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Cellphone Use Tied to Changes in Brain Activity

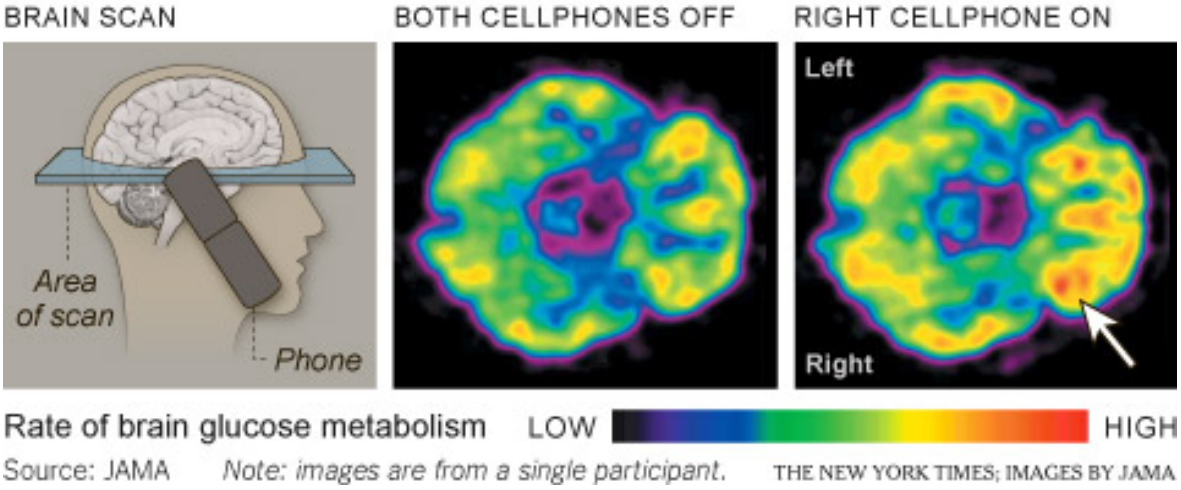
By TARA PARKER-POPE

Researchers from the National Institutes of Health have found that less than an hour of cellphone use can speed up brain activity in the area closest to the phone antenna, raising new questions about the health effects of low levels of radiation emitted from cellphones.

The researchers, led by Dr. Nora D. Volkow, director of the National Institute on Drug Abuse, urged caution in interpreting the findings because it is not known whether the changes, which were seen in brain scans, have any meaningful effect on a person's overall health.

But the study, published Wednesday in The Journal of the American Medical Association, is among the first and largest to document that the weak radio-frequency signals from cellphones have the potential to alter brain activity.

CELLPHONES AND THE BRAIN Researchers tested 47 people by placing a cellphone at each ear. Both phones were off in one test, and in the other test the right phone was on a muted call. After 50 minutes, brain scans showed increased consumption of glucose, or sugar, in areas of the brain near the activated phone.



Source: JAMA *Note: images are from a single participant.* THE NEW YORK TIMES; IMAGES BY JAMA

"The study is important because it documents that the human brain is sensitive to the electromagnetic radiation that is emitted by cellphones," Dr. Volkow said. "It also highlights the importance of doing studies to address the question of whether there are — or are not — long-lasting consequences of repeated stimulation, of getting exposed over five, 10 or 15 years."

Although preliminary, the findings are certain to reignite a debate about the safety of cellphones. A few observational studies have suggested a link between heavy cellphone use and rare brain tumors, but the bulk of the available scientific evidence shows no added risk. Major medical groups have said that cellphones are safe, but some top doctors, including the former director of the University of Pittsburgh Cancer Center and prominent neurosurgeons, have urged the use of headsets as a precaution.

Dr. Volkow said that the latest research is preliminary and does not address questions about cancer or other heath issues, but it does raise new questions about potential areas of research to better understand the health implications of increased brain activity resulting from cellphone use.

"Unfortunately this particular study does not enlighten us in terms of whether this is detrimental or if it could even be beneficial," Dr. Volkow said. "It just tells us that even though these are weak signals, the human brain is activated by them."

Most major medical groups, including the American Cancer Society, the National Cancer Institute and the Food and Drug Administration, have said the existing data on cellphones and health has been reassuring, particularly a major European study released last year by the World Health Organization that found no increased risk of rare brain tumors among cellphone users.

When asked to comment on the latest study, the leading industry trade group, CTIA – The Wireless Association, released a statement emphasizing recent studies that have shown no elevated cancer risk associated with cellphone use.

"The peer-reviewed scientific evidence has overwhelmingly indicated that wireless devices, within the limits established by the F.C.C., do not pose a public health risk or cause any adverse health effects," said John Walls, vice president of public affairs for the trade group, adding that leading global health groups "all have concurred that wireless devices are not a public health risk."

But the new research differed from the large observational studies that have been conducted to study cellphone use. In Dr. Volkow's study, the researchers used brain scans to directly measure how the electromagnetic radiation emitted from cellphones affected brain activity..

The randomized study, conducted in 2009, asked 47 participants to undergo positron emission tomography — or PET — scans, which measure brain glucose metabolism, a marker of brain activity. Each study subject was fitted with a cellphone on each ear and then underwent two 50-minute scans.

During one scan, the cellphones were turned off, but during the other scan, the phone on the right ear was activated to receive a call from a recorded message, although the sound was turned off to avoid auditory stimulation.

Whether the phone was on or off did not affect the overall metabolism of the brain, but the scans did show a 7 percent increase in activity in the part of the brain closest to the antenna. The finding was highly statistically significant, the researchers said. They said the activity was unlikely to be associated with heat from the phone because it occurred near the antenna rather than where the phone touched the head.

In the past, any concerns about the health effects of cellphones have been largely dismissed because the radiofrequency waves emitted from the devices are believed to be benign. Cellphones emit nonionizing radiation, waves of energy that are too weak to break chemical bonds or to set off the DNA damage known to cause cancers. Scientists have said repeatedly that there is no known biological mechanism to explain how nonionizing radiation might lead to cancer or other health problems.

But the new study opens up an entirely new potential area of research. Although an increase in brain glucose metabolism happens during normal brain function, the question is whether repeated artificial stimulation as a result of exposure to electromagnetic radiation might have a detrimental effect.

Although speculative, one theory about how an artificial increase in brain glucose metabolism could be harmful is that it could potentially lead to the creation of molecules called free radicals, which in excess can

damage healthy cells. Or it may be that repeated stimulation by electromagnetic radiation could set off an inflammatory response, which studies suggest is associated with a number of heath problems, including cancer.

Among cancer researchers and others interested in the health effects of cellphones, the study, listed in the medical journal under the heading "Preliminary Communications," was met with enthusiasm because of the credibility of the researchers behind it and the careful methods used.

"It's a high-quality team, well regarded, and if nothing else they're showing that radiation is doing something in the brain," said Louis Slesin, editor of Microwave News, a newsletter on the health effects of electromagnetic radiation. "The dogma in the cellphone community says that it doesn't do anything. What she's shown is that it does do something, and the next thing to find out is what it's doing and whether it's causing harm."

Dr. Ronald B. Herberman, former director of the Pittsburgh Cancer Institute and now chief medical officer for the Intrexon Corporation, a biotechnology company in Germantown, Md., said, "I think it's a very well-designed study, and they have clearly shown that there is biologic activity being induced in the nerve cells in the region where the antenna is the closest." Dr. Herberman said skeptics about the risks of cellphones have focused on the fact that the type of radiation they emit is too weak to break chemical bonds and cannot plausibly be implicated in cancer. However, the new research suggests a potentially different pathway for cancer and other health problems to develop.

"I think it's an important new direction to go in for biologists to start delving deeper into sorting out what might be going on," Dr. Herberman said.

In an editorial accompanying the Journal article, Henry C. Lai, a University of Washington professor of bioengineering who has long raised concerns about cellphone safety, said he hoped the data would broaden the focus of cellphone research and health.

"The bottom line is that it adds to the concern that cellphone use could be a health hazard," said Dr. Lai. "Everybody is worried about brain cancer, and the jury is still out on that question. There are actually quite a lot of studies showing cellphone radiation associated with other events, like sleep disturbances. But people have not been paying a lot of attention to these other types of studies."

Dr. Volkow said future research may even show that the electromagnetic waves emitted from cellphones could be used to stimulate the brain for therapeutic reasons. She said the research should not set off alarms about cellphone use because simple precautions like using a headset or earpiece can alleviate any concern.

"It does not in any way preclude or decrease my cellphone utilization," she said.

http://well.blogs.nytimes.com/2011/02/22/cellphone-use-tied-to-changes-in-brain-activity/?src=me&ref=general

Turning a Rearview Mirror on Kevin Roche

By NICOLAI OUROUSSOFF

Kevin Roche John Dinkeloo and Associates

The Ford Foundation headquarters in Manhattan, by Kevin Roche John Dinkeloo and Associates, with its 12-story atrium, was highly praised when it was completed in 1968

NEW HAVEN — Few figures better illustrate the divide between how architects see the world and how the general public does than Kevin Roche.

To many people, Mr. Roche's buildings sum up everything that was wrong with modern architecture in the 1960s and '70s, a period associated with hulking megastructures that seemed completely out of touch with what was once called "the human scale." In this view, the recent demolition of his long-neglected New Haven Veterans Memorial Coliseum, a raw steel and concrete structure with a four-story parking garage on its roof, was a godsend, another nail in the coffin of an era best forgotten.

But a growing number of architects, especially those who were babies when Mr. Roche, now 88, was at the height of his powers, embrace him as a visionary. His blunt urban forms, conceived on the scale of bridges and freeways, suggest an appealing alternative to both commercial kitsch and the kind of flamboyance often used in contemporary architecture to sugarcoat the brutal effects of the global economy.

"Kevin Roche: Architecture as Environment," an exhibition at the Yale School of Architecture here, is the latest attempt to buff his image, and it makes a convincing case for the deep intelligence of much of his work, as well as for its raw power.

Mr. Roche's career was built on solid Modernist foundations. Born in Dublin, he moved to London soon after World War II, where he worked in the office of Maxwell Fry, one of the fathers of British Modernism. In 1948 he left for the United States, where he briefly studied under Mies van der Rohe in Chicago and then spent more than a decade as a designer in the Michigan office of Eero Saarinen, a pillar of postwar corporate architecture and Mr. Roche's most influential mentor.

Mr. Roche got his first major commission, for the Oakland Museum of California, a few months after Saarinen's death of a brain tumor in 1961, and its design, done with Mr. Roche's longtime partner, John Dinkeloo, reflected many of the themes that would come to define his later work. Covering four blocks, the museum was conceived as an urban composition, a series of terraces with low buildings and gardens stepping down a softly sloping artificial hillside built over parking. Its fusion of humans and nature, cars and pedestrians spoke to Mr. Roche's desire to connect his work to the wider urban infrastructure — the parks, freeways, bridges and tunnels that bind us together.

The same desire was evident a few years later in his most celebrated building, the Ford Foundation headquarters on East 43rd Street in Manhattan. Completed in 1968, the project was organized around a 12-story atrium garden that slopes down from 43rd to 42nd Street, part of a public route that cut right through the building. The offices, set behind glass walls on two sides of this atrium, were supported by massive granite piers and Corten steel beams that evoked conventional bridge construction. Writing in The New York Times, Ada Louise Huxtable called it a "splendid, shimmering Crystal Palace."

Mr. Roche followed this triumph with increasingly bold, even brash proposals. In an unbuilt 1969 design for a new Federal Reserve building in the Financial District of Manhattan, for example, he proposed standing a tower on top of four 150-foot-tall columns to create space for a public park underneath and allow unobstructed views from surrounding streets to both the old Italianate Federal Reserve building next-door and a nearby Methodist church.

But it is two other projects, built in the late 1960s and early '70s, that cemented his reputation as an architect of big gestures. The first of these, the Knights of Columbus headquarters in New Haven, looked more like the headquarters for a security agency than the home of a fraternal order. A sullen concrete, steel-and-glass structure anchored at each corner by a cylindrical service tower, it was meant, with its muscular forms, to relate to a nearby freeway.

Completed three years later on a nearby site, the New Haven Veterans Memorial Coliseum applied a similar strategy to even bolder effect. Rather than bury the parking underground or place it on surrounding lots, as you might expect, Mr. Roche turned the typical stadium diagram on its head, placing a four-story parking garage on top of the main event space. Two external ramps, one at each end of the structure, spiraled up to the parking; escalators along the facades suggested a crude version of the Pompidou Center's playful people-moving machines. Like the Pompidou, it echoed the theoretical fantasies of British architects like Cedric Price and the team that formed Archigram, who dreamed in the 1960s of giant mechanized buildings.

For all their bluntness, Mr. Roche's buildings can have their own kind of poetry. The faceted exterior of his One United Nations Plaza (1975), for example, is in one sense a straightforward expression of what's inside: the enormous base reflects the size of the floors needed for offices, the upper portion has the smaller floors of a hotel, while the top is designed to fit a rooftop tennis court. Yet to someone passing by on the street, the meaning of the form is elusive. Its glass surface shifts in unexpected angles as it rises, giving it a mysterious appearance, as if it had been chiseled out of a block of ice.

But the work Mr. Roche created in this period also reflected the end of something. Completed not long after the World Trade Center towers, One United Nations Plaza exudes a confidence in the future that we associate with a triumphant American century. By the time it opened, New York was going bankrupt, and later additions to the project were scaled back. The next decade would be defined not by a faith in the future but by a longing for the past: the nostalgic appeal of Philip Johnson's 1984 AT&T Building and, from the same period, Michael Graves's proposal for a monstrous pseudo-Classical addition to the Whitney Museum of American Art.

Seen from the perspective of today, with the country's infrastructure crumbling and no one, it seems, able to muster the energy to do anything about it, Mr. Roche's optimism seems like something worth revisiting.

"Kevin Roche: Architecture as Environment" runs through May 6 at the Yale School of Architecture, 180 York Street, New Haven; www.architecture.yale.edu.

http://www.nytimes.com/2011/02/23/arts/design/23roche.html?ref=design

Haiti's Scars, and Its Soul, Find Healing on Walls

By DAMIEN CAVE

Eliana Aponte for The New York Times

The Smithsonian's Stephanie Hornbeck at the Episcopal Trinity Cathedral in Port-au-Prince

PORT-AU-PRINCE, Haiti — Colorful and sad, beautiful but cracked, the three remaining murals of the Episcopal Trinity Cathedral received the soft afternoon sun after last year's earthquake only because the rest of the church had collapsed.

Haitians walking by looked heartbroken. All 14 murals had been internationally treasured. Painted in the early 1950s during an artistic renaissance here, they depicted biblical scenes from a proud, local point of view: with Jesus carrying a Haitian flag as he ascended to heaven; and a last supper that, unlike some famous depictions, does not portray Judas with darker skin than the other disciples.

"All of this was painted from a Haitian perspective," said the Rev. David César, the church's main priest and its music school director. He marveled at the image miraculously still standing: Judas, with the white beard and wavy white hair often assigned to God himself.

It was his favorite mural, he said, and now, it is being saved.

In a partnership between the Episcopal Church and the Smithsonian, all three surviving murals are being stabilized and carefully taken to a climate-controlled warehouse in Haiti where they will be protected until they can be redisplayed in a new home.

The painstaking 18-month project began in the fall, with conservators analyzing how the paintings were bound to the walls (weak mortar) and the materials that were used to paint them (egg tempera). It was clear

that they were fragile. A portion of one painting near the former altar faded to abstraction during the rainy season.

The other collapsed murals seemed to disappear. Perhaps portions were pulverized by the earthquake; perhaps some were stolen. But when conservators and Haitian art students separated the fragments from the rubble, they found only tiny pieces, usually the size of a hand or smaller, that could not be reassembled.

"We have only about 10 percent of the 11 murals that fell," said Stephanie Hornbeck, the chief conservator with the Smithsonian, whose master's degree focused on Haitian art. "When you have that little left, there's nothing you can do."

For the murals still standing, she said experts had higher hopes and immediate plans. For the past several weeks, Haitian workers in what was once the sanctuary have been carefully constructing scaffolding. A web of wooden beams now holds up tin and vinyl to protect the paintings, supporting both the art and the workers trying to carefully chisel it away.

Simply hearing hammers and seeing scaffolding — what smiles they bring here in a city where reconstruction is practically non-existent. No less soothing is the classical music — the high wail of trumpets, the smooth pull of violins — that frequently comes from behind the church, where Mr. César teaches outside. He is one of the many in Haiti who learned his first bars of music at the church's music school. "My whole identity is here," he said, and on this campus at least, reconstruction means more than architecture: a full artistic life is also being rebuilt. The effort to save the murals is a visible extension of a little-known cross-border bond. The Episcopal Church of Haiti was founded by an African-American named James Theodore Holly, who led about 2,000 black Americans to Haiti in 1861 as part of a wider emigration movement. He and his sons played prominent roles as professionals and scholars after founding "what was actually Haiti's first national church, and the first Episcopal church founded outside of the Anglophone world," said Laurent Dubois, a historian at Duke University. The eight muralists, while Haitian from their toes to the tips of their paintbrushes, also had American ties. Many trained at an academy founded by an American artist, DeWitt Peters, who came to Haiti in 1943.

Credit for the work, though, must also be shared by the Haitian bishops and priests who "gave them the liberty they needed," said Mr. César. Some of the unconventional images would later become controversial for Christians who saw links to voodoo, but for many Haitians and art historians, they represented one of this country's proudest cultural moments.

The earthquake ruined much of that. Only The Last Supper, Native Procession and The Baptism of Christ survived — and each work bears the wounds of the vicious tremor that killed 300,000 people. The paintings' winding cracks, running through legs, through torsos, and through the neck of a dark-skinned woman in the baptism scene who seems to be screaming, are violent and painful.

Ms. Hornbeck said that conservators and the church are still discussing which damaged elements must be fixed. But Mr. César, standing near the church's former entrance, said he had little doubt about whether the paintings would be fully restored, or left how they appeared after the quake. He said that instead of rebuilding the church, religious leaders are planning to create a garden for the murals, in which they can reside in nature, earthquake scars and all. He said it was the only way to remember, the only way to move on.

"We have to live with it," he said, staring at the roofless sanctuary and piles of rubble. "We have to learn how to live with it."

http://www.nytimes.com/2011/02/23/world/americas/23haiti.html?ref=design

Another Stop on a Long, Improbable Journey

By EDWARD ROTHSTEIN

PHILADELPHIA — There are times, at the Penn Museum here, when you are almost hesitant to breathe. And it has nothing to do with the recent flurry of events in which Chinese officials suddenly forbid the display of the remarkable objects in the exhibition "Secrets of the Silk Road," ultimately relenting and allowing them to be shown for just a short time. These doings (about which more later) are scarcely blinks in the history of these objects.

Most of these astonishing artifacts should have ceased to exist long ago. Exposed to breath and light, you can imagine them disintegrating into powdery mist: silk pillows and robes, thin brocades of cloth with floral patterns and rich colors, woven baskets, felt hats, a braided fried dough twist, feathers from caps and arrows. Ephemera, surely: these are not lasting things of stone, bone and gold, and the newest are at least 1,000 years old.

And speaking of ephemera, what of the bundled infant, whose light-brown hair can be seen peeking out of a blue cashmere cap? It is wrapped in a wool cloth tied with thick cords of red and blue. Two rectangular blue stones rest over its eyes, and at its side is a prehistoric nursing bottle made from a goat's bladder. The baby's age? Less than 10 months, or, reckoning from its death, 28 centuries.

In another part of this 6,000-square-foot exhibition lies the body of a woman wrapped in a wool cloak, her lavish brown hair draped to the side of her face, long lashes still framing her sunken eyes. Her skin, tinged with a white coating is eerily sensuous. That must have been a cold winter: she is still wearing fur-lined leather boots. She is in her early 40s, we are told, though that was at least 3,500 years ago. The Beauty of Xiaohe she's called, and we forgive the poetic liberty, because in her death, against all the cautionary chastisements of later centuries, even that ephemeral aesthetic property remains intact.

These artifacts and bodies have all been uncovered from under the inhospitable sands of the Tarim Basin in the far western Xinjiang Uyghur Autonomous Region of China, where the seasonal temperatures range from 40 degrees below zero Fahrenheit to 104 degrees above. Bodies seem to have been preserved not by design — the way the ancient Egyptians prepared for the afterlife — but accidentally. When buried during the winters, in tightly sealed coffins, many corpses were preserved from the indignities of decay by mineral salts and dry weather. The harshness of that environment is in sharp contrast to the almost genteel delicacy of the objects discovered there in recent decades in ancient cemeteries.

But the extremes may be in keeping with the political environment that led to recent controversies. The two mummies (on view until March 15) and the artifacts on loan from China (on view until March 28), are part of an exhibition organized by the Bowers Museum in Santa Ana, Calif., that opened there a year ago; it also traveled to the Houston Museum of Natural Science. Victor Mair, a leading scholar of these artifacts and a professor of Chinese language and literature at the University of Pennsylvania, is editor of the informative exhibition catalog and has served as a consultant, shaping the show for the Penn Museum (formally known as the University of Pennsylvania Museum of Archaeology and Anthropology).

This, the show's final stop, was to last from Feb. 5 through June 5. Special timed tickets were sold, events and lectures planned. The exhibition was expected to elevate the income and stature of this already distinguished museum.

Just days before the opening, though, the Chinese government announced that no objects could be shown at all, even though they had already been displayed in Santa Ana and Houston. No explanations were offered, and no museum official would comment. Photographs were substituted for the missing items and admission prices eliminated. One museum spokesman attributed the problem to a "miscommunication" and would not elaborate. Then, last week, negotiations led to the abbreviated schedule.

Look around and you can begin to see why these artifacts might have more than a purely anthropological or aesthetic importance. It would be foolhardy to think that they reflect a single culture. The Tarim Basin is a sixth the size of China and nearly the size of Western Europe; artifacts here range over thousands of years from multiple sites.

Moreover the exhibition's title is too narrow. The Silk Road, a network of trading routes that crossed the Basin region, was in its prime during the first millennium. These artifacts reach back to the Bronze Age. Sometime between 1800 B.C. and 1500 B.C., the Beauty of Xiahoe was buried. Would she have had any familiarity with the uncannily well-preserved pastries shown here that have a freshness date of sometime in the ninth century? A lot happens in 2,500 years.

In addition the exhibition text points out that even before the height of the Silk Road the basin was a multicultural area. Records of 28 different languages have been found there, including Tocharian, unique to the region. Buddhism was practiced (as several artifacts show); so were Zoroastrianism, Nestorian Christianity and Judaism. Conquests by Islam and by Genghis Khan's armies led to still other transformations.

One of the most remarkable sets of artifacts are the trappings of a man found at Yingpan, dating from the third to the fifth century. His mummy was too fragile to travel, but his clothes are arrayed in a coffinlike space and reflected in a tilted mirror. He was 6 feet 6 inches tall and buried with a Roman glass bowl that might have come from Syria. The pillow he rests on, we are told, shows the influence of Han Chinese culture, but his elaborately decorated clothes include images from Greek and Roman mythology. The hypothesis is that he was a Sogdian trader from the eastern region of Iran. His features do not have any affinity to those of Eastern Asia.

This is the crux of the matter, for most bodies found in this region have what are called Caucasoid features. And though many objects here are clearly associated with later Chinese traditions — like the delicate figurines of women making pottery (from the seventh to ninth centuries) — others come from cultural worlds that can still not be clearly identified.

A felt hat from the fifth to third centuries B.C. could easily be imagined atop the head of a Tarim leprechaun. (The exhibition notes that some textile patterns seem related to Celtic styles.)

The Beauty of Xiaohe mummy not only has features that seem alien to the region, but she was also buried in a style that has little connection with local traditions of later millenniums. The wooden coffins in her cemetery are shaped like overturned boats and sealed with clay and mud; women seem to have been buried with icons representing the phallus, men with icons of the vulva. (That cemetery is near a dried up riverbed, which may help account for the boatlike coffins and the ready use of wood in burial artifacts.)

As Mr. Mair points out, the basin, because of its geographic isolation and brutal climate, was one of the last areas on the planet settled by humans. It also proved, he says in the catalog, to be an "unparalleled storehouse of genetic, anthropological and cultural material of peoples who entered it from all directions at different times during the last four millenniums." Recent genetic research on DNA samples also suggests that there was far more migration of populations than was once thought in the era before the Silk Road.

The problem is that right now this is the worst possible news, given the political climate. There are hints in the catalog of problems Western scholars have confronted: incomplete skeletal remains, unreleased photographs, difficulty in conducting genetic analysis. The unexpected appearance of non-Chinese-seeming cultures and bodies in this region is being treated a bit like the way some American Indian tribes treated the 1996 discovery of Kennewick Man in Washington State, his prehistoric remains showing Caucasoid or Asian features; the tribes asserted ownership over the remains and wanted to prevent scientific analysis.

In this case the issues have ramifications in territorial claims on this oil-rich region. One museum in Xinjiang insists that the territory "has been an inalienable part of the territory of China." But in 1993 the Chinese government was concerned enough to prevent Mr. Mair from leaving China with 52 tissue samples after having authorized him to go to Xinjiang and collect them. And the region's Uighurs, a Turkic-speaking Muslim people, have hailed the discovery of these non-East Asian mummies as proof of their own historical claims. There is a separatist movement of Uighurs; there are also Chinese attempts to rein in Islam in the region.

But the DNA and cultural analysis support neither opposing claim. (Nor would it matter if they did.) In a helpful essay in the current issue of the Penn Museum's magazine Mr. Mair points out that xinjiang means "new borders." That's what were established in the region when it was conquered by the Chinese in the 19th century and what were created again, when, after an era of independence, Chinese control was reasserted in the 20th century, turning it into an "autonomous region." In the catalog Lothar von Falkenhausen, an art historian at the University of California at Los Angeles, suggests, "The present exhibition, for reasons connected with the historical situation of Xinjiang today, particularly emphasizes the Chinese cultural impact on the 'Western Regions.' " Maybe Mr. Mair's particular emphasis on cosmopolitan themes made the Chinese particularly nervous, but other visitors, can only react with something like awe at how much there is still to learn from what is buried in the sands, and what an enduring impact ephemera can have.

The artifacts are on view through March 28 at the Penn Museum, 3260 South Street, Philadelphia; (215) 898-4000, penn.museum.

http://www.nytimes.com/2011/02/21/arts/design/21silk.html?ref=design

Aerobic Exercise May Improve Memory In Seniors

by Michelle Trudeau

February 21, 2011

There's a very small structure deep in the center of our brains called the hippocampus. It's smaller than your pinkie, but it plays an absolutely essential role in learning and memory. The hippocampus encodes new information so that we can recall it later. Without a hippocampus, we would be unable to form new memories; we'd only be able to remember the old ones.

Patrick Sinkel/AFP via Getty Images

An elderly couple holds hands while walking along a Berlin street. A recent study showed that walking grows the region of the brain that archives memories.

An elderly couple holds hands while walking along a Berlin street. A recent study showed that walking grows the region of the brain that archives memories.

As part of normal aging, the hippocampus shrinks. And this shrinkage speeds up as we grow older, foreshadowing memory problems and dementias like Alzheimer's disease.

But there's been some good news in the past decade: Scientists have discovered that in certain areas of the aging brain, new cells are born and grow throughout through life. Neuroscientist Peter Snyder, a researcher at Brown University's Alpert Medical School and Rhode Island Hospital, says the hippocampus is one of those brain areas that continue to form new cells and make new connections between cells.

"What we're finding is that of all of these noninvasive ways of intervening, it is exercise that seems to have the most efficacy at this point — more so than nutritional supplements, vitamins and cognitive interventions," says Snyder, who studies what we can do to maintain memory as our brains age.

Power Of Exercise

Snyder says several studies have been published recently on the power of exercise on the aging brain.

"The literature on exercise is just tremendous," he says. "What we find is that with exercise — with aerobic exercise, a moderate amount on a regular basis — there are chemical changes that occur in the brain that promote the growth of new neurons in [the hippocampus]."

The major chemical change in the hippocampus during aerobic exercise is an increase in a brain protein called BDNF, which acts like a fertilizer during the birth of new brain cells by nourishing new connections between neurons.

Some of the most provocative evidence on the power of exercise on the brain comes from a study just published in the *Proceedings of the National Academy of Sciences* by neuroscientist Art Kramer at the University of Illinois at Urbana-Champaign. Kramer and his colleagues have documented the impact of exercise on the growth of the hippocampus in a small group of elderly people over the course of one year.

"The participants in our study were 120 very sedentary people," Kramer says.

He adds none had dementia or memory problems when they entered the study. "They were relatively healthy, but certainly 'couch potatoes' would fit as a label."

Getting Couch Potatoes Moving

One of those "couch potatoes" who volunteered for the study was Gregory Stanton, a 66-year-old semi-retired college professor. He admits to not exercising regularly but counters that he was physically quite active remodeling his home. So he refers to himself as "a semi-couch potato."

Stanton and the other 120 men and women in the study ranged from 60 to 80 years old. When they entered the study, they were randomly divided into two groups.

"One was the aerobic exercise group," Kramer says. "Those were people who walked further and faster as time went on. And the others in our control group were in a toning, stretching and light-strengthening group."

Stanton was randomly assigned to the aerobic exercise group.

"Basically, it's walking a track in one of the gym facilities," Stanton says. He and the others in the aerobic group walked the track for about 40 minutes three times a week for a year. Stanton says he averaged about 3 miles each session. After each session, he was breathing hard and had worked up a sweat, he says.

The idea was for each participant to walk fast enough to reach aerobic exercise level, Kramer explains, which is generally considered to be 70 percent of one's maximum heart rate.

Walkers Fared Better

All the participants in the study had MRI brain scans done before the study began and again a year later when the study ended. Then the researchers analyzed the MRI data.

"What we found," Kramer says, "is that individuals in the aerobic group showed increases in the volume of their hippocampus."

The increase in volume — again for the aerobic but not for the non-aerobic group — was about 2 percent.

Scientists are trying to figure out how physical and mental exercise protects the brain.

"The 2 percent increase we can think of as turning back the clock about two years," Kramer says.

The increased volume was found in the anterior, or front part, of the hippocampus. That's the area of the hippocampus that has been shown to grow as a function of exercise in several animal studies.

By comparison, "the individuals in the control group — in the toning and stretching group — lost about 1.5 percent [of their hippocampal volume]," Kramer says. "So we can think of it as about a 3.5 percent difference compared to those individuals who didn't benefit aerobically."

The results are small but suggestive. This finding shows that not only did the aerobic exercise protect against normal shrinkage, but also that new cells were added to the hippocampus. The researchers also saw a significant increase in that important brain-fertilizing chemical BDNF in the plasma of those in the aerobic exercise group — but not in the control group.

Impact On Memory

But did the growth in the hippocampus translate into improvements in memory? Both groups were given memory tests before and after the yearlong exercise program. Kramer says these tests looked specifically at a type of memory called "spatial memory," which records information about our environment, like the layout of the neighborhood or the interior of the grocery store.

At the start of the study, both the aerobic and the non-aerobic group scored similarly on the spatial memory test. But after the yearlong program, the group that did aerobic exercises had improved significantly on its spatial memory tests, bettering its own scores from a year earlier. The non-aerobic group had not improved in memory after a year of stretching, toning and lightweight lifting.

As for "semi-couch potato" Stanton, who'd been in the aerobic group, he says he didn't notice any improvement in his memory. He still has problems remembering people's names. But he did notice he had more physical stamina after the yearlong aerobic walking program.

In spite of this, Stanton says he still doesn't maintain a regular exercise regimen. He says while he knows it's good for him, he, like many of us, can't find the time. He's just too busy.

http://www.npr.org/2011/02/21/133777018/aerobic-exercise-may-improve-memory-in-seniors&sc=nl&cc=hh-20110228

The Next Impasse

By DEXTER FILKINS

THE WRONG WAR

Grit, Strategy, and the Way Out of Afghanistan

By Bing West

Illustrated. 307 pp. Random House. $28.

Tyler Hicks/The New York Times

A security checkpoint at the edge of Marja, Afghanistan, May 2010.

In the nine years since the first American troops landed in Afghanistan, a new kind of religion has sprung up, one that promises success for the Americans even as the war they have been fighting has veered dangerously close to defeat. Follow the religion's tenets, give yourself over to it and the new faith will reward you with riches and fruits.

The new religion, of course, is counterinsurgency, or in the military's jargon, COIN. The doctrine of counterinsurgency upends the military's most basic notion of itself, as a group of warriors whose main task is

to destroy its enemies. Under COIN, victory will be achieved first and foremost by protecting the local population and thereby rendering the insurgents irrelevant. Killing is a secondary pursuit. The main business of American soldiers is now building economies and political systems. Kill if you must, but only if you must.

The showcase for COIN came in Iraq, where after years of trying to kill and capture their way to victory, the Americans finally turned the tide by befriending the locals and striking peace deals with a vast array of insurgents. In 2007 and 2008, violence dropped dramatically. The relative stability in Iraq has allowed Americans to come home. As a result, counterinsurgency has become the American military's new creed, the antidote not just in Iraq but Afghanistan too. At the military's urging, President Obama has become a convert, ordering thousands of extra young men and women to that country, in the hopes of saving an endeavor that was beginning to look doomed. No one in the Obama administration uses the phrase "nation-building," but that is, of course, precisely what they are trying to do — or some lesser version of it. Protect the Afghan people, build schools and hold elections. And the insurgents will wither away.

So what's wrong? Why hasn't the new faith in Afghanistan delivered the success it promises? In his remarkable book, "The Wrong War," Bing West goes a long way to answering that question. "The Wrong War" amounts to a crushing and seemingly irrefutable critique of the American plan in Afghanistan. It should be read by anyone who wants to understand why the war there is so hard.

The strength of West's book is the legwork he's done. Most accounts of America's wars, particularly those by former military officers, are written in the comfort of an office in the United States. Not so here. At age 70, West, the author of several books on America's wars, went to Afghanistan and into the bases and out on patrols with the grunts, waded through the canals, ran through firefights and humped up the mountains. (At one point he contracted cholera and was evacuated by helicopter.) Embedding with American troops in God-forsaken places like Kunar and Helmand Provinces is hard business. What drives this man? West is worth a book in himself.

But the legwork pays off. West shows in the most granular, detailed way how and why America's counterinsurgency in Afghanistan is failing. And, in the places where the effort is showing promise, he demonstrates why we don't have the resources to duplicate that success on a wider scale. Mind you, West is no antiwar lefty: he's a former infantry officer who fought in Vietnam. An assistant secretary of defense in the Reagan administration, he admires — nay, adores — America's fighting men and women, and he wants the United States to succeed. But the facts on the ground, it appears, lead him to darker truths.

West joined American troops in Garmsir, Marja and Nawa in Helmand Province; Barge Matal in Nuristan; and the Korengal Valley in Kunar — all in the heart of the fight. His basic argument can be summed up like this: American soldiers and Marines are very good at counterinsurgency, and they are breaking their hearts, and losing their lives, doing it so hard. But the central premise of counterinsurgency doctrine holds that if the Americans sacrifice on behalf of the Afghan government, then the Afghan people will risk their lives for that same government in return. They will fight the Taliban, finger the informants hiding among them and transform themselves into authentic leaders who spurn death and temptation.

This isn't happening. What we have created instead, West shows, is a vast culture of dependency: Americans are fighting and dying, while the Afghans by and large stand by and do nothing to help them. Afghanistan's leaders, from the presidential palace in Kabul to the river valleys in the Pashtun heartland, are enriching themselves, often criminally, on America's largesse. The Taliban, whatever else they do, fight hard and for very little reward. American soldiers, handcuffed by strict rules of engagement, have surrendered the initiative to their enemies. Most important, the Afghan people, though almost certainly opposed to a Taliban redux, are equally wary of both the Americans and their Afghan "leaders." They will happily take the riches lavished on them by the Americans, but they will not risk their lives for either the Americans or their own government. The Afghans are waiting to see who prevails, but prevailing is impossible without their help.

Time after time, West shows the theory of counterinsurgency scraping up against the hard and jagged ground of the real Afghanistan. In one instance, he examines the work of a group of American soldiers and civilians, known as a provincial reconstruction team, whose job was to provide development assistance to Afghan locals in Asadabad (A-Bad to the Americans) in eastern Afghanistan. It was overseen by a battalion known as the 1-32 and commanded by a lieutenant colonel named Mark O'Donnell. In June 2009, after the reconstruction team had been working there for three years, an American supply truck blew a tire on the main road. A crowd of Afghans gathered, and then suddenly a grenade exploded, killing and maiming several Afghans. A riot ensued. "Kill the Americans!" the Afghans shouted. "Protect Islam!" Only later did a videotape of the incident show clearly that an Afghan had tossed the grenade.

About this, West writes:

"For three years, the provincial reconstruction team had lived in a compound a few blocks from the scene of the tragedy. The P.R.T. had paid over $10 million to hire locals, who smiled in appreciation. Every time a platoon from 1-32 patrolled through town, they stopped to chat with storekeepers and to buy trinkets and candy to give to the street urchins. Yet the locals had turned on the soldiers in an instant. That the townspeople in A-Bad who profited from American protection and projects would believe the worst of O'Donnell's soldiers — whom they knew personally — suggested that the Americans were tolerated but not supported, regardless of their good works and money."

West's book is coming out just as the American military, fortified by the extra troops, is claiming to be making significant progress in routing the Taliban from their strongholds in the south. This may be true, but remember who is doing most of the hard work: the Americans, not the Afghans themselves. It's still an American war.

The subtitle of West's book promises a "way out," but it's a little thin on exit strategies. His solution, tacked on to the final pages of the book, is to transform the American mission to one almost entirely dedicated to training and advising the Afghan security forces. Let the Afghans fight. "Our mistake in Afghanistan was to do the work of others for 10 years, expecting reciprocity across a cultural and religious divide."

West is not the first to advocate such a course. But it's not that simple, as he well knows. Nothing in Afghanistan is. Nine years of training and investment have created an Afghan Army fraught with the same corruption and lack of cohesion as the rest of the country. As it is, the Americans are now pouring more resources into the Afghan security forces than ever before. At best, the Afghans are years away from taking over the bulk of the fighting. And even that is a very fragile hope.

Until then, what? As "The Wrong War" shows so well, the Americans will spend more money and more lives trying to transform Afghanistan, and their soldiers will sacrifice themselves trying to succeed. But nothing short of a miracle will give them much in return.

Dexter Filkins is a staff writer for The New Yorker.

http://www.nytimes.com/2011/02/27/books/review/Filkins-t.html?_r=1&nl=books&emc=booksupdateema1

Seniors Can Still Bulk Up On Muscle By Pressing Iron

by Patti Neighmond

February 21, 2011

Jason Millstein for NPR

Sandy Palais, 73, of Arizona started lifting weights about 10 years ago after she was diagnosed with osteoporosis.

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February 21, 2011

As we age, our muscle mass decreases at surprising rates. According to Dr. David Heber, director of UCLA's Center for Human Nutrition, an average male who weights 180 pounds might after age 60 lose as much as 10 pounds of muscle mass over a decade.

But can we turn that around?

Heber says absolutely.

In fact, new research published in the journal *Medicine & Science In Sports & Exercise* finds older adults who begin lifting weights after 50 may win the battle against age-related muscle loss.

Jason Millstein for NPR

Palais started weight training to build bone mass. But she built muscle mass as well.

Palais started weight training to build bone mass. But she built muscle mass as well.

"You have to do what we call resistance exercise," Heber says. This can take a lot of different forms. "It could be lifting weights, it could be stretchy bands, but the key is you have to stretch a muscle."

When you stretch a muscle to the point of straining it, as is the goal during weight lifting, you set in motion the body's natural muscle-building response. The muscle has to adapt to the damage and build itself up to be prepared for the next weightlifting assault. In this way, muscles build fiber and actually increase in size.

Success Story

Take the success story of 73-year-old Sandy Palais of Tempe, Ariz., who does resistance training six days a week for about an hour each day. Palais started lifting weights about 10 years ago, shortly after she was diagnosed with osteoporosis. Weight training builds both muscle and bone mass.

Palais started going to the gym three days a week. It didn't cost much, and student trainers were there to help. Within a year, she was able to compete in the local senior Olympics.

"My top score was 380 pounds: I squatted 135; I benched 80; and I deadlifted 165," she says, laughing.

Now Palais has a drawer full of silver and gold medals.

"I feel strong," says Palais, who was able to compete in the local senior Olympics.

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Reversing Mindset

Exercise physiologist and researcher Mark Peterson first met Palais when he was a student trainer at Arizona State University. Now, Peterson works at the University of Michigan where he authored the new research published in *Medicine & Science In Sports & Exercise* that looked at whether older people can reverse the process of muscle loss.

"The time in which we say that older adults can't do more exercise is long gone," he says.

In Peterson's analysis of 39 studies, he found that among more than 1,300 adults over the age of 50, muscle mass could be increased by an average of nearly 2.5 pounds in just five months.

Not only did that reverse any age-related muscle loss, it actually built lots of new muscle. Related research found the greater the intensity of weight-lifting programs, the more dramatic the outcomes. Adults who lifted the most weight boosted their upper and lower body strength by nearly a third.

Jason Millstein for NPR

Applying The Research

Muscle strength and balance help prevent falls, one of the most common reasons seniors end up in the hospital. For sedentary adults who resolve to take up weight lifting, Peterson suggests starting slowly. You could actually begin by simply getting in and out of a chair. He says the ability to stand up out of a chair is much compromised after the age of 65 if people don't take part in resistance training. So, using one's own body mass as a dead weight is a "reasonable way to start."

Repeat that at least 10 times. Then, add repetitions and weights like small barbells as you become comfortable with the exercise. Increases of 5 pounds per weight are reasonable after mastering the lift, says Peterson.

And, after exercising, don't forget to eat, adds Heber. If you don't, muscles could actually get beaten down and not have the building blocks to get bigger and stronger. Protein is essential, Heber says, adding that your best bets are chicken, fish, soy, beans and nuts like pistachios, walnuts and almonds.

Palais says she thinks the extra effort she exerts is worth it.

"I feel strong," she says. "I can lift the bags of groceries without too much sweat."

http://www.npr.org/2011/02/21/133776800/seniors-can-still-bulk-up-on-muscle-by-pressing-iron&sc=nl&cc=hh-20110228

Centennial Celebration for a Special Collection

By TAMMY LA GORCE

courtesy of Newark Museum

DEITY A statue of Ushnishavijaya from the Newark Museum.

KATHERINE ANNE PAUL, curator of the Newark Museum's Arts of Asia collection, says that when she travels the world researching Tibetan art, "I see more about the Newark Museum than any other institution."

The museum was the first in the world to display an exhibition dedicated solely to Tibetan art, in 1911, Dr. Paul said. She is the curator of "Tibet Collection Centennial," a nine-month celebration of the museum's more than 5,000 Tibetan artworks, scheduled to open on March 5 and run until December.

Programs, workshops and special events are in the works. The most special of the events, arguably, will be a visit by the Dalai Lama when he is in the city for the Newark Peace Education Summit, which runs from May 13 through May 15. He will stop by the museum for an invitation-only talk. Dr. Paul said, "This will be his fourth visit to us at the museum, and we're very lucky, because he is the most amazing, charismatic speaker."

The museum has five galleries permanently dedicated to the display of Tibetan art, which are being reinstalled for the centennial over the next two months. Objects on display include sculptures of longevity deities and

prayer stones. All five galleries are arranged around a Tibetan altar, parts of which have been in the museum's possession since 1935, and which the Dalai Lama consecrated in 1990.

Also opening on March 5 — the date coincides with the Tibetan New Year festival of Losar — is a temporary exhibition called "Tsongkhapa — The Life of a Tibetan Visionary."

It is a complete set of 15 paintings newly conserved, thanks to a National Endowment for the Arts Masterpiece grant, and it is one of only three known complete sets worldwide, Dr. Paul said. The paintings, part of the museum's founding collection, date from the 18th century and illustrate the biography of Tsongkhapa (1357 to 1419), founder of the Gelug religious order of Tibetan Buddhism, whose most renowned member is the Dalai Lama.

Before the centennial celebration closes in December, the museum will host three Tibetan art lectures, a fall art course called "Teachings of Tibet" and a Tibetan bazaar running from May 8 to May 15.

At the bazaar, visitors will be able to buy rugs, furniture, prayer wheels, jewelry, Tibetan music and incense from vendors. "We're doing it to overlap with the visit" from the Dalai Lama, Dr. Paul said. "We want him to feel right at home."

The Newark Museum, 49 Washington Street, Newark, is open Wednesdays through Sundays, noon to 5 p.m. (973) 596-6550 or newarkmuseum.org.

http://www.nytimes.com/2011/02/27/nyregion/27spotnj.html?ref=design

Why We Gain Weight As We Age

by Patti Neighmond

February 22, 2010

Al Bello/Getty Images

As we age, our muscles deteriorate, and they don't repair as quickly as they used to. But the good news is that exercise and weightlifting can still make muscles stronger.

text size A A A
February 22, 2010

It's a pretty common lament, the idea that you just can't eat what you used to. But why is that so? And is it avoidable? There are a number of reasons why we put on the pounds as years go by, but take heart: There are ways to fight back — and win!

There are some particular biological changes that happen as we age. For one, aging muscles actually contribute to the increase in the amount of fat we store in our bodies, says Cheryl Phillips, president of the American Geriatrics Society.

"So, if you look at a woman who is 70 years old and compare her to what her body was like at 25 years of age, even though her weight may be exactly the same, she had more percentage of muscle in her body when she was 25 than she does when she's 70."

Our Aging Muscles

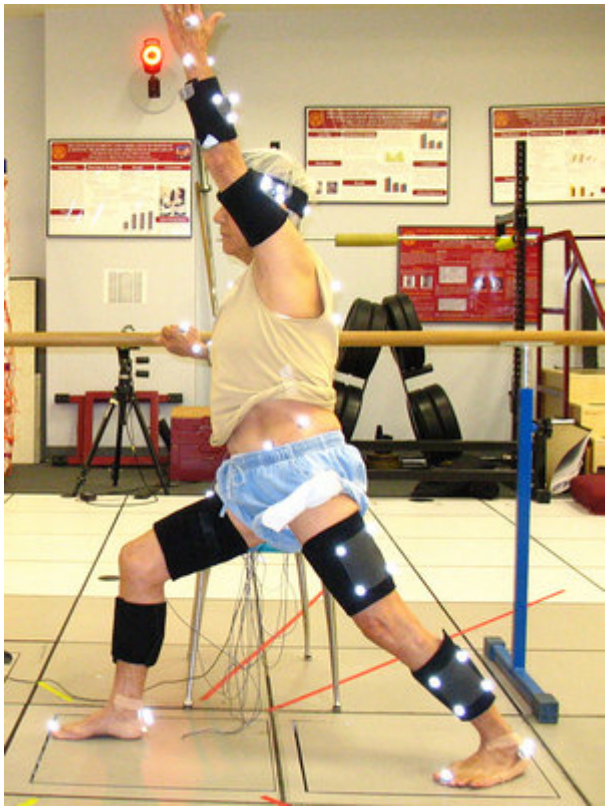
In large part, that's because we lose muscle cells as we age. When younger muscle cells get damaged, they're quickly repaired. That's not the case with older muscles, according to UCLA researcher and geriatrician

Jonathan Wanagat. He says we don't know why muscles literally shrink as we age. But there are a number of theories.

"I think one of the ones that have become increasingly interesting and popular is the idea that the stem cells in the muscle are not able to respond to damage or to aging the way they did when we were younger," says Wanagat. And if damaged muscle cells aren't repaired, they sort of whittle away and die, he says. Decreases in growth hormone, testosterone and estrogen levels may also account for the loss of muscle fiber and the inability of tissue to replenish itself.

In addition, the muscle cells we're left with are sort of worn out, according to Phillips. "If you think of muscles as being the energy powerhouse of our body, that's where most of our calories are burned. And when we talk about metabolism, what we're really talking about is how efficiently those powerhouse cells — the muscle cells of our body — burn the energy we bring in."

Energy is delivered to the body in the form of calories. And if you keep your caloric intake exactly the same as you get older, says Phillips, those unburned calories end up as fat.



Musculoskeletal Biomechanics Research Laboratory at USC

Researchers test older adults in different yoga positions to determine how each pose stresses muscles and joints — to maximize strength-building and minimize risk of injury. The markers on the subject help the researchers create a musculoskeletal model of the poses.

Researchers test older adults in different yoga positions to determine how each pose stresses muscles and joints — to maximize strength-building and minimize risk of injury. The markers on the subject help the researchers create a musculoskeletal model of the poses.

Its sort of a one-two punch, says Wanagat. The energy powerhouse cells in muscles get damaged with age. That damage accumulates over time and, on top of that, the body's ability to repair that damage also dwindles with aging.

Building Strength At Any Age

And that's where exercise comes in. Wanagat says countless studies have shown that exercise — even among individuals in their 80s — works. It actually helps the muscle cells get bigger. And beyond size, it makes the muscles stronger.

"We aren't sure exactly how exercise makes muscles stronger, but we know that when we measure the grip strength of the hands or feet, grip is strongest just after exercise, even among people in their 80s and 90s. So weightlifting at any age offers low risk and great benefit, says Wanagat.

At UCLA, geriatrician and researcher Gail Greendale has just begun a second yoga study with seniors to try to figure out what poses work best for the older body. Greendale wants to understand how each yoga pose stresses muscles and joints. Then, she hopes to figure out how to modify the poses for the older body in order to maximize strength-building and minimize injury.

In addition, Greendale says that as we age the immune system can get out of whack, turning on an inflammatory response when there are no bacteria or viruses to kill, and keeping it on long after the body's invaders have left. Such an inappropriate inflammatory response can actually damage one's own cells in whatever part of the body the inflammation occurs, whether it's in muscles, joints or organs.

Ensuring such muscle and joint strength can also help fight this and other unfortunate aspects of aging, arthritis and inflammation. People over 75 are likely to have chronic joint problems, says Greendale. The joints are less able to tolerate the strain and stress of movement; they can be painful and swollen. Building joint and muscle strength can defend against that.

http://www.npr.org/templates/story/story.php?storyId=123887823

Authorship or Translation? Notes Toward Redefining Creativity

By KAREN ROSENBERG

Whitney Museum of American Art,

"Drawn From Photography," at the Drawing Center in SoHo, is all about the vulnerability of movements, some aesthetic, others political. It's a narrow slice of drawing today, encompassing a mere 13 artists, but it feels right for our moment of global trepidation.

In formal terms it might be seen as a coda to the Museum of Modern Art's recent show "On Line: Drawing Through the Twentieth Century." The drawings at MoMA leapt from the plane into three-dimensional space, but the 21st-century works at the Drawing Center aren't so liberated. They cling to the page and adhere, often rigidly, to various photographic sources.

For the most part those sources document wars, riots, protests and other scenes of social unrest: historical and contemporary, fleeting and continuing, effective and not. These photo-based media — generally photographs, but sometimes text-heavy posters or newspaper pages — are meticulously recreated in pen, pencil and watercolor.

The work is methodical and labor intensive, and may strike some viewers as pointless or redundant. As the show's curator, Claire Gilman, writes in the catalog, "This is drawing reduced to its most basic application, a kind of anybody-can-do-it approach that is high on effort but not necessarily on imagination, which raises the question of why spend the time at all?"

That's a rhetorical question of course, and she goes on to answer it: "Or is there perhaps some value in the time spent, as if careful attention to other people's achievements is itself a form of commitment, one that might redefine the nature of creative expression and drawing's role in it?"

Her essay, not incidentally, is reproduced from a hand-lettered version by the artist Serkan Ozkaya. The shaky words can be difficult to read, but that difficulty cleverly reinforces the show's thesis.

Drawing, as defined here, isn't authorship. It's translation. And it's not mechanical translation, as in, say, Warhol's silk-screened photographs of riots, but a recognizably human kind, as in Frank Selby's hand-drawn copies of similar images. Mr. Selby pays special attention to the technical glitches of the images he's working with, the scratches and overexposures, and he also sometimes uses mediums, for instance blue watercolor on Mylar, that make precision difficult.

D-L Alvarez does something just as transformative, drawing from computerized images of Manson family members and Black Panthers that break down, upon magnification, into pixelated grids. His delicately shaded graphite rectangles make faces and slogans appear unresolved and illegible.

Andrea Bowers goes further, drawing select figures from photographs of activist groups practicing nonviolent resistance. She floats the bodies on large sheets of white paper, divorcing gesture from context (or, maybe, asking whether it's possible to do so).

Curiously, the show doesn't differentiate between artists who use found images and those who work from their own snapshots. Ewan Gibbs takes "tourist" photographs of New York, from the vantage point of the Empire State Building, and then renders them on graph paper using tiny triangles, circles and other notations from knitting pattern books. And Richard Forster draws from his own photographs, taken from a moving train, of an English steel plant that had been slated for closing. In both cases drawing becomes a way to rationalize a sentimental image.

For other artists it's a way to take back control of a picture that has been released, voluntarily or not, to the Internet. Paul Sietsema's mesmerizing pen-and-ink self-portrait is based on a photograph that he found during an episode of self-Googling. It had been taken by Hedi Slimane for a feature about the Los Angeles art scene but lived on as part of Mr. Slimane's Fashion Diary; with his drawing Mr. Sietsema reclaims his own visage from the fashion designer's archive.

And though it looks like a newspaper page, Karl Haendel's "Birthday Drawing" is also a kind of self-portrait, a rendering of the front page of the Soviet newspaper Pravda from July 1, 1976, the day he was born. The show could have used more work from Mr. Haendel, whose installations of photo-based drawings make technical discipline look like a radical choice.

While "Birthday Drawing" looks back to a specific date, two other projects in the show are continuing. In her diaristic series "Currency" Mary Temple makes a kind of graph or matrix from portrait heads of world leaders in the news. She assigns them to high or low spots on the page based on her feelings about that person on that particular day. It's drawing as Twitter post, an in-the-moment thing; weekly updates will help to keep it fresh, though it's doubtful that viewers will find anything contentious in Ms. Temple's placement of, say, Col. Muammar el-Qaddafi.

More poignantly Emily Prince has been making small portraits of all of the American servicemen and women who have died in Iraq and Afghanistan since 2004: 5,720 in all, as of Dec. 31, 2010.

Here she is showing more than 500 drawings dating back to the beginning of last year, pinned to the wall in the form of a large United States map, and will add to them as new casualties are reported.

The drawings are fairly crude, based only on images from the Web site Military City, and Ms. Prince's use of five shades of paper to approximate different skin tones is a well-intentioned gaffe. But she is performing an important function: paying "careful attention to the achievements of others," in Ms. Gilman's words, the kind of attention that's hard to sustain in more current forms of media.

As the fiction writer Lynne Tillman, another catalog essayist, reflects: "I see a hand moving on paper, erasing a line, doing it again. It's so human."

"Drawn From Photography" continues through March 31 at the Drawing Center, 35 Wooster Street, SoHo; (212) 219-2166, drawingcenter.org.

http://www.nytimes.com/2011/02/25/arts/design/25drawn.html?ref=design

A Burgeoning Film Career Built on Random Encounters

By KEN JOHNSON

Leslie Tonkonow Artworks + Projects

Laurel Nakadate filmed her own contortions alongside a stranger she met on the street for "Exorcism in January," one of her short video works

Laurel Nakadate might be on the cusp of a great new career. She is known for disconcerting, sexually provocative short videos, but in the last three years she has made two feature-length narrative films, the more recent of which heralds the dawn of a distinctive cinematic vision.

Both movies, shot on video, are included in "Only the Lonely," an enthralling survey of her career to date at MoMA P.S. 1 in Queens. Everything Ms. Nakadate (pronounced nah-ka-da-TAY) has done during her decade-long career is discomfiting, and willfully so. Some will call her a narcissist, an opinion not dispelled by a display of 365 large color photographs of herself crying — one for every day of 2010 — in most cases stripped down to her underwear or less. Since she is a fit and attractive woman in her mid-30s who has an M.F.A. from Yale and is now enjoying this retrospective, you might wonder what she has to be so lachrymose about.

A more sympathetic view is that she has been tapping into a river of grief and loneliness running under the surface of American life.

Ms. Nakadate's eureka moment happened when she decided that rather than brush off the attention of unknown men, she would engage with some of the least appealing specimens: balding, overweight, badly dressed, pathetic solitaries in their 40s, 50s and 60s. In response to their advances, she would propose to go home with them if they would collaborate with her in making an art video.

One man, an artist, suggested that she pose for him for life drawing. “Lessons 1 - 10” (2001) shows her in sexy underwear, in a girl’s private-school uniform and in nothing but panties and roller skates as he sketches her in charcoal. In “Exorcism in January” (2009), she kneels and writhes on the floor as if possessed by Satan, while a man on a slumping sofa with a cane and a big belly chants, “Go away bad spirits, leave her alone, she’s a good girl, she isn’t bothering anybody.”

The videos in “Only the Lonely,” organized by Klaus Biesenbach, MoMA P.S. 1’s director, are fascinating and excruciating. A multitude of questions and doubts arises. Is she exploiting, teasing and ridiculing these poor, seemingly harmless fellows out of some misguided feminist rage? Is she putting herself in danger? Is she perverted or crazy?

Yet there is something oddly tender about these scenes, too. The men seem not only willing but also happy to participate; she seems to like them. What happens after she completes a video shoot, we don’t know. Perhaps she leaves her subjects with memories they will treasure until their last days. Maybe she leaves them more lonely than ever. If these videos were literary short stories, they would resemble those of Mary Gaitskill.

One of Ms. Nakadate’s greatest strengths is her uncanny ability to connect intimately with other people and get them to do what she wants. She could be a serial seducer, a con artist or what she has become, a movie director. Working behind the camera with amateur actors in “Good Morning Sunshine” (2009), she makes seduction itself a disquieting subject. In each of three five-minute vignettes, the camera’s point of view takes us into a bedroom and to a teenage girl asleep in her bed. As the subject awakes and emerges from her covers, we hear Ms. Nakadate’s wheedling voice:

“Good morning, Sunshine. Time to get up. You’re so pretty, you’re such a pretty girl, you know you’re the prettiest girl? Show me your feet. What’s under your shirt?” and so on. By the end of each segment, she has the young woman down to her underwear, looking self-consciously flattered, putty in an emotional predator’s hands. It is all staged, of course, but the seduction — in multiple senses — of both us viewers and the girl has a wonderfully, creepily real feeling.

What is it like to be a pretty girl? To possess an almost magical power of attraction and yet know so little about how the world really works? In Ms. Nakadate’s first two feature-length movies (each about 90 minutes), it feels as if we were getting as close to the elusive, naked truth as a film can get.

Each has the lingering pace and visual beauty of a Jim Jarmusch movie. “Stay the Same Never Change” (2009) follows three suburban teenagers, one of whom fabricates a life-size dummy of a man for her lover. There is a kidnapper in a car, an abduction and a possible sexual assault and murder of a girl by a group of men. The girls drift here and there, seemingly cocooned in their own heads, and all events remain inconclusive, as if they were pieces of dreams.

In “The Wolf Knife” (2010), Ms. Nakadate focuses on a pair of teenage friends in Florida, one aggressive, the other passive. They talk randomly, groom each other, sneak in for a swim in an unknown person’s pool and run away from home to Nashville, where the more active girl hopes to find her lost father. He turns out to be a pedophiliac former third-grade teacher. Her meeting with him, which leads to a kind of rape, is terrifically harrowing.

While the plot arcs to a desolating yet satisfyingly melodramatic finish, Ms. Nakadate tracks her characters’ chastely erotic, best-friend love with exquisite, heartaching care. Laurel Nakadate, “Only the Lonely,” is on view through Aug. 8 at MoMA P.S. 1, 22-25 Jackson Avenue, Long Island City, Queens; (718) 784-2084, momaps1.org.

http://www.nytimes.com/2011/02/25/arts/design/25nakadate.html?ref=design

Supercolossal Street Art

By GABY WOOD

JR/Agence VU

SHANGHAI In "The Wrinkles of the City," photos of elders were used to represent the past

In a Paris suburb in October 2005, two teenagers of African descent were running away from the police and tried to hide inside a power substation. They were electrocuted instantly. The violence that broke out in protest of police harassment soon spread to neighboring communities and eventually to housing projects across the whole of France. When the media came to document the events in Clichy-sous-Bois, they were met with an additional, unexpected kind of confrontation: behind one of the countless cars in flames was a black-and-white photograph that was pasted onto the side of an apartment building some time before and took up its entire width. From its center, surrounded by a group of boys striking aggressive poses, a black man several times larger than life stared out, pointing with what appeared at first to be a shotgun. On closer inspection, it was a video camera. Get out, he seemed to be saying, we're recording this too, and we'll tell the story the way we see it.

In the bottom right-hand corner of the poster was a label, too sophisticated to be a graffiti artist's tag but something along those lines: a Japanese-like calligraphic symbol concocted from the letters "J" and "R" above a Web address. Suddenly, amid all the fear and long-bred loathing, questions were being asked about this strange work of art. How did it come to be there? Who was, as one newspaper asked, "this kamikaze image-maker," JR?

More than five years have passed; he has pasted similar portraits all over the world, and the public still doesn't know the artist's full name. He insists on JR — his real initials. He used to refer to himself as a photograffeur, which puts him somewhere between a photographer and a graffiti artist. His M.O. is to show up in a shantytown in Kenya or a favela in Brazil, a place where some event has been noted in the media and captured his attention, and turn it inside out, photographing the residents, then wrapping their buildings with the results, on a scale so vast that you can see their eyes from the sky. Often he has worked at night, and as soon as he's done, he disappears; so when the installation becomes front-page news, there is no one left to explain it but the people whose voices had not been previously heard. As a woman from Kibera, a neighborhood in Nairobi, puts it in "Women Are Heroes," a documentary recently released in France that JR made about his work: "Photos can't change the environment. But if people see me there, they'll ask me: 'Who are you? Where do you come from?' And then I'm proud."

I first met JR one afternoon late last November in his studio in Paris. The nearest Metro station is named after Alexandre Dumas, and there's something "Three Musketeers"-ish about the team inside too: JR; one right-hand man, Emile Abinal; and the other, their "philosopher and guru," Marco Berrebi, were winding down from a poster-pasting trip to Shanghai and preparing for a press conference about the positive aftereffects of their portraits in the Middle East. They never really had people in the studio before, and there was some cleaning up to do — for one thing, a yellow Kawasaki motorcycle was parked right in the middle of it. Hanging on a far wall, hidden between large-scale photographs of JR's installations, was a small trophy cabinet containing two battered broom brushes, a squeegee and a box of powdered glue. "We kneel down and pray in front of that every day," JR said.

We sat in a corner to talk about the TED Prize, which he won a month earlier. Every year since 2005, the New York-based TED organization has awarded $100,000 to prominent figures like Bono and Bill Clinton and Jamie Oliver who are expected to use the money to fulfill "one wish to change the world." Now 28 years old, JR is the prize's youngest winner.

"I don't even know how they knew my work," he said, still flush from the news. "What I love about the TED is that it's not, Hey, take this check and enjoy. It's, Do something with this, and we'll help you. I think that's the most beautiful prize I've ever heard of." Until JR announces his plans this week at the TED conference, the contours of his next project are secret, but it's likely to resemble his earlier actions, as he calls them; only this time, he says, it will be bigger.

The specifics of his actions are as various as the settings in which they take place. When JR and his team show up, they "don't know if it will happen — you have to go there and write the story as you go," he says. In Brazil, he had pictures up in less than a month; in Kenya, he had to take the photos, return to Paris to have them printed, then return to Kenya to paste them up. Pasting can take between 8 and 12 days and involve a crew of as many as 10 friends who have worked with JR for years.

Sometimes he has permission; sometimes he doesn't. In 2009 the mayor of the fourth Arrondissement in Paris authorized JR to take over the Île Saint-Louis — something that hadn't been done since Christo wrapped the Pont-Neuf 25 years earlier — but permission was all he had. He financed the action himself. A hundred or so volunteers, drawn to the site by word of mouth or friendship or happenstance as they walked by, helped by passing strips of paper from scaffolding ledge to ledge, cutting out and pasting 2,500 feet of posters on the walls leading down to the Seine.

The Middle East was the site of his biggest illegal exhibition in 2007. At four Israeli and four Palestinian sites, JR pasted pairs of portraits, of Israelis and Palestinians who held the same jobs. The locals held impromptu discussions about why their presumed enemies were decorating their walls; a bespoke-travel agent was inspired by JR to create tours that took in both sides. "Part of the work is the conversation that follows," JR told me.

A sort of conversation was prompted by his work in Kenya, too, where people take their roof portraits with them when they move. “In Kenya, when we finished doing the first roofs,” JR told me, “a neighbor said: ‘Why stop there? Why are you doing that roof and not mine?’ ” He smiled as he considered the fine-art answer. “You can’t say, ‘That’s what the graphic work dictates.’ You have to say, ‘I’ll come back.’ And so there’s a social continuation of the artistic project.”

If you saw JR’s portraits of ghetto kids from Clichy pasted onto walls in the posher neighborhoods of Paris in the mid-2000s, you would have been forgiven for thinking they were somehow connected to Nike. (Indeed, the scale and the idiom of his images still share so much with the world of publicity that they prompt the question: What’s being advertised?) So it is perhaps inevitable that he should have been approached by some major brands. He has turned them down every time, whether the offer was to finance his work or to donate money to his subjects or to collaborate on a pair of sneakers.

“It’s something to think about,” he said when we spoke at the studio. “I’m not averse to working with brands, but it has to make as much sense for the people as it does for me as an artist and for the brand, and I haven’t found that equation yet. So I prefer to take small steps.

“I’ll give you an example,” he went on. A sporting-goods company inquired about building a soccer field in the Providencia, the oldest favela in Brazil. “And they were going to do a whole big thing, bringing in the national team to play with the kids and staging tournaments there. I thought: O.K., they already have a soccer pitch. It’s not the most beautiful soccer pitch in the world, but they have one. And the idea of bringing in the big sports stars — even journalists have to come in to the favela in armored cars; they could walk up there, but their jobs dictate that they need an armored car — so imagine the athletes’ arriving accompanied by a whole army of security, while three poor kids in T-shirts are trying to play soccer on their pretty new pitch. . . . I just thought, Instead of doing some good, we’re going to create a monster. So in the end I said, ‘Actually, no.’ ”

His resistance to such things has presented the people at TED with “a challenge we’re trying to work through together,” in the words of Amy Novogratz, the prize director.

The TED community comprises some of the wealthiest names in Silicon Valley and Hollywood and elsewhere, and its renowned conferences are sponsored by the likes of Coca-Cola, Goldman Sachs, Levi’s and Rolex. But because JR has insisted that there be no corporate backing, Novogratz is planning to ask people to “step up anonymously or as individuals.” She adds, “It’s exciting but frustrating.” They are working on what Novogratz calls “the preproduction of his wish.” She also predicts that it will go on for some time, noting, “It takes a lot longer than a year to change the world.”

JR’s style is a little bit Belmondo, a little bit Buddy Holly — the glasses are Perspex — and he speaks in the enthusiastic slang of a hip, young Parisian. “*C’était ouf!*” is how he often describes some exciting or exceptional event — the punched-in-the-gut exhalation of that last word standing in for anything more precise. “Nickel,” short for “nickel-chrome,” is applied liberally to mean “great.”

“I grew up in the suburbs,” JR says, “a calm suburb, without tension, with working-class and middle-class people mixed together.” He won’t say where or say anything about his parents. His request for anonymity is quite specific: he explains that when posing for photographs, he wears shades; though many people know his real name, including those he has photographed (and the police in countries where he has been arrested), they tend to refrain from divulging it because he wouldn’t be able to work as freely as he does if it were made public. When it is suggested that keeping his full name secret might be just a way to enhance his mystique, he says, “I’ve never considered anonymity to be an effect or a question of style.” Initially it was just a way of avoiding the fines he incurred as a graffiti artist. Now, he claims, a personality cult would go against what he is trying to do, to reveal to the world the faces of the unfamous. In other words, as he puts it, “Look at what I’m showing you and not at who I am.”

…Nevertheless, some biographical information will still trickle out. He was never very focused at school, he says, and after being expelled at 16, he moved to Paris to live with his cousins. “I was,” he says, “a turbulent child.”

If you ask him why he does what he does, he’ll tell you that he has never really asked himself that question. “I think it comes from several things,” he says. “Firstly a real curiosity about the world. When I was little, I didn’t really travel — from the suburbs to Paris was already a journey. I had a foreigner’s eye on the city, and I still enjoy that point of view. Then there’s the fact that one of the things that touches me most is injustice. I’m of mixed origins — North Africa, Eastern Europe, Spain — and this generation today, we’re all a little bit from everywhere. My parents were born abroad. I was born in France, but I feel comfortable everywhere — I don’t see the borders.”

Soon after he moved to Paris, he found a camera on the metro. It had a strong flash. He used it to document graffiti artists in the subway; then he would print those images, copy them and return to the site where they were taken in order to paste the picture. He would spray a red frame around it and write “expo2rue” (“street exhibition”). Emile Abinal, then an art student at the Louvre, discovered him this way; he was enthralled by the *mise-en-abîme* of the graffiti work. JR went back to school, studied economics, took a photography class and earned a diploma. “The paradox is that I got my baccalaureate for the very things that got me into trouble with the law,” he says with a smile. “And even now, what gets you arrested in some countries gets you an exhibition in others.”

Street art has a fairly long history of being gobbled up by the establishment. If Basquiat begat Banksy, the invisible British graffiti artist, then it’s fair to ask what comes next. Anyone who saw Banksy’s documentary, “Exit Through the Gift Shop,” which received an Academy Award nomination this year, will automatically think there’s a potential “Emperor’s New Clothes” aspect to this art. And it’s possible that no one worries about suspicions of charlatanism more than JR.

In January, I met him one night as he got off a train from the South of France, where “Women Are Heroes” had just been shown to an entire village. He moved down the platform as if on little springs and barely broke stride when I joined him at the end. As we walked from the Gare de Lyon to his apartment, he expressed anxiety about the prices of his work. Through Steve Lazarides, Banksy’s former gallerist in London, JR sells individual works — large images pasted onto wood or corrugated metal panels — for around $50,000 to $70,000. This is how he finances his actions, and he was planning to make a few new pieces to sell to those who would like to contribute to his TED project, because he wanted people to get something for their money as opposed to giving to charity. “I’m not a humanitarian,” he said.

A week earlier, however, a work of his sold at an auction of street art at Bonhams in London for four times what the collector paid for it 18 months before. This is something JR strives to avoid. “I want to sell to people who buy the work because they want to be part of the broader project,” he claimed, “and not because they want to sell the work on.” He considers Banksy’s precipitous rise to be a cautionary tale. He worries about an attendant fall and just wants the prices of his work to be steady. “I watch the market quite closely, because I don’t want to gamble with it,” he said. “I’m happy to take other risks — to put up posters where it’s illegal, to scale very tall buildings, but. . . .” When I asked what he thought might be so risky about making a lot of money, he replied: “I don’t know. It’s just a gut feeling.”

Steve Lazarides told me: “JR doesn’t want his work to be about the money. He works on a different set of morals. But once it’s in the public arena, there’s very little you can do.” Lazarides refused to be drawn into comparisons between JR and Banksy (“There are not a great deal of similarities,” he said), but he said, “The world would be a better place if it had more people like JR in it.”

Such high-mindedness does not resolve one tricky question, however. The more valuable his work becomes, the more stark the contrast between the world in which it's made and the world in which it's sold. How long can he go on without paying his subjects?

"I think paying people takes away its entire meaning," JR replied when I put the matter to him. "It would take away the soul of the project. People wouldn't do it for the same reasons."

But if he were rich, wouldn't he feel more guilt?

He laughed. "Just by virtue of being white in these places, you're rich!" he said. "Whether your father is the director-general of Renault or runs a corner shop in the sticks, to them it's all the same: you're foreign, so you're rich. They're not going to pore over your bank statements.

"What they hope for, much more than cash, is culture. They appreciate the idea of conveying a different image of themselves to the world." When we returned to the subject of the TED wish, he said he had to put a great deal of thought into it, because it came to him at a very young age. "One wish," he said, "if you could sum things up in one wish, what would it be? Something that symbolizes a single desire today. What is it I want to defend?"

"And?" I asked. "What is it?"

He took the question rhetorically. "Well, exactly," he replied.

One evening, as I was running along behind JR, wondering how his little side-to-side bounce could take him so far, so fast, he offered a mental tour of clandestine Paris, from his days as a guerrilla "graffeur." The reminiscence gave a sense of the way in which he can slip in anywhere, as well as a glimpse of the kind of panoramic gaze he takes for granted. "To change the way you see things," he told me, "is already to change things themselves."

Once he had two special keys. One led underground, to hidden tunnels and abandoned metro stations. He doesn't remember exactly how to get to them now, and even when he had the key, he had to try every locked door, Wonderland-like, until he found one that opened, but he remembers the marvel of that world and its beauty. He has thrown away that key — it was too dangerous a thing to have on your person, especially if you had a tendency to get arrested. But he still has a second key, what he calls "the key of the mailbox man," which opens up a way to the roofs. "I love the rooftops of Paris," he said, still advancing at great speed with his slight jog, "and I've been on most of them." He looked up — we were on a large boulevard in the 11th Arrondissement — and explained that he used to leave his tag on the apartment buildings he climbed. Then he showed me how to open the door to one.

"Shall we go up?" I asked. He shrugged. "Sure."

He took the wooden stairs two at a time, knocked on the door at the top to make sure no one was in, scaled the door frame in his squeaky sneakers and pulled at a panel in the ceiling. It came down, padlock and all, scattering plaster all over the floor. JR shook his head: "Usually there's a ladder." We stared at the unreachable attic space for a while then tidied the plaster into polite little piles and went back down to the street. "This line of work gets trickier every day," he said.

Gaby Wood is the literary editor at The Daily Telegraph in London.

http://www.nytimes.com/2011/02/27/magazine/27Photograffeur-t.html?src=me&ref=magazine

Willingness to Listen to Music Is Biological, Study of Gene Variants Suggests

Violinist. Our willingness to listen to music is biological trait and related to the neurobiological pathways affecting social affiliation and communication, suggests a recent Finnish study. (Credit: iStockphoto)

ScienceDaily (Feb. 28, 2011) — Our willingness to listen to music is biological trait and related to the neurobiological pathways affecting social affiliation and communication, suggests a recent Finnish study.

Music is listened to in all known cultures. Similarities between human and animal song have been detected: both contain a message, an intention that reflects innate emotional state that is interpreted correctly even among different species. In fact, several behavioral features in listening to music are closely related to attachment: lullabies are sung to infants to increase their attachment to a parent, and singing or playing music together is based on teamwork and may add group cohesion.

In the study of University of Helsinki and Sibelius-Academy, Helsinki, the biological basis of music listening was examined. Data consisted of 31 Finnish families with 437 family members. The participants of the study were 8 to 93 years old from professional or amateur musicians to participants with no music education. To dissect listening habits further, active and passive listening of music were separately defined and surveyed using a questionnaire. Active listening was defined as attentively listening to music, including attending concerts. Passive listening was defined as hearing or listening to music as background music. All participants were tested for musical aptitude using three music tests and a blood sample was taken for DNA analysis.

In the study the participants reported weekly average active listening to music of 4.6 hours and passive listening to music of 7.3 hours. It was noted that music education, high music test scores and creativity in music tended to add active music listening.

Recent genetic studies have shown familial aggregation of tone deafness, absolute pitch, musical aptitude and creative functions in music. In this study, willingness to listen to music and the level of music education varied in pedigrees.

This is one of the first studies where listening to music has been explored at molecular level, and the first study to show association between arginine vasopressin receptor 1A (*AVPR1A*) gene variants and listening to music. Previously, an association between *AVPR1A* and musical aptitude had been reported. *AVPR1A* gene is a gene that has been associated with social communication and attachment behavior in human and other species. The vasopressin homolog increases vocalization in birds and influences breeding in lizards and fishes. The results suggest biological contribution to the sound perception (here listening to music), provide a molecular evidence of sound or music's role in social communication, and are providing tools for further studies on gene-culture evolution in music.

The study belongs to the larger research project where biological basis of musical aptitude is investigated. The leader of the study is Professor Irma Järvelä from the University of Helsinki. The principal investigator is MSc Liisa Ukkola-Vuoti. The experts in statistical analyses are docent Päivi Onkamo and BSc Jaana Oikkonen from the University of Helsinki. Experts in musical aptitude are Doctor of Music Pirre Raijas and docent Kai Karma from Sibelius-Academy. The study has been published in the *Journal of Human Genetics.*

Story Source:

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

Journal Reference:

1. Liisa Ukkola-Vuoti, Jaana Oikkonen, Päivi Onkamo, Kai Karma, Pirre Raijas, Irma Järvelä. **Association of the arginine vasopressin receptor 1A (AVPR1A) haplotypes with listening to music**. *Journal of Human Genetics*, 2011; DOI: 10.1038/jhg.2011.13

http://www.sciencedaily.com/releases/2011/02/110225090844.htm

Migrating Sea Turtles Have Magnetic Sense for Longitude

A newborn caretta caretta (loggerhead) sea turtle. From the very first moments of life, hatchling loggerhead sea turtles have an arduous task. They must embark on a transoceanic migration, swimming from the Florida coast eastward to the North Atlantic and then gradually migrating over the course of several years before returning again to North American shores. (Credit: iStockphoto/Burcin Tuncer)

ScienceDaily (Feb. 28, 2011) — From the very first moments of life, hatchling loggerhead sea turtles have an arduous task. They must embark on a transoceanic migration, swimming from the Florida coast eastward to the North Atlantic and then gradually migrating over the course of several years before returning again to North American shores. Now, researchers reporting online on February 24 in *Current Biology* have figured out how the young turtles find their way.

"One of the great mysteries of animal behavior is how migratory animals can navigate in the open ocean, where there are no visual landmarks," said Kenneth Lohmann of the University of North Carolina at Chapel Hill.

"The most difficult part of open-sea navigation is determining longitude or east-west position. It took human navigators centuries to figure out how to determine longitude on their long-distance voyages," added Nathan Putman, a graduate student in Lohmann's lab and lead author of the study. "This study shows, for the first time, how an animal does this."

It appears that the turtles pick up on magnetic signatures that vary across Earth's surface in order to determine their position in space -- both east-west and north-south -- and steer themselves in the right direction. Although several species, including sea turtles, were known to rely on magnetic cues as a surrogate for latitude, the findings come as a surprise because those signals had been considered unpromising for determining east-west position.

The loggerheads' secret is that they rely not on a single feature of the magnetic field, but on a combination of two: the angle at which the magnetic field lines intersect Earth (a parameter known as inclination) and the strength of the magnetic field.

Near the Equator, the field lines are approximately parallel to Earth's surface, Putman and Lohmann explained. As one travels north from the Equator, the field lines grow progressively steeper until they reach the poles, where they are directed straight down into Earth. The magnetic field also varies in intensity, being generally strongest near the poles and weakest near the equator. Both parameters appear to vary more reliably from north to south than east to west, which had led many researchers to conclude that the magnetic field is useful only for latitudinal information.

"Although it is true that an animal capable of detecting only inclination or only intensity would have a hard time determining longitude, loggerhead sea turtles detect both magnetic parameters," Putman said. "This means that they can extract more information from the Earth's field than is initially apparent."

What had been overlooked before is that inclination and intensity vary in slightly different directions across Earth's surface, Putman added. As a result of that difference, particular oceanic regions have distinct magnetic signatures consisting of a unique combination of inclination and intensity.

The researchers made the discovery by subjecting hatchlings to magnetic fields replicating those found at two locations, both along the migratory route but at opposite ends of the Atlantic Ocean. Each location had the same latitude but different longitude. The turtles were placed in a circular water-filled arena surrounded by a computerized coil system used to control the magnetic field and tethered to an electronic tracking unit that relayed their swimming direction.

Turtles exposed to a field like one existing on the west side of the Atlantic near Puerto Rico swam to the northeast. Those exposed to a field like that on the east side of the Atlantic near the Cape Verde Islands swam to the southwest.

The findings may have important implications for the turtles, the researchers say.

"This work not only solves a long-standing mystery of animal behavior but may also be useful in sea turtle conservation," Lohmann said. "Understanding the sensory cues that turtles rely on to guide their migrations is an important part of safeguarding their environment."

The discovery may also lead to new approaches in the development of navigational technologies, the researchers added.

Story Source:

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

Journal Reference:

1. Nathan F. Putman, Courtney S. Endres, Catherine M.F. Lohmann, Kenneth J. Lohmann. **Longitude Perception and Bicoordinate Magnetic Maps in Sea Turtles**. *Current Biology*, 24 February 2011 DOI: 10.1016/j.cub.2011.01.057

http://www.sciencedaily.com/releases/2011/02/110224121855.htm

Subtle Shifts, Not Major Sweeps, Drove Human Evolution

Researchers examined the sequences of nearly 200 human genomes, and discovered new evidence arguing against selective sweeps as the dominant mode of human adaptation. (Credit: iStockphoto/Claude Dagenais)

ScienceDaily (Feb. 17, 2011) — The most popular model used by geneticists for the last 35 years to detect the footprints of human evolution may overlook more common subtle changes, a new international study finds.

Classic selective sweeps, when a beneficial genetic mutation quickly spreads through the human population, are thought to have been the primary driver of human evolution. But a new computational analysis, published in the February 18, 2011 issue of *Science*, reveals that such events may have been rare, with little influence on the history of our species.

By examining the sequences of nearly 200 human genomes, researchers led by Ryan Hernandez, PhD, assistant professor of Bioengineering and Therapeutic Sciences at the University of California at San Francisco, found new evidence arguing against selective sweeps as the dominant mode of human adaptation.

The reversal suggests that smaller changes in multiple genes may have been the primary driver of changes in human phenotypes, and that new models are needed to retrace the genetic steps of evolution.

"Our findings suggest that recent human adaptation has not taken place through the arrival and spread of single changes of large effect, but through shifts of frequency in many places of the genome," said Molly Przeworski, PhD, professor of Human Genetics and Ecology & Evolution at the University of Chicago and co-senior author of the paper. "It suggests that human adaptation, like most common human diseases, has a complex genetic architecture."

Under the classic selective sweep model, a new, advantageous gene appears and quickly spreads through the population. Because of its rapid rise, the gene becomes fixed in the genome with less variation than a gene that spread more slowly and was subject to the shuffling effects of recombination.

Geneticists have used this model to look for genetic segments surrounded by "troughs" of low variation, the theoretical footprint of a selective sweep. Applying the model has identified more than 2,000 genes -- roughly 10 percent of the human genome -- suggesting that selective sweeps were a frequent occurrence that drove the evolution of humans away from their primate ancestors.

"The selective sweep model was introduced in 1974 and has pretty much been the central model ever since," Przeworski said. "It is fair to say that it is the model behind almost every scan for selection done to date, in humans or in other organisms."

However, areas of low diversity around gene segments might also be produced by other evolutionary mechanisms. To test whether selective sweeps were the predominant cause of these troughs, a group of scientists from the University of Chicago, the University of California at San Francisco, Hebrew University of Jerusalem, and the University of Oxford used data from179 subjects in the 1000 Genomes Project, an international effort to catalogue human variation.

"This is really a groundbreaking dataset that allowed this type of analysis to be done for the very first time," Hernandez said.

The research team looked at genes with human-specific substitutions, where the nucleotide sequence is different from close primate relatives. In some cases, the new sequence switches an amino acid in the protein the gene encodes, a replacement that likely improved the protein's function. In other genes, the sequence change is "synonymous," coding for the same amino acid as before and leaving the protein's function unperturbed. Under the classic selective sweep model, genetic diversity would be lower surrounding the first group of mutations, those that produced beneficial changes in function, because of their quick spread.

But when the two groups were compared, the troughs of low diversity were similar for genes that produce functional changes and genes with synonymous substitutions that do not. The result suggests that classic selective sweeps could not have been the most common cause of these low diversity troughs, leaving the door open for other modes of evolution.

"Phenotypic variation in humans isn't as simple as we thought it would be," Hernandez said. "The idea that human adaptation might proceed by single changes at the amino acid level is quite a nice idea, and it's great that we have a few concrete examples of where that occurred, but it's too simplistic a view."

Further evidence against common selective sweeps was provided by comparing genome variation in different populations. Because Nigerian, European, and Chinese/Japanese populations separated roughly 100,000 years ago and subsequently adapted to different environments, frequent selective sweeps would be expected to fix clear genetic differences between the populations.

However, comparing genomes of different populations from the 1000 Genomes Project detected only subtle differences in allele frequencies, representative of small changes over time rather than rapid sweeps.

"It dovetails quite well with findings coming out of medical mapping studies, which also suggest that many loci of small effect influence disease risk," Przeworski said. "These findings call into question how much more there is to find using the selective sweep approach, and should also make us skeptical of how many of the findings to date will turn out to be validated."

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Story Source:

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

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1. R. D. Hernandez, J. L. Kelley, E. Elyashiv, S. C. Melton, A. Auton, G. McVean, G. Sella, M. Przeworski. **Classic Selective Sweeps Were Rare in Recent Human Evolution**. *Science*, 2011; 331 (6019): 920 DOI: 10.1126/science.1198878

http://www.sciencedaily.com/releases/2011/02/110217141307.htm

Brain's 'Reward' Center Also Responds to Bad Experiences

Roller coaster. New findings may help explain the "thrill" of thrill-seeking behavior or maybe just the thrill of surviving it. (Credit: iStockphoto/Chaim Danzinger)

ScienceDaily (Feb. 28, 2011) — The so-called reward center of the brain may need a new name, say scientists who have shown it responds to good and bad experiences. The finding, published in *PLoS One*, may help explain the "thrill" of thrill-seeking behavior or maybe just the thrill of surviving it, according to scientists at Georgia Health Sciences University and East China Normal University.

Eating chocolate or falling off a building -- or just the thought of either -- can evoke production of dopamine, a neurotransmitter that can make the heart race and motivate behavior, said Dr. Joe Z. Tsien, Co-Director of GHSU's Brain & Behavior Discovery Institute.

Scientists looked at dopamine neurons in the ventral tegmental area of the mouse brain, widely studied for its role in reward-related motivation or drug addiction. They found essentially all the cells had some response to good or bad experiences while a fearful event excited about 25 percent of the neurons, spurring more dopamine production.

Interestingly neuronal response lasted as long as the event and context was important, Tsien said. Scientists used a conditioned tone to correlate a certain setting with a good or bad event and later, all it took was the tone in that setting to evoke the same response from the dopamine neurons of mice.

"We have believed that dopamine was always engaged in reward and processing the hedonic feeling," Tsien said. "What we have found is that dopamine neurons also are stimulated or respond to negative events."

Just how eating chocolate or jumping off a building induces dopamine production remains a mystery. "That is just the way the brain is wired," Tsien said. He notes that genetics can impact the number of cells activated by bad events -- and while interpretation of the findings needs more work -- they could help explain inappropriate behaviors such as drug addiction or other risky habits.

In a second paper in *PLoS One*, Tsien and his colleagues at Boston University have provided more insight into how brains decide how much to remember good or bad. Inside the hippocampus, where memory and knowledge are believe to be formed, recordings from hundreds of mouse brain cells in a region called CA1 showed all are involved in sensing what happens, but not in the same way.

They found among most cells a big event, such as a major earthquake, evoked a bigger sensory response than a mild earthquake. But slightly less than half the cells involved logged a more consistent neural response to all

events big and small. These are called invariant cells because of their consistent firing regardless of event intensity. Tsien said these cells are critical in helping the brain remember those events.

The initial muted sensory response was followed by the cells replaying what they just experienced. It's that reverberation that corresponds with learning and memory. "If they play it over and over, you can remember it for a long time," Tsien said of these memory makers.

But these invariant cells vary in that some keep replaying specific memories while the majority focus on more general features of what occurred. "The general-knowledge cells have the 'highest volume,'" Tsien said. "So we walk away with general knowledge that will guide your life, which is more important than the details."

As with the number of dopamine cells that respond to bad or risky behavior, genetics likely plays a role in an individual's specific ratio of cells involved in encoding general versus more detailed memories, Tsien said. A person with a photographic memory likely has more of the specific memory makers while those with autism or schizophrenia, who have difficulty coping in society, may have fewer of the general memory makers that help provide correct context and understanding of complex relationships.

Story Source:

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

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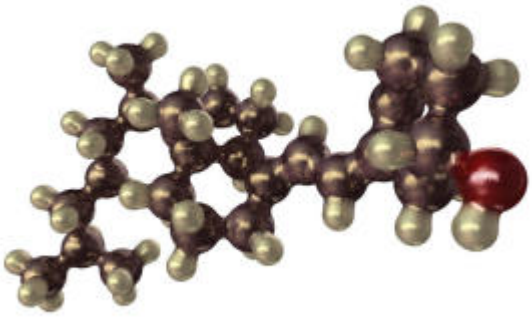
Markedly Higher Vitamin D Intake Needed to Reduce Cancer Risk, Researchers Say



A molecular model of Vitamin D_3, also known as cholecalciferol. (Credit: iStockphoto/Martin McCarthy)

ScienceDaily (Feb. 22, 2011) — Researchers at the University of California, San Diego School of Medicine and Creighton University School of Medicine in Omaha have reported that markedly higher intake of vitamin D is needed to reach blood levels that can prevent or markedly cut the incidence of breast cancer and several other major diseases than had been originally thought.

The findings are published February 21 in the journal *Anticancer Research*.

While these levels are higher than traditional intakes, they are largely in a range deemed safe for daily use in a December 2010 report from the National Academy of Sciences Institute of Medicine.

"We found that daily intakes of vitamin D by adults in the range of 4000-8000 IU are needed to maintain blood levels of vitamin D metabolites in the range needed to reduce by about half the risk of several diseases -- breast cancer, colon cancer, multiple sclerosis, and type 1 diabetes," said Cedric Garland, DrPH, professor of family and preventive medicine at UC San Diego Moores Cancer Center. "I was surprised to find that the intakes required to maintain vitamin D status for disease prevention were so high -- much higher than the minimal intake of vitamin D of 400 IU/day that was needed to defeat rickets in the 20th century."

"I was not surprised by this" said Robert P. Heaney, MD, of Creighton University, a distinguished biomedical scientist who has studied vitamin D need for several decades. "This result was what our dose-response studies predicted, but it took a study such as this, of people leading their everyday lives, to confirm it."

The study reports on a survey of several thousand volunteers who were taking vitamin D supplements in the dosage range from 1000 to 10,000 IU/day. Blood studies were conducted to determine the level of 25-vitamin D -- the form in which almost all vitamin D circulates in the blood.

"Most scientists who are actively working with vitamin D now believe that 40 to 60 ng/ml is the appropriate target concentration of 25-vitamin D in the blood for preventing the major vitamin D-deficiency related diseases, and have joined in a letter on this topic," said Garland. "Unfortunately, according a recent National Health and Nutrition Examination Survey, only 10 percent of the US population has levels in this range, mainly people who work outdoors."

Interest in larger doses was spurred in December of last year, when a National Academy of Sciences Institute of Medicine committee identified 4000 IU/day of vitamin D as safe for every day use by adults and children

nine years and older, with intakes in the range of 1000-3000 IU/day for infants and children through age eight years old.

While the IOM committee states that 4000 IU/day is a safe dosage, the recommended minimum daily intake is only 600 IU/day.

"Now that the results of this study are in, it will become common for almost every adult to take 4000 IU/day," Garland said. "This is comfortably under the 10,000 IU/day that the IOM Committee Report considers as the lower limit of risk, and the benefits are substantial." He added that people who may have contraindications should discuss their vitamin D needs with their family doctor.

"Now is the time for virtually everyone to take more vitamin D to help prevent some major types of cancer, several other serious illnesses, and fractures," said Heaney.

Other co-authors of the article were Leo Baggerly, PhD, and Christine French.

More facts are available from Anticancer Research: www.GrassrootsHealth.net; and the National Academy of Sciences -- Institute of Medicine: www.iom.edu/Reports/2010/Dietary-Reference-Intakes-for-Calcium-and-Vitamin-D.aspx

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Story Source:

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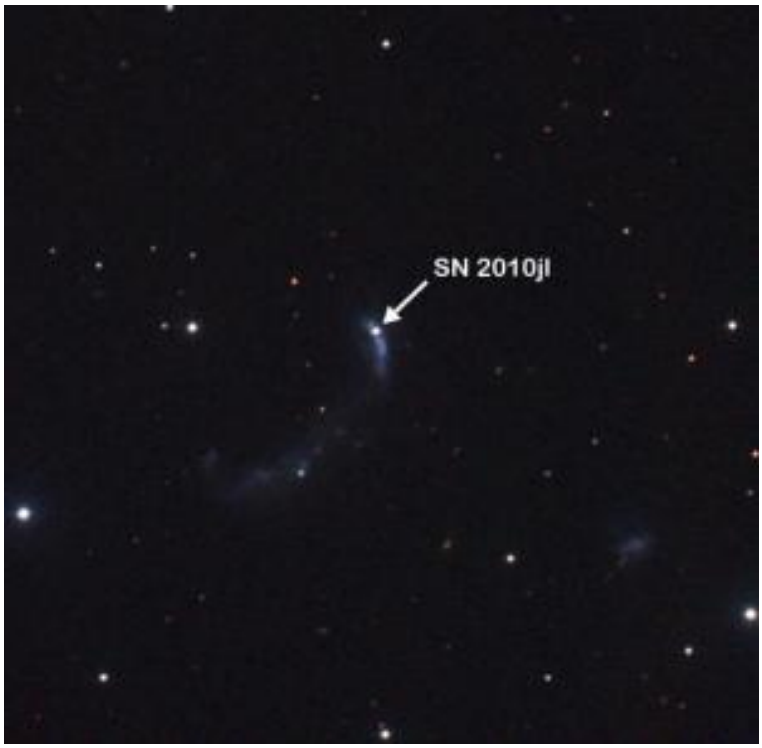
http://www.sciencedaily.com/releases/2011/02/110222140546.htm

Asymmetric Supernovae: Not All Stellar Explosions Expand Spherically



Colour image of SN 2010jl (arrow) in galaxy UGC 5189A, obtained by Petat's team with CAFOS and the Zeiss 2.2 m reflector of Calar Alto Observatory.

ScienceDaily (Feb. 27, 2011) — Stars are balls of glowing gas, with a nearly spherical shape. Accordingly, one would expect that when some stars explode as supernovae at the end of their lives, the resulting colossal fireballs should share this spherical symmetry. However, recent investigations are revealing that some of these events are not round. New data gathered at Calar Alto Observatory reinforce this surprising finding.

As one knows from the Sun, stars are nearly perfect spheres of glowing gas. One might expect that a star retained this shape, even when dramatic events happen during its lifetime. Therefore, both the slow, steady stellar winds from massive stars, as well as the cataclysmic explosions called supernovae, in which some stars end their lives, were assumed to be symmetric -quasi-spherical clouds of matter expelled into space.

However, recent developments in the observation of supernovae are providing increasing evidence that the explosion of a (nearly round) star can result in a strongly deformed fireball.

Supernovae of various kinds

The most powerful stellar explosions are called *supernovae*. Their amazing luminosity makes them visible over huge intergalactic distances. Some supernovae arise as a result of the interaction of peculiar stars, white dwarfs, with other stars placed very close to them. These are the so-called *thermonuclear supernovae*. Other explosions, *core-collapse* or *gravitational supernovae*, happen when very massive stars die. These stars have consumed the fuel that makes them shine, the energy source that supports their internal structure against the tendency to shrink and collapse due to the pull of gravity. They suffer an energy crisis that leads to an extremely violent collapse and, after that, to an explosion of apocalyptic intensity.

We are now interested in one specific sub-class of gravitational supernovae: those labelled as "Type IIn supernovae." So far only three of them have been observed with techniques capable of providing information on the shape of the explosions. But, interestingly enough, in all three cases strong evidence of an asymmetric fireball has been found! The most recent of these studies was conducted by an international team of astronomers lead by F. Patat (ESO, Garching, Germany), who observed supernova 2010jl in November 2010 using Calar Alto telescopes and instruments.

Supernova 2010jl scrutinized

Supernova 2010jl appeared in the constellation Leo during the first days of November 2010. Its host galaxy was UGC 5189A, a strangely shaped specimen, an example of a galaxy in strong tidal interaction with some neighbouring galaxies. Such interaction usually leads to an intense formation of new stars, the more massive of which later will appear as gravitational supernovae. The distance to UGC 5189A is estimated to be some 160 million light-years (49 megaparsecs). This means that, although the event was seen in November 2010, the explosion really took place 160 million years ago.

Patat's team observed this explosion using a specific technique, called *spectropolarimetry*, which allows to infer information on the shape of an object, even though the object itself appears as a simple, tiny point at the telescope. They made use of the spectropolarimetric capabilities of the instrument CAFOS attached to the Zeiss 2.2 m Calar Alto reflector. In the course of these observations, the researchers analysed in detail the excellent performance of this instrument, which allowed them to deduce interesting details about the process of the stellar explosion.

Light propagates through space as a wave, a vibration of the electromagnetic field that can be compared to the waves produced when a stone is dropped on the surface of water. But water waves imply only vertical movements of the surface (up and down), while natural light waves oscillate in all possible planes: up-down, left-right, and all intermediate combinations; none of them is preferred over the others. Several physical mechanisms can, however, lead to an emission of light in which one of the oscillation directions is dominant: in these cases we speak of polarized light. All processes leading to polarization imply the existence of privileged directions in the emitter, i.e. a certain degree of asymmetry. The observations of SN 2010jl show, in the researchers' words, that light from the supernova "appears to be polarized at a very significant level across the whole spectral range; […] the level of polarization measured in SN 2010jl (~2%) is indicative of a substantial asphericity, of axial ratio ≤0.7."

Where does the asymmetry come from?

Gravitational supernovae arise from massive stars. In the case of SN 2010jl, it has been estimated that the parent star had a mass around thirty times that of the Sun, if not larger. Such heavy stars drive their lives wildly, consume their resources rapidly and shine only for a few million years (which is short compared with the estimated total lifespan for the Sun -some ten thousand million years). The intense energy output tears material out from the stellar surface. So, the star is continuously emitting not only energy, but also some amount of matter, atomic and subatomic particles that constitute the stellar wind and form an envelope around the star. When the final hour comes and the star explodes as a supernova, the expanding fireball collides with this envelope, and emits light due to processes that happen both inside the hot gas and at the contact surface between the hot gas and the envelope.

In SN 2010jl, the processes responsible for the polarization of light are due to the interaction with the envelope. So, the question arises: is the asymmetry caused by an intrinsically non-spherical explosion, or are we facing a more symmetrical fireball interacting with an elongated envelope? In any case, both the explosion and the envelope come from the same almost spherical star. Rotation and magnetic fields are no doubt involved in the generation of the asymmetry, but further studies are needed to clarify this point. Calar Alto telescopes and instruments will be ready to help in this effort.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Calar Alto Observatory-CAHA**.

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Scientists Find Gene Responsible for Color Patterns in Mice

How did the leopard get its spots? How did the zebra get its stripes? Scientists find the gene responsible for mice being able to see color patterns. (Credit: iStockphoto)

ScienceDaily (Feb. 27, 2011) — Scientists at Harvard University are moving closer to answering some age-old questions. How did the leopard get its spots? How did the zebra get its stripes?

The answer may be a gene called Agouti, which the Harvard team has found governs color patterns in deer mice, the most widespread mammal in North America. This gene, found in all vertebrates, may establish color pattern in a wide variety of species, a process that has been poorly understood at both the molecular and the evolutionary level.

"The question of how color patterns are established in vertebrates has been a black box," says Marie Manceau, a research associate in Harvard's Department of Organismic and Evolutionary Biology and lead author of a paper appearing this week in the journal *Science*. "Taking advantage of the simple color pattern of deer mice -- which have a dark back and a light belly -- we showed that small changes in the activity of a single pigmentation gene in embryos generate big differences in adult color pattern."

Manceau and senior author Hopi E. Hoekstra found that color patterns in these mice rely on the establishment of an embryonic "pre-pattern" of Agouti expression. In the mice they studied, this took place midway through gestation -- just 12 days after conception, well before the first pigments are ever produced in the skin.

Agouti had previously been known to affect the type of pigment found in vertebrate fur, feathers, and scales: Little expression of the gene in adults results in the production of dark pigments, while robust Agouti activity generally yields light pigment production. But Manceau and Hoekstra found that subtle changes in the gene's embryonic activity can also make a profound difference in the distribution of pigments across the entire body.

"During embryogenesis, Agouti is expressed in the belly, where it delays maturation of the cells that will eventually produce pigments," says Hoekstra, John L. Loeb Associate Professor of the Natural Sciences at Harvard. "This leads to a lighter colored belly in adults, which is the most common color pattern across a wide variety of vertebrates, from fish to antelope."

Beyond color patterning, this study highlights how genetic and developmental mechanisms underlying trait variation can affect the evolution of natural diversity: Even small changes in Agouti gene expression can establish a completely new color pattern. In deer mice, natural selection drives changes in the amount and place of Agouti expression, which in turn results in new color patterns that can camouflage animals from visual predators in habitats including dark forests and light sandy beaches.

"It is hard not to speculate that Agouti plays a role in generating more complex patterns -- from stripes to spots -- in a diversity of vertebrates," Hoekstra says.

Manceau and Hoekstra now plan to continue researching the molecular basis of animals with more complex color patterns, such as zebra mice, chipmunks, thirteen-lined ground squirrels, and perhaps eventually even leopards and zebras.

"Are the same pre-patterning mechanisms we see in deer mice also involved in the formation and evolution of more complex pigment patterns, like the racing stripes of chipmunks?" Manceau asks. "That's the exciting question now."

Manceau and Hoekstra's co-authors on the *Science* paper are Vera S. Domingues and Ricardo Mallarino, both of Harvard's Department of Organismic and Evolutionary Biology. Their work was supported by the National Science Foundation and the Portuguese Foundation for Science and Technology.

Story Source:

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

Journal Reference:

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http://www.sciencedaily.com/releases/2011/02/110224145555.htm

Placebo Effect Works Both Ways: Beliefs About Pain Levels Appear to Override Effects of Potent Pain-Relieving Drug

Man entering MRI. Poor expectations of treatment can override all the effect of a potent pain-relieving drug, a brain imaging study at Oxford University has shown. Volunteers experienced different levels of pain when their expectations were changed, although the administration of pain relief remained constant. (Credit: iStockphoto/Brad Wieland)

ScienceDaily (Feb. 27, 2011) — Poor expectations of treatment can override all the effect of a potent pain-relieving drug, a brain imaging study at Oxford University has shown.

In contrast, positive expectations of treatment doubled the natural physiological or biochemical effect of the opioid drug among the healthy volunteers in the study.

The study of the placebo effect -- and its opposite the nocebo effect -- is published in *Science Translational Medicine*. The findings suggest that doctors may need to consider dealing with patients' beliefs about the effectiveness of any treatment, as well as determining which drug might be the best for that patient.

'Doctors shouldn't underestimate the significant influence that patients' negative expectations can have on outcome,' says Professor Irene Tracey of the Centre for Functional Magnetic Resonance Imaging of the Brain at Oxford University, who led the research. '

For example, people with chronic pain will often have seen many doctors and tried many drugs that haven't worked for them. They come to see the clinician with all this negative experience, not expecting to receive anything that will work for them. Doctors have almost got to work on that first before any drug will have an effect on their pain.'

The placebo effect describes the improvements seen when patients -- unknowingly -- are given dummy pills or sham treatments but believe it will do them good. This is a very real physiological effect; it is not just about patients 'feeling' better. The nocebo effect is the opposite: patients see poorer outcomes as the result of doubts about a medical treatment.

Previous studies have investigated the basis of the placebo effect, when using sugar pills or saline injections for example, and confirmed it can elicit a real response.

This new research, funded by the Medical Research Council and German research funders, goes a step further by examining how manipulating participants' expectations can influence their response to an active drug.

The Oxford University team, along with colleagues from the University Medical Center Hamburg-Eppendorf in Germany, Cambridge University, and the Technische Universität München, set out to investigate these effects among 22 healthy adult volunteers by giving them an opioid drug and manipulating their expectations of the pain relief they might receive at different points.

The volunteers were placed in an MRI scanner and heat applied to the leg at a level where it begins to hurt -- set so that each individual rated the pain at 70 on a scale of 1 to 100. An intravenous line for administration of a potent opioid drug for pain relief was also introduced.

After an initial control run, unknown to the participants, the team started giving the drug to see what effects there would be in the absence of any knowledge or expectation of treatment. The average initial pain rating of 66 went down to 55.

The volunteers were then told that the drug would start being administered, although no change was actually made and they continued receiving the opioid at the same dose. The average pain ratings dropped further to 39.

Finally, the volunteers were led to believe the drug had been stopped and cautioned that there may be a possible increase in pain. Again, the drug was still being administered in the same way with no change. Their pain intensity increased to 64. That is, the pain was as great as in the absence of any pain relief at the beginning of the experiment.

The researchers used brain imaging to confirm the participants' reports of pain relief. MRI scans showed that the brain's pain networks responded to different extents according to the volunteers' expectations at each stage, and matching their reports of pain.

This showed the volunteers really did experience different levels of pain when their expectations were changed, although the administration of pain relief remained constant.

Professor Tracey notes that these results have been seen in a small, healthy group of volunteers, and that these are short-term, not sustained, manipulations of the participants' beliefs about the treatment.

But she says it's important not to underestimate the strength of the effect of such expectations on any treatment, and that clinicians need to know how to manage that.

Professor Tracey says there may also be lessons for the design of clinical trials. These are often carried out comparing a candidate drug against a dummy pill to see if there is any effect of a drug above and beyond that of the placebo.'We should control for the effect of people's expectations on the results of any clinical trial. At the very least we should make sure we minimize any negative expectations to make sure we're not masking true efficacy in a trial drug.'

Story Source:

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

Journal Reference:

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Transgenic Fungi May Be Able to Combat Malaria and Other Bug-Borne Diseases

This stink bug has been infected with a fungi. St. Leger and his team also are creating transgenic fungi designed to control stink bugs, bed bugs, locusts and other pests. (Credit: Image by Weiguo Fang, University of Maryland)

ScienceDaily (Feb. 26, 2011) — New findings by a University of Maryland-led team of scientists indicate that a genetically engineered fungus carrying genes for a human anti-malarial antibody or a scorpion anti-malarial toxin could be a highly effective, specific and environmentally friendly tool for combating malaria, at a time when the effectiveness of current pesticides against malaria mosquitoes is declining.

In a study published in the February 25 issue of the journal *Science*, the researchers also say that this general approach could be used for controlling other devastating insect and tick bug-borne diseases, such as or dengue fever and Lyme disease. "Though applied here to combat malaria, our transgenic fungal approach is a very flexible one that allows design and delivery of gene products targeted to almost any disease-carrying arthropod," said Raymond St. Leger, a professor of Entomology at the University of Maryland.

"In this current study we show that spraying malaria-transmitting mosquitoes with a fungus genetically altered to produce molecules that target malaria-causing sporozoites could reduce disease transmission to humans by at least five-fold compared to using an un-engineered fungus," St. Leger said.

St. Leger, his post doctoral researcher Weiguo Fang and colleagues at the Johns Hopkins School of Public Health and the University of Westminster, London created their transgenic anti-malarial fungus, by starting with *Metarhizium anisopliae*, a fungus that naturally attacks mosquitoes, and then inserting into it genes for a human antibody or a scorpion toxin. Both the antibody and the toxin specifically target the malaria-causing parasite *P. falciparum*. The team then compared three groups of mosquitoes all heavily infected with the malaria parasite. In the first group were mosquitoes sprayed with the transgenic fungus, in the second were those sprayed with an unaltered or natural strain of the fungus, and in the third group were mosquitoes not sprayed with any fungus.

The research team found that compared to the other treatments, spraying mosquitoes with the transgenic fungus significantly reduced parasite development. The malaria-causing parasite *P. falciparum* was found in the salivary glands of just 25 percent of the mosquitoes sprayed with the transgenic fungi, compared to 87 percent of those sprayed with the wild-type strain of the fungus and to 94 percent of those that were not

sprayed. Even in the 25 percent of mosquitoes that still had parasites after being sprayed with the transgenic fungi, parasite numbers were reduced by over 95 percent compared to the mosquitoes sprayed with the wild-type fungus.

"Now that we've demonstrated the effectiveness of this approach and cleared several U.S. regulatory hurdles for transgenic *Metarhizium* products, our principal aim is to get this technology into field-testing in Africa as soon as possible," St. Leger said. "However, we also want to test some additional combinations to make sure we have the optimized malaria-blocking pathogen."

Noting that the University of Maryland has pioneered the science and practice of creating transgenic fungi, St Leger said that he and colleagues at Maryland and at partnering institutions are already working to create genetically engineered fungi that can be used to reduce transmission of other illnesses, like Lyme disease and sleeping sickness. In related work, they are employing genes encoding highly specific toxins to produce hypervirulent pathogens that can control pests like locusts, bed bugs and stink bugs.

"Insects are a critical part of the natural diversity and the health of our environment, but our interactions with them aren't always to our benefit," said St. Leger, who is widely recognized for research that employs insects and their pathogens as models for understanding how pathogens in general cause disease, adapt and evolve, and in the application of that understanding to the creation of new methods for safely reducing crop destruction, disease transmission and other damaging insect impacts.

The Malaria Challenge

Infection by malaria-causing parasites results in approximately 240 million cases around the globe annually, and causes more than 850,000 deaths each year, mostly children, according to the World Health Organization. Most of these cases occur in sub-Saharan Africa, but the disease is present in 108 countries in regions around the world. Treating bed nets and indoor walls with insecticides is the main prevention strategy in developing countries, but mosquitoes are slowly becoming resistant to these insecticides, rendering them ineffective.

"Malaria prevention strategies can greatly reduce the worldwide burden of this disease, but, as mosquitoes continue to acquire resistance to currently used methods, new and innovative ways to prevent malaria will be needed, experts say.

One such strategy is killing Anopheles mosquitoes by spraying them with the pathogenic fungus *M. anisopliae*. Previous studies by African, Dutch and British scientists have found that this method nearly eliminates disease transmission but only when mosquitoes are sprayed soon after being infected by the malaria parasite. The difficulties with this strategy are that it requires high coverage with fungal biopesticides to ensure early infection, and is not sustainable in the long term. If spraying mosquitoes with *M. anisopliae* kills them before they have a chance to reproduce and pass on their susceptibility, mosquitoes that are resistant to the fungus will soon become predominant and the spray will no longer be effective.

The approach developed by St. Leger and his colleagues avoids these problems because their engineered strains selectively target the parasite within the mosquito, and allow the fungus to combat malaria when applied to mosquitoes that already have advanced malaria infections. In addition "Our engineered strains slow speed of kill enable mosquitoes to achieve part of their reproductive output, and so reduces selection pressure for resistance to the biopesticide," St. Leger said. "Mosquitoes have an incredible ability to evolve and adapt so there may be no permanent fix. However, our current transgenic combination could translate into additional decades of effective use of fungi as an anti-malarial biopesticide."

The National Institute of Allergy and Infectious Diseases (NIAID), part of the National Institutes of Health, funded this research.

Story Source:

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

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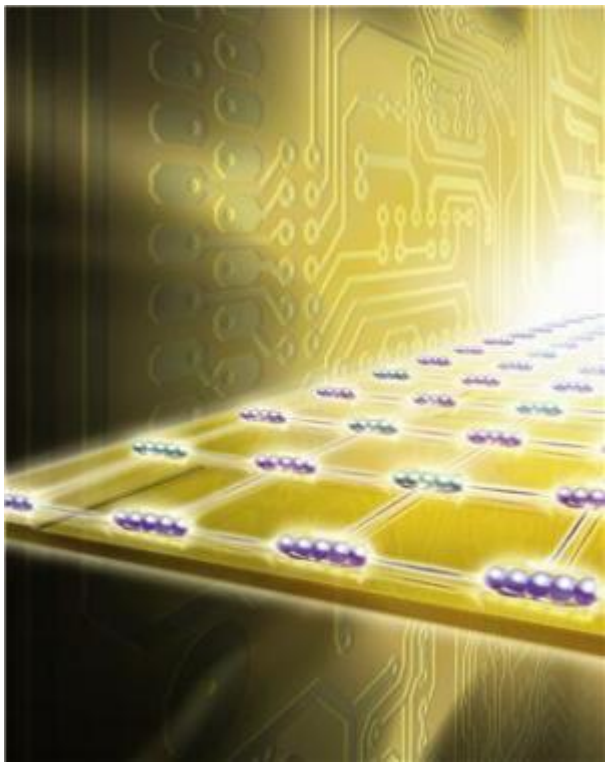
http://www.sciencedaily.com/releases/2011/02/110224145641.htm

Atomic Antennas Transmit Quantum Information Across a Microchip



Quantum antennae enable the exchange of quantum information between two separate memory cells located on a computer chip. (Credit: Harald Ritsch)

ScienceDaily (Feb. 26, 2011) — The Austrian research group led by physicist Rainer Blatt suggests a fundamentally novel architecture for quantum computation. They have experimentally demonstrated quantum antennas, which enable the exchange of quantum information between two separate memory cells located on a computer chip. This offers new opportunities to build practical quantum computers.

The researchers have published their work in the scientific journal *Nature.*

Six years ago scientists at the University of Innsbruck realized the first quantum byte -- a quantum computer with eight entangled quantum particles; a record that still stands. "Nevertheless, to make practical use of a quantum computer that performs calculations, we need a lot more quantum bits," says Prof. Rainer Blatt, who, with his research team at the Institute for Experimental Physics, created the first quantum byte in an electromagnetic ion trap. "In these traps we cannot string together large numbers of ions and control them simultaneously."

To solve this problem, the scientists have started to design a quantum computer based on a system of many small registers, which have to be linked. To achieve this, Innsbruck quantum physicists have now developed a revolutionary approach based on a concept formulated by theoretical physicists Ignacio Cirac and Peter Zoller. In their experiment, the physicists electromagnetically coupled two groups of ions over a distance of about 50 micrometers. Here, the motion of the particles serves as an antenna. "The particles oscillate like electrons in the poles of a TV antenna and thereby generate an electromagnetic field," explains Blatt. "If one antenna is tuned to the other one, the receiving end picks up the signal of the sender, which results in coupling." The energy exchange taking place in this process could be the basis for fundamental computing operations of a quantum computer.

Antennas amplify transmission

"We implemented this new concept in a very simple way," explains Rainer Blatt. In a miniaturized ion trap a double-well potential was created, trapping the calcium ions. The two wells were separated by 54 micrometers. "By applying a voltage to the electrodes of the ion trap, we were able to match the oscillation frequencies of the ions," says Blatt.

"This resulted in a coupling process and an energy exchange, which can be used to transmit quantum information." A direct coupling of two mechanical oscillations at the quantum level has never been demonstrated before. In addition, the scientists show that the coupling is amplified by using more ions in each well. "These additional ions function as antennas and increase the distance and speed of the transmission," says Rainer Blatt, who is excited about the new concept. This work constitutes a promising approach for building a fully functioning quantum computer.

"The new technology offers the possibility to distribute entanglement. At the same time, we are able to target each memory cell individually," explains Rainer Blatt. The new quantum computer could be based on a chip with many micro traps, where ions communicate with each other through electromagnetic coupling. This new approach represents an important step towards practical quantum technologies for information processing.

The quantum researchers are supported by the Austrian Science Fund FWF, the European Union, the European Research Council and the Federation of Austrian Industries Tyrol.

Story Source:

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

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Collisions of Protein Machines Cause DNA Replication Derailment

A model of strands of DNA. DNA damage, if not kept in check, can lead to many problems including cancers. Researchers have shown that the process of replication is even riskier than originally thought. (Credit: iStockphoto/Martin McCarthy)

ScienceDaily (Feb. 28, 2011) — Scientists have published results that will forever change the way researchers view the interplay between gene expression, DNA replication and the prevention of DNA damage.

DNA damage, if not kept in check, can lead to many problems including cancers. Researchers have shown that the process of replication is even riskier than originally thought.

Lead researcher Panos Soultanas, a Professor of Biological Chemistry from The University of Nottingham School of Chemistry said "Consider DNA as a bi-directional rail track with two types of train: a big fast one like an eight-carriage cross country train and a small slow one like a two-carriage regional train. As it travels, the big train - the DNA replisome - is responsible for copying the DNA e.g. when a cell is preparing to divide. And the small train - the RNA polymerase - makes its journey to deal with the expression of genes contained within the DNA sequence."

Just like trains, collisions between proteins moving along a strand of DNA can be catastrophic and this is one reason why areas of DNA that are being used a lot are particularly prone to damage. Until now it was thought that only head-on collisions between the DNA replisome (the big, fast, cross country train) and the RNA polymerase (the small, slow, regional train) could lead to serious DNA damage. This research shows that collisions between big and small trains running in the same direction can be just as dangerous and hence the problem in areas of high use is exacerbated.

This new information is published February 24 in the journal *Nature.*

Professor Soultanas said "Until now we thought that if the fast and slow protein-trains meet going in the same direction along the track then the faster DNA replication train just slows down and follows along behind the slower gene expression train until it has finished its job and moved out of the way. Our new research shows that this isn't the case at all and in fact they do collide quite often causing what, in this analogy, we could only describe as a major derailment!"

When the DNA replisome falls off the DNA there are other proteins - called "restart replication proteins" - that come in to help get it back on track. Although this ensures that DNA replication can continue, it can potentially increase the risk of mistakes occurring during the copying process, particularly if such restart

replication proteins are malfunctioning. In some cases these mistakes can lead to problems e.g. if the mistake causes a genetic malfunction that can lead to a cancer developing.

Describing what happens to the DNA replisome in areas of DNA where there are many RNA Polymerases working on genes that are in high use, Professor Soultanas said: "We are now realizing that when there are a lot of slow moving trains close together on the track, the fast moving train is faced with a huge obstacle and any failure to safely negotiate these areas could easily result in significant errors. Therefore, replication restart mechanisms are of vital importance to ensure accurate copying of the genetic material."

Professor Douglas Kell, Chief Executive, BBSRC said "This is exciting news and an excellent achievement. Biological sciences as a discipline is unique because there are a collection of key ideas, tools, techniques and processes that are applied across an enormous range of topics. The interplay between gene expression, DNA replication and the prevention of DNA damage is an example of just such a tenet of biology and so this result has the potential to touch on research right across BBSRC's portfolio and beyond."

This research was funded by the Biotechnology and Biological Sciences Research Council (BBSRC) and the Wellcome Trust.

Story Source:

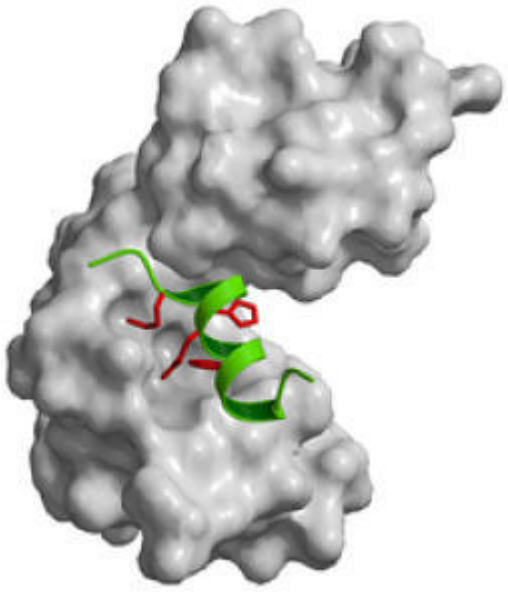
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Biotechnology and Biological Sciences Research Council**.

Journal Reference:

1. Houra Merrikh, Cristina Machón, William H. Grainger, Alan D. Grossman, Panos Soultanas. **Co-directional replication–transcription conflicts lead to replication restart**. *Nature*, 2011; 470 (7335): 554 DOI: 10.1038/nature09758

http://www.sciencedaily.com/releases/2011/02/110224103043.htm

Mystery About Recognition of Unfolded Proteins Solved: The Lock Shapes the Key



S-protein and ±-helical S-peptide of Ribonuclease S. (Credit: Image courtesy of Technische Universitaet Muenchen)

ScienceDaily (Feb. 28, 2011) — Interactions between proteins are of fundamental importance for a number of processes in virtually every living cell. However, in order for the proteins to carry out any biological function, they must first assume their specific three-dimensional shape. A number of reactions have been described in recent years, where one of the interaction partners does not assume its active structure until the actual binding process commences. It was still a great mystery, though, how the binding partners could actually recognize such unstructured proteins.

Scientists led by Professor Thomas Kiefhaber (TUM) posed the question of whether local properties are sufficient for the recognition to take place or whether the unstructured binding partner first had to assume a specific spatial structure. Possible candidates were regularly structural elements such as coiled α-helices or β-pleated sheets, in which internal hydrogen bonds are formed.

In collaboration with Professor Gunter Fischer's research group at the Max Planck Research Unit for Enzymology of Protein Folding Halle/Saale, the scientists developed a novel method for observing the formation of individual hydrogen bonds in the course of a binding process.

The model system was the enzyme ribonuclease S, which in its active form comprises the S-protein and an α-helical S-peptide. While the S-protein has a defined three-dimensional shape, the S-peptide on its own is initially unfolded. The scientists attempted to determine whether the S-protein recognizes the unstructured S-peptide or a small fraction of peptide molecules in their helical conformation. To this end, the oxygen atoms in the peptide bonds were replaced by sulfur atoms via chemical protein synthesis, causing individual hydrogen bonds to become destabilized.

Time-based measurements of the binding process of the altered peptide have now shown that the hydrogen bonds in the S-peptide, and as such in the α-helical structure, do not form until after the bonding to the S-protein. Thus, they cannot play a role in the recognition process. Protein-protein recognition in this case takes place via hydrophobic interaction of the S-protein with two spatially clearly defined areas of the unstructured S-peptide.

These results are of fundamental importance for understanding the mechanism of protein-protein interactions. In the future, this method can be used to examine in detail the structure formation in proteins in other systems, as well.

This research work was funded through the Federal Ministry of Education and Research (ProNet-T3) and the Deutsche Forschungsgemeinschaft (Excellence Cluster Munich Center for Integrated Protein Science).

Story Source:

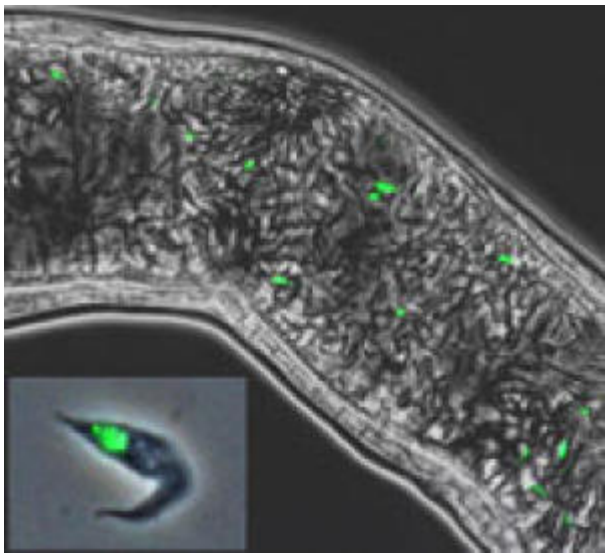
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Technische Universitaet Muenchen**.

Journal Reference:

1. Annett Bachmann, Dirk Wildemann, Florian Praetorius, Gunter Fischer, and Thomas Kiefhaber. **Mapping backbone and side-chain interactions in the transition state of a coupled protein folding and binding reaction**. *PNAS*, 14 February 2011 DOI: 10.1073/pnas.1012668108

http://www.sciencedaily.com/releases/2011/02/110215130741.htm

Shining a Light on Trypanosome Reproduction



Professor Wendy Gibson and colleagues used fluorescently-tagged proteins to make trypanosomes light up like tiny light bulbs. (Credit: Image courtesy of University of Bristol)

ScienceDaily (Feb. 28, 2011) — Compelling visual evidence of sexual reproduction in African trypanosomes, single-celled parasites that cause major human and animal diseases, has been found by researchers from the University of Bristol.

The research could eventually lead to new approaches for controlling sleeping sickness in humans and wasting diseases in livestock which are caused by trypanosomes carried by the bloodsucking tsetse fly.

Biologists believe that sexual reproduction evolved very early and is now ubiquitous in organisms with complex cell structure (the eukaryotes, essentially all living organisms except bacteria). However, real evidence is lacking for a large section of the evolutionary tree.

Trypanosomes represent an early and very distant branch of the eukaryote tree of life and until now it was unclear whether they do indeed reproduce sexually.

Offspring that result from sexual reproduction inherit half their genetic material from each parent. At the core of this process is meiosis, the cellular division that shuffles the parental genes and deals them out in new combinations to the offspring. In organisms which cause diseases, sexual reproduction can spread genes which make them more virulent, or resistant to drugs used for treatment, as well as creating completely new strains with combinations of genes not previously encountered.

Some time ago it was shown that genetic shuffling could occur when two different trypanosome strains were mixed in the tsetse fly, but it was far from clear that this was true sexual reproduction. Direct visualization of the process was difficult because it happened inside the insect.

To get round this problem, Professor Wendy Gibson and colleagues used fluorescently-tagged proteins to make trypanosomes light up like tiny light bulbs [see image]. The tagged proteins only function during meiosis in other well-studied eukaryotes such as yeast.

Professor Gibson said: "It seems that meiosis in trypanosomes has eluded observers because it occurs hidden inside the insect carrying the parasite -- a difficult and technically challenging system to work with. These new results will further our understanding of events at the very beginning of eukaryote evolution, and of the way that new strains of disease-causing microbes emerge."

The study, carried out by researchers from Bristol's Schools of Biological Sciences and Veterinary Sciences in collaboration with the University of Cambridge, is published this week in *Proceedings of the National Academy of Sciences (PNAS)*.

The research was funded by the Wellcome Trust.

Story Source:

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

Journal Reference:

1. L. Peacock, V. Ferris, R. Sharma, J. Sunter, M. Bailey, M. Carrington, W. Gibson. **Identification of the meiotic life cycle stage of Trypanosoma brucei in the tsetse fly**. *Proceedings of the National Academy of Sciences*, 2011; DOI: 10.1073/pnas.1019423108

http://www.sciencedaily.com/releases/2011/02/110217125121.htm

Running on a Faster Track: Researchers Develop Scheduling Tool to Save Time on Public Transport

Researchers have developed a new "Service Oriented Timetable" that relies on computers and complicated algorithms to do the scheduling. (Credit: iStockphoto/Arkadiy Yarmolenko)

ScienceDaily (Feb. 28, 2011) — What matters for commuters is not just if the train will be on time, but how long the journey will take. It's an important factor in public transportation and can make the difference in helping commuters choose mass transit over more polluting and costly transport like cars or airplanes.

Dr. Tal Raviv and his graduate student Mor Kaspi of Tel Aviv University's Department of Industrial Engineering in the Iby and Aladar Fleischman Faculty of Engineering have developed a tool that makes passenger train journeys shorter, especially when transfers are involved -- a computer-based system to shave precious travel minutes off a passenger's journey.

Dr. Raviv's solution, the "Service Oriented Timetable," relies on computers and complicated algorithms to do the scheduling. "Our solution is useful for any metropolitan region where passengers are transferring from one train to another, and where train service providers need to ensure that the highest number of travellers can make it from Point A to Point B as quickly as possible," says Dr. Raviv.

Saves time and resources

In the recent economic downturn, more people are seeking to scale back their monthly transportation costs. Public transportation is a win-win -- good for both the bank account and the environment. But when travel routes are complicated by transfers, it becomes a hard job to manage who can wait -- and who can't -- between trains.

Another factor is consumer preference. Ideally, each passenger would like a direct train to his destination, with no stops en route. But passengers with different itineraries must compete for the system's resources.

Adding a stop at a certain station will improve service for passengers for whom the station is the final destination, but will cause a delay for passengers who are only passing through it. The question is how to devise a schedule which is fair for everyone. What are the decisions that will improve the overall condition of passengers in the train system?

It's not about adding more resources to the system, but more intelligently managing what's already there, Dr. Raviv explains.

More time on the train, less time on the platform

In their train timetabling system, Dr. Raviv and Kaspi study the timetables to find places in the train scheduling system that can be optimized so passengers make it to their final destination faster.

Traditionally, train planners looked for solutions based on the frequency of trains passing through certain stops. Dr. Raviv and Kaspi, however, are developing a high-tech solution for scheduling trains that considers the total travel time of passengers, including their waiting time at transfer stations.

"Let's say you commute to Manhattan from New Jersey every day. We can find a way to synchronize trains to minimize the average travel time of passengers," says Dr. Raviv. "That will make people working in New York a lot happier."

The project has already been simulated on the Israel Railway, reducing the average travel time per commuter from 60 to 48 minutes. The tool can be most useful in countries and cities, he notes, where train schedules are robust and very complicated.

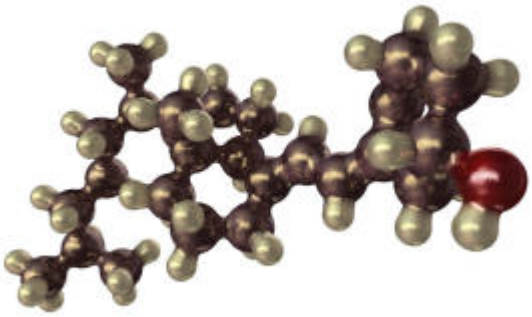
The researchers won a competition of the Railway Application Section of the International Institute for Operation Research and Management Science (INFORMS) last November for their computer program that optimizes a refuelling schedule for freight trains. Dr. Raviv also works on optimizing other forms of public transport, including the bike-sharing programs found in over 400 cities around the world today.

Story Source:

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

http://www.sciencedaily.com/releases/2011/02/110216110853.htm

Markedly Higher Vitamin D Intake Needed to Reduce Cancer Risk, Researchers Say



A molecular model of Vitamin D_3, also known as cholecalciferol. (Credit: iStockphoto/Martin McCarthy)

ScienceDaily (Feb. 22, 2011) — Researchers at the University of California, San Diego School of Medicine and Creighton University School of Medicine in Omaha have reported that markedly higher intake of vitamin D is needed to reach blood levels that can prevent or markedly cut the incidence of breast cancer and several other major diseases than had been originally thought.

The findings are published February 21 in the journal *Anticancer Research*.

While these levels are higher than traditional intakes, they are largely in a range deemed safe for daily use in a December 2010 report from the National Academy of Sciences Institute of Medicine.

"We found that daily intakes of vitamin D by adults in the range of 4000-8000 IU are needed to maintain blood levels of vitamin D metabolites in the range needed to reduce by about half the risk of several diseases -- breast cancer, colon cancer, multiple sclerosis, and type 1 diabetes," said Cedric Garland, DrPH, professor of family and preventive medicine at UC San Diego Moores Cancer Center. "I was surprised to find that the intakes required to maintain vitamin D status for disease prevention were so high -- much higher than the minimal intake of vitamin D of 400 IU/day that was needed to defeat rickets in the 20th century."

"I was not surprised by this" said Robert P. Heaney, MD, of Creighton University, a distinguished biomedical scientist who has studied vitamin D need for several decades. "This result was what our dose-response studies predicted, but it took a study such as this, of people leading their everyday lives, to confirm it."

The study reports on a survey of several thousand volunteers who were taking vitamin D supplements in the dosage range from 1000 to 10,000 IU/day. Blood studies were conducted to determine the level of 25-vitamin D -- the form in which almost all vitamin D circulates in the blood.

"Most scientists who are actively working with vitamin D now believe that 40 to 60 ng/ml is the appropriate target concentration of 25-vitamin D in the blood for preventing the major vitamin D-deficiency related diseases, and have joined in a letter on this topic," said Garland. "Unfortunately, according a recent National Health and Nutrition Examination Survey, only 10 percent of the US population has levels in this range, mainly people who work outdoors."

Interest in larger doses was spurred in December of last year, when a National Academy of Sciences Institute of Medicine committee identified 4000 IU/day of vitamin D as safe for every day use by adults and children

nine years and older, with intakes in the range of 1000-3000 IU/day for infants and children through age eight years old.

While the IOM committee states that 4000 IU/day is a safe dosage, the recommended minimum daily intake is only 600 IU/day.

"Now that the results of this study are in, it will become common for almost every adult to take 4000 IU/day," Garland said. "This is comfortably under the 10,000 IU/day that the IOM Committee Report considers as the lower limit of risk, and the benefits are substantial." He added that people who may have contraindications should discuss their vitamin D needs with their family doctor.

"Now is the time for virtually everyone to take more vitamin D to help prevent some major types of cancer, several other serious illnesses, and fractures," said Heaney.

Other co-authors of the article were Leo Baggerly, PhD, and Christine French.

More facts are available from Anticancer Research: www.GrassrootsHealth.net; and the National Academy of Sciences -- Institute of Medicine: www.iom.edu/Reports/2010/Dietary-Reference-Intakes-for-Calcium-and-Vitamin-D.aspx

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Story Source:

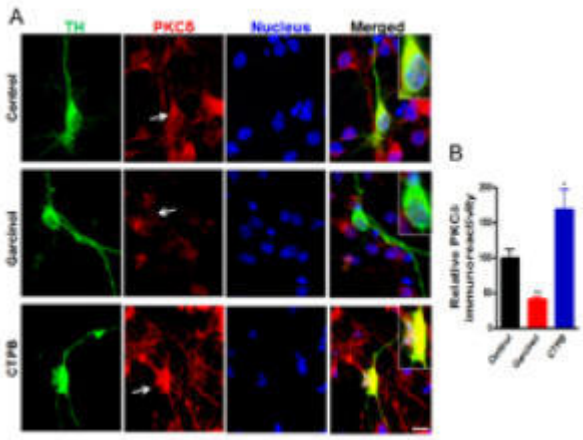
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of California - San Diego**. The original article was written by Kim Ewdards.

Journal Reference:

1. Cedric F. Garland, Christine B. French, Leo L. Baggerly, Robert P. Heaney. **Vitamin D Supplement Doses and Serum 25-Hydroxyvitamin D in the Range Associated with Cancer Prevention**. *Anticancer Research*, 2011; 31: 607-612 [link]

http://www.sciencedaily.com/releases/2011/02/110222140546.htm

New Hope for Solving Parkinson's Disease Puzzle



This image shows how the inhibition of p300 activity by a chemical compound reduces the level of PKC-delta protein. Testing additional compounds that inhibit PKC-delta level may provide a better treatment option for slowing the progression of Parkinson's disease.

ScienceDaily (Feb. 28, 2011) — A protein pathway that may hold the secret to understanding Parkinson's disease has been discovered and explained by Iowa State University researchers.

Anumantha Kanthasamy, a distinguished professor of biomedical sciences and the W. Eugene and Linda R. Lloyd Endowed Chair in Neurotoxicology at the ISU College of Veterinary Medicine, has been working to understand the complex mechanisms of the disease for more than a decade. He believes this recent discovery offers hope for the cure.

Parkinson's disease sufferers lack a sufficient amount of a brain chemical called dopamine. In previous research, Kanthasamy has shown that a novel protein -- known as protein kinase-C (specifically PKCδ) -- kills essential dopamine-producing cells in the brain.

Now, Kanthasamy has shown how to modify the production of the kinase-C, and, more important, how to inhibit it.

The process begins with a protein called alpha-synuclein (ά-synuclein) that -- after interacting with other proteins in cells -- becomes part of the protein complex that modifies kinase-C level in the cells.

One of the proteins that alpha-synuclein interacts with inside the cell is known as p300.

By changing the activity of p300 protein, Kanthasamy believes that production of the destructive kinase-C will be inhibited.

"We have identified an essential pathway that regulates the survival of dopamine-producing nerve cells," he said.

"This p300 is an intermediate protein that is implicit in the Parkinson's disease," he said. "By modifying this protein, we can potentially reduce the expression of kinase-C and the associated destructive effects on dopamine-producing cells."

"We found the mechanism," said Kanthasamy of the pathway. "Now we can focus on finding chemicals that may be able to control the mechanism."

Parkinson's disease strikes around 50,000 people each year, and approximately 1 million people have the disease. Parkinson's sufferers include actor Michael J. Fox and former boxing champion Muhammad Ali.

Currently, there is no cure for Parkinson's and available therapies only treat the symptoms.

Symptoms of Parkinson's disease include trembling in hands, arms, legs, jaw, and face; rigidity or stiffness of the limbs and trunk; slowness of movement; and impaired balance and coordination. As these symptoms become more pronounced, patients may have difficulty walking, talking, or completing other simple tasks. Because the disease typically affects people over the age of 50, the National Institutes of Health anticipates the incidence of Parkinson's will increase as the nation's population ages.

The research was funded by the National Institutes of Health and is published in the *Journal of Neuroscience.*

Story Source:

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

Journal Reference:

1. H. Jin, A. Kanthasamy, A. Ghosh, Y. Yang, V. Anantharam, A. G. Kanthasamy. **-Synuclein Negatively Regulates Protein Kinase C Expression to Suppress Apoptosis in Dopaminergic Neurons by Reducing p300 Histone Acetyltransferase Activity**. *Journal of Neuroscience*, 2011; 31 (6): 2035 DOI: 10.1523/JNEUROSCI.5634-10.2011

http://www.sciencedaily.com/releases/2011/02/110228121458.htm

Power of cool: Liquid air to store clean energy

- 28 February 2011 by **Helen Knight**

Magazine issue 2801

Chill until needed (Image: Jez Coulson/Highview)

STANDING in a container full of pipes and valves, wearing a hard hat and sturdy boots, we gaze at a dull grey panel with green and red on and off switches.

"This panel means we're connected to the grid," says my companion Rob Morgan, grinning proudly. "To an engineer, this is really exciting."

We are on an industrial estate in Slough in the UK, on the grounds of a 100-megawatt biomass plant owned by energy firm Scottish and Southern. But what we've come to see is the small cluster of containers and a gleaming white liquid nitrogen tank tucked away in one corner of the site. Here Morgan, chief engineer at Highview Power Storage, London, and his colleagues have been running a pilot plant designed to store potential energy in the form of liquid air.

Until recently, the only way grid operators could store energy was in huge hydropower reservoirs. In future, renewable intermittent generators of electricity will form a larger part of our energy mix. So we are going to need ways of storing the power they produce for use in the hours or even days when the sun isn't shining or the wind isn't blowing. Since we cannot build a huge new reservoir near every large town and city, more compact storage systems are key to the future of green power.

This is why Highview has been testing its 300-kilowatt pilot plant for the past nine months, supplying electricity to the UK's National Grid. The process stores excess energy at times of low demand by using it to cool air to around -190 °C. Excess electricity powers refrigerators that chill the air, and the resulting liquid air, or cryogen, is then stored in a tank at ambient pressure (1 bar). When electricity is needed, the cryogen is subjected to a pressure of 70 bars and warmed in a heat exchanger. This produces a high-pressure gas that drives a turbine to generate electricity. The cold air emerging from the turbine is captured and reused to make more cryogen. Using ambient heat to warm it, the process recovers around 50 per cent of the electricity that is fed in, says Highview's chief executive Gareth Brett. The efficiency rises to around 70 per cent if you harness waste heat from a nearby industrial or power plant to heat the cryogen to a higher than ambient temperature, which increases the turbine's force, he says.

Unlike pumped-storage hydropower, which requires large reservoirs, the cryogen plants can be located anywhere, says Brett. Batteries under development in Japan have efficiencies of around 80 to 90 per cent, but cost around $4000 per kilowatt of generating capacity. Cryogenic storage would cost just $1000 per kilowatt because it requires fewer expensive materials, claims Brett.

"Lower costs are always better for energy storage, even if it comes at the price of slightly reduced efficiency," says Aidan Rhodes at the UK Energy Research Centre in London. Highview has so far been receiving cryogen from an external source and using it to store and produce electricity. But the firm has recently added an on-site liquefaction plant, and will begin producing its own cryogen from late March. It plans to build a 3.5-megawatt, commercial-scale system by late 2012, which will be increased to an 8 to 10 megawatt plant by early 2014.

The sponge that soaks up air

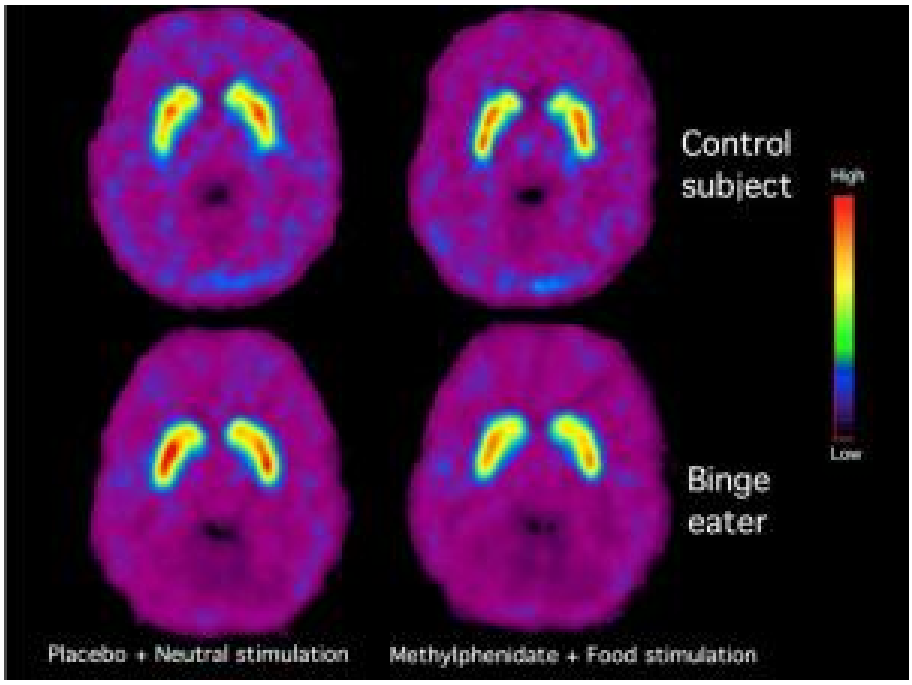
Another way of storing excess electrical energy is as compressed air. Any unwanted energy is used to compress air, which is stored in tanks. When demand for electricity rises, the compressed air is released and used to drive a gas turbine.

However, it is prohibitively expensive to keep the tanks of pressurised air safely above ground so the technology can only be used underground. Timothy Havel at Energy Compression, in Boston, Massachusetts, is using compounds called zeolites to store compressed air at a lower pressure.

Zeolites have a honeycomb structure with micropores that trap air molecules when the material is cooled, and release it again when heated. "The material is like a sponge for air," says Havel.

http://www.newscientist.com/article/mg20928014.800-power-of-cool-liquid-air-to-store-clean-energy.html

Binge Eaters' Dopamine Levels Spike at Sight, Smell of Food



Brain scans comparing the effects of methylphenidate plus food stimulation to placebo plus neutral stimulation in obese binge eaters and obese control subjects who were not binge eaters. Since the radiotracer competes with the brain's natural dopamine to bind to receptors, a weaker signal from the tracer (less red) indicates more dopamine in the brain. The decrease in red in the binge eaters exposed to food and methylphenidate (lower right) compared to the placebo/neutral stimulation condition (lower left) therefore indicates that food stimulation triggered a spike in dopamine levels in these subjects. There was no difference in dopamine levels between these conditions in the non-binge eaters (upper images). (Credit: Image courtesy of DOE/Brookhaven National Laboratory)

ScienceDaily (Feb. 28, 2011) — A brain imaging study at the U.S. Department of Energy's (DOE) Brookhaven National Laboratory reveals a subtle difference between ordinary obese subjects and those who compulsively overeat, or binge: In binge eaters but not ordinary obese subjects, the mere sight or smell of favorite foods triggers a spike in dopamine -- a brain chemical linked to reward and motivation.

The findings -- published online on February 24, 2011, in the journal *Obesity* -- suggest that this dopamine spike may play a role in triggering compulsive overeating.

"These results identify dopamine neurotransmission, which primes the brain to seek reward, as being of relevance to the neurobiology of binge eating disorder," said study lead author Gene-Jack Wang, a physician at Brookhaven Lab and the Mount Sinai School of Medicine. Previous studies conducted by Wang's team have identified a similar dopamine spike in drug-addicted individuals when they were shown images of people taking drugs, as well as other neurochemical similarities between drug addiction and obesity, including a role for dopamine in triggering desire for drugs and/or food.

"In earlier studies of normal-weight healthy people who had been food-deprived for 16 hours, we found that dopamine releases were significantly correlated with self-reports of hunger and desire for food. These results provided evidence of a conditioned-cue response to food," Wang said.

In the current study, the researchers suspected that binge-eating obese subjects would show stronger conditioned responses to food stimuli when compared with non-binging obese subjects.

"Understanding the neurobiological mechanisms underlying food stimulation might point us toward new ways to help individuals regulate their abnormal eating behaviors," Wang said.

The scientists studied 10 obese people with a clinical diagnosis of binge eating disorder, based on evaluations at St. Luke's-Roosevelt Hospital, and 8 obese subjects who were not binge eaters.

The scientists used positron emission tomography (PET) to scan the subjects' brains after injecting a radiotracer designed to bind to dopamine receptors in the brain. Because the tracer competes with the brain's natural dopamine to bind to these receptors, the signal picked up by the PET scanner provides an inverse measure of the brain's dopamine levels: a strong signal from the bound tracer indicates low levels of natural brain dopamine; a low signal from the tracer indicates high levels of dopamine in the brain.

Each subject was scanned four times on two different days to test the effects of food stimulation vs. neutral stimulation with and without pre-administration of a drug known to amplify dopamine signals. The drug, methylphenidate, blocks the reuptake of dopamine from brain synapses, allowing it to linger longer. In scans without methylphenidate, subjects were given a placebo drug.

In the food stimulation condition, research subjects' favorite foods were heated (if appropriate) and waved in front of their mouths and noses so they could smell and even taste tiny amounts swabbed onto their tongues. For the neutral stimulation scans, researchers displayed non-food-related pictures and inanimate objects such as toys and clothing items in close proximity so research subjects could smell them while lying in the scanner. In all cases, research subjects had been fasting for 16 hours prior to scans.

Results

Food stimulation with methylphenidate significantly increased dopamine levels in the caudate and putamen regions of the brain in binge eaters but not in the non-binge eaters. Subjects with the most severe binge eating disorder, as assessed by psychological evaluations, had the highest dopamine levels in the caudate.

Dopamine levels did not rise significantly in other brain regions or under any other condition (neutral stimulation with or without methylphenidate, or food stimulation without methylphenidate) in either group, and were not correlated with body mass index of the research subjects. Assessments of the levels of receptors for dopamine also did not differ between the two groups.

"So the key difference we found between binge eaters and non-binge eating obese subjects was a fairly subtle elevation of dopamine levels in the caudate in the binge eaters in response to food stimulation," Wang said.

"This dopamine response is in a different part of the brain from what we've observed in studies of drug addiction, which found dopamine spikes in the brain's reward center in response to drug-associated cues. The caudate, in contrast, is believed to be involved in reinforcement of action potentially leading to reward, but not in processing of the reward per se. That means this response effectively primes the brain to seek the reward, which is also observed in drug-addicted subjects," Wang said.

Inasmuch as binge eating is not exclusively found in obese individuals, the scientists believe further studies are warranted to assess the neurobiological factors that may differentiate obese and non-obese binge eaters.

This study was funded by the National Institutes of Health through the Intramural Program of the National Institute on Alcoholism and Alcohol Abuse and the General Clinical Research Center of Stony Brook University, using infrastructure supported at Brookhaven Lab by DOE's Office of Science.

Story Source:

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

Journal Reference:

1. Gene-Jack Wang, Allan Geliebter, Nora D. Volkow, Frank W. Telang, Jean Logan, Millard C. Jayne, Kochavi Galanti, Peter A. Selig, Hao Han, Wei Zhu, Christopher T. Wong, Joanna S. Fowler. **Enhanced Striatal Dopamine Release During Food Stimulation in Binge Eating Disorder**. *Obesity*, 2011; DOI: 10.1038/oby.2011.27

http://www.sciencedaily.com/releases/2011/02/110228104308.htm

Two planets found sharing one orbit

- Updated 18:01 24 February 2011 by **Marcus Chown**
- Magazine issue 2801.

Room for two (Image: NASA/Ames/JPL-Caltech)

Buried in the flood of data from the Kepler telescope is a planetary system unlike any seen before. Two of its apparent planets share the same orbit around their star. If the discovery is confirmed, it would bolster a theory that Earth once shared its orbit with a Mars-sized body that later crashed into it, resulting in the moon's formation.

The two planets are part of a four-planet system dubbed KOI-730. They circle their sun-like parent star every 9.8 days at exactly the same orbital distance, one permanently about 60 degrees ahead of the other. In the night sky of one planet, the other world must appear as a constant, blazing light, never fading or brightening.

Gravitational "sweet spots" make this possible. When one body (such as a planet) orbits a much more massive body (a star), there are two Lagrange points along the planet's orbit where a third body can orbit stably. These lie 60 degrees ahead of and 60 degrees behind the smaller object. For example, groups of asteroids called Trojans lie at these points along Jupiter's orbit.

In theory, matter in a disc of material around a newborn star could coalesce into so-called "co-orbiting" planets, but no one had spotted evidence of this before. "Systems like this are not common, as this is the only one we have seen," says Jack Lissauer of NASA's Ames Research Center in Mountain View, California. Lissauer and colleagues describe the KOI-730 system in a paper submitted to the *Astrophysical Journal* (arxiv.org/abs/1102.0543).

Richard Gott and Edward Belbruno at Princeton University say we may even have evidence of the phenomenon in our own cosmic backyard. The moon is thought to have formed about 50 million years after the birth of the solar system, from the debris of a collision between a Mars-sized body and Earth. Simulations suggest the impactor, dubbed Theia, must have come in at a low speed. According to Gott and Belbruno, this could only have happened if Theia had originated in a leading or trailing Lagrange point along Earth's orbit. The new finds "show the kind of thing we imagined can happen", Gott says.

Will KOI-730's co-orbiting planets collide to form a moon someday? "That would be spectacular," says Gott. That may be so, but simulations by Bob Vanderbei at Princeton suggest the planets will continue to orbit in lockstep with each other for the next 2.22 million years at least.

http://www.newscientist.com/article/dn20160-two-planets-found-sharing-one-orbit.html

Climate Change Causing Demise of Lodgepole Pine in Western North America

A massive epidemic of bark beetle infestation on these stands of lodgepole pine in British Columbia reflect the impact that changing climate is having on the ability of this tree species to survive, a new study suggests. (Credit: Photo courtesy of Richard Waring, Oregon State University)

ScienceDaily (Feb. 28, 2011) — Lodgepole pine, a hardy tree species that can thrive in cold temperatures and plays a key role in many western ecosystems, is already shrinking in range as a result of climate change -- and may almost disappear from most of the Pacific Northwest by 2080, a new study concludes.

Including Canada, where it is actually projected to increase in some places, lodgepole pine is expected to be able to survive in only 17 percent of its current range in the western parts of North America.

The research, just published in the journal *Climatic Change*, was done by scientists from the College of Forestry at Oregon State University and the Department of Forest Resource Management at the University of British Columbia. It was based on an analysis of 12,600 sites across a broad geographic range.

Lodgepole pine ecosystems occupy large areas following major fires where extreme cold temperatures, poor soils and heavy, branch-breaking snows make it difficult for other tree species to compete. This includes large parts of higher elevation sites in Oregon, Washington, the Rocky Mountains and western Canada. Yellowstone National Park is dominated by this tree species.

However, warming temperatures, less winter precipitation, earlier loss of snowpack and more summer drought already appear to be affecting the range of lodgepole pine, at the same time increasing the infestations of bark beetles that attack this tree species.

The researchers concluded that some of these forces have been at work since at least 1980, and by around 2020 will have decreased the Pacific Northwest range of lodgepole pine by 8 percent. After that, continued climatic changes are expected to accelerate the species' demise. By 2080, it is projected to be almost absent from Oregon, Washington and Idaho, some of the areas facing the most dramatic changes.

"For skeptics of climate change, it's worth noting that the increase in vulnerability of lodgepole pine we've seen in recent decades is made from comparisons with real climatic data, and is backed up with satellite-observations showing major changes on the ground," said Richard Waring, an OSU distinguished professor emeritus of forest science.

"This is already happening in some places," Waring said. "Bark beetles in lodgepole pine used to be more selective, leaving the younger and healthier trees alone.

"Now their populations and pheromone levels are getting so high they can more easily reach epidemic levels and kill almost all adult trees," he said. "Less frost, combined with less snow favors heavier levels of bark beetle infestation. We're already seeing more insect attack, and we project that it will get worse."

Some species are adapted to lower elevations, experts say, but lodgepole pine is predominately a sub-alpine tree species. Its new foliage can handle frost down to temperatures below freezing, it easily sheds snow that might break the branches of tree species more common at lower elevations, and it can survive in marginal soils.

But it makes these adaptations by growing more slowly, and as the subalpine environment becomes less harsh, lodgepole pine may increasingly be displaced by other species such as Douglas-fir, grand fir and ponderosa pine, which are also more drought-tolerant.

As lodgepole pine continues to decline, one of the few places on the map where it's still projected to survive by 2080 is Yellowstone National Park -- a harsh, high-elevation location -- and a few other sub-alpine locations.

The species historically has played important ecological and cultural roles. It provided long, straight and lightweight poles often sought for tepees by Native American tribes, was later harvested commercially for poles and fence materials, and offers cover and habitat for big game animals.

Funding for this research was provided by NASA and the Natural Sciences Engineering and Research Council of Canada. A co-author of the study was Nicholas Coops with the University of British Columbia.

Story Source:

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

http://www.sciencedaily.com/releases/2011/02/110228121452.htm

Sex Differences in Male and Female Learning Revealed by Gibbons

Gibbon. Differences in the way male and female learning has evolved have been revealed by new research into gibbons. (Credit: iStockphoto/Catharina Van Den Dikkenberg)

ScienceDaily (Feb. 28, 2011) — Differences in the way male and female learning has evolved have been revealed by new research into gibbons, conducted by the University of Abertay Dundee.

Female gibbons benefited significantly from having access to a tool before being tested on using the tool to retrieve food. However, the males showed no beneficial learning effects at all.

The researchers believe that the potential dangers of new objects or new situations to females -- particularly if they are pregnant or caring for young infants -- have given an evolutionary advantage to being cautious. Male gibbons, who lack the same 'reproductive costs', by contrast seem to have evolved no such caution.

Dr Clare Cunningham, a psychology lecturer at Abertay University who led the research, said: "This result was a genuine surprise to us, as we'd not expected such a large difference with the females who had the learning opportunity before we conducted the test.

"We found that female gibbons who had no experience of the tool before being tested took almost three times as long to successfully use the tool to retrieve food from behind a barrier."

The researchers also discovered that having access to the rake-like tool before testing did not increase the likelihood of success.

Interestingly, the male gibbons who had previous experience of the tool actually took much longer during the test to approach the tool and try to retrieve the tool, suggesting that males are less interested in objects they have previously experienced.

Clare added: "We believe that female gibbons who are more cautious to new objects and new situations may have an evolutionary advantage, resulting in a greater likelihood of survival and their cautious dispositions being passed on to the next generation.

"The research is very exciting, as it opens up a whole range of new questions for us to consider. For instance, have other species -- like humans -- also evolved with this same sex difference to learning? If so, this could be a very important study indeed."

The research was conducted at the Gibbon Conservation Centre in Santa Clarita, California, which works to ensure the survival of this endangered ape through conservation and scientific research.

The research is published online in the journal Animal Cognition, and is forthcoming in print.

Story Source:

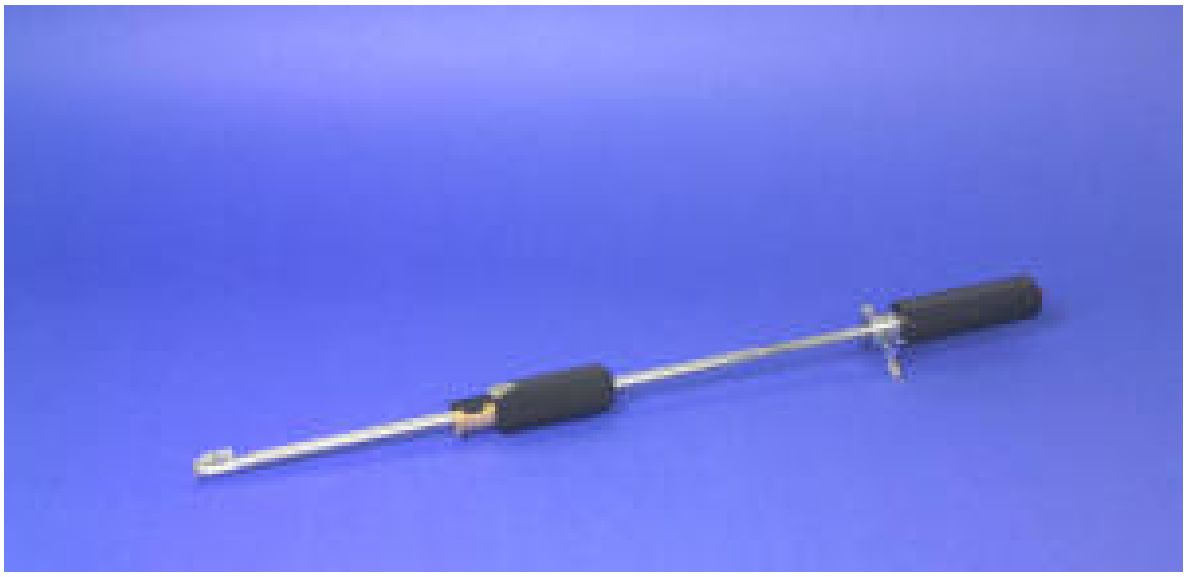
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Abertay Dundee**, via AlphaGalileo.

Journal Reference:

1. Clare Cunningham, James Anderson, Alan Mootnick. **A sex difference in effect of prior experience on object-mediated problem-solving in gibbons**. *Animal Cognition*, 2011; DOI: 10.1007/s10071-011-0380-y

http://www.sciencedaily.com/releases/2011/02/110228105310.htm

Minimally Invasive Surgeries: Laser Suturing



Minimally invasive surgical instrument simplifies surgeries. (Credit: Copyright Fraunhofer-Gesellschaft)

ScienceDaily (Feb. 28, 2011) — Surgeries with the endoscope are exacting and require special capabilities of the surgeon. The suturing of the tissue and the setting of the knots, in particular, is very complicated due to the lack of space for movement. A new, minimally invasive suturing tool simplifies the procedure. In the future, the suture material will no longer be knotted, but welded with a laser.

The device will be displayed at the MEDTEC Fair in Stuttgart, from March 22 -- 24, 2011.

More and more often, abdominal surgeries are being carried out in a minimally invasive manner. A small incision in the abdominal wall is sufficient for the surgeon to be able to insert the instrument and make the organs visible with an endoscope. This technique is gentler and does not stress the body as much as traditional surgeries do. However, these minimally invasive surgeries pose a special challenge to the surgeons. In particular, the suturing -- meaning joining the tissue with needle and suture material -- demands great skill and dexterity. Very often, piercing the tissue and tying the knots is difficult -- after all, the surgeons must perform surgeries in very tight quarters, while having very little room to move. Unlike when sewing textiles, a knot must be made after every stitch, which is a very exacting process that stresses the patient and can cause a number of complications. If the suture is too tight, there is the danger of a minor hemorrhage. In addition, the suture material can cut into the tissue and strangulate vessels. In worst cases the tissue may even die. However, if the suture is too loose, there may be bleeding at the edges of the wound.

Currently, setting the correct suture tension depends on the experience of the surgeon. He must subjectively estimate the optimum tension -- and do this anew for every surgery. He does not have access to a reproducible, standardized setting. In the future, a minimally invasive suturing instrument shall make suturing easier. The researchers of the Fraunhofer Institute for Production Technology IPT in Aachen have developed this instrument within the scope of the InnoNet project "The Suture" (see below). In a new, semi-automatic process the suturing instrument enables the surgeon to connect the suture material with a previously set, predefined tension. Not only does it shorten the suturing process with respect to time, it also hastens the healing of the wound. The patient is able to recover more quickly. "With our new device, the edges of the wound can be joined quickly and safely, since it automatically ensures the optimum tension for the suture. The surgeon no longer has to deal with that. In the future, the difficult task of knotting the ends of the suture

material will no longer be necessary, since they simply will be welded with the laser," explains Dipl.-Ing. Adrian Schütte, a scientist at the IPT.

The idea for this process is based on the laser welding process for plastics. During this process, two thermo-plastic pieces to be lasered together are welded together by means of laser energy. Adrian Schütte said: "In our case, the suture material is one of the two pieces to be lasered together, the other one is the sleeve. It is located in the tip of the new suturing device, which has a diameter of ten millimeters."

But, how does the new process work? First, the surgeons access the abdominal cavity through a small tube -- the experts call it a trocar. After they pierce the tissue with a needle, they pull the end of the suture material out with the surgical forceps, through the trocar, and clip it into the sleeve. A defined tension can be set for the suture by pushing the sleeve through the trocar and simultaneously tensioning the suture. Once the desired tension has been achieved, the suture material is welded to the sleeve by laser. The laser is located at the end of the suturing instrument, the laser beam is sent via the light conducting fiber through the instrument. The superfluous suturing material is cut off behind the sleeve. And, as a last step, the surgeons pull the suturing instrument out through the trocar. After the lasering, the sleeve remains in the abdominal cavity. Schütte remarked: "Currently, the sleeve consists of polypropylene, in the future we would like to manufacture it from resorbing materials."

Together with the InnoNet Project Partners (see below), the scientist and his team were already able to successfully carry out the suturing process during tests in the laboratory. The expert remarked: "We were able to achieve the best results with a suture tension of zero to five Newton and a lasering time of 0.1 seconds." The preclinical studies are slated to start in the course of this year at the Aachen university hospital. To begin with, the suturing instrument will be utilized for minimally invasive surgeries in the abdominal area. The researcher is convinced that it can also be adapted to keyhole surgeries of the heart. The researchers from the IPT will display a prototype of the minimally invasive suturing instrument at the MEDTEC Europe Fair in Stuttgart.

Story Source:

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

http://www.sciencedaily.com/releases/2011/02/110228104316.htm

What's an alien solar system like?

- 23 February 2011 by **David Shiga**
- Magazine issue 2801.

Art imitates reality (Image: Detlev Van Ravenswaay/SPL)

WHAT are the billions of stars and planets beyond our solar system up to? Do they behave like ours or are we a freak of nature?

While definitive answers are far from nailed down, a recent deluge of observations released by NASA's Kepler space telescope has tripled the number of candidate alien planets, taking the total to 1235, and has already yielded many tantalising revelations.

"We're starting to see what's out there; the groups of planets that exist," says Gregory Laughlin at the University of California, Santa Cruz, who is not part of the Kepler team but is studying their data closely. "It's very exciting."

When NASA announced the release of the new data on 2 February, the initial headlines focused on possible habitable planets and an intriguing six-planet star system. More recently, excitement at the annual meeting of the American Association for the Advancement of Science (AAAS) in Washington DC centred on a planet

candidate that might be an Earth "twin". Yet the new release from Kepler offers many more insights that have received relatively little attention so far.

Read more: "Two planets found sharing one orbit"

Kepler surveys about 150,000 stars, most of which are between 600 and 3000 light years away, and detects planets when they pass in front of their parent stars. Kepler is highly sensitive to these "transits", which cause the stars to dim periodically, allowing the telescope to see small, Earth-sized planets missed by other hunts.

Because phenomena such as starspots can mimic this dimming, further observations are needed to confirm a planet's existence. Nevertheless, these planet "candidates" can give a view of the environment beyond our solar system, including a new estimate for the proportion of stars that host planets.

So far, the telescope has seen planet candidates around just 997 of the 150,000 stars that it watches. But there must be vastly more planets out there. As Kepler only detects planets that it catches transiting, it only sees those with orbits that happen to be edge-on from its viewpoint - probably just 1 per cent of all planets. What's more, the data released so far only covers the first four months since Kepler's launch in March 2009, so only planets with relatively short orbital periods, which will have transited in that period, will definitely be detected.

Now the Kepler team has corrected for these factors, and estimates that 34 per cent of the stars that Kepler watches host a planet with a period of less than 125 days (arxiv.org/abs/1102.0543). A previous estimate, which put the figure at 12 per cent, was restricted to planets much more massive than Earth, with periods of less than 50 days.

Another unknown was how common multi-planet solar systems such as our own are. Previously, a few dozen were known, but this was thanks to a variety of surveys with various sensitivities and biases so their relative abundance was difficult to estimate. But Kepler has delivered an unprecedented number of candidates, including smaller planets, and can now reveal that of the solar systems it detects, 17 per cent contain more than one planet candidate.

What does all this tell us? Since Kepler only sees planets that transit in line-of-sight with their star, the solar systems it flags as multi-planet systems are solar systems similar to our own, inasmuch as several planets orbit their star in the same plane (see diagram).

However, the figure of 17 per cent is more complicated than it seems. Attempts to model the relative abundances of various multi-planet solar systems predict fewer single-planet systems than the telescope sees. One explanation is that some alien solar systems that look to Kepler like they only have one planet, are in fact multi-planet systems: Kepler is simply blind to these other orbits.

This interpretation would suggest a violent past for many solar systems. Earlier surveys using different measurements have turned up signs that many gas giant planets orbiting close to their stars are very misaligned with the equator of their stars. As planets are thought to form in a disc of gas and dust that circles the star's equator, these errant planets are thought to have been flung into misaligned orbits by violent encounters with other planets.

"Some of the planets merge, some are ejected, some fall into the star and you're left with fewer planets for those reasons, and the remaining planets, if there is more than one, will have high inclinations," says Kepler member Daniel Fabrycky of the University of California, Santa Cruz.

Many of the apparently single-planet systems seen by Kepler involve planets at the lower end of the mass scale, which may be even more vulnerable to violent changes to their orbits than gas giants. So it is not a stretch to imagine that similar violent encounters might explain some of the "single-planet" Kepler systems, says Joshua Winn of the Massachusetts Institute of Technology, who is not a member of the Kepler team. "Smaller planets are easier to throw around," he says.

As well as exotic solar-system architectures, Kepler has also turned up other oddities, which in turn are feeding back clues to how our moon formed (see "Two planets found sharing one orbit").

Laughlin stresses that these views of activity beyond our solar system, while fuller than ever, are just a start. Kepler will also have the chance to spot planets farther from their stars that transit less frequently, including more candidates that may be capable of hosting life - the count currently stands at 54. "It would be very hard to imagine we're not going to have all sorts of candidate habitable planets - I think there will be plenty."

http://www.newscientist.com/article/mg20928013.300-whats-an-alien-solar-system-like.html?

Surgical Instruments With Electronic Serial Numbers

Surgical instruments with electronic serial numbers. (Credit: Image courtesy of Fraunhofer-Gesellschaft)

ScienceDaily (Feb. 28, 2011) — Gone are the days of having to compromise on surgeons' demands because of the limitations associated with metal processing: Laser melting has abolished production-related restrictions on surgical instruments. The technique permits customized tools to be manufactured in a single step and also allows the integration of additional new functions such as RFID. Researchers from the Fraunhofer-Gesellschaft will be exhibiting a surgical instrument with an integrated electronic chip at this year's MEDTEC Europe trade show in Stuttgart.

Be it a heart transplant or a Cesarean section, every operation requires a wide variety of surgical instruments, from simple retractors, clamps, scalpels and scissors to more specialist devices such as cerclage wire passers, which surgeons employ to repair long, oblique fractures in bones. These are shaped in such a way as to half encircle the broken bone, and incorporate a hollow channel. In a process not unlike stringing a parcel for posting, thread or wire is fed through the channel around the damaged bone and then knotted in place, both to support the bone and to hold the broken parts together. "Until now, it has always been time-consuming and expensive to manufacture surgical instruments featuring this kind of channel," says Claus Aumund-Kopp of the Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM in Bremen. Because it is nigh-on impossible to machine curved channels, shaped tubes have traditionally had to be cast, or else welded or soldered retrospectively.

At the MEDTEC Europe trade show in Stuttgart from March 22 through 24, the Bremen-based scientists will be presenting a technique that enables the manufacture of surgical instruments of any shape, even those with complex interiors like channels, or those with integrated RFID chips. The technique in question is laser melting. Originally developed for the production of industrial prototypes, this manufacturing method uses an extremely fine laser beam to melt a powder material into almost any desired form, one layer at a time.

"Nowadays, laser melting is a mature technology, which has already proved its worth in the manufacture of medical implants," states Aumund-Kopp. Like all generative -- i.e. bottom-up -- manufacturing techniques, it

has two major advantages: First, unlike in turning, drilling or milling, hardly any material is wasted; and second, there are no production-related restrictions on the shape or interior structure of the workpiece. "The designer can focus exclusively on the surgeon's stated requirements," says the engineer. For surgical instruments, either cobalt-chromium steel or titanium powders could be used -- both are standard materials in generative manufacturing. Although no-one has yet begun using the laser melting technique to produce surgical instruments, Aumund-Kopp believes it would be an ideal manufacturing method: "Even small quantities of customized surgical instruments incorporating completely new functions could easily be produced in this way," he reports. 3-dimensional model on a computer is the only template needed; intermediate stages, including the production of special tools or casting molds, are eliminated.

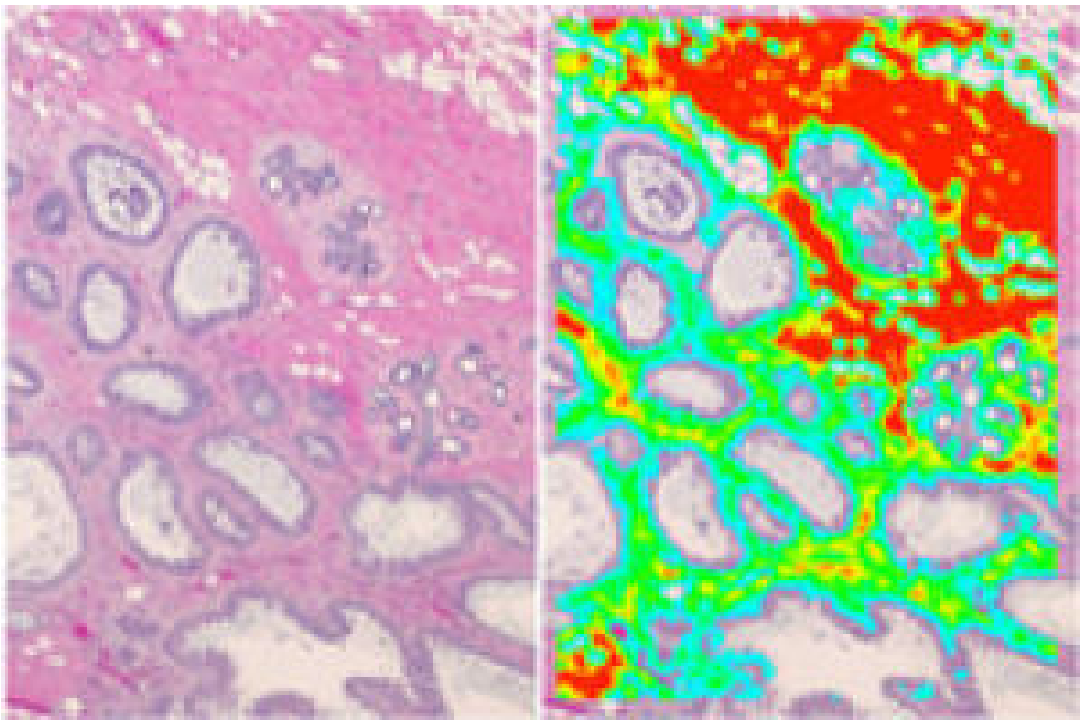
Steel components that are produced using laser melting technology also demonstrate particular electrical properties. Normally, metals shield against electromagnetic radiation such as radio waves, so whenever an RFID chip is cast in metal, a small opening must be left above it, otherwise it will not be readable. But this is not necessary with laser-melted instruments; even though they are completely shrouded in metal, the integrated RFID chips are still able to transmit and receive over short distances. "We assume that the layered structure of the material shapes the field in such a way that the chips remain readable despite their metal covering," explains Aumund-Kopp. This could prove advantageous in the operating room: After every operation, all surgical instruments have to be cleaned, sterilized and counted; if they had integrated RFID chips, quantities and individual numerical codes could be checked quickly and easily and could be electronically linked to the operation report or to specific instrument data such as date of manufacture, protocols for use or current state of cleanliness.

Story Source:

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

http://www.sciencedaily.com/releases/2011/02/110228104314.htm

Potential 'Game Changer' for Pathologists



SIVQ heatmap of breast tissue with a single vector selected from an area of stroma. (Credit: Image courtesy of University of Michigan Health System)

ScienceDaily (Feb. 28, 2011) — Ulysses Balis, M.D., clicks a mouse to identify a helicopter in a satellite photo of Baghdad, Iraq. With another click, an algorithm that he and his team designed picks out three more choppers without highlighting any of the buildings, streets, trees or cars.

Balis isn't playing war games. The director of the Division of Pathology Informatics at the University of Michigan Medical School is demonstrating the extreme flexibility of a software-tool aimed at making the detection of abnormalities in cell and tissue samples faster, more accurate and more consistent.

In a medical setting, instead of helicopters, the technique, known as Spatially-Invariant Vector Quantization (SIVQ), can pinpoint cancer cells and other critical features from digital images made from tissue slides.

But SIVQ isn't limited to any particular area of medicine. It can readily separate calcifications from malignancies in breast tissue samples, search for and count particular cell types in a bone marrow slide, or quickly identify the cherry red nucleoli of cells associated with Hodgkin's disease, according to findings just published in the *Journal of Pathology Informatics*.

"The fact that the algorithm operates effortlessly across domains and lengths scales, while requiring minimal user training, sets it apart from conventional approaches to image analysis," Balis says.

The technology -- developed in conjunction with researchers at Massachusetts General Hospital and Harvard Medical School -- differs from conventional pattern recognition software by basing its core search on a series of concentric, pattern-matching rings, rather than the more typical rectangular or square blocks. This approach takes advantage of the rings' continuous symmetry, allowing for the recognition of features no matter how they're rotated or whether they're reversed, like in a mirror.

"That's good because in pathology, images of cells and tissue do not have a particular orientation," Balis says. "They can face any direction." One of the images included with the paper demonstrates this principle; SIVQ consistently identifies the letter A from a field of text, no matter how the letters are rotated.

How it works

In SIVQ, a search starts with the user selecting a small area of pixels, known as a vector, which she wants to try to match elsewhere in the image. The vector can also come from a stored library of images.

The algorithm then compares this circular vector to every part of the image. And at every location, the ring rotates through millions of possibilities in an attempt to find a match in every possible degree of rotation. Smaller rings within the main ring can provide an even more refined search.

The program then creates a heat map, shading the image based on the quality of match at every point.

This technique wouldn't work with a square or rectangular-shaped search structure because those shapes don't remain symmetrical as they rotate, Balis explains.

Why hasn't everyone been using circles all along?

"It's one of those things that's only obvious in hindsight," Balis says.

In testing the algorithm, researchers even used it to find Waldo in an illustration from a Where's Waldo? children's book.

"You just have to generate a vector for his face," explains Jason Hipp, M.D., Ph.D., co-lead author of the paper -- just as one would generate a vector to recognize calcifications in breast tissue.

A "game changer"

Hipp believes the technology has the potential to be a "game changer" for the field by opening myriad new possibilities for deeper image analysis.

"It's going to allow us to think about things differently," says Hipp, a pathology informatics research fellow and clinical lecturer in the Department of Pathology. "We're starting to bridge the gap between the qualitative analysis carried out by trained expert pathologists with the quantitative approaches made possible by advances in imaging technology."

For example, the most common way to look at tissue samples is still a staining technique that dates back to the1800s. Reading these complex slides and rendering a diagnosis is part of the art of pathology.

SIVQ, however, can assist pathologists by pre-screening an image and identifying potentially problematic areas, including subtle features that may not be readily apparent to the eye.

SIVQ's efficiency in pre-identifying potential problems becomes apparent when one considers that a pathologist may review more than 100 slides in a single day.

"Unlike even the most diligent humans, computers do not suffer from the effects of boredom or fatigue," Balis says.

Working together

Vectors can also be pooled to create shared libraries -- a catalog of reference images upon which the computer can search -- Balis explains, which could help pathologists to quickly identify rare anomalies.

"Bringing such tools into the clinical workflow could provide a higher level of expertise that is distributed more widely, and lower the rate at which findings get overlooked," Balis says.

Following the publication of this first paper presenting the SIVQ algorithm, the team has a number of research projects nearing completion that demonstrate the technology's potential usefulness in a number of basic science and clinical applications. These efforts involve collaborations with researchers at the National Institutes of Health, Mayo Clinic, Rutgers University, Harvard Medical School and Massachusetts General Hospital.

SIVQ may also help with the analysis of "liquid biopsies," an experimental technique of scanning blood samples for tiny numbers of cancer cells hiding amid billions of healthy ones. Balis was involved with the development of that technology at Massachusetts General Hospital before he came to U-M and members of that research team are also involved in developing SIVQ and its applications.

Still, pathologists shouldn't be worried that SIVQ will put them out of a job.

"No one is talking about replacing pathologists any time soon," Balis says. "But working in tandem with this technology, the hope is that they will be able to achieve a higher overall level of performance."

Story Source:

