Rapacinos have also faced more recent challenges. A government of leftist military officers in the 1970s created economic havoc with nationalization, sowing chaos exploited by the Maoist guerrillas of the Shining Path who terrorized Rapaz into the 1990s, effectively shutting it off from significant contact with the rest of Peru.

But throughout it all, perhaps because of the village's high level of cohesion and communal ownership of land and herds, Rapacinos somehow preserved their khipus in their Kaha Wayi.

"They feel that they must protect the khipu collection for the same reason we feel that we have to defend the physical original of the Declaration of Independence and the Constitution," Professor Salomon said. "I've heard people say, 'It's our Constitution, it's our Magna Carta.' "

Despite Rapaz's forbidding geography, changes in the rhythm of village life here are emerging that may alter the way Rapacinos relate to their khipus.

About a year ago, villagers say, a loudspeaker replaced the town crier. And a new cellphone tower enables Rapacinos to communicate more easily with the outside world. Those changes are largely welcome. More menacing are the rustlers in pickup trucks who steal llamas, cattle and vicuñas — Andean members of the camel family prized for their wool.

The most immediate threat to the khipus may be from Rapaz's tilt toward Protestantism, a trend witnessed in communities large and small throughout Latin America. About 20 percent of Rapacino families already belong to new Protestant congregations, which view rituals near the khipus as pagan sacrilege.

Far from Rapaz, the pursuit to decipher khipus faces its own challenges, even as new discoveries suggest that they were used in Andean societies long before the Inca Empire emerged as a power in the 15th century.

Scholars say they lack the equivalent for khipus of a Rosetta Stone, the granite slab whose engravings in Greek were used to decipher ancient Egyptian hieroglyphics. Jesuit manuscripts discovered in Naples, Italy, had seemed to achieve something similar for khipus, but are now thought to be forgeries.

In Rapaz, villagers still guard their khipus the way descendants of those in the West might someday protect shreds of the Bible or other documents if today's civilizations were to crumble.

"They must remain here, because they belong to our people," said Fidencio Alejo Falcón, 42. "We will never surrender them."

Andrea Zárate contributed reporting from Lima, Peru.

http://www.nytimes.com/2010/08/17/world/americas/17peru.html?ref=science

Tai Chi Reported to Ease Fibromyalgia

By PAM BELLUCK

The ancient Chinese practice of tai chi may be effective as a therapy for fibromyalgia, according to a study published on Thursday in The New England Journal of Medicine.

A clinical trial at Tufts Medical Center found that after 12 weeks of tai chi, patients with fibromyalgia, a chronic pain condition, did significantly better in measurements of pain, fatigue, physical functioning, sleeplessness and depression than a comparable group given stretching exercises and wellness education. Tai chi patients were also more likely to sustain improvement three months later.

"It's an impressive finding," said Dr. Daniel Solomon, chief of clinical research in rheumatology at Brigham and Women's Hospital in Boston, who was not involved in the research. "This was a well-done study. It was kind of amazing that the effects seem to carry over."

Although the study was small, 66 patients, several experts considered it compelling because fibromyalgia is a complex and often-confusing condition, affecting five million Americans, mostly women, according to the Centers for Disease Control and Prevention. Since its symptoms can be wide-ranging and can mimic other disorders, and its diagnosis depends largely on patients' descriptions, not blood tests or biopsies, its cause and treatment have been the subject of debate.

"We thought it was notable that The New England Journal accepted this paper, that they would take fibromyalgia on as an issue, and also because tai chi is an alternative therapy that some people raise eyebrows about," said Dr. Robert Shmerling, clinical chief of rheumatology at Beth Israel Deaconess Medical Center in Boston, co-author of an editorial about the study.

"Fibromyalgia is so common, and we have such a difficult time treating it effectively. It's defined by what the patient tells you," he added. "It's hard for some patients' families and their doctors to get their head around what it is and whether it's real. So, that these results were so positive for something that's very safe is an impressive accomplishment."

Recent studies have suggested that tai chi, with its slow exercises, breathing and meditation, could benefit patients with other chronic conditions, including arthritis. But not all of these reports have been conclusive, and tai chi is hard to study because there are many styles and approaches.

The fibromyalgia study involved the yang style of tai chi, taught by a Boston tai chi master, Ramel Rones. Dr. Solomon and other experts cautioned that bigger studies with other masters and approaches were necessary.

Still, patients, who received twice-weekly tai chi classes and a DVD to practice with 20 minutes daily, showed weekly improvement on an established measurement, the Fibromyalgia Impact Questionnaire, improving more than the stretching-and-education group in physicians' assessments, sleep, walking and mental health. One-third stopped using medication, compared with one-sixth in the stretching group.

Dr. Chenchen Wang, a Tufts rheumatologist who led the study, said she attributed the results to the fact that "fibromyalgia is a very complex problem" and "tai chi has multiple components — physical, psychological, social and spiritual."

The therapy impressed Mary Petersen, 59, a retired phone company employee from Lynn, Mass., who said that before participating in the 2008 study, "I couldn't walk half a mile," and it "hurt me so much just to put my hands over my head." Sleeping was difficult, and she was overweight. "There was no joy to life," she said. "I was an entire mess from head to foot."

She had tried and rejected medication, physical therapy, swimming and other approaches. "I was used to being treated in a condescending manner because they couldn't diagnose me: 'She's menopausal, she's crazy.' " Before the study, "I didn't know tai chi from a sneeze," said Ms. Petersen, who has diabetes and other conditions. "I was like, 'Well, O.K., I'll get to meet some people, it will get me out of the house.' I didn't believe any of it. I thought this is so minimal, it's stupid."

After a few weeks, she said she began to feel better, and after 12 weeks "the pain had diminished 90 percent." She has continued tai chi, lost 50 pounds and can walk three to seven miles a day. "You could not have convinced me that I would ever have done this or continued with this," she said. "I wouldn't say it's a cure. I will say it's an effective method of controlling pain."

Dr. Shmerling said that though tai chi is inexpensive compared with other treatments, some patients would reject such an alternative therapy. And Dr. Gloria Yeh, a Beth Israel Deaconess internist and co-author of the editorial, said others "will say, 'It's too slow, I can't do that.' "

But she said it offered a "gentler option" for patients deterred by other physical activities. "The mind-body connections set it apart from other exercises," she said, adding that doctors are seeking "anything we can offer that will make patients say 'I can really do this.' "

http://www.nytimes.com/2010/08/19/health/19taichi.html?ref=science

Difficulty Swallowing a Sign of Poor Prognosis Among Hospitalized Patients

ScienceDaily (Aug. 23, 2010) — Dysphagia, or difficulty swallowing, is associated with longer hospital stays among patients with any diagnosis, is increasingly prevalent with older age and is an indicator of a poor prognosis, according to a report in the August issue of *Archives of Otolaryngology-Head & Neck Surgery.*

"The consequences of dysphagia can be profound. Although it is appreciated that nutrition, hydration, quality of life issues and social isolation may arise, aspiration (especially if not immediately recognized) may be the pivotal factor that precipitates a significant decline in a patient's outcome," the authors write as background information in the article. The harmful effects of dysphagia on patients with stroke, heart disease and pneumonia have been recognized.Kenneth W. Altman, M.D., Ph.D., of The Mount Sinai School of Medicine, New York, and colleagues analyzed data from the 2005 to 2006 National Hospital Discharge Survey to evaluate the presence of dysphagia and the most common co-occurring medical conditions. Demographics, associated diseases, length of hospital stay, illness and death were assessed.

During the time period studied, more than 77 million hospital admissions were recorded, of which 271,983 were associated with dysphagia. "Dysphagia was most commonly associated with fluid or electrolyte disorder, esophageal disease, stroke, aspiration pneumonia, urinary tract infection and congestive heart failure," the authors write. Being older than age 75 was associated with double the risk of dysphagia.The median (midpoint) number of days in the hospital was 4.04 among patients with dysphagia, compared with 2.4 among patients without, a 40-percent increase in length of stay. Patients undergoing rehabilitation had a greater than 13-fold increased risk of death during their hospitalization if they had dysphagia; the condition was also associated with increased risk of death among patients with intervertebral disk disorders and heart disease.

"While dysphagia occurs in only a small portion of hospitalized patients, the impact on hospital resources is substantial," the authors conclude. "We recommend early identification of dysphagia in hospitalized patients, particularly in those with high-risk co-morbid conditions such as older age, stroke, dehydration, malnutrition, neurodegenerative disease, pneumonia, cardiac disease and the need for rehabilitation. The plan of care in these patients should include proper assessment, early intervention using appropriate therapy and aspiration precautions and consideration of enteral feeding or supplementation options in the high-risk population.""Further clinical research to address clinical pathways and outcomes in these populations could help to mitigate both the clinical and economic ill effects of this potentially devastating condition."

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **JAMA and Archives Journals**.

Journal Reference:

1. Kenneth W. Altman; Gou-Pei Yu; Steven D. Schaefer. **Consequence of Dysphagia in the Hospitalized Patient: Impact on Prognosis and Hospital Resources**. *Arch Otolaryngol Head Neck Surg*, 2010; 136 (8): 784-789 [link]

http://www.sciencedaily.com/releases/2010/08/100816162647.htm

Protein Made by Breast Cancer Gene Purified

ScienceDaily (Aug. 22, 2010) — A key step in understanding the origins of familial breast cancer has been made by two teams of scientists at the University of California, Davis. The researchers have purified, for the first time, the protein produced by the breast cancer susceptibility gene BRCA2 and used it to study the oncogene's role in DNA repair.

The results will be published online Aug. 22 in the journals *Nature*, and *Nature Structural and Molecular Biology*. They open new possibilities for understanding, diagnosing and perhaps treating breast cancer.

BRCA2 is known to be involved in repairing damaged DNA, but exactly how it works with other molecules to repair DNA has been unclear, said Stephen Kowalczykowski, distinguished professor of microbiology in the UC Davis College of Biological Sciences, UC Davis Cancer Center member and senior author of the Nature paper.

"Having the purified protein makes possible far more detailed studies of how it works," Kowalczykowski said.

Kowalczykowski's group has purified the protein from human cells; another group led by Professor Wolf-Dietrich Heyer, also in the UC Davis Department of Microbiology and leader of the Cancer Center's molecular oncology program, used genetic engineering techniques to manufacture the human protein in yeast. That work is published in *Nature Structural and Molecular Biology*.

The two approaches are complementary, Heyer said, and the two teams have been talking and cooperating throughout.

"It's nice to be able to compare the two and see no disagreements between the results," Heyer said.

Experiments with the BRCA2 protein confirm that it plays a role in repairing damaged DNA. It acts as a mediator, helping another protein, RAD51, to associate with a single strand of DNA and stimulating its activity. One BRCA2 molecule can bind up to six molecules of RAD51.

The RAD51/DNA complex then looks for the matching strand of DNA from the other chromosome to make an exact repair.

If the BRCA2/RAD51 DNA repair system is not working, the cell resorts to other, more error-prone methods.

"It's at the apex of the regulatory scheme of DNA repair," Kowalczykowski said. Your DNA is constantly suffering damage, even if you avoid exposure to carcinogens. If that damage is not repaired, errors start to accumulate, Kowalczykowski said. Those errors can eventually lead to cancer.

The BRCA2 gene was discovered in 1994. Mutations in BRCA2 are associated with about half of all cases of familial breast and ovarian cancer (cases where the propensity to develop cancer seems to be hereditary), and are the basis for genetic tests.

But purifying the protein made by the gene has proved difficult.

"It's very large, it does not express well, and it degrades easily," Kowalczykowski said.

Ryan Jensen, a postdoctoral researcher in Kowalczykowski's lab, after testing many different cell lines, succeeded in introducing a BRCA2 gene into a human cell line and expressing (producing) it as a whole protein. Jensen and another postdoc, Aura Carreira, tested the purified protein for its function in repairing damaged DNA.

Jie Liu, a postdoctoral researcher in Heyer's lab, found that a much smaller protein called DSS1 stimulated BRCA2 to assemble functional RAD51/DNA complexes. Together with Liu, staff research associate Tammy Doty and UC Davis undergraduate student Bryan Gibson (now a doctoral student at Cornell University) purified the human BRCA2 and DSS1 proteins from yeast.

One application of the purified protein would be to make antibodies to BRCA2 that could be used in test kits as a supplement to existing genetic tests, Kowalczykowski said.

A more exciting possibility, he said, would be to use the system to screen for drugs that activate or inhibit the interaction between BRCA2, RAD51 and DNA. Many cancer treatments work by creating breaks in DNA, and a drug that selectively shuts down a specific DNA repair pathway -- making it harder for cancer cells to recover -- could make the cells more vulnerable to treatment. That strategy is already being exploited by a new class of drugs called PARP inhibitors, currently in clinical trials. PARP inhibitors target an alternate DNA repair pathway that cells use when the BRCA2 repair pathway is not available.

The BRCA2 protein can also be used to study how different mutations affect the gene's function.

"We're just starting to scratch the surface and understand more of the mechanisms and interaction with other factors," Kowalczykowski said.

The work was supported by grants from the National Institutes of Health, the U.S. Department of Defense Breast Cancer Research Program, the Susan G. Komen Breast Cancer Foundation, and the UC Davis Cancer Center. Jensen was supported by a fellowship from the American Cancer Society; Carreira was supported by a fellowship from the Spanish Ministry of Education and Science, and Liu by a fellowship from the Tobacco-Related Disease Research Program.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of California - Davis - Health System**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Ryan B. Jensen, Aura Carreira & Stephen C. Kowalczykowski. **Purified human BRCA2 stimulates RAD51-mediated recombination**. *Nature*, 2010; DOI: 10.1038/nature09399

http://www.sciencedaily.com/releases/2010/08/100822150649.htm

Molecular Mechanisms Underlying the Pathogenesis of Asthma Illuminated

ScienceDaily (Aug. 18, 2010) — Scientists at the University Medical Center of Johannes Gutenberg University Mainz, Germany have taken a further step towards improving our understanding of how asthma develops. New findings show that the gene-regulating molecule "IRF4" plays a key role in the development of T helper 9 lymphocytes (Th9 cells), which can play a major part in the development of this chronic, inflammatory illness of the respiratory tract. The findings were shown for the first time in research carried out by the work group led by Dr. Tobias Bopp and Professor Dr. Edgar Schmitt from the Institute for Immunology, which was recently published in the internationally scientific journal *Immunity.*

Over the past 100 years, asthma has developed from a relatively rare lung disease into an epidemic. Around 300 million people suffer from asthma worldwide. And twice as many men suffer from the illness than women. We know that allergic immune reactions can contribute significantly to the development of asthma. Hyperreactive Th cells, which form part of the body's own immune system, play a major role in the manifestation of this illness.

Different T cells carry out various tasks in the body's immune defense: Cells with a helper function known as T helper (Th) cells produce various cytokines that enable the different immune defense cells to communicate with each other, which in turn helps them launch a coordinated attack on pathogens or even tumour cells. However, if these cells react disproportionately to harmless substances, they can also cause disease. T helper cells can be divided into several sub-groups, including Th9 cells. These Th9 cells were characterized in two phases: They were described for the first time in 1994 as interleukin (IL)-9-producing T helper cells by Professor Schmitt, and finally became known as Th9 cells in 2008.

"Until now, only evidence was provided for the existence of Th9 cells and the crucial importance of IL-9 in the pathogenesis of asthma. However, as other cells beside T cells can produce IL-9 the major source of this cytokine was far from being definitive. To enable targeted therapeutic intervention, however, it was necessary to uncover the basic molecular mechanism underlying the development and function of IL-9-producing Th9 cells. Our analyses finally showed that IRF4 -- a molecule that plays a key role in the regulation of genes -- is essential for the development and function of Th9 cells," explain Dr. Tobias Bopp and Professor Dr. Edgar Schmitt from the Institute for Immunology.

The functional studies were carried out mainly on mice. The starting point was the observation that T cells in mice missing an intact IRF4 molecule do not develop into Th9 cells and are therefore unable to produce significant quantities of IL-9. As IL-9 is responsible for a variety of different asthma symptoms, the scientists led by Dr. Tobias Bopp and Professor Dr. Edgar Schmitt investigated to what extent IRF4 and consequently Th9 cells contribute to development and manifestation of asthma. These experiments showed that a failure in Th9 development prevents IRF4-deficient mice from asthma. Transfer of Th9 cells led to reappearance of asthma symptoms in such mice confirming the importance of this Th-subpopulation for the induction of asthma.

Professor Dr. Hansjörg Schild, Director of the Institute for Immunology, stresses how important basic research is for the development of new therapeutic strategies: "Asthma has been on the increase for decades in industrial countries. The discovery of Dr. Tobias Bopp and Professor Dr. Edgar Schmitt could provide the first step to improve existing therapeutic treatments but we still have a long and arduous journey ahead." The next step of the research process is to screen substances, among them naturally occurring molecules/agents, that suppress the production of IL-9 to develop innovative approaches for the treatment of asthma.

This view is also shared by the Scientific Director of the University Medical Center Mainz, Professor Dr. Dr. Reinhard Urban: "Immunological illnesses are playing an ever greater role in our society. It is therefore only logical that the researchers in the University Medical Center should focus on the basic cellular mechanisms and use their results to help improve treatment for patients."

Story Source:

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

Journal Reference:

1. Valérie Staudt, Evita Bothur, Matthias Klein, Karen Lingnau, Sebastian Reuter, Nadine Grebe, Bastian Gerlitzki, Markus Hoffmann, Alexander Ulges, Christian Taube. **Interferon-Regulatory Factor 4 Is Essential for the Developmental Program of T Helper 9 Cells**. *Immunity*, 2010; DOI: 10.1016/j.immuni.2010.07.014

http://www.sciencedaily.com/releases/2010/08/100818131428.htm

New Ways of Boosting Healthful Antioxidant Levels in Potatoes

Scientists have reported discovery of two simple, inexpensive ways of boosting the amounts of healthful antioxidant substances in potatoes. One involves giving spuds an electric shock. The other involves zapping them with ultrasound, high frequency sound waves. (Credit: iStockphoto/Maria Toutoudaki)

ScienceDaily (Aug. 22, 2010) — Here's a scientific discovery fit to give Mr. Potato Head static cling and flyaway hair (if that vintage plastic toy had hair). Scientists have reported discovery of two simple, inexpensive ways of boosting the amounts of healthful antioxidant substances in potatoes. One involves giving spuds an electric shock. The other involves zapping them with ultrasound, high frequency sound waves.

Those new insights into improving the nutritional content of one of the Western world's favorite side dishes were reported August 22 at the 240th National Meeting of the American Chemical Society (ACS), being held in Boston Massachusetts, U.S.

"We found that treating the potatoes with ultrasound or electricity for 5-30 minutes increased the amounts of antioxidants -- including phenols and chlorogenic acid -- by as much as 50 percent," said Kazunori Hironaka, Ph.D., who headed the research. "Antioxidants found in fruits and vegetables are considered to be of nutritional importance in the prevention of chronic diseases, such as cardiovascular disease, various cancers, diabetes, and neurological diseases."

Hironaka, who is with Obihiro University in Hokkaido, Japan, indicated that the process could have widespread commercial application, due to growing consumer interest in so-called "functional foods." Those are products like berries, nuts, chocolate, soy, and wine that may have health benefits beyond traditional nutrition. Such foods may promote overall good health, for instance, or reduce the risk of specific diseases. Hironaka estimated that sales of such products in the United States alone now approach $20 billion annually.

"We knew from research done in the past that drought, bruising, and other stresses could stimulate the accumulation of beneficial phenolic compounds in fresh produce," Hironaka explained. "We found that there hasn't been any research on the healthful effects of using mechanical processes to stress vegetables. So we decided in this study to evaluate effect of ultrasound and electric treatments on polyphenols and other antioxidants in potatoes."

The ultrasound treatment consisted of immersing whole potatoes in water and subjecting them to ultrasound for 5 or 10 minutes. For the electrical treatment, the scientists immersed potatoes in a salt solution for 10 seconds and subsequently treated the spuds with a small electrical charge for 10, 20, and 30 minutes. The study team then measured antioxidant activity and the phenolic content and concluded that the stresses increased the amount of these compounds. The 5 minutes of ultrasound, for instance, increased polyphenol levels by 1.2 times and other antioxidants by about 1.6 times.

Story Source:

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

http://www.sciencedaily.com/releases/2010/08/100822150636.htm

Language as a Window Into Sociability

ScienceDaily (Aug. 13, 2010) — People with Williams syndrome-known for their indiscriminate friendliness and ease with strangers-process spoken language differently from people with autism spectrum disorders-characterized by social withdrawal and isolation-found researchers at the Salk Institute for Biological Studies.

Their findings, to be published in a forthcoming issue of *Social Cognitive and Affective Neuroscience*, will help to generate more specific hypotheses regarding language perception and processing in both Williams syndrome and autism spectrum disorders, as well as the core mechanisms involved in the development of communication and social skills.

"Spoken language is probably the most important form of social interaction between people and, maybe not surprisingly, we found that the way the brain processes language mirrors the contrasting social phenotypes of Williams syndrome and autism spectrum disorders," says lead author Inna Fishman, Ph.D., a neuropsychologist in the Laboratory of Cognitive Neuroscience at the Salk, who conceived the study together with Debra Mills, Ph.D., currently a reader at Bangor University in UK.

Autism spectrum disorders and Williams syndrome are both neurodevelopmental disorders but their manifestations couldn't be more different: While autistic individuals live in a world where objects make much more sense than people do, people with Williams syndrome are social butterflies who bask in other people's attention.

Despite myriad health problems, generally low IQs and severe spatial problems, people with Williams syndrome are irresistibly drawn to strangers, look intently at people's faces, remember names and faces with ease, and are colorful and skillful storytellers.

"The discrepancy between their language ability and IQ is startling," says co-author Ursula Bellugi, professor and director of the Laboratory of Cognitive Neuroscience at the Salk Institute, who has been studying the behavioral aspects of Williams syndrome for more than 20 years. "Children with Williams syndrome have elaborate and rich vocabularies and use very descriptive, affect-rich expressive language, which makes their speech very engaging."

In contrast, many people with autism struggle to learn and use language effectively, especially when talking to other people. Chit-chat and gossip, the social glue that binds people together, mean nothing to them. Although there is considerable variation in linguistic ability-from the absence of functional speech to near normal language skills-deficits in semantic processing, especially interpreting language in context, are common across the whole spectrum of autistic disorders, including Asperger syndrome.

"It is this divide in language skills and use, which mirrors the opposite social profiles, that led us to explore how brains of individuals with Williams syndrome and autistic spectrum disorders process language," says Fishman.

For their study, she and her colleagues compared brain response patterns linked to language processing in individuals with Williams syndrome, autism spectrum disorders and healthy controls. They focused on the so-called N400, a distinct pattern of electrical brain activity that can be measured by electrodes placed on the scalp. Known as ERP or event-related potential, the N400 is part of the normal brain response to words and other meaningful or potentially meaningful stimuli and peaks about 400 milliseconds after the stimulus.

When presented with a typical sentence that finished with an odd ending ("I take my coffee with sugar and shoes"), individuals with Williams syndrome exhibited an abnormally large N400 response indicating that they are particularly sensitive and attuned to semantic aspects of language. In contrast, individuals with ASD did not show this negativity, suggesting that the inability to integrate lexical information into the ongoing context may underlie their communicative and language impairments. Healthy people fell between those two extremes.

"The N400 reflects the cognitive demand incurred by the integration of a meaningful stimulus such as a word into a more general semantic context such as a sentence," explains Fishman. The smaller N400 effect found in the ASD group suggests that they make less use of contextual information, which makes it harder for them to grasp the meaning of words.

"Our results suggest that language skills, or their brain correlates, go hand-in-hand with the level of sociability, potentially mediating the likelihood of interaction and communication with others," she says. In fact, Fishman and her colleagues have preliminary data supporting this association between the sociability and the magnitude of one's N400 response, among individuals with WS.

To gain a better understanding of the neural and genetic correlates of social behavior in different social phenotypes Bellugi's team is now integrating these findings with the exquisitely mapped genetic profile of Williams syndrome. They hypothesize that specific genes in the Williams syndrome region may be involved in the dysregulation of specific neuropeptide and hormonal systems, which could explain the observed hypersocial behavior.

Researchers who also contributed to the work include A. Yam, a former research assistant at the Laboratory for Cognitive Neuroscience, and Alan Lincoln, Ph.D., professor at the Alliant International University in San Diego.

The work was funded in part by the National Institute of Child Health and Human Development and the National Institute of Mental Health.

Story Source:

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

http://www.sciencedaily.com/releases/2010/08/100816095806.htm

Street Outreach Workers an Important Tool for Violence Prevention and Intervention

ScienceDaily (Aug. 23, 2010) — A new study by researchers at the Johns Hopkins Center for Injury Research and Policy describes how using street outreach workers is an effective strategy to reach and engage youth with the goal of violence prevention and intervention. Street outreach workers are typically members of the community who intervene to prevent conflict and retaliation, and in some programs, also connect individuals with needed services, such as housing and job training.

While cities across the United States are utilizing street outreach workers as part of their violence prevention programs, including CeaseFire in Chicago and Safe Streets in Baltimore, this is the first peer-reviewed study on a program to be published. This is also the first evaluation of this type of program in a smaller community; the researchers studied the street outreach workers program run by the United Teen Equality Center (UTEC) in Lowell, Mass., a city of 105,167 residents north of Boston. The results are published in the Fall 2010 issue of *Progress in Community Health Partnerships: Research, Education, and Action*.

Analysis of the data collected from interviews with the UTEC managers, the UTEC street workers, and representatives from local community groups yielded five major factors that contribute to the UTEC street outreach workers program's success: involvement of youth in hiring street outreach workers; investment in quality training for the street outreach workers; providing street outreach workers with a comprehensive benefits package and team retreats to prevent staff turnover and burnout; establishment of community partnerships; and incorporation of peacemaking into outreach.

"These features should be considered both by communities with existing street outreach worker programs and by communities in the process of establishing one, as they have demonstrated importance for both program success and sustainability," said Shannon Frattaroli, PhD, MPH, assistant professor with the Johns Hopkins Bloomberg School of Public Health's Department of Health Policy and Management and the paper's lead author.The process of peacemaking, which typically involves engaging gang leaders in conflict mediation, convening peace circles, participating in a peace summit, and organizing a peace council, is a unique feature of the Lowell program. The UTEC team has invested in peacemaking because they believe it has helped to reduce conflict among gangs that have participated in the process. Another integral aspect of the UTEC program is an emphasis on providing resources for creating viable alternatives to violence, such as education advancement, skills development, and securing employment."As communities around the country continue to struggle with how to address youth violence, it's important to recognize that young people need resources in addition to strategies that help them to negotiate conflict," said Keshia Pollack, PhD, MPH, also an assistant professor with the Bloomberg School's Department of Health Policy and Management and co-author of the paper. "Coupling support with essential services is a key to helping youth make healthy and safe transitions to adulthood."Additional authors of "Streetworkers, Youth Violence Prevention, and Peacemaking in Lowell, Massachusetts: Lessons and Voices from the Community" are Karen Jonsberg (Johns Hopkins Center for Injury Research and Policy), Gregg Croteau, MSW (United Teen Equality Center), JuanCarlos Rivera (United Teen Equality Center), and Jennifer S. Mendel (Johns Hopkins Center for Injury Research and Policy).

The research was funded by the Robert Wood Johnson Foundation.

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Johns Hopkins University Bloomberg School of Public Health**, via EurekAlert!, a service of AAAS.

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Self-Cleaning Technology from Mars Can Keep Terrestrial Solar Panels Dust Free

Researchers have developed technology for large-scale solar power installations to self-clean. (Credit: iStockphoto/Flavio Massari)

ScienceDaily (Aug. 23, 2010) — Find dusting those tables and dressers a chore or a bore? Dread washing the windows? Imagine keeping dust and grime off objects spread out over an area of 25 to 50 football fields. That's the problem facing companies that deploy large-scale solar power installations, and scientists have now presented the development of one solution -- self-dusting solar panels — based on technology developed for space missions to Mars.

In a report at the 240th National Meeting of the American Chemical Society (ACS) on August 22, they described how a self-cleaning coating on the surface of solar cells could increase the efficiency of producing electricity from sunlight and reduce maintenance costs for large-scale solar installations.

"We think our self-cleaning panels used in areas of high dust and particulate pollutant concentrations will highly benefit the systems' solar energy output," study leader Malay K. Mazumder, Ph.D. said. "Our technology can be used in both small- and large-scale photovoltaic systems. To our knowledge, this is the only technology for automatic dust cleaning that doesn't require water or mechanical movement."

Mazumder, who is with Boston University, said the need for that technology is growing with the popularity of solar energy. Use of solar, or photovoltaic, panels increased by 50 percent from 2003 to 2008, and forecasts suggest a growth rate of at least 25 percent annually into the future. Fostering the growth, he said, is emphasis

on alternative energy sources and society-wide concerns about sustainability (using resources today in ways that do not jeopardize the ability of future generations to meet their needs).

Large-scale solar installations already exist in the United States, Spain, Germany, the Middle East, Australia, and India. These installations usually are located in sun-drenched desert areas where dry weather and winds sweep dust into the air and deposit it onto the surface of solar panel. Just like grime on a household window, that dust reduces the amount of light that can enter the business part of the solar panel, decreasing the amount of electricity produced. Clean water tends to be scarce in these areas, making it expensive to clean the solar panels.

"A dust layer of one-seventh of an ounce per square yard decreases solar power conversion by 40 percent," Mazumder explains. "In Arizona, dust is deposited each month at about 4 times that amount. Deposition rates are even higher in the Middle East, Australia, and India."

Working with NASA, Mazumder and colleagues initially developed the self-cleaning solar panel technology for use in lunar and Mars missions. "Mars of course is a dusty and dry environment," Mazumder said, "and solar panels powering rovers and future manned and robotic missions must not succumb to dust deposition. But neither should the solar panels here on Earth."

The self-cleaning technology involves deposition of a transparent, electrically sensitive material deposited on glass or a transparent plastic sheet covering the panels. Sensors monitor dust levels on the surface of the panel and energize the material when dust concentration reaches a critical level. The electric charge sends a dust-repelling wave cascading over the surface of the material, lifting away the dust and transporting it off of the screen's edges.

Mazumder said that within two minutes, the process removes about 90 percent of the dust deposited on a solar panel and requires only a small amount of the electricity generated by the panel for cleaning operations.

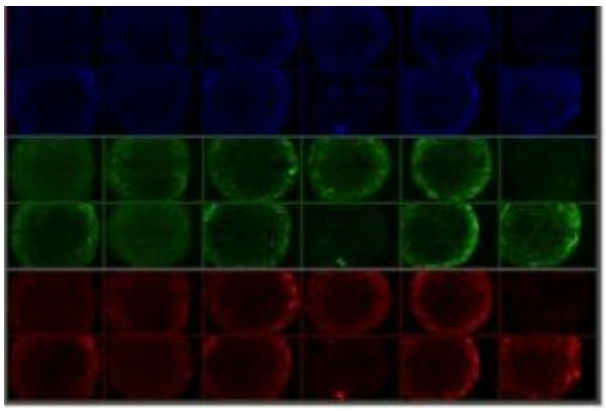
The current market size for solar panels is about $24 billion, Mazumder said. "Less than 0.04 percent of global energy production is derived from solar panels, but if only four percent of the world's deserts were dedicated to solar power harvesting, our energy needs could be completely met worldwide. This self-cleaning technology can play an important role."

Story Source:

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

http://www.sciencedaily.com/releases/2010/08/100822150641.htm

Better Way to Grow Stem Cells Developed



This image shows human embryonic stem cells grown on a synthetic surface developed by MIT researchers. The cells at top (blue) are stained to reveal their nuclei, while the cells in the middle and bottom are stained for proteins that are known to be present when cells are pluripotent. Green cells are stained for Oct4 (using green fluorescent protein) and red cells are stained for SSEA-4. (Credit: Ying Mei, Krishanu Saha, Robert Langer, Rudolf Jaenisch, and Daniel G. Anderson)

ScienceDaily (Aug. 23, 2010) — Human pluripotent stem cells, which can become any other kind of body cell, hold great potential to treat a wide range of ailments, including Parkinson's disease, multiple sclerosis and spinal cord injuries. However, scientists who work with such cells have had trouble growing large enough quantities to perform experiments -- in particular, to be used in human studies. Furthermore, most materials now used to grow human stem cells include cells or proteins that come from mice embryos, which help stimulate stem-cell growth but would likely cause an immune reaction if injected into a human patient.

To overcome those issues, MIT chemical engineers, materials scientists and biologists have devised a synthetic surface that includes no foreign animal material and allows stem cells to stay alive and continue reproducing themselves for at least three months. It's also the first synthetic material that allows single cells to form colonies of identical cells, which is necessary to identify cells with desired traits and has been difficult to achieve with existing materials.

The research team, led by Professors Robert Langer, Rudolf Jaenisch and Daniel G. Anderson, describes the new material in the Aug. 22 issue of *Nature Materials*. First authors of the paper are postdoctoral associates Ying Mei and Krishanu Saha.

Human stem cells can come from two sources -- embryonic cells or body cells that have been reprogrammed to an immature state. That state, known as pluripotency, allows the cells to develop into any kind of specialized body cells.

It also allows the possibility of treating nearly any kind of disease that involves injuries to cells. Scientists could grow new neurons for patients with spinal cord injuries, for example, or new insulin-producing cells for people with type 1 diabetes.

To engineer such treatments, scientists would need to be able to grow stem cells in the lab for an extended period of time, manipulate their genes, and grow colonies of identical cells after they have been genetically modified. Current growth surfaces, consisting of a plastic dish coated with a layer of gelatin and then a layer of mouse cells or proteins, are notoriously inefficient, says Saha, who works in Jaenisch's lab at the Whitehead Institute for Biomedical Research.

"For therapeutics, you need millions and millions of cells," says Saha. "If we can make it easier for the cells to divide and grow, that will really help to get the number of cells you need to do all of the disease studies that people are excited about."

Previous studies had suggested that several chemical and physical properties of surfaces -- including roughness, stiffness and affinity for water -- might play a role in stem-cell growth. The researchers created about 500 polymers (long chains of repeating molecules) that varied in those traits, grew stem cells on them and analyzed each polymer's performance. After correlating surface characteristics with performance, they found that there was an optimal range of surface hydrophobicity (water-repelling behavior), but varying roughness and stiffness did not have much effect on cell growth.

They also adjusted the composition of the materials, including proteins embedded in the polymer. They found that the best polymers contained a high percentage of acrylates, a common ingredient in plastics, and were coated with a protein called vitronectin, which encourages cells to attach to surfaces.

Using their best-performing material, the researchers got stem cells (both embryonic and induced pluripotent) to continue growing and dividing for up to three months. They were also able to generate large quantities of cells -- in the millions.

The MIT researchers hope to refine their knowledge to help them build materials suited to other types of cells, says Anderson, from the MIT Department of Chemical Engineering, the Harvard-MIT Division of Health Sciences and Technology, and the David H. Koch Institute for Integrative Cancer Research. "We want to better understand the interactions between the cell, the surface and the proteins, and define more clearly what it takes to get the cells to grow," he says.

Other MIT authors of the paper are Said Bogatyrev, Z. Ilke Kalcioglu, Maisam Mitalipova, Neena Pyzocha, Fredrick Rojas and Krystyn Van Vliet. Jing Yang, Andrew Hook, Martyn Davies and Morgan Alexander of the University of Nottingham (United Kingdom) and Seung-Woo Cho of Yonsei University (Korea) are also authors of the paper.

Story Source:

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

Journal Reference:

1. Ying Mei, Krishanu Saha, Said R. Bogatyrev, Jing Yang, Andrew L. Hook, Z. Ilke Kalcioglu, Seung-Woo Cho, Maisam Mitalipova, Neena Pyzocha, Fredrick Rojas, Krystyn J. Van Vliet, Martyn C. Davies, Morgan R. Alexander, Robert Langer, Rudolf Jaenisch and Daniel G. Anderson. **Combinatorial development of biomaterials for clonal growth of human pluripotent stem cells**. *Nature Materials*, 2010; DOI: 10.1038/nmat2812

http://www.sciencedaily.com/releases/2010/08/100822150643.htm

DNA Puts Chemists on Scent of Better Artificial Nose

Florent Samain displays a fluorescence microscope image showing how the fluorescent sensors change color in the presence of organic vapors. (Credit: Linda Cicero, Stanford University News Service)

ScienceDaily (Aug. 23, 2010) — A new approach to building an "artificial nose" -- using fluorescent compounds and DNA -- could accelerate the use of sniffing sensors into the realm of mass production and widespread use, say Stanford chemists. If their method lives up to its promise, it could one day detect everything from incipiently souring milk to high explosives.

By sticking fluorescent compounds onto short strands of the molecules that form the backbone of DNA, the researchers have produced tiny sensor molecules that change color when they detect certain substances. The sensors were made using existing technology for synthesizing DNA, and are viewed with a fluorescence microscope.

The color changes enable the new sensors to convey far more information than most other existing optical sensors, which typically just detect one specific molecule, said Eric Kool, professor of chemistry and senior author of a paper published online this week in the German journal *Angewandte Chemie*.

"We were blown away by how strong the color changes were," Kool said. "One of the surprising findings was that we could tell the difference between four different organic vapors with just one sensor, because it would turn different colors with different vapors."

The key to Kool's versatile sensor molecules lies in the structure of DNA, the famous double helix that encodes the genetic blueprint for life, often described as looking like a twisted ladder. Two long parallel chains of sugar and phosphate molecules constitute the rails of the ladder, with the rungs made of pairs of molecules called bases. The arrangement of the bases, of which there are only four types, encodes the genetic data.

Kool's team of researchers developed a new set of fluorescent replacements for the DNA bases -- seven different ones they could choose from -- to attach to the DNA backbone of the new sensor in place of the usual four. They used only a single helix, so the bases project out from a single twisted pole, ready to detect organic vapors.

Florent Samain, a postdoctoral researcher in chemistry and lead author on the *Angewandte Chemie* paper, used DNA synthesis techniques to generate a library of all 2,401 possible ways that the seven substitute molecules could be combined in a string of four units.

The team then screened all the possible combinations for sensitivity to four different test substances -- as vapors -- that differed significantly in their structural and electronic properties.

One substance was commonly used as an aquatic herbicide, another as a solvent in research and industrial applications, another as an inhibitor of mold and bacteria in food and the fourth as an ingredient in products ranging from shoe polish to pesticides, as well as in the preparation of explosives.

The researchers found multiple sensors that showed marked fluorescent responses when exposed to the four test substances. "This is our first try with vapors and it ended up working really well," Kool said.

"What makes these sensors work exceptionally well is that the bases in DNA are stacked on one another, physically touching each other," he said. "DNA bases talk to one another, electronically."

That close physical contact also allows the compounds that Kool's group attaches to the DNA backbone to communicate with each other, which is crucial to their functionality.

What is also crucial, the researchers found out, is the order of the compounds along the DNA backbone. Like the sequence of natural DNA, which varies among different animals, the different sequences of the artificial DNA sensors gave different color changes.

"We saw a couple of examples where we had the same components, but in a different order and got a different response," Kool said. "So clearly they are talking to one another and whoever is next to someone else, it makes a difference."

"One of our long-term goals is to now build up a set of sensors for a much more complex range of possible substances for analysis," Kool said. "Because we get such a diversity of responses -- even one molecule can tell the difference among four different things -- we could have a set of 10 or 20, or 100 sensors, which would give a vast array of responses to many different kinds of molecules."

Having a large number of sensors available in a single device could broaden the application of the sensors from pure organic molecules such as the ones used in the tests to the many mixtures of molecules often encountered outside the laboratory.

Outside the lab is where the researchers see the DNA sensors being used most effectively. They hope to eventually pair their sensors with some type of portable device that would contain an inexpensive fluorescence microscope, which Kool says a number of other laboratories are already working on. One example -- called the "CellScope" -- was recently developed at the University of California-Berkeley.

The researchers still need to determine how small a quantity of any given substance the DNA sensors can detect.

"Another of our long-term goals is to print these sensors on plastic, and if the spots were big enough to see, you could see the color changes," Kool said. "You could hold a black light over the sensor and read the

response. Then you could match up the color of the sensor with a key of some sort and say, 'Ah, this sensor best compares with this color on the key -- this milk is about to go sour.'"

Kool said it might even be possible, with more research, to use the DNA sensors in liquids.

"To me, the most intriguing possibility is smelling differences that are biologically important," Kool said. "It could be smelling differences in cells that are related to disease or sensing toxins in the environment. Those are probably the most likely applications in the near future.

"We want to sense everything," Kool said. "That is our ultimate goal."

Samantak Ghosh and Yin Nah Teo, both of whom recently graduated with PhD degrees in chemistry, also worked on the study and are coauthors of the paper in *Angewandte Chemie*. Kool is the George A. and Hilda M. Daubert Professor in Chemistry at Stanford.

Story Source:

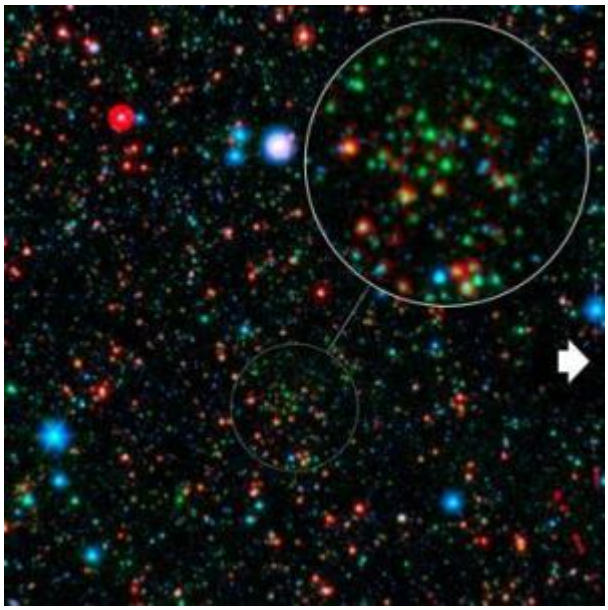
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Stanford University**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Florent Samain, Samantak Ghosh, Yin Nah Teo, Eric T. Kool. **Polyfluorophores on a DNA Backbone: Sensors of Small Molecules in the Vapor Phase**. *Angewandte Chemie*, 2010; DOI: 10.1002/ange.201002701

http://www.sciencedaily.com/releases/2010/08/100820101506.htm

Ancient Galaxy Cluster Still Producing Stars



Star formation in the Galaxy Cluster CIG J02182-05102. (Credit: Spitzer Space Telescope, IRAC, MIPS/Subaru/NASA/JPL-Caltech/K Tran & C. Papovich (Texas A&M University))

ScienceDaily (Aug. 23, 2010) — Much like quiet, middle-aged baby boomers peacefully residing in some of the world's largest cities, families of some galaxies also have a hidden wild youth that they only now are revealing for the first time, according to research by astronomers at Texas A&M University.

In ongoing observations of one of the universe's earliest, most distant cluster of galaxies using NASA's Spitzer Space Telescope, an international team of researchers led by Texas A&M's Dr. Kim-Vy Tran has discovered that a significant fraction of those ancient galaxies are still actively forming stars.

Tran, an assistant professor in the Texas A&M Department of Physics and Astronomy and member of the George P. and Cynthia Woods Mitchell Institute for Fundamental Physics and Astronomy, and her team have spent the past four months analyzing images taken from the Multiband Imaging Photometer for Spitzer (MIPS), essentially looking back in time nearly 10 billion years at a high red-shift cluster known as CLG J02182-05102. Mere months after first discovering the cluster and the fact that it is shockingly "modern" in its appearance and size despite being observed just 4 billion years after the Big Bang, the Texas A&M-led team was able to determine that the galaxy cluster produces hundreds to thousands of new stars every year -- a far higher birthrate than what is present in nearby galaxies.

What is particularly striking, according to Tran, is the fact that the stellar birthrate is higher in the cluster's center than at the cluster's edges -- the exact opposite of what happens in our local portion of the universe, where the cores of galaxy clusters are known to be galactic graveyards full of massive elliptical galaxies composed of old stars.

"A well-established hallmark of galaxy evolution in action is how the fraction of star-forming galaxies decreases with increasing galaxy density," explains Tran, lead author of the team's study which appears in *The Astrophysical Journal Letters*. "In other words, there are more star-forming galaxies in the field than in the crowded cores of galaxy clusters. However, in our cluster, we find many galaxies with star-formation rates comparable to their cousins in the lower-density field environment."

Exactly why this star power increases as galaxies become more crowded remains a mystery. Tran thinks the densely-populated surroundings could lead to galaxies triggering activity in one another, or that all galaxies were extremely active when the universe was young.

The group's discovery holds potentially compelling implications that could ultimately reveal more about how such massive galaxies form. Observations of nearby galaxy clusters confirm that they are made of stars that are at least 8 to 10 billion years old, which means that CLG J02182-05102 is nearing the end of its hyperactive star-building period.

Now that they have pinpointed the epoch when galaxy clusters are making the last of their stars, astronomers can focus on understanding why massive assemblies of galaxies transition from very active to passive. Identifying how long it takes for galaxies in clusters to build up their stellar mass as well as the time at which they stop provides strong constraints for how these massive galaxies form.

"Our study shows that by looking farther into the distant universe, we have revealed the missing link between the active galaxies and the quiescent behemoths that live in the local universe," Tran adds. "Our discovery indicates that future studies of galaxy clusters in this red-shift range should be particularly fruitful for understanding how these massive galaxies form as a function of their environment."

Tran's team includes fellow Texas A&M astronomer Dr. Casey Papovich, who first identified the galaxy cluster CLG J02182-05102 in May. The collection of roughly 60 galaxies is observed just 4 billion years after the Big Bang, making it the earliest cluster of galaxies ever detected. However, the team was struck not by its age, but by its astoundingly modern appearance -- a huge, red collection of galaxies typical in only local clusters.

The fact that Tran's team was able to see these active galaxies so far back in time (Tran likens their find to discovering that her mild-mannered grandparent had lived a fast and furious youth) is only the preface to what they expect eventually to learn about these clusters. Tran will continue to lead an international collaboration with Papovich and their postdoctoral researchers to examine these clusters more thoroughly and hopefully to understand why they are still so energetic.

"We will analyze new observations scheduled to be taken with the Hubble Space Telescope and Herschel Space Telescope to study these galaxies more carefully to understand why they are so active," Tran adds. "We will also start looking at several more distant galaxy clusters to see if we find similar behavior."

Story Source:

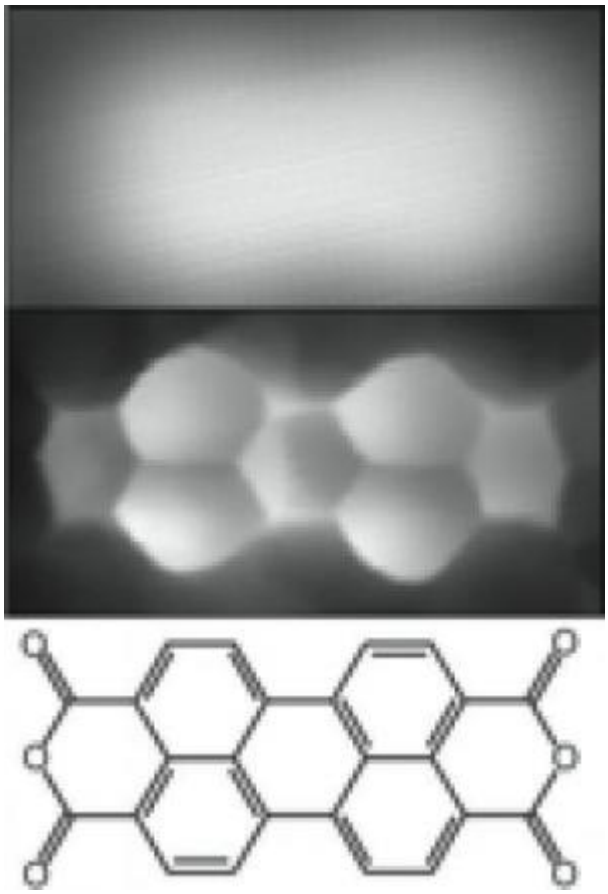
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Texas A&M University**.

Journal Reference:

1. Tran et al. **Reversal of Fortune: Confirmation of an Increasing Star Formation-Density Relation in a Cluster at z=1.62**. *The Astrophysical Journal*, 2010; 719 (2): L126 DOI: 10.1088/2041-8205/719/2/L126

http://www.sciencedaily.com/releases/2010/08/100818141549.htm

Researchers Take a Look Inside Molecules



The Juelich method makes it possible to resolve molecule structure where only a blurred cloud was visible before. (Credit: Forschungszentrum Jülich)

ScienceDaily (Aug. 22, 2010) — Looking at individual molecules through a microscope is part of nanotechnologists' everyday lives. However, it has so far been difficult to observe atomic structures inside organic molecules. In a new study published in *Physical Review Letters*, Juelich researchers explain their novel method, which enables them to take an "X-ray view" inside molecules. The method may facilitate the analysis of organic semiconductors and proteins.

For their look into the nanoworld, the Jülich researchers used a scanning tunneling microscope. Its thin metal tip scans the specimen surface like the needle of a record player and registers the atomic irregularies and differences of approximately one nanometre (a billionth of a millimetre) with minuscule electric currents. However, even though the tip of the microscope only has the width of an atom, it has not been able so far to take a look inside molecules.

"In order to increase the sensitivity for organic molecules, we put a sensor and signal transducer on the tip," says Dr. Ruslan Temirov. Both functions are fulfilled by a small molecule made up of two deuterium atoms, also called heavy hydrogen. Since it hangs from the tip and can be moved, it follow the contours of the

molecule and influences the current flowing from the tip of the microscope. One of the first molecules studied by Temirov and co-workers was the perylene tetracarboxylic dianhydride compound. It consists of 26 carbon atoms, eight hydrogen atoms and six oxygen atoms forming seven interconnected rings. Earlier images only showed a spot with a diameter of approximately one nanometre and without any contours. Much like an X-ray image, the Jülich scanning tunneling microscope shows the molecule's honeycombed inner structure, which is formed by the rings.

"It's the remarkable simplicity of the method that makes it so valuable for future research," says Prof. Stefan Tautz, Director at the Institute of Bio- and Nanosystems at Forschungszentrum Jülich. The Jülich method has been filed as a patent and can easily be used with commercial scanning tunnelling microscopes. "The spatial dimensions inside molecules can now be determined within a few minutes, and the preparation of the specimen is based predominantly on standard techniques," says Tautz. In the next step, the Jülich scientists are planning to calibrate the measured current intensity as well. If they are successful, the measured current intensities may allow the type of atoms to be directly determined.

After publishing initial images produced with the new method in 2008, the research group of Tautz and Temirov has now been able to explain the quantum mechanical principle of operation of the deuterium at the tip of the microscope. Their results were supported by computer-assisted calculations by the working group of Prof. Michael Rohlfing at the University of Osnabrück. The so-called short-range Pauli repulsion is a quantum-physical force between the deuterium and the molecule which modulates the conductivity and allows us to measure the fine structures very sensitively.

The Jülich method can be used to measure the structure and charge distribution of flat molecules which can be used as organic semiconductors or as part of fast and efficient future electronic devices. Large three-dimensional biomolecules such as proteins can be examined as soon as the techniques have been refined.

Story Source:

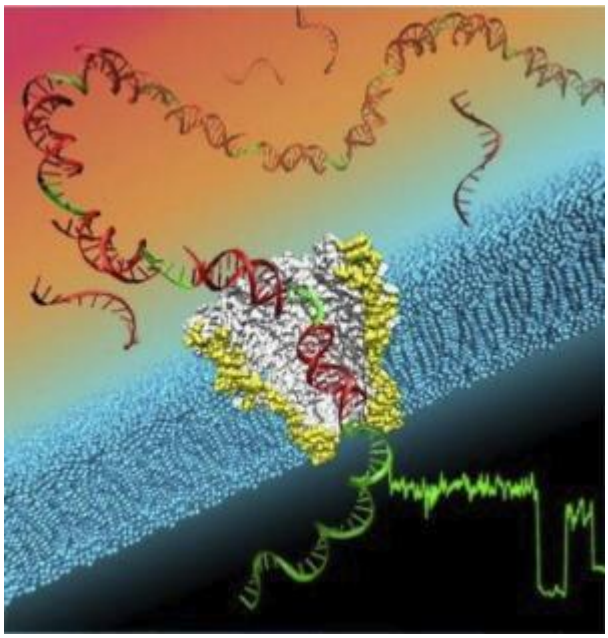
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Helmholtz Association of German Research Centres**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. C. Weiss, C. Wagner, C. Kleimann, M. Rohlfing, F. Tautz, R. Temirov. **Imaging Pauli Repulsion in Scanning Tunneling Microscopy**. *Physical Review Letters*, 2010; 105 (8): 086103 DOI: 10.1103/PhysRevLett.105.086103

http://www.sciencedaily.com/releases/2010/08/100820072031.htm

Nanoscale DNA Sequencing Could Spur Revolution in Personal Health Care



This illustration depicts a single strand of DNA moving through a nanopore that is being used to sequence the DNA. (Credit: Image courtesy of University of Washington)

ScienceDaily (Aug. 21, 2010) — In experiments with potentially broad health care implications, a research team led by a University of Washington physicist has devised a method that works at a very small scale to sequence DNA quickly and relatively inexpensively.

That could open the door for more effective individualized medicine, for example providing blueprints of genetic predispositions for specific conditions and diseases such as cancer, diabetes or addiction.

"The hope is that in 10 years people will have all their DNA sequenced, and this will lead to personalized, predictive medicine," said Jens Gundlach, a UW physics professor and lead author of a paper describing the new technique published the week of Aug. 16 in the *Proceedings of the National Academy of Sciences*.

The technique creates a DNA reader that combines biology and nanotechnology using a nanopore taken from *Mycobacterium smegmatis porin A*. The nanopore has an opening 1 billionth of a meter in size, just large enough to measure a single strand of DNA as it passes through.

The scientists placed the pore in a membrane surrounded by potassium-chloride solution. A small voltage was applied to create an ion current flowing through the nanopore, and the current's electrical signature changed depending on the nucleotides traveling through the nanopore. Each of the nucleotides that are the essence of DNA -- cytosine, guanine, adenine and thymine -- produced a distinctive signature.

The team had to solve two major problems. One was to create a short and narrow opening just large enough to allow a single strand of DNA to pass through the nanopore and for only a single DNA molecule to be in the

opening at any time. Michael Niederweis at the University of Alabama at Birmingham modified the *M. smegmatis* bacterium to produce a suitable pore.

The second problem, Gundlach said, was that the nucleotides flowed through the nanopore at a rate of one every millionth of a second, far too fast to sort out the signal from each DNA molecule. To compensate, the researchers attached a section of double-stranded DNA between each nucleotide they wanted to measure. The second strand would briefly catch on the edge of the nanopore, halting the flow of DNA long enough for the single nucleotide to be held within the nanopore DNA reader. After a few milliseconds, the double-stranded section would separate and the DNA flow continued until another double strand was encountered, allowing the next nucleotide to be read.

The delay, though measured in thousandths of a second, is long enough to read the electrical signals from the target nucleotides, Gundlach said.

"We can practically read the DNA sequence from an oscilloscope trace," he said.

Besides Gundlach and Niederweiss, other authors are Ian Derrington, Tom Butler, Elizabeth Manrao and Marcus Collins of the UW; and Mikhail Pavlenok at Alabama-Birmingham.

The work was funded by the National Institutes of Health and its National Human Genome Research Institute as part of a program to create technology to sequence a human genome for $1,000 or less. That program began in 2004, when it cost on the order of $10 million to sequence a human-sized genome.

The new research is a major step toward achieving DNA sequencing at a cost of $1,000 or less.

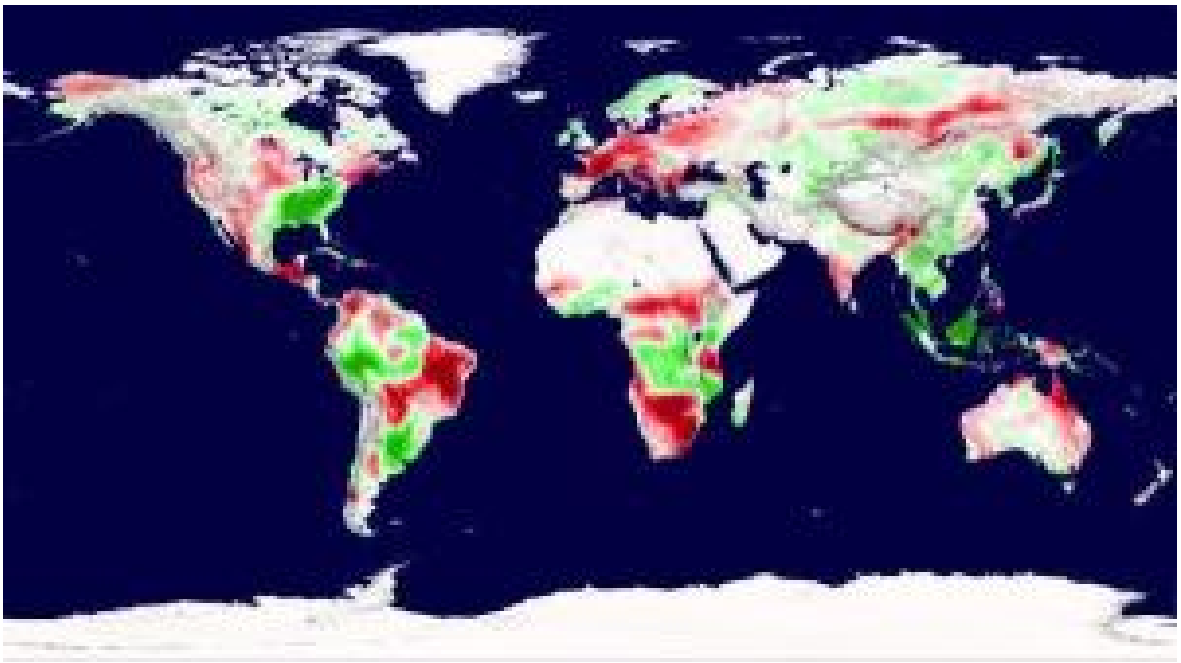
"Our experiments outline a novel and fundamentally very simple sequencing technology that we hope can now be expanded into a mechanized process," Gundlach said.

Story Source:

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

http://www.sciencedaily.com/releases/2010/08/100816155002.htm

Drought Drives Decade-Long Decline in Plant Growth



A snapshot of Earth's plant productivity in 2003 shows regions of increased productivity (green) and decreased productivity (red). Tracking productivity between 2000 and 2009, researchers found a global net decrease due to regional drought. (Credit: NASA Goddard Space Flight Center Scientific Visualization Studio)

ScienceDaily (Aug. 21, 2010) — Global plant productivity that once was on the rise with warming temperatures and a lengthened growing season is now on the decline because of regional drought, according to a new study of NASA satellite data.

Plant productivity is a measure of the rate of the photosynthesis process that green plants use to convert solar energy, carbon dioxide and water to sugar, oxygen and eventually plant tissue. Compared with a 6 percent increase in plant productivity during the 1980s and 1990s, the decline observed over the last decade is only 1 percent. The shift, however, could impact food security, biofuels and the global carbon cycle.

Researchers Maosheng Zhao and Steven Running of the University of Montana in Missoula discovered the global shift from an analysis of NASA satellite data. The discovery comes from an analysis of plant productivity data from the Moderate Resolution Imaging Spectroradiometer on NASA's Terra satellite, combined with other growing season climate data, including temperature, solar radiation and water.

"We see this as a bit of a surprise, and potentially significant on a policy level because previous interpretations suggested global warming might actually help plant growth around the world," Running said.

Previous research found land plant productivity was on the rise. A 2003 paper in the journal *Science* led by scientist Ramakrishna Nemani, now a researcher at NASA's Ames Research Center in Moffett Field, Calif., showed the 6 percent increase in global terrestrial plant productivity between 1982 and 1999. The increase

was traced to nearly two decades of temperature, solar radiation and water availability conditions, influenced by climate change, that were favorable for plant growth.

Setting out to update that analysis, Zhao and Running expected to see similar results as global average temperatures continued to climb. Instead, they found the negative impact of regional drought overwhelmed the positive influence of a longer growing season, driving down global plant productivity between 2000 and 2009. The team published its findings August 19 in *Science*.

"This is a pretty serious warning that warmer temperatures are not going to endlessly improve plant growth," Running said.

Zhao and Running's analysis showed that since 2000, high-latitude Northern Hemisphere ecosystems have continued to benefit from warmer temperatures and a longer growing season. But that effect was offset by warming-associated drought that limited growth in the Southern Hemisphere, resulting in a net global loss of land productivity.

"This past decade's net decline in terrestrial productivity illustrates that a complex interplay between temperature, rainfall, cloudiness, and carbon dioxide, probably in combination with other factors such as nutrients and land management, will determine future patterns and trends in productivity," said Diane Wickland, program manager of the Terrestrial Ecology research program at NASA Headquarters in Washington.

Researchers want to continue monitoring these trends in the future because plant productivity is linked to shifting levels of greenhouse gas carbon dioxide in the atmosphere and stresses on plant growth that could challenge food production.

"Even if the declining trend of the past decade does not continue, managing forests and crop lands for multiple benefits to include food production, biofuel harvest, and carbon storage may become exceedingly challenging in light of the possible impacts of such decadal-scale changes," Wickland said.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **NASA/Goddard Space Flight Center**. The original article was written by Kathryn Hansen.

Journal Reference:

1. Zhao et al. **Drought-Induced Reduction in Global Terrestrial Net Primary Production from 2000 Through 2009**. *Science*, 2010; 329 (5994): 940 DOI: 10.1126/science.1192666

http://www.sciencedaily.com/releases/2010/08/100820101504.htm

Autism Linked to Multisensory Integration

An EEG cap is used to measure the brain's response to sensory stimuli. (Credit: Photo courtesy of Albert Einstein College of Medicine)

ScienceDaily (Aug. 20, 2010) — A new study by researchers at Albert Einstein College of Medicine of Yeshiva University has provided concrete evidence that children with autism spectrum disorders (ASD) process sensory information such as sound, touch and vision differently than typically developing children.

The study, which appears in the August 17 online issue of *Autism Research*, supports decades of clinical and anecdotal observations that individuals with ASD have difficulty coping with multiple sources of sensory information. The Einstein finding offers new insights into autism and could lead to objective measures for evaluating the effectiveness of autism therapies.

"One of the classic presentations of autism is the child in the corner with his hands over his ears rocking back and forth trying to block out the environment," said senior author Sophie Molholm, Ph.D., associate professor in the Dominick P. Purpura Department of Neuroscience and of pediatrics. "People have long theorized that these children might not be integrating information across the senses very well. If you have all these sights and sounds coming at you but you can't put them together in a meaningful way, the world can be an overwhelming place."

The theory that autistic kids have trouble processing multisensory information has not been reliably supported by behavioral studies, and has rarely, if at all, been tested using measures of brain activity. Over the last few years, Dr. Molholm and her colleagues have been refining methods for measuring multisensory integration (MSI) using brainwave electroencephalogram (EEG) recordings.

In the current study, MSI was measured in 17 ASD children, ages 6 to 16, and 17 typically developing children matched for age and non-verbal IQ. The children watched a silent video of their choice while they were presented with unrelated sounds and vibrations. The auditory and vibrational stimuli were presented separately (creating so-called unisensory conditions) and then together (multisensory condition), which acted as the researchers' index of MSI. The children's EEG responses to the unisensory conditions were summed and compared to their EEG responses to multisensory conditions.

The responses of the typically developing children to the multisensory stimuli exceeded the sum of their responses to the unisensory stimuli—an indication of healthy MSI, according to the researchers. In the ASD children, by contrast, the differences between the sum of children's unisensory responses and their MSI responses were not nearly as pronounced, indicating that these kids were not integrating multisensory information as effectively.

"Our data makes a compelling case, at least for these conditions, that there are differences in multisensory integration between the two groups," said Dr. Molholm.

After our nerves are stimulated, "sensory information arrives in the brain's cortex within 20 milliseconds (ms), or 20/1000ths of a second," said co-author John Foxe, Ph.D., professor in the Dominick P. Purpura Department of Neuroscience and of pediatrics and director of research of the Children's Evaluation and Rehabilitation Center at Einstein. "Then it takes an additional 100 to 200 ms for the brain to integrate information arriving from different senses, since many brain regions are involved in analyzing it."

In this study, the differences between the typically developing and ASD children were most striking for that time interval in which multisensory stimuli is normally processed. "We saw robust MSI in the typically developing kids from 100 and 200 ms after sensory stimulation reached the brain's cortex," said Dr. Foxe. "But in the ASD kids, MSI occurred significantly later -- at about 310 ms -- and at a much lower level."

"This doesn't mean that the children with ASD didn't integrate the information at all," he added. "It does mean that they didn't integrate it as effectively as they should have, given their age and maturity. They may go on to integrate well later in life. We don't know. This is a single slice of the developmental trajectory."

"This was a much-needed study of multisensory integration in autism," said Barry E. Stein, Ph.D., professor and chair of neurobiology & anatomy at Wake Forest University School of Medicine, who was not involved in the Einstein study. "Using simple logic and standard techniques for electrically mapping the brain, the authors have identified defects in the way ASD individuals synthesize cues from different senses. In doing so, they have not only helped confirm the insights of parents and clinicians, but they've improved our understanding of how the behavioral differences in children with ASD may result from sensory anomalies."

"Today, there's a cottage industry -- actually more like a military-industrial complex -- for multisensory integration therapies for children with autism," said Dr. Foxe. "A lot of parents' hard-earned cash goes into these interventions, all in the absence of actual empirical evidence that there is anything wrong with MSI in these children or that these therapies do any good."

The researchers are currently evaluating MSI in children from 6 years of age through early adulthood to better understand the developmental trajectory of multisensory integration. They also plan to study MSI in lower-functioning ASD children. "This experimental paradigm is especially good for that, because it makes so little demand on the kids," said Dr. Foxe. "As you can imagine, asking them to do tasks doesn't work very well."

Support for this research was provided by Cure Autism Now, the National Institute of Mental Health, the Wallace Research Foundation and the Canadian Institute of Health Research.

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Albert Einstein College of Medicine**.

Journal Reference:

1. Natalie Russo et al. **Multisensory processing in children with autism: high-density electrical mapping of auditory-somatosensory integration**. *Autism Research*, August 17, 2010

http://www.sciencedaily.com/releases/2010/08/100819173840.htm

Is the Ice in the Arctic Ocean Getting Thinner?

Propeller of Polar 5, the scientific aircraft of Alfred Wegener Institute, on its flight across Svalbard. (Credit: Ralf Röchert, Alfred Wegener Institute)

ScienceDaily (Aug. 20, 2010) — The extent of the sea ice in the Arctic will reach its annual minimum in September. Forecasts indicate that it will not be as low as in 2007, the year of the smallest area covered by sea ice since satellites started recording such data. Nevertheless, sea ice physicists at the Alfred Wegener Institute are concerned about the long-term equilibrium in the Arctic Ocean.

They have indications that the mass of sea ice is dwindling because its thickness is declining. To substantiate this, they are currently measuring the ice thickness north and east of Greenland using the research aircraft Polar 5. The objective of the roughly one-week campaign is to determine the export of sea ice from the Arctic. Around a third to half of the freshwater export from the Arctic Ocean takes place in this way -- a major drive factor in the global ocean current system.

The question of when the Arctic will be ice-free in the summer has been preoccupying the sea ice researchers headed by Prof. Dr. Rüdiger Gerdes from the Alfred Wegener Institute for Polar and Marine Research in the Helmholtz Association for a long time now. Satellites have been recording the extent of the Arctic ice for more than 30 years. In addition to the area covered, the thickness of the ice is a decisive factor in assessing how much sea ice there is.

However, the thickness can only be determined locally, for example by means of the so-called EM-Bird, an electromagnetic measuring device which helicopters or planes tow over the ice. For Gerdes this is a very special job because he usually models his forecasts on his home computer. The campaign with the research aircraft Polar 5 of the Alfred Wegener Institute now takes him on an expedition in the Arctic for the first time. "I'm very keen on seeing the results of the sea ice thickness measurements," says Gerdes. "Only when we know the distribution of ice of varying thickness, can we calculate how much freshwater is carried out of the Arctic Ocean via ice."

About 3000 cubic kilometres of ice drift out of the Arctic Ocean every year, corresponding to around 2700 billion tons. The ice exports freshwater that reaches the Arctic Ocean via rivers and precipitation. This maintains its salt concentration, which has been constant over the long term. The temperature rise observed worldwide is especially pronounced in the Arctic latitudes. Researchers have been observing that the ice is getting thinner and thinner for several years now. As a result, it stores and exports less freshwater and the salt concentration (also referred to as salinity) of the Arctic Ocean declines.

On the one hand, this influences all living things that have adapted to the local conditions. On the other hand, changes in salinity also have an impact on current patterns of global ocean circulation and thus on meridional heat transport. In the TIFAX (Thick Ice Feeding Arctic Export) measurement campaign the researchers are primarily interested in ice that is several years old, several metres thick and occurs predominantly on the northern coast of Greenland. "Taking off on the measurement flights from Station Nord here is a special adventure," reports Gerdes from one of the northernmost measuring stations in the world. "Flying through virtually unsettled regions of the Arctic in the high-tech research aircraft is a stark contrast to my modelling work on the computer."

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Helmholtz Association of German Research Centres**.

http://www.sciencedaily.com/releases/2010/08/100820101356.htm

Ancient Chinese Medicine May Help Chemotherapy Patients

ScienceDaily (Aug. 18, 2010) — A centuries-old traditional Chinese medicine may reduce the intestinal side effects of chemotherapy in cancer patients by stimulating gut cell division and reducing inflammation, a new study in mice suggests.The research will appear in the Aug. 18 issue of *Science Translational Medicine,* which is published by AAAS, the nonprofit science society.

Peonies and a pretty purple flower called skullcap, together with licorice and fruit from a buckthorn tree form Huang Qin Tang (pronounced Hu-ang Chin Tong), an ancient herbal medicine used in China to treat intestinal disorders such as diarrhea, nausea and vomiting. Recently, a Western-style phase 1/2 trial confirmed that this drug reduces gut damage caused by chemotherapy in colon and rectal cancer patients.In the new study, Yung-Chi Cheng, along with Wing Lam and colleagues from Yale University School of Medicine and a company called PhytoCeutica, Inc. use a carefully prepared, lab formulation of this medicine (called PHY906) and show that the healing effects of this blend of plants arise from its ability to target numerous biological processes in mice.

"The reductionist approach to treating multiple side effects triggered by cancer chemotherapy or complicated disease may not be sufficient. Rigorous studies of the biology of traditional herbal medicines, which target multiple sites with multiple chemicals, could lead to the development of future medicines," said Cheng.Dr. Cheng is a scientific founder of and has equity interest in PhytoCeutica, Inc., which develops traditional Chinese medicine into drugs for the treatment of cancer and that licenses PHY906 from Yale University. Additionally, two authors of this paper own stock in PhytoCeutica, Inc. Yale University holds a patent on the herbal composition PHY906 and its use in chemotherapy.

In the study, the researchers treated cancerous mice with chemotherapy, which shrank tumors but also caused massive destruction in the intestinal lining of the animals. After a few days of treatment with PHY906, the medicine restored the damaged intestinal linings in the mice. The team found that stem cell signaling molecules (known as Wnts) were present in higher than normal levels in the guts of the treated mice. Taking a closer look, the researchers discovered that PHY906 itself did not stimulate Wnt signaling, but that mixing PHY906 with a bacterial enzyme common in the gut triggered Wnt signaling, which drives the replacement of damaged intestinal stem cells with healthy ones.

In addition to replenishing healthy gut cells, the herbal medicine blocked the migration of inflammatory cells to the gut and reduced inflammation--effects that seem to be caused by multiple actions of PHY906. These results suggest that traditional Chinese medicine may be a model approach for drug developers, who are eagerly testing combinations of agents in the hope that they hope will work better than any one alone.

"We will continue to refine these processes to better study and understand the sophisticated nature of herbal medicines. Revisiting history may lead us to discovering future medicines," said Cheng.

PHY906 is currently only available for patients enrolled in a clinical trial. The authors caution that many herbal products claiming to be Huang Qin Tang may contain harmful or ineffective substitutes and should be avoided.

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http://www.sciencedaily.com/releases/2010/08/100818141543.htm

New Study Finds New Connection Between Yoga and Mood

Woman practicing yoga. Researchers from Boston University School of Medicine (BUSM) have found that yoga may be superior to other forms of exercise in its positive effect on mood and anxiety. (Credit: iStockphoto)

ScienceDaily (Aug. 19, 2010) — Researchers from Boston University School of Medicine (BUSM) have found that yoga may be superior to other forms of exercise in its positive effect on mood and anxiety. The findings, which currently appear on-line at *Journal of Alternative and Complementary Medicine*, is the first to demonstrate an association between yoga postures, increased GABA levels and decreased anxiety.

The researchers set out to contrast the brain gamma-aminobutyric (GABA) levels of yoga subjects with those of participants who spent time walking. Low GABA levels are associated with depression and other widespread anxiety disorders.

The researchers followed two randomized groups of healthy individuals over a 12-week long period. One group practiced yoga three times a week for one hour, while the remaining subjects walked for the same period of time. Using magnetic resonance spectroscopic (MRS) imaging, the participants' brains were scanned before the study began. At week 12, the researchers compared the GABA levels of both groups before and after their final 60-minute session.

Each subject was also asked to assess his or her psychological state at several points throughout the study, and those who practiced yoga reported a more significant decrease in anxiety and greater improvements in mood

than those who walked. "Over time, positive changes in these reports were associated with climbing GABA levels," said lead author Chris Streeter, MD, an associate professor of psychiatry and neurology at BUSM.

According to Streeter, this promising research warrants further study of the relationship between yoga and mood, and suggests that the practice of yoga be considered as a potential therapy for certain mental disorders.

Funding for this study was provided by the National Institutes of Health.

Story Source:

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

Journal Reference:

1. Streeter et al. **Effects of Yoga Versus Walking on Mood, Anxiety, and Brain GABA Levels: A Randomized Controlled MRS Study**. *The Journal of Alternative and Complementary Medicine*, 2010; 100819060353058 DOI: 10.1089/acm.2010.0007

http://www.sciencedaily.com/releases/2010/08/100819112124.htm

Study of Cell Division Sheds Light on Special Mechanism in Egg Cells

ScienceDaily (Aug. 22, 2010) — In a study of egg cells using time-lapse microscopy, researchers at the University of California, San Diego School of Medicine and the Ludwig Institute for Cancer Research have discovered an unusual property of meiosis - cell division that produces reproductive cells in sexually reproducing organisms. The discovery of an "inside out" mechanism by which egg cell chromosomes separate from each other may shed light on mistakes made in chromosome distribution that can lead to Down syndrome, high miscarriage rates in humans, and the age-related decrease in fertility in human females.

Their findings are reported in the September issue of *Nature Cell Biology*.

Sexual reproduction relies on the merger of chromosomes present in the sperm and egg at fertilization. Formation of sperm and egg cells requires the process of meiosis, which halves the chromosome number of each parent, so that the sperm-egg merger regenerates a cell with two copies of each chromosome. The reduction of chromosome number in meiosis is accomplished through two divisions without an intervening duplication of the genome.

Both meiotic and mitotic divisions require specialized protein polymers called microtubules. These polymers are organized into a football-shaped spindle with the polymer ends embedded in a special organelle - called the centrosome - at each end of the football. Egg cells, however, are unusual in that they lack centrosomes, and instead use a spindle that is self-organized from microtubules. Egg cells, especially in humans, are prone to mistakes in dividing the chromosomes during meiosis; mistakes which result in reproductive problems in humans such as Down syndrome, infertility and miscarriages.

Researchers led by Arshad Desai, PhD, professor of Cellular and Molecular Medicine and investigator with the Ludwig Institute at UC San Diego, used the roundworm *C. elegans*, as a model to study egg cell division. Julien Dumont, a postdoctoral fellow in the Desai lab, developed time lapse microscopy methods to observe egg cell meiosis with high precision.

Prior to this study, dividing cell chromosomes were thought to move apart by pulling on the microtubule polymers and moving into the ends of the spindle, like a person pulling himself up on a rope. But the UCSD researchers discovered that, in *C. elegans* egg cells, chromosome move apart by being pushed in the middle - most likely caused by the growth of microtubule polymers between the chromosome halves.

"This finding suggests that egg cells use a special mechanism for meiotic chromosome separation," said Desai. "Since defects in egg cell meiosis underlie infertility in humans, it will be important for future research to address whether such a mechanism is also operating in human females."

Karen Oegema, PhD, professor at the Ludwig Institute and the UCSD Department of Cellular and Molecular Medicine was a co-contributor to the paper. This research was supported by ants from Human Frontiers Science Program, the National Institutes of Health and funding from the Ludwig Institute for Cancer Research.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of California - San Diego**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Julien Dumont, Karen Oegema & Arshad Desai. **A kinetochore-independent mechanism drives anaphase chromosome separation during acentrosomal meiosis**. *Nature Cell Biology*, 2010; DOI: 10.1038/ncb2093

http://www.sciencedaily.com/releases/2010/08/100822150647.htm

Worldwide Shortage of Isotopes for Medical Imaging Could Threaten Quality of Patient Care

ScienceDaily (Aug. 23, 2010) — Twenty million medical scans and treatments are done each year that require radioactive isotopes and scientists are now describing a global shortage of these life-saving materials that could jeopardize patient care and drive-up health care costs.

They spoke at a symposium at one of the opening sessions of the 240th National Meeting of the American Chemical Society on August 22. The symposium is being held in Boston, Massachusetts, U.S.

Medical isotopes are minute amounts of radioactive substances used to diagnose and treat a variety of diseases. Isotopes injected into the body can enable doctors to determine whether the heart has adequate blood flow; cancer has spread to a patient's bones; and help diagnose gallbladder, kidney, and brain disorders. When delivered into a malignant tumor, isotopes can kill the cancer cells minimizing damage to nearby healthy tissue. The shortage of radioactive isotopes also threatens activities in other areas, including basic and environmental research, oil exploration, and nuclear proliferation, the scientists noted.

"Although the public may not be fully aware, we are in the midst of a global shortage of medical and other isotopes," said Robert Atcher, Ph.D., MBA, in an interview. "If we don't have access to the best isotopes for medical imaging, doctors may be forced to resort to tests that are less accurate, involve higher radiation doses, are more invasive, and more expensive."

The shortage already is forcing some doctors to reduce the number of imaging procedures that they order for patients, he added. Atcher directs the National Isotope Development Center (NIDC), a U. S. Department of Energy unit that is responsible for production of isotopes nationwide.

Each day more than 50,000 patients in the United States receive diagnostic and therapeutic procedures using medical isotopes, particularly individuals with heart problems and cancer. Eight out of every 10 procedures require one specific isotope, technetium-99m, which has a "half-life" of only six hours. Half-life is the time it takes for 50 percent of a given quantity of a radioactive substance to "decay" and disappear. Thus, like other radioactive isotopes, technetium-99m can't be stockpiled. It must be constantly made fresh, and distributed quickly to medical facilities.

Wolfgang Runde, Ph.D., who works with Atcher at the Los Alamos National Laboratory in New Mexico and presented a report on the situation here, said that an unexpected shut down of a major isotope production facility in Chalk River, Ontario, Canada, in 2009 precipitated the shortage. Los Alamos also is part of the U.S. Department of Energy. The Chalk River facility was scheduled to restart this summer but remained closed as of early August. The Chalk River facility produces 50 percent of the U.S. supply of the isotope used to make technetium-99m. Production problems occurred at other isotope facilities, compounding the problem. Remaining isotope suppliers have not been able to make-up for the resulting shortage, leaving the United States in an isotope supply crunch.

"Shortage of this key medical isotope makes it more difficult to carry out important medical procedures, such as finding out whether cancer has spread to the bones," Atcher said. "Doctors have been trying everything they can think of to meet the needs of patients, including the use of other less-than-ideal isotopes, but it has been a real struggle."

Atcher also noted that the United States is highly dependent on foreign suppliers of medical isotopes. Only about 10-15 percent of the isotopes used in medicine are produced domestically. The nuclear medicine community has been pressuring the U.S. government to develop improved domestic capability for producing these materials to reduce this dependence, Atcher said.

Medical isotopes aren't the only isotopes in short supply, Atcher noted. Helium-3, for instance, is a non-radioactive isotope with multiple uses, including efforts to develop nuclear fusion reactors and monitoring to prevent illegal nuclear material from being smuggled into the U.S. Another, californium-252, is used for oil exploration, to help start-up nuclear power reactors, and in mass spectroscopy, a mainstay analytical tool in chemistry, astronomy, and other fields of research.

"The challenge we have is to produce enough materials to meet commercial needs as well as needs of the research community -- from nuclear physics, to environmental research, to medical research -- amid increasing demands and fewer isotope sources," Atcher said. "The long-term solution to this crisis remains to be seen."

Story Source:

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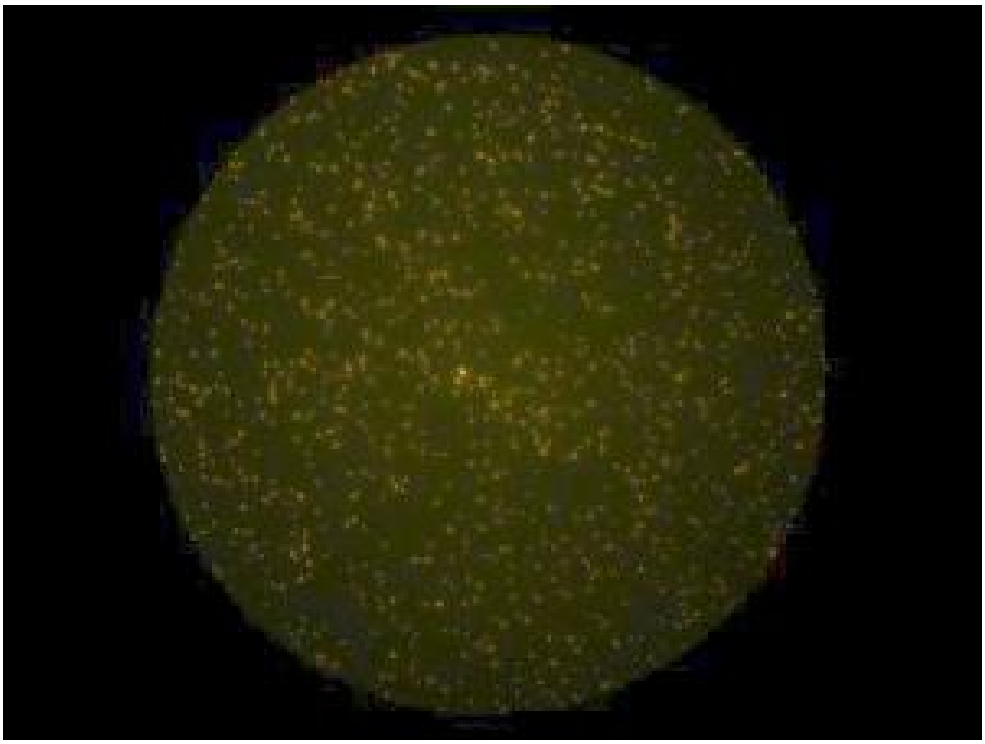
http://www.sciencedaily.com/releases/2010/08/100822104822.htm

Ancient Microbes Responsible for Breathing Life Into Ocean 'Deserts'



The orange cells in this microscope image are Synechococcus, a unicellular cyanobacterium only about 1 µm in size. Organisms like Synechococcus were responsible for pumping oxygen into the environment 2.5 billion years ago. (Credit: Susanne Neuer/Amy Hansen)

ScienceDaily (Aug. 22, 2010) — More than two and a half billion years ago, Earth differed greatly from our modern environment, specifically in respect to the composition of gases in the atmosphere and the nature of the life forms inhabiting its surface. While today's atmosphere consists of about 21 percent oxygen, the ancient atmosphere contained almost no oxygen. Life was limited to unicellular organisms. The complex eukaryotic life we are familiar with -- animals, including humans -- was not possible in an environment devoid of oxygen.

The life-supporting atmosphere Earth's inhabitants currently enjoy did not develop overnight. On the most basic level, biological activity in the ocean has shaped the oxygen concentrations in the atmosphere over the last few billion years. In a paper published August 23 by *Nature Geoscience* online, Arizona State University researchers Brian Kendall and Ariel Anbar, together with colleagues at other institutions, show that "oxygen oases" in the surface ocean were sites of significant oxygen production long before the breathing gas began to accumulate in the atmosphere.

By the close of this period, Earth witnessed the emergence of microbes known as cyanobacteria. These organisms captured sunlight to produce energy. In the process, they altered Earth's atmosphere through the production of oxygen -- a waste product to them, but essential to later life. This oxygen entered into the seawater, and from there some of it escaped into the atmosphere.

"Our research shows that oxygen accumulation on Earth first began to occur in surface ocean regions near the continents where the nutrient supply would have been the highest," explains Kendall, a postdoctoral research associate at the School of Earth and Space Exploration in ASU's College of Liberal Arts and Sciences. "The evidence suggests that oxygen production in the oceans was vigorous in some locations at least 100 million years before it accumulated in the atmosphere. Photosynthetic production of oxygen by cyanobacteria is the simplest explanation."

The idea of "oxygen oases," or regions of initial oxygen accumulation in the surface ocean, was hypothesized decades ago. However, it is only in the past few years that compelling geochemical evidence has been presented for the presence of dissolved oxygen in the surface ocean 2.5 billion years ago, prior to the first major accumulation of oxygen in the atmosphere (known as the Great Oxidation Event).

Kendall's work is the latest in a series of recent studies by a collaborative team of researchers from ASU; University of California, Riverside; and University of Maryland that point to the early rise of oxygen in the oceans. Together with colleagues from University of Washington and University of Alberta, this team first presented evidence for the presence of dissolved oxygen in these oceans in a series of four *Science* papers over the past few years. These papers focused on a geologic formation called the Mt. McRae Shale from Western Australia. One of these papers, led by the ASU team, presented geochemical profiles that showed an abundance of two redox-sensitive elements -- rhenium (Re) and molybdenum (Mo) -- implying that small amounts of oxygen mobilized these metals from the crust on land or in the ocean, and transport them through an oxic surface ocean to deeper anoxic waters where the metals were hidden into organic-rich sediments. Kendall participated in this research while a postdoctoral student at the University of Alberta.

Kendall's goal in the new project was to look for evidence of dissolved oxygen in another location. He wanted to see if the geochemical evidence from the Mt. McRae Shale in Western Australia would be found in similarly-aged rocks from South Africa. Those rocks were obtained in a project supported by the Agouron Institute. Kendall's research was supported by grants from NASA and the National Science Foundation.

What Kendall discovered was a unique relationship of high rhenium and low molybdenum enrichments in the samples from South Africa, pointing to the presence of dissolved oxygen on the seafloor itself.

"In South Africa, samples from the continental slope beneath the shallower platform were thought to be deposited at water depths too deep for photosynthesis. So it was a big surprise that we found evidence of dissolved oxygen on the seafloor at these depths. This discovery suggests that oxygen was produced at the surface in large enough quantities that some oxygen survived as it was mixed to greater depths. That implies a significantly larger amount of oxygen production and accumulation in 'oxygen oases' than was previously realized."

A key contribution to this study came from Christopher Reinhard and Timothy Lyons, collaborators at the University of California, Riverside, and Simon Poulton at Newcastle University, who found that the chemistry of iron (Fe) in the same shales is also consistent with the presence of dissolved oxygen.

"It was especially satisfying to see two different geochemical methods -- rhenium and molybdenum abundances and Fe chemistry -- independently tell the same story," Kendall noted.

Evidence that the atmosphere contained at most minute amounts of oxygen came from measurements of the relative abundances of sulfur (S) isotopes. These measurements were performed by Alan Kaufman, a collaborator at the University of Maryland.

"Research like Brian's on the co-evolution of Earth's atmosphere, oceans and biosphere is not only important for unraveling key events in Earth history, it also has broad relevance to our search for life on other planets," explains Professor Ariel Anbar, director of the Astrobiology Program at ASU and Kendall's postdoctoral mentor. "One of the ways we will look for life on planets orbiting other stars is to look for oxygen in their atmospheres. So we want to know how the rise of oxygen relates to the emergence of photosynthesis."

On a more practical level, Anbar observes that the research also connects to emerging concerns about our own planet. "Recent research in the modern oceans reveals that the amount of oxygen is decreasing in some places," he explains. "Some suspect this decrease is tied to global warming. One of the ways we might figure that out is to reconstruct ocean oxygen content on the slopes of the seafloor in recent history. So the same techniques that Brian is advancing and applying to billion-year-old rocks might be used to understand how humans are changing the environment today."

Story Source:

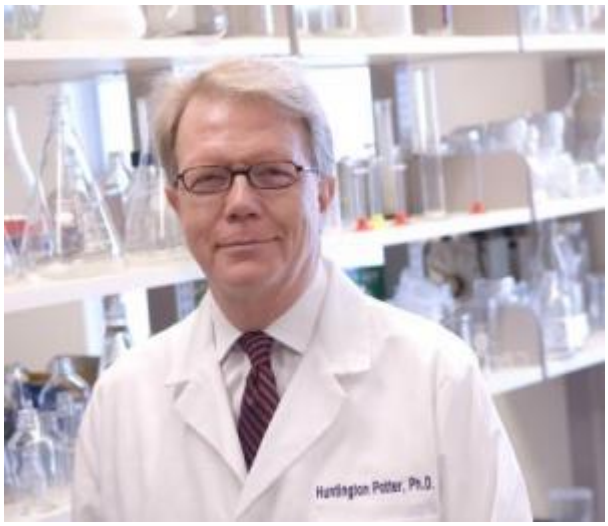
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Arizona State University**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Brian Kendall, Christopher T. Reinhard, Timothy W. Lyons, Alan J. Kaufman, Simon W. Poulton & Ariel D. Anbar. **Pervasive oxygenation along late Archaean ocean margins**. *Nature Geoscience*, 2010; DOI: 10.1038/ngeo942

http://www.sciencedaily.com/releases/2010/08/100823113436.htm

Rheumatoid Arthritis Signaling Protein Reverses Alzheimer's Disease in Mouse Model



Huntington Potter, professor at the USF Health Byrd Alzheimer's Institute, University of South Florida, was principal investigator for the study. (Credit: © University of South Florida)

ScienceDaily (Aug. 22, 2010) — A signaling protein released during rheumatoid arthritis dramatically reduced Alzheimer's disease pathology and reversed the memory impairment of mice bred to develop symptoms of the neurodegenerative disease, a new study by the University of South Florida reports. Researchers found that the protein, GM-CSF, likely stimulates the body's natural scavenger cells to attack and remove Alzheimer's amyloid deposits in the brain.

The study appears online in the *Journal of Alzheimer's Disease*.

People with rheumatoid arthritis, a chronic disease leading to inflammation of joints and surrounding tissue, are less likely than those without arthritis to develop Alzheimer's. While it was commonly assumed that non-steroidal anti-inflammatory drugs may help prevent onset and progression of Alzheimer's disease, recent NSAID clinical trials proved unsuccessful for patients with Alzheimer's.

The USF researchers are among the first to look at what effect innate immunity gone awry in rheumatoid arthritis may play in protecting against Alzheimer's disease.

"Our findings provide a compelling explanation for why rheumatoid arthritis is a negative risk factor for Alzheimer's disease," said principal investigator Huntington Potter, PhD, professor of molecular medicine at the USF Health Byrd Alzheimer's Institute and director of the Florida Alzheimer's Disease Research Center.

"Moreover, the recombinant human form of GM-CSF (Leukine®) is already approved by the FDA and has been used for years to treat certain cancer patients who need to generate more immune cells," Dr. Potter said. "Our study, along with the drug's track record for safety, suggests Leukine should be tested in humans as a potential treatment for Alzheimer's disease."

The researchers analyzed three rheumatoid arthritis growth factors in mouse models and identified the signaling protein GM-CSF as the most promising for potential protective benefit against Alzheimer's disease. Then, they peripherally injected GM-CSF into two groups of mice -- those genetically altered to develop memory problems mimicking Alzheimer's disease and normal, aged mice. Behavioral tests confirmed the Alzheimer's mice were exhibiting signs of memory impairment at age 12 months. Another two control groups of mice -- the Alzheimer's mice and normal mice -- were administered saline (placebo).

After the 10th day of injections, all the mice began a series of behavioral testing. At the end of the 20-day study, the cognitively impaired mice treated with GM-CSF performed substantially better on tests measuring their working memory and learning. In fact, their memories were similar to normal aged mice without dementia. Even the normal mice treated with GM-CSF performed slightly better than their untreated peers. The Alzheimer's mice administered saline continued to do poorly on the tests.

"We were pretty amazed that the treatment completely reversed cognitive impairment in 20 days," said Tim Boyd, PhD, who, together with Steven Bennett, PhD, is a study lead author.

In addition, the brains of GM-CSF-treated Alzheimer's mice showed more than a 50-percent decrease in beta amyloid, a substance forming the sticky clumps of plaques that are a hallmark of Alzheimer's disease. This reduction in Alzheimer's plaques and associated restoration of memory was accompanied by more immune cells known as microglia in the brain. Microglia are like the body's natural garbage collection cells that rush to damaged or inflamed areas to get rid of toxic substances.

The researchers suggest that GM-CSF boosted during the immune system overdrive of rheumatoid arthritis helps harness the beneficial properties of inflammation in the brain. The protein may do this by recruiting more microglia from the peripheral blood into the brain to remove Alzheimer's plaques, Dr. Potter said. An apparent increase in neural cell connections in the brains of the GM-CSF-treated mice may also help explain GM-CSF's association with improving memory decline in Alzheimer's disease, the researchers said.

The USF Health Byrd Alzheimer's Institute plans to begin a pilot clinical trial later this year investigating GM-CSF (Leukine) in patients with mild or moderate Alzheimer's disease.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of South Florida (USF Health)**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Tim D. Boyd, Steven P. Bennett, Takashi Mori, Nikolas Governatori, Melissa Runfeldt, Michelle Norden; Jaya Padmanabhan, Peter Neame, Inge Wefes, Juan Sanchez-Ramos, Gary W. Arendash, Huntington Potter. **GM-CSF up-regulated in reumatoid arthritis reverses cognitive impairment and amyloidosis in Alzheimer mice**. *Alzheimer's and Dementia*, 2010; 6 (4): S575 DOI: 10.1016/j.jalz.2010.05.1962

http://www.sciencedaily.com/releases/2010/08/100822211549.htm

Titanium Coating With Protein 'Flower Bouquet' Nanoclusters Strengthens Implant Attachment

Georgia Tech research technician Kellie Templeman (left) and former graduate student Tim Petrie display a piece of titanium coated with a bio-inspired polymer that enhances bone formation around the metal after implantation. (Credit: Georgia Tech Photo: Gary Meek)

ScienceDaily (Aug. 18, 2010) — Researchers have developed an improved coating technique that could strengthen the connection between titanium joint-replacement implants and a patients' own bone. The stronger connection -- created by manipulating signals the body's own cells use to encourage growth -- could allow the implants to last longer.

Implants coated with "flower bouquet" clusters of an engineered protein that mimics the body's own cell-adhesion material fibronectin made 50 percent more contact with the surrounding bone than implants coated with protein pairs or individual strands. The cluster-coated implants were fixed in place more than twice as securely as plugs made from bare titanium -- which is how joints are currently attached.

Researchers believe the biologically-inspired material improves bone growth around the implant and strengthens the attachment and integration of the implant to the bone. This work also shows for the first time that biomaterials presenting biological sequences clustered together at the nanoscale enhance cell adhesion signals. These enhanced signals result in higher levels of bone cell differentiation in human stem cells and promote better integration of biomaterial implants into bone.

"By clustering the engineered fibronectin pieces together, we were able to create an amplified signal for attracting integrins, receptors that attached to the fibronectin and directed and enhanced bone formation around the implant," said Andrés García, professor in Georgia Tech's Woodruff School of Mechanical Engineering and the Petit Institute for Bioengineering and Bioscience.

Details of the new coating were reported in the August 18 issue of the journal *Science Translational Medicine*. The research was supported by the National Institutes of Health, the Arthritis Foundation, and the Atlanta Clinical and Translational Science Institute through the Georgia Tech/Emory Center for the Engineering of Living Tissues.

Total knee and hip replacements typically last about 15 years until the components wear down or loosen. For many younger patients, this means a second surgery to replace the first artificial joint. With approximately 40 percent of the 712,000 total hip and knee replacements in the United States in 2004 performed on younger patients 45-64 years old, improving the lifetime of the titanium joints and creating a better connection with the bone becomes extremely important.

In this study, Georgia Tech School of Chemistry and Biochemistry professor David Collard and his students coated clinical-grade titanium with a high density of polymer strands -- akin to the bristles on a toothbrush. Then, García and Tim Petrie -- formerly a graduate student at Georgia Tech and currently a postdoctoral fellow at the University of Washington -- modified the polymer to create three or five self-assembled tethered clusters of the engineered fibronectin, which contained the arginine-glycine-aspartic acid (RGD) sequence to which integrins binds.

To evaluate the in vivo performance of the coated titanium in bone healing, the researchers drilled two-millimeter circular holes into a rat's tibia bone and pressed tiny clinical-grade titanium cylinders into the holes. The research team tested coatings that included individual strands, pairs, three-strand clusters and five-strand clusters of the engineered fibronectin protein.

"To investigate the function of these surfaces in promoting bone growth, we quantified osseointegration, or the growth of bone around the implant and strength of the attachment of the implant to the bone," explained García, who is also a Woodruff Faculty Fellow at Georgia Tech.

Analysis of the bone-implant interface four weeks later revealed a 50 percent enhancement in the amount of contact between the bone and implants coated with three- or five-strand tethered clusters compared to implants coated with single strands. The experiments also revealed a 75 percent increase in the contact of the three- and five-strand clusters compared to the current clinical standard for replacement-joint implants, which is uncoated titanium.

The researchers also tested the fixation of the implants by measuring the amount of force required to pull the implants out of the bone. Implants coated with three- and five-strand tethered clusters of the engineered fibronectin fragment displayed 250 percent higher mechanical fixation over the individual strand and pairs coatings and a 400 percent improvement compared to the unmodified polymer coating. The three- and five-cluster coatings also exhibited a twofold enhancement in pullout strength compared to uncoated titanium.

Georgia Tech bioengineering graduate students Ted Lee and David Dumbauld, chemistry graduate students Subodh Jagtap and Jenny Raynor, and research technician Kellie Templeman also contributed to this study.

This work was partly funded by Grant No. R01 EB004496-01 from the National Institutes of Helath (NIH) and PHS Grant UL1 RR025008 from the Clinical and Translational Science Award program, NIH, National Center for Research Resources. The content is solely the responsibility of the principal investigator and does not necessarily represent the official view of the NIH.

Story Source:

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http://www.sciencedaily.com/releases/2010/08/100818141545.htm

HIV Virus Hides in the Brain, Swedish Study Finds

ScienceDaily (Aug. 23, 2010) — Studies of the spinal fluid of patients given anti-HIV drugs have resulted in new findings suggesting that the brain can act as a hiding place for the HIV virus. Around 10% of patients showed traces of the virus in their spinal fluid but not in their blood -- a larger proportion than previously realised, reveals a thesis from the University of Gothenburg, Sweden.

We now have effective anti-HIV drugs that can stop the immune system from being compromised and prevent AIDS. Although these drugs effectively prevent the virus from multiplying, the HIV virus also infects the brain and can cause damage if the infection is not treated.

"Antiviral treatment in the brain is complicated by a number of factors, partly because it is surrounded by a protective barrier that affects how well medicines get in," says Arvid Edén, doctor and researcher at the Institute of Biomedicine at the Sahlgrenska Academy. "This means that the brain can act as a reservoir where treatment of the virus may be less effective."

The thesis includes a study of 15 patients who had been effectively medicated for several years. 60% of them showed signs of inflammation in their spinal fluid, albeit at lower levels than without treatment.

"In another study of around 70 patients who had also received anti-HIV drugs, we found HIV in the spinal fluid of around 10% of the patients, even though the virus was not measurable in the blood, which is a significantly higher proportion than previously realised," explains Edén.

The results of both studies would suggest that current HIV treatment cannot entirely suppress the effects of the virus in the brain, although it is not clear whether the residual inflammation or small quantities of virus in the spinal fluid in some of the patients entail a risk of future complications.

"In my opinion, we need to take into account the effects in the brain when developing new drugs and treatment strategies for HIV infection," says Edén.

HIV

HIV, human immunodeficiency virus, belongs to the retrovirus family and takes two forms, HIV-1 and HIV-2, which can be transmitted through blood, semen and other secretions and bodily fluids. In the acute phase, patients suffer from fever, swollen lymph glands and rashes. These symptoms do recede, but AIDS develops after a long period of infection. Attempts to produce an HIV vaccine have been ongoing since the 1980s, but have yet to be successful.

Story Source:

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

http://www.sciencedaily.com/releases/2010/08/100823080816.htm

Young People Identify With an Online Community Almost as Strongly as With Their Own Family

ScienceDaily (Aug. 23, 2010) — Teenage online community users feel part of their online community almost as much as they feel part of their own family.

An international study of the users of teenage online community Habbo reveals that users identify more strongly with the online community than with their neighbourhood or offline hobby group. The study is based on a survey with 4299 respondents from United Kingdom, Spain and Japan. All three nationalities yielded similar results.

The study was authored by Dr. Vili Lehdonvirta, a researcher at the Helsinki Institute for Information Technology HIIT (currently a visiting scholar at the University of Tokyo), and Professor Pekka Räsänen from the University of Turku, Finland.

The authors point out that peer groups are important for the development of adolescents' identity and values. The study addresses the question of whether online groups are standing in for traditional peer groups that are thought to be weakening in some developed countries. The results confirm that online groups can act as strong psychological anchoring points for their members. The authors conclude that games, social networking sites and other online hangouts should be seen as crucial contexts for today's youths' identification and socialisation experiences.

The results also suggest that in relatively young information societies such as Spain, online groups are more often "virtual communities" consisting of relative strangers. In mature information societies such as Japan, online groups are more likely to be a way of keeping in touch with family and friends. This may influence the experiences that youth receive from online groups in different countries.

The study, titled "How do young people identify with online and offline peer groups? A comparison between United Kingdom, Spain and Japan," is published by the Journal of Youth Studies, the leading international scholarly journal focusing on youth research.

Habbo is a popular teenage virtual world developed by Sulake Corporation. It has 15 million monthly unique visitors from over 150 countries, according to Sulake. The site is available in 11 local language versions and recently celebrated its 10th anniversary. 90 percent of Habbo users are between 13 and 18 years old.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Helsinki Institute for Information Technology**.

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http://www.sciencedaily.com/releases/2010/08/100823080820.htm

The Third Replicator
By SUSAN BLACKMORE

All around us information seems to be multiplying at an ever increasing pace. New books are published, new designs for toasters and i-gadgets appear, new music is composed or synthesized and, perhaps above all, new content is uploaded into cyberspace. This is rather strange. We know that matter and energy cannot increase but apparently information can.

It is perhaps rather obvious to attribute this to the evolutionary algorithm or Darwinian process, as I will do, but I wish to emphasize one part of this process — copying. The reason information can increase like this is that, if the necessary raw materials are available, copying creates more information. Of course it is not new information, but if the copies vary (which they will if only by virtue of copying errors), and if not all variants survive to be copied again (which is inevitable given limited resources), then we have the complete three-step process of natural selection (Dennett, 1995). From here novel designs and truly new information emerge. None of this can happen without copying.

I want to make three arguments here.

Imitation is not just some new minor ability. It changes everything. It enables a new kind of evolution.

The first is that humans are unique because they are so good at imitation. When our ancestors began to imitate they let loose a new evolutionary process based not on genes but on a second replicator, memes. Genes and memes then coevolved, transforming us into better and better meme machines.

The second is that one kind of copying can piggy-back on another: that is, one replicator (the information that is copied) can build on the products (vehicles or interactors) of another. This multilayered evolution has produced the amazing complexity of design we see all around us.

The third is that now, in the early 21st century, we are seeing the emergence of a third replicator. I call these temes (short for technological memes, though I have considered other names). They are digital information stored, copied, varied and selected by machines. We humans like to think we are the designers, creators and controllers of this newly emerging world but really we are stepping stones from one replicator to the next.

As I try to explain this I shall make some assertions and assumptions that some readers may find outrageous, but I am deliberately putting my case in its strongest form so that we can debate the issues people find most interesting or most troublesome.

Some may entirely reject the notion of replicators, and will therefore dismiss the whole enterprise. Others will accept that genes are replicators but reject the idea of memes. For example, Eva Jablonka and Marion J. Lamb (2005) refer to "the dreaded memes" while Peter J. Richerson and Robert Boyd (2005), who have contributed so much to the study of cultural evolution, assert that "cultural variants are not replicators." They use the phrase "selfish memes" but still firmly reject memetics (Blackmore 2006). Similarly, in a previous "On The Human" post, William Benzon explains why he does not like the term "meme," yet he needs some term to refer to the things that evolve and so he still uses it. As John S. Wilkins points out in response, there are several more classic objections: memes are not discrete (I would say *some* are not discrete), they do not form lineages (*some* do), memetic evolution appears to be Lamarckian (but only *appears* so), memes are not replicated but re-created or reproduced, or are not copied with sufficient fidelity (see discussions in Aunger

2000, Sterelny 2006, Wimsatt 2010). I have tackled all these, and more, elsewhere and concluded that the notion is still valid (Blackmore 1999, 2010a).

So I will press on, using the concept of memes as originally defined by Dawkins who invented the term; that is, memes are "that which is imitated" or whatever it is that is copied when people imitate each other. Memes include songs, stories, habits, skills, technologies, scientific theories, bogus medical treatments, financial systems, organizations — everything that makes up human culture. I can now, briefly, tell the story of how I think we arrived where we are today.

Both memes and genes are vast competing sets of information, all selfishly getting copied whenever and however they can.

First there were genes. Perhaps we should not call genes the first replicator because there may have been precursors worthy of that name and possibly RNA-like replicators before the evolution of DNA (Maynard Smith and Szathmary 1995). However, Dawkins (1976), who coined the term "replicator," refers to genes this way and I shall do the same.

We should note here an important distinction for living things based on DNA, that the genes are the replicators while the animals and plants themselves are vehicles, interactors, or phenotypes: ephemeral creatures constructed with the aid of genetic information coded in tiny strands of DNA packaged safely inside them. Whether single-celled bacteria, great oak trees, or dogs and cats, in the gene-centered view of evolution they are all gene machines or Dawkins's "lumbering robots." The important point here is that the genetic information is faithfully copied down the generations, while the vehicles or interactors live and die without actually being copied. Put another way, this system copies the instructions for making a product rather than the product itself, a process that has many advantages (Blackmore 1999, 2001). This interesting distinction becomes important when we move on to higher replicators.

So what happened next? Earth might have remained a one-replicator planet but it did not. One of these gene machines, a social and bipedal ape, began to imitate. We do not know why, although shifting climate may have favored stealing skills from others rather than learning them anew (Richerson and Boyd 2005). Whatever the reason, our ancestors began to copy sounds, skills and habits from one to another. They passed on lighting fires, making stone tools, wearing clothes, decorating their bodies and all sorts of skills to do with living together as hunters and gatherers. The critical point here is, of course, that they *copied* these sounds, skills and habits, and this, I suggest, is what makes humans unique. No other species (as far as we know) can do this. Song birds can copy some sounds, some of the other great apes can imitate some actions, and most notably whales and dolphins can imitate, but none is capable of the widespread, generalized imitation that comes so easily to us. Imitation is not just some new minor ability. It changes everything. It enables a new kind of evolution.

This is why I have called humans "Earth's Pandoran species." They let loose this second replicator and began the process of memetic evolution in which memes competed to be selected by humans to be copied again. The successful memes then influenced human genes by gene-meme co-evolution (Blackmore 1999, 2001). Note that I see this process as somewhat different from gene-culture co-evolution, partly because most theorists treat culture as an adaptation (e.g. Richerson and Boyd 2005), and agree with Wilson that genes "keep culture on a leash." (Lumsden and Wilson 1981 p 13).

Benzon, in responding to Peter Railton's post here at The Stone, points out the limits of this metaphor and proposes the "chess board and game" instead. I prefer a simple host-parasite analogy. Once our ancestors

could imitate they created lots of memes that competed to use their brains for their own propagation. This drove these hominids to become better meme machines and to carry the (potentially huge and even dangerous) burden of larger brain size and energy use, eventually becoming symbiotic. Neither memes nor genes are a dog or a dog-owner. Neither is on a leash. They are both vast competing sets of information, all selfishly getting copied whenever and however they can.

To help understand the next step we can think of this process as follows: one replicator (genes) built vehicles (plants and animals) for its own propagation. One of these then discovered a new way of copying and diverted much of its resources to doing this instead, creating a new replicator (memes) which then led to new replicating machinery (big-brained humans). Now we can ask whether the same thing could happen again and — aha — we can see that it can, and is.

As "temes" proliferate, using ever more energy and resources, our own role becomes ever less significant.A sticking point concerns the equivalent of the meme-phenotype or vehicle. This has plagued memetics ever since its beginning: some arguing that memes must be inside human heads while words, technologies and all the rest are their phenotypes, or "phemotypes"; others arguing the opposite. I disagree with both (Blackmore 1999, 2001). By definition, whatever is copied is the meme and I suggest that, until very recently, there was no meme-phemotype distinction because memes were so new and so poorly replicated that they had not yet constructed stable vehicles. Now they have.

Think about songs, recipes, ways of building houses or clothes fashions. These can be copied and stored by voice, by gesture, in brains, or on paper with no clear replicator/vehicle distinction. But now consider a car factory or a printing press. Thousands of near-identical copies of cars, books, or newspapers are churned out. Those actual cars or books are not copied again but they compete for our attention and if they prove popular then more copies are made from the same template. This is much more like a replicator-vehicle system. It is "copy the instructions" not "copy the product."

Of course cars and books are passive lumps of metal, paper and ink. They cannot copy, let alone vary and select information themselves. So could any of our modern meme products take the step our hominid ancestors did long ago and begin a new kind of copying? Yes. They could and they are. Our computers, all linked up through the Internet, are beginning to carry out all three of the critical processes required for a new evolutionary process to take off. Computers handle vast quantities of information with extraordinarily high-fidelity copying and storage. Most variation and selection is still done by human beings, with their biologically evolved desires for stimulation, amusement, communication, sex and food. But this is changing. Already there are examples of computer programs recombining old texts to create new essays or poems, translating texts to create new versions, and selecting between vast quantities of text, images and data. Above all there are search engines. Each request to Google, Alta Vista or Yahoo! elicits a new set of pages — a new combination of items selected by that search engine according to its own clever algorithms and depending on myriad previous searches and link structures.

This is a radically new kind of copying, varying and selecting, and means that a new evolutionary process is starting up. This copying is quite different from the way cells copy strands of DNA or humans copy memes. The information itself is also different, consisting of highly stable digital information stored and processed by machines rather than living cells. This, I submit, signals the emergence of temes and teme machines, the third replicator.

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A Graphic Text

August 20, 2010

Jeremy Short's students read comic books in class. Then they take exams, do well, and finish the semester with an understanding of the fundamentals of business management. In an effort to make dry content more interesting, Short co-wrote a set of two graphic novels together with Talya Bauer, professor of management at Portland State University, and Dave Ketchen, professor of management at Auburn University. The second of their books was released this summer.

"Textbooks are just plain boring," said Short, who is a professor of management at Texas Tech University. He said that standard business textbooks use a lot of disconnected examples and irrelevant stock photos, and he wanted to create something that would be "more like a movie," that would get the necessary points across while keeping students engaged. *Atlas Black: Managing to Succeed* was his first attempt at a graphic-novel textbook; it covers, Short says, all the bases of what his students need to learn, while telling a story in panels about a college kid named Atlas and his friends. His adventures continue in *Atlas Black: Management Guru?*

Atlas is a bit of a slacker, but eventually graduates from college, learns to run a business, and becomes a fledgling entrepreneur. The graphic novel introduces concepts from principles of management, organizational behavior, strategic management, and entrepreneurship while illustrating Atlas' quest to make money, get over a breakup, and open the No Cover Cafe, where college students can listen to free music and buy moderately priced pizza.

To convey some of the important concepts, Atlas talks to his girlfriend about how he is doing better in school and applying a "balanced scorecard" (a strategic performance-management tool) to his life, and later in the book explores the options necessary for hiring employees and suppliers, and developing the best business model for his restaurant. When Atlas's friend has trouble understanding motivation, Atlas takes him to his baseball coach, who uses straightforward examples from running a baseball team to illustrate complex ideas about motivation -- a key concept in business. Atlas plays chess with his friend and they discuss the similarities: "In both chess and business you have to deal with ambiguity and uncertainty. You have to anticipate your opponents' moves. You have to consider a lot of potential options that aren't necessarily clear or perfect. In business and chess, you can take 'old moves' and put new twists on them."

The graphic-novel genre appeals to a young audience, Short said, and he wanted a medium that would be a more interesting and effective way to communicate with students, who live in an increasingly visually-oriented world. He's used the books in his undergraduate and M.B.A. classes, and has received praise for the books from both types of students.

Paul Barowsky, an M.B.A. student at Texas Tech who took a class with Short, said he liked the book and would prefer graphic novels to traditional textbooks in most courses (with the exception of numbers-intensive classes). "A story format forces the author to 'net out' his/her ideas in a concise, easily comprehensible dialogue compared to traditional textbooks, which tend to be repetitive and long-winded," he said in an e-mail.

Formal evaluations showed that 86 percent of his students that used the book said they agreed or strongly agreed that it "compares favorably" to other management textbooks they've had, Short said. He added that the most rewarding part of the process teaching with *Atlas Black* is having students wonder what happens in the

story when the book ends. “The idea of a student asking what comes next in a textbook is really just unfathomable,” he said.

Though the idea of teaching from a graphic novel may have its skeptics, the response to Short’s books has been overwhelmingly positive.

“When I first told [my colleagues] that I was going to do a graphic-novel textbook, a lot of them gave me a sideways glance,” Short said. “But I haven’t heard anyone ever say that they look at the first chapter and say it’s a bad idea.”

Likewise, professors at the University of Vermont School of Business "rolled their eyes" at the idea that E. Lauck Parke, an associate professor there, was incorporating such a nontraditional teaching tool into his course. Parke is nearing retirement, and said that many professors of his age are used to the straightforward black-and-white texts that they read in college. "You were lucky if you got a *Wall Street Journal* black-and-white sort of sketch or visual in a chapter," he said. "So we're sitting here having been taught in one methodology, and many of us haven't gotten used to all the new literature about trying to understand the different ways in which a human learns."

Parke said *Atlas Black* provided a good skeleton for the concepts he taught in his course, and is considering using it again.

“It’s not a typical graphic novel by any stretch of the imagination,” said Thomas Moliterno, assistant professor of management at the University of South Carolina. He incorporated *Atlas Black* into an undergraduate class, and said that he would use it again in future courses. “Textbooks tend to be imposing to students and expensive, and I think it’s a real challenge to find a textbook that students are willing to buy and/or read,” he said.

In addition to telling a story with pictures and text bubbles as a traditional comic book would, Short’s book also has paragraphs of text on certain pages, which allows the author to create a richer discussion of content than a normal comic book would, Moliterno said. On the other hand, he noted that it’s difficult to skip around in the textbook because it follows a narrative arc, and confines the professor to framing a course entirely around the book.

Dale Dunn, professor and chair of the pathology department at the Texas Tech School of Medicine, is currently also in the M.B.A. program and took Short’s organizational behavior class, in which he read *Atlas Black*. He said that the graphic novel, as a genre, has yet to overcome a stigma of existing just for entertainment purposes, and it may be a challenge to get students to take it seriously. However, he said it certainly has a niche in education, and he has even been discussing the possibility with Short of creating a graphic-novel textbook for health care risk-management courses.

“As you start reading it, you start thinking, ‘Can I take this seriously?’ But as you get involved you realize there’s more to it than just entertainment,” Dunn said. “There’s a lot of didactic information, and from my vantage point it was more memorable and unique because you could identify the information with specific characters.”

This isn’t the first time comic books have been used to communicate educational concepts. Professors at the Duke Law School created a comic book to illustrate issues in copyright law, and the Federal Reserve

published a series of comic books targeted at a younger audience to explain financial and economic issues. But creating an entire textbook is a unique project, Short said.

"This is the first that really covers all the concepts and frameworks and that is age-appropriate," he said. "I don't know of any other thing that's like this."

Big textbook publishers like McGraw-Hill do not have any textbooks in the graphic novel format, said a spokesman for the company. *Atlas Black* is published by Flat World Knowledge, and it is the first book of its type for the open-source textbook publisher, which Short chose because of its affordability. Students can order the book for $14.95, but it is expected to be free to read online by spring 2011.

Jeff Shelstad, CEO of Flat World Knowledge, said the Atlas Black books are among the company's more successful products, though it might be "a slow build" for Short because faculty are hesitant about change. Still, of the 1,300 faculty members using any of Flat World's products this fall, about 25 will be assigning *Atlas Black*, he said.

Short is currently at work on a third graphic novel -- about franchising.

— Iza Wojciechowska

http://www.insidehighered.com/news/2010/08/20/graphic

Blinding Technology of Online Learning

August 23, 2010

Online learning is often heralded as a way to make college an option for people who would not otherwise have the money or mobility to access it. But for blind students, online learning can present more obstacles than opportunities — especially as e-learning materials become more technologically sophisticated.

"When faculty or course developers hear about a new tool being introduced at a distance education conference, they want to bring it home and try it out," says Kelly Hermann, chair of the Online Education Special Interest Group at the Association on Higher Education and Disability, or AHEAD. "But what they fail to recognize is where that new tool might create barriers to accessibility."

That new types of course content being developed for online learning might create accessibility problems is not a new revelation. But the courts have made little progress toward defining and enforcing accessibility standards for online education in the last decade, even as online degree programs have proliferated and been adopted into mainstream higher education. Only in the last few months has the federal government hinted that online education, and technological innovations associated with it, might soon face legal scrutiny.

In the meantime, advocates for the blind are worried that it is becoming harder for the assistive technology used by blind students to keep pace with advances in educational technology. "Dynamic" e-learning content — e.g., graphics that change as a user rolls over or clicks on different parts — could present huge challenges to blind students, says Chris Danielsen, a spokesman for the National Federation for the Blind, or NFB. Figuring out how translate static tables and diagrams for blind students was trouble enough, he says; it is not yet clear how to deal with newer, more interactive e-learning objects that may soon pervade online education.

"Assistive technology does the best it can to keep up with changes in [educational] technology, but a lot of times you have a university that is using the latest, cutting-edge Web technology… screen-reader technology tries to keep up, but more often than not it's behind," says Danielsen. For example, screen-readers rely on a screen having to reload every time new content appears on a page — a step dynamic content eliminates. Advocacy groups do not believe online classrooms should deploy such materials until they can be made accessible to blind students.

The news is not all bad. The NFB last week gave Blackboard — the e-learning industry leader whose learning-management platform is used by many online programs — a pat on the back for setting a new standard for accessibility with its the latest version of its online learning portal. Moodle, the open-source learning-management platform that has been making modest gains against Blackboard for several years, allows individual campuses to customize their portals such that they are accessible to blind students. The accessibility of learning-management systems is especially germane to the accessibility of online courses, since in online learning the learning-management platform is not just a supplement to the classroom — it is the classroom.

Unfortunately, making the learning-management system accessible is only part of the battle to make online education accessible. "Even though Moodle itself is accessible, courses and imported content might not be," says Brad Schleicher, a spokesperson for Moodlerooms, the company that provides support to users of the Moodle platform. Imported content is becoming as much a part of online course delivery as the discussion forums and other features governed by the accessibility practices of the learning-management system.

At Blackboard's user conference in July, Michael Chasen, the company's CEO, demonstrated how the company was creating more dynamic, seamless ways to integrate outside content into course pages. In the latest version of the platform, "we've taken steps to ensure that content from third-party sources like YouTube and others is fully accessible once it is brought into the course, but as a platform solution, there are infinite types of content that could be used within the system," says Stephanie Cupp, a senior director of user experience at Blackboard. (It should also be noted that less than a third of Blackboard clients have upgraded to the more accessible version, which the company released in April.)

"Third-party content is a problem," says Anne Taylor, director of access technology at the National Federation for the Blind. As learning-management systems have made it easier to do so, some professors have drawn increasingly from disparate sources — online video sites, blogs, other nonacademic websites — for course material. The more professors "do their own thing," drawing from nontraditional sources, the less likely it is that everything students need to succeed in an online course is accessible, says Pratik Patel, chair of the information access committee at the American Council of the Blind.

Legal Recourse

None of the advocacy groups contacted by *Inside Higher Ed* could pinpoint the exact number of blind students currently enrolled in U.S. colleges, but Hermann, of AHEAD, says the proportion is very, very small. Only three to five percent of college students report having any disability at all, Hermann says, and that includes learning and mental disorders. Blindness is, she says, a "low-incidence disability."

This means that advocates for the blind often need to use federal anti-discrimination laws to keep from being left in the dust on new technologies. Last summer, the NFB and the American Council of the Blind sued Arizona State University under the Americans with Disabilities Act and other laws, forcing it to end a pilot program designed to assess the educational uses of Amazon's Kindle DX, which had an inaccessible menu feature. The U.S. Justice Department subsequently forced three other institutions to shut down their Kindle pilots.

So if online education presents so many obstacles to accessibility, why has no one filed a similar lawsuit against any of the institutions that offer it?

"It's a good question," says Hermann. "It's the colleges' obligation under [federal law] to make every program of their institution accessible."

"Obviously, we're cautious about talking about our legal strategies," says Danielsen, the NFB spokesman. However, the spokesman did note that litigation is an "expensive, time consuming process, and outcomes are by no means guaranteed." In other words, you do not sue unless you know you can win. "From our perspective, it's a last resort," Danielsen says.

Eric Bridges, the government affairs director at the American Council of the Blind, noted that advocacy groups have had little success with litigation dealing with a similar topic: the accessibility of college websites. "Some of the litigation that's been done over website access has not always been the greatest as far as settlements and outcomes, so I think some organizations have been hesitant," he says.

The chances of a successful lawsuit might become clearer sometime in the next year or two. The Department of Justice has suggested that it might soon articulate exactly what kind of legal recourse blind and otherwise

disabled students have with respect to the accessibility of online courses. Last month, the department issued several notices, saying it is collecting public comment on a number of topics related to accessibility and the Web in preparation to lay out the specific obligations of various institutions under federal law.

While online education is not explicitly mentioned, Bridges says his group is planning to lobby that it be included on the rulemaking agenda. "What they're doing is putting out feelers," he says. "They want to see… how the industry feels about even broaching this subject." The department will probably release a more specific agenda within a year or so, Bridges says, adding that he would be surprised if online learning does not make the cut.

In June, the Justice Department and the Education Department jointly released a "dear colleague" letter to colleges, warning them that the government plans to crack down on institutions that require disabled students to use emerging technology that does not comply with federal accessibility laws. This, again, did not explicitly mention online education, but Bridges says it was a shot across the bow.

John Wodatch, chief of the disability rights section of the Justice Department, did not respond to repeated requests for comment. However, at a June meeting of the National Association of College and University Attorneys, Wodatch urged college officials to think about the accessibility of their online courses to blind students and those with limited manual dexterity, indicating that the government may indeed be preparing to address the issue.

Until then, the innovators will presumably continue to populate online learning environments with new tools, while assistive technology providers and their blind students try to keep up.

For the latest technology news from Inside Higher Ed, follow IHEtech on Twitter.

— Steve Kolowich

http://www.insidehighered.com/news/2010/08/23/accessibility

Illustrating the Moxie of Broadway

By ERIK PIEPENBURG

ACTORS covet them. Producers dream of them. Marvin Hamlisch even composed a musical about one. On Broadway, the word "lines" means different things to different people.

To the theater illustrator Al Hirschfeld, lines told stories. A single stroke bestowed elegance on a clown. A thicket of swirls became an elaborate costume. Swoops made an actor's feet fly.

Hirschfeld, whose artwork was synonymous with theater coverage in The New York Times for decades, was an exhaustive chronicler of almost every Broadway show and personality of the 20th century. Gish, Gielgud, Minnelli, Streisand — he drew everyone, and everyone wanted to be drawn by him.

Several living artists still document that Broadway energy, including Richard Baratz, whose celebrity caricatures line the walls of Sardi's, and James McMullan, whose posters have cataloged the seasons at Lincoln Center. But since Hirschfeld's death in 2003, at the age of 99, there has been no clear heir apparent to his title as Broadway's go-to illustrator.

Not that the pad-and-pencil tradition of drawing Broadway is extinct. (Shrinking, yes, but not dead.) The artist Victor Juhasz, referring to Hirschfeld, writes: “His work was clearly distinctive but by no means the final statement on Broadway illustrations.”

The art of today’s theater illustrators and caricaturists is featured regularly in magazines, playbills and online. (With the exception of the work of Mr. McMullan, however, most show posters these days are photographed or done using computer software, not drawn.) Most lucratively, their pieces are given out in limited editions as gifts on opening or closing nights, or are commissioned for private collections. (Corporate gigs help pay the rest of the bills.)

More examples of these illustrators' works are available in an interactive feature at nytimes.com/theater.

VICTOR JUHASZ

What essentially drew me to theater stuff was that it was a great departure from what I normally do. I do more sarcastic, ironic caricature, political, opinionated stuff. Here was a chance to focus on imagery for imagery's sake. The point of view would come as a result of the atmosphere that I was trying to put into a painting, even though it doesn't show itself in a lot of the more serious work I do. I draw inspiration from Otto Dix and George Grosz and Lucien Freud, people who could catch this atmosphere about each of their subjects. I love going to the theater, but I tend to be more inclined toward the more serious, meaty fare.

MATT LOGAN

I fight when people ask me to put color in a picture. I love color, but I'm more intrigued by the relationship between black and white and space. That's something Al Hirschfeld did so beautifully, especially as his artwork changed during different phases. The more spare it was, I found, the more moved I was. A line with a hand at the end of it can give you just enough to envision an arm. But if you put color to it, then it becomes about the sleeve rather than the gesture. I would never put myself in the same field as Hirschfeld. I look at him with such awe. It's a language he created. We just try to learn to speak that language in our own way.

ROBERT RISKO

My work is stylized, angular, retro, minimalist shapes, with roots in Cubism. When I was growing up outside of Pittsburgh, Warhol was an icon by that point, in the early '60s. In that area the steel mills were thriving, and a manufactured look, things that were plastic, was the aesthetic of the day. Whether it be airbrushed illustrations of welding machines or Warhol's repetitive Campbell's soup cans, it was all about the manufactured look, which is something I always try to achieve. In the digital age, when a manufactured look is so easy to do, you always

have to leave a sign that it was done by human hand. There has to be some imperfection somewhere. There needs to be a playful spirit in it.

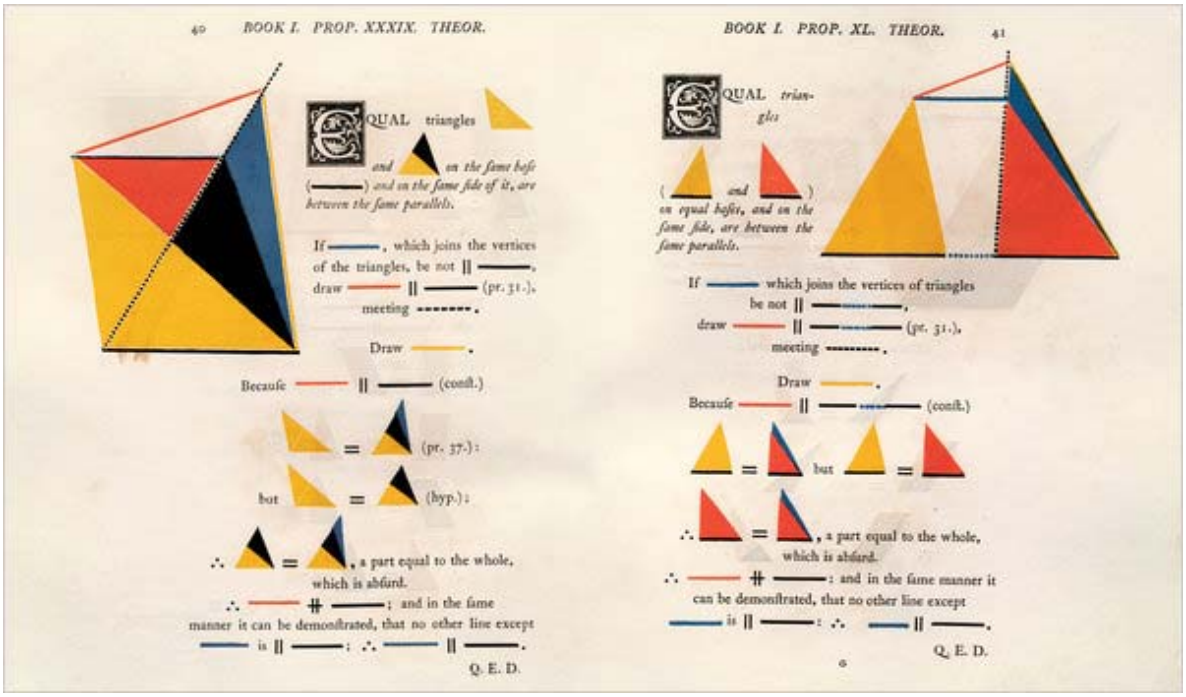
JUSTIN ROBERTSON (SQUIGS)

I don't do a lot of over-the-top, crazy exaggeration in the caricatures. It's not wild illustration. I try to focus more on subtleties. I think a lot of it is trying to keep my eyes open and pay attention when looking at someone. I'm a people pleaser, so I'm always trying to make it accurate. It's not about lampooning for me. It's about celebrating a likeness and a persona and the hard work that goes into what theater is. Onstage it can seem magical, but we know how much work goes on behind that. Theater and caricature are a culmination of everything I like.

http://www.nytimes.com/2010/08/22/arts/design/22caricature.html?ref=design

Forms and Functions

By STEVEN HELLER



In 1847, Oliver Byrne, "surveyor of Her Majesty's settlements in the Falkland Islands and author of numerous mathematical works," wrote and designed an illustrated book so far ahead of its time that, with the exception of a few passé typographical details, it could have been published today. In fact, it *has* been published today, as a stunning boxed facsimile edition. Given its "less is more" layout and primary-color palette — red, blue, yellow, black — **THE FIRST SIX BOOKS OF THE ELEMENTS OF EUCLID: In Which Coloured Diagrams and Symbols Are Used Instead of Letters for the Greater Ease of Learners (Taschen, $59.99)** prefigures the art and design of 20th-century avant-garde movements. Yet although the illustration on the title page is the spitting image of a de Stijl and Bauhaus design, the mid-19th-century publishing date disqualifies it from being "modern" in the Museum of Modern Art sense of the word. Now, that's obtuse.

Sure, the book may have one of those lengthy old-fashioned titles, but "The First Six Books of the Elements of Euclid" is so rationalist, minimalist and aesthetically pure, every graphic designer, book lover and math nerd will be as awe-struck as I was. (It comes with a pamphlet containing an essay by Werner Oechslin, an architectural historian and theorist.) In the 1980s, the graphic-design historian Philip B. Meggs introduced me to the book through his illustrated series of articles in Print magazine called "Landmarks of Book Design." Later, at a rare-book fair, when I saw an actual copy, with its vibrant color illustrations of geometric shapes, I decided I had to own an original. Of course, I would have had to mortgage the house, kids and dog to acquire it; so this facsimile not only satisfies my desire, it is more economical and functional in the bargain. I can actually page through the book without fear or guilt — and if it gets dog-eared, I can buy another.

Every high school student has suffered through Euclid's fundamentals of geometry, which is why the pragmatic Byrne wrote: "The arts and sciences have become so extensive, that to facilitate their acquirement

is of as much importance as to extend their boundaries. Illustration, if it does not shorten the time of study, will at least make it more agreeable." Lo and behold, he was right. The color symbols — circles, squares, diamonds, etc. — effectively substitute for key words, rebus-style, making comprehension much simpler. By the time the complicated theorems and formulas appear, toward the end of the book, the reader is fluent in the visual language.

"This work," Byrne continues, "has a greater aim than mere illustration; we do not introduce colors for the purpose of entertainment, or to amuse *by certain combinations of tint and form*, but to assist the mind in its researches after truth, to increase the facilities of instruction and to diffuse permanent knowledge."

The time has long passed since I was forced to learn Euclidean geometry, but I believe this masterpiece of beautifully functional book design is so effective it could even help recalcitrant students today — perhaps as an iPhone app.

Byrne made complex information accessible, which is a job qualification for a graphic designer. One of the designer's roles is to turn disorder into order, particularly when it comes to everyday documents like forms for banks, insurance companies, utilities, the census and so much more. When they are logically, rationally and, yes, handsomely designed, it could mean the difference between minutes and hours of labor. This is why **THE FORM BOOK: Creating Forms for Printed and Online Use (Thames & Hudson, $65),** by Borries Schwesinger, is so necessary. Not only is this an invaluable handbook for designers, it should open the eyes of anyone who produces forms.

But form users stand to benefit too, since they are probably unaware of the mundane details that go into making effective forms, details that, if ignored or rendered poorly, can lead to extreme frustration. For example, the book examines page numbering: "When a form consists of multiple pages, it is essential to number them." Sounds obvious, but take a look at your forms and see how often page numbers are missing. And what about contact details? "They establish a practical connection with the provider, indicating who sent the form, where it should be returned." And, naturally, typography is an overriding concern that is often ignored: "Good typography is a prerequisite for optimal legibility and demands a particular and considered approach to text. . . . Type can be austere or accessible, straight or rounded, emotive or exaggerated."

Unless one has an obsessive-compulsive streak for filling out forms, this manual will probably seem arcane. However, one possible unintended consequence of "The Form Book," which should concern everyone, is seeing in the numerous examples, from government agencies and private companies, just how much data — personal and otherwise — is regularly being collected from all of us. Not even good design will mitigate these privacy concerns.

There are no forms to be found in **STRANGE AND WONDERFUL: An Informal Visual History of Manuscript Books and Albums (Sanctuary, $50),** with an introduction by the art critic Jed Perl. But there are selections from a delightful handmade book called "Collezione di Rebus" (1820), with original watercolor drawings that replace words in sentences or phrases. This was produced 27 years before Oliver Byrne used the rebus concept in "The First Six Books of the Elements of Euclid," though there is no evidence to prove that this is where he got the idea. Doubtless not a single professional artist or designer was inspired by the journals and albums in this book, since each of them is the work of an amateur, although some were created by people who wanted to be published authors.

"Certain volumes are not so much finished products," Perl writes, "as means to an end, for the authors surely hoped that what had at first been made by hand would eventually make its way through the printing press."

These specimens are organized according to genre (rather than date), from “Advertising” and “Album Amicorum” to “Walmart” and “Weaving.” None follow strict design conventions, and virtually all of them have some kind of undeniably quirky essence. “Weaving,” for instance, contains geometric patterns in red, blue and a hint of yellow, not unlike the illustrations in the Euclid book.

My favorite is the “Monograms” journal, which recalls Saul Steinberg’s fixation with official seals and monograms, yet without the satirical edge. These monograms were cut out from various sources and used as building blocks in other compositions. Likewise, the book under the heading “Emblems” reveals a fascination with the manipulation of letter forms that are similar to contemporary logos and trademarks. Some of the books are personalized how-to manuals, like the one for “Carpentry,” with detailed drawings of moldings and stairways. Others, like “Cat Story,” are maquettes for comic graphic novellas.

There is no real rhyme (though there is certainly a reason) for what the editor, Dan Wechsler, has included in “Strange and Wonderful.” But the combination of old and recent photography and drawing, some of it surreal and some of it quite real, triggers a stimulating visual, often contemplative experience. Indeed, these books are not unlike some blogs today — only it’s more fun to turn real pages.

For some bibliophiles, there is no greater pleasure than looking at smartly conceived and elegantly designed book covers and jackets. The next best thing just might be paging through **PENGUIN 75: Designers, Authors, Commentary (the Good, the Bad . . .) (Penguin, paper, $25),** edited by Paul Buckley, a noted creative director at Penguin.

This lushly illustrated book is a testament to the importance of design in Penguin’s publishing program. In 1946, the modernist typographer Jan Tschichold revamped its entire design scheme — though a lot has changed since then. The covers have become more conceptual and typographically variegated. Buckley also consistently uses young illustrators whose styles add contemporary luster to the books. And in recent years he’s recruited a group of graphic novelists, like Chris Ware (who wrote the foreword to this book), Jason Lambiek, Julie Doucet, Art Spiegelman and Daniel Clowes, among many others.

The book features 75 Penguin covers (in celebration of the publisher’s 75th anniversary), with the designers, illustrators and authors commenting on the process and result. The most interesting parts involve short “Rashomon”-type stories in which authors and designers tell their respective tales. But it is also nice to learn how authors feel when they see their babies — i.e., their books — wearing jackets and covers for the first time (most authors, mercifully, do not have a say in the art). I particularly liked the novelist Penelope Lively’s admission: “I am always wonderfully startled by the first sight of the jacket art for a forthcoming book — Oh! So that’s how they see it!”

Dave Eggers, who studied art and design in college, has created a distinct identity for his McSweeney’s publishing empire, based on new writing, ironic visual content and an expanding universe of artists and designers. In **ART OF McSWEENEY’S (Chronicle, $45),** by the editors of McSweeney’s, 11 years of alternative-publishing history are packed into 263 pages. And what comes through, as it does in “Penguin 75,” is an appreciation for good design and a preference for comics. McSweeney’s champions Chris Ware, Tony Millionaire, Art Spiegelman, Charles Burns and others. The entire McSweeney’s No. 13, covered with a foldout comics page by Ware, was devoted to old and new comics and was guest-edited by Ware as well.

Comics are not the sum total of McSweeney’s graphic personality, but they play a huge role in cementing the literary and visual personas in both McSweeney’s and its sister publication, The Believer. Since many literary journals avoid a strong visual presence — perhaps because it competes with the writing — it’s refreshing that

Eggers has successfully combined the two mediums and their aesthetics. McSweeney's has become a hothouse of 21st-century editorial graphics, and this book proves it.

When the history of 21st-century popular art is written, Maira Kalman will be included alongside McSweeney's. They embody the zeitgeist in different yet similar ways. Both use art to entertain and inform, but not in a didactic or polemical way. Whereas popular art in the '60s was acidly satirical, even angry (and for good reason), McSweeney's artists and Kalman offer a more laid-back worldview. Wit and humor still abound, but so does a curious, comforting optimism, especially in Kalman's impressionistic work.

Ingrid Schaffner's **MAIRA KALMAN: Various Illuminations (of a Crazy World) (Institute of Contemporary Art, University of Pennsylvania/DelMonico/Prestel, $34.95),** the catalog from Kalman's first major museum exhibition, for the Institute of Contemporary Art at the University of Pennsylvania, is also the first analytical/historical monograph devoted to her. Until now, her art has mostly been seen in her children's and adult books, as well as in various other publications, including The New York Times (where her illustrated blogs "And the Pursuit of Happiness" and "The Principles of Uncertainty" appeared). A catalog is always going to be a different experience.

Comparing this with Kalman's original books would not be fair. Those were total entities, with narrative arcs. This is a document (midway through her career) that records her work in a collection of independent images, and therefore lacks some of the artist's storytelling verve. The biographical chronology is useful, and the essays, by Schaffner and other scholars, are a good foundation for further study. But the book could use Kalman's delightfully quirky ooh-la-la voice.

http://www.nytimes.com/2010/08/22/books/review/Heller-t.html?ref=design

A Design Challenge for St. Louis: Connecting the City With Its Symbol

By MALCOLM GAY

ST. LOUIS — Since its completion in 1965, the Gateway Arch, Eero Saarinen's shimmering steel monument to westward expansion, has been an iconic point of pride for this city.

The 91-acre park that surrounds it? Not so much. Its snaking paths and undulating reflecting ponds have been dubbed an area of "splendid isolation" by critics, who say the park, along with the sunken Interstate that severs the city from the Mississippi River, has acted as a foot to the throat of recent efforts to revitalize the city's struggling downtown.

Previous efforts to integrate the memorial have foundered on the enormousness of the infrastructural task. But that goal took a major step forward on Tuesday, when an international design competition unveiled plans that could reshape the Arch grounds.

Equally challenging may be the effort to secure the $305 million or more the National Park Service, which administers the site, estimates it will take to build the winning design.

"I don't know exactly how we're going to get there, but I have great confidence that we will get there," Ken Salazar, the interior secretary, said Friday while viewing the five finalists' designs. "This has all the elements to be one of the most important great urban parks."

The competition, sponsored by a private foundation that includes citizens, politicians and Park Service employees, spotlights several common remedies. Each design proposes placing a "lid" over Interstate 70, whereas today's visitors must traverse 10 lanes of traffic to reach the Arch from downtown.

The designs would also enhance the east side of the river — a derelict patch of overgrown levee whose defining feature is a grain elevator — by connecting it to the Arch grounds via a network of foot and bike trails. In one of the more fanciful visions, a gondola crosses the river, delivering visitors to an outdoor amphitheater that overlooks a floating stage. Other visions offer up a prairie forest or a beer garden that doubles as an ice rink in the winter. The designs are currently on view at the Arch, and a winner will be announced on Sept. 24.

Many view redesigning the Arch grounds as a crucial step to revitalizing St. Louis, which, like many other Midwestern cities, has seen its fortunes decline as manufacturing jobs have moved overseas. The city has suffered major population losses — roughly 500,000 people over the half-century — and entire neighborhoods were razed in the middle of the last century to accommodate highways.

In recent years, however, several neighborhoods have begun to show signs of renewed life. Downtown St. Louis is now home to thousands of lofts. It has a small entertainment district, and in the past year the downtown has added a sculpture park and its first new grocery store.

Nevertheless, the Arch grounds present a sort of Gordian knot of urban design: Girdled by depressed highways and busy surface roads, the park is bounded to the east by the Mississippi, which is prone to flooding. While the Arch, at 630 feet high, may offer sweeping views of the surrounding city and farmland, there are no amenities or restaurants on the grounds and little to encourage repeat visits.

To further complicate matters, the original design of the Arch grounds by Dan Kiley is a national historic landmark, meaning the teams are limited in how much they can alter the character of the park. “There’s a complexity that can’t be solved by a single silver bullet,” said the competition manager, Don Stastny. “There have been efforts in the past, but they’ve been very incremental. This is a much more global look at things.”

Some observers seem less impressed. In a letter to The St. Louis Post-Dispatch, Ralph Tharp called connecting downtown to the Arch grounds “the most ‘no duh’ idea ever conjured up by us local hayseed professionals.” He added, “Missouri backwater designers and planners should be prideful that our counterparts in more sophisticated areas of the world agree with our findings from 20 years ago.”

The design challenge may be rivaled by the difficulties in raising money. While Senator Claire McCaskill, Democrat of Missouri, expressed confidence Friday that her Congressional colleagues would view her state’s project as a “priority,” some competition organizers were more skeptical.

“I still have to sell this to the National Park Service, which is looking at projects from 400 parks around the country,” said Tom Bradley, superintendent for the Arch. “Let’s face facts: The whole line-item construction for the whole National Park Service is probably $100 million for next year. So we have to be realistic.”

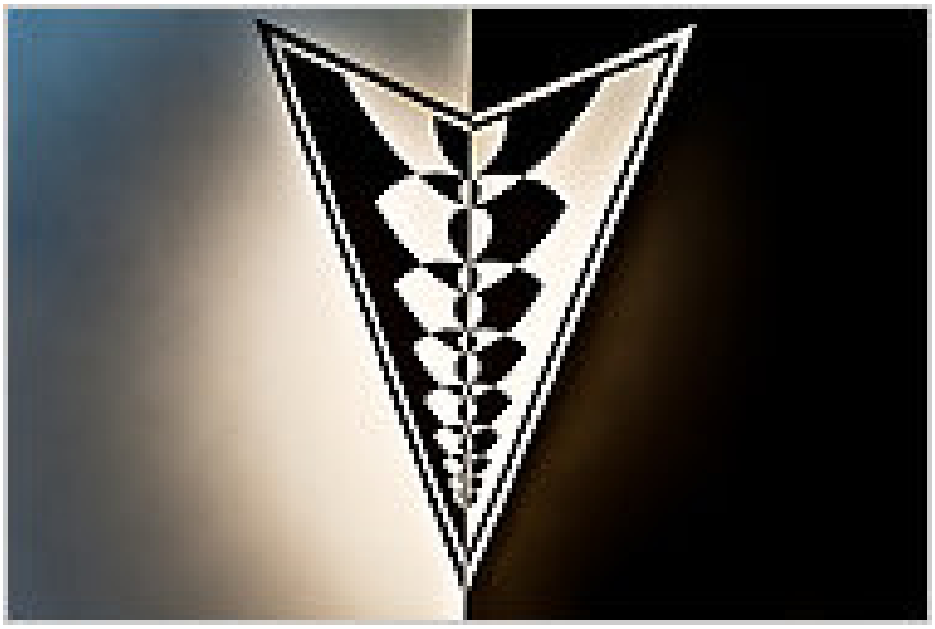
Walter Metcalfe Jr., an area lawyer and member of the foundation CityArchRiver 2015, said that large parts of the park and the highway system were antiquated and in dire need of federal money for repair.

“A lot of costs are going to have to be incurred by the National Park Service on this park,” Mr. Metcalfe said, “whether they subscribe to a new design or whether they just bring it up do date.”

http://www.nytimes.com/2010/08/21/us/21arch.html?ref=design

The Lights of Big Brother's Eyes, Blinking in the City

By KAREN ROSENBERG



If you're walking along East 52nd Street at night, you might notice a medium-rise building that's developed a kind of nervous tic. It's the glass-fronted Austrian Cultural Forum, where inside the lights flash on and off at unpredictable intervals.

Suggesting an electrical system gone rogue, this sinister-looking intervention by the Austrian artist Judith Fegerl advertises the forum's summer show. Titled "NineteenEightyFour," after George Orwell's dystopian novel, the exhibition is well worth a return trip during daylight hours (when the galleries are open).

The Orwellian theme, relevant as it is today, has been overplayed in contemporary art since the panopticon-obsessed 1980s. But it's handled deftly here, with works that are as nuanced and versatile as they are on-message. Many are by talented newcomers, American and European.

In a show about surveillance and control, the forum's awkward gallery space, spread over five levels of its narrow, wedge-shaped headquarters, becomes an advantage. In one ingenious example Florian and Michael Quistrebert's wall painting "Illuminati" makes use of a corner that's visible from several stories. The black-and-white eyes seem to follow you from floor to floor.

More covert spying is done by Cory Arcangel and Hanne Mugaas's hygrometer, a device typically used to regulate humidity levels in museums and galleries. The version here isn't hooked up to the building's cooling system, so it becomes a way to measure the body heat of visitors.

It's hardly surprising to find flowchart drawings by Mark Lombardi in this show — he seems to be in every exhibition about the uses and abuses of power — but the smaller sketches and studies here reveal much about his process. One is a purely abstract series of bubbles and lines, awaiting names and dates.

The same everything-is-connected concept underscores diagrammatic paintings by Paul Laffoley. They combine a Da Vinci Code's worth of occult symbolism with cryptic texts that fuse art, science and religion. In this context compound words like "Bauharoque" and "Christogenesis" echo Orwell's "NewSpeak."

Specific references to "Nineteen Eighty-Four," the novel, are subtle, when they're there at all. One is buried in a smart video by Jordan Wolfson. Watching it, you see a camera slowly pulling away from an old Macintosh computer that's been discarded on the side of a highway; meanwhile, you hear the solemn voice of the art critic Philip Leider from a 1972 documentary on American painting. With a nod to Ridley Scott's 1984 commercial for Apple, Mr. Wolfson seems to ask, "Which is the obsolete product?"

Up a flight of stairs is another clever video, by the Austrian Flora Watzal, in which a bouncing orange ball foils a surveillance attempt. The piece could be an abstract tribute to the "Nineteen Eighty-Four" protagonist Winston Smith, but it's also reminiscent of early works by Bruce Nauman and Dan Graham.

More video art can be found in the forum's bunkerlike basement, along with an old-media installation by the suddenly ubiquitous Tris Vonna-Michell. A version of a piece shown at the X Initiative last year, it incorporates a dimly lighted desk, flashing slide projections and a stuttering, almost incomprehensible monologue. The artist's voice is the difference maker, transforming a classroom setup into a shadowy ministry.

Less ambitious, but just as evocative, is another piece by the Quistrebert brothers: a shifting black-and-white abstraction titled "Ex-Futuro." If the intrusive telescreens in "Nineteen Eighty-Four" had been equipped with screen savers, this is what they might have looked like.

Privacy, so scarce in Orwell's Oceania, is zealously guarded in a large sculpture by Rachel Owens. Her "Privet," a tall, Hamptons-style hedge, is composed of glass bottle shards in various shades of green — a much-needed physical diversion from all the cerebral, time-based work.

It's harder to have any reaction to the show's few photographs, which are strictly architectural. Gerold Tagwerker makes large-scale black-and-white prints of skyscrapers; digital renderings by the team of Nicolas Grospierre and Kobas Laska reimagine a cold-war-era Polish airport as a goose farm. (Perhaps there's another Orwell reference here.)

In their texts and labels, the American and Austrian curators — David Harper, Martha Kirszenbaum and David Komary — do their best to update "Nineteen Eighty-Four" for 2010. The monitoring that concerns them isn't the sort done by totalitarian governments. It's the kind performed in democracies by digital marketers, search engines and social networks, often with our cooperation.

As the forum's director, Andreas Stadler, writes in an introduction to the show, "On the one hand we're intrigued by the anonymity that the Net offers, and on the other hand, we readily repress the fact that it is only presumed."

It might have been interesting to consider how these tools and systems function in countries that limit access to the Internet or restrict political expression. (Facebook, Twitter and Google might seem like Big Brother here, but in China, Iran or Saudi Arabia, it's a different story.)

But that's for another exhibition, best undertaken by a bigger, broader institution than the forum. In the meantime, "NineteenEightyFour" gives artists (and curators) permission to keep probing Orwell's long-lived political fiction.

"NineteenEightyFour" continues through Sept. 5 at the Austrian Cultural Forum, 11 East 52nd Street, Manhattan; (212) 319-5300, acfny.org.

http://www.nytimes.com/2010/08/20/arts/design/20nineteen.html?ref=design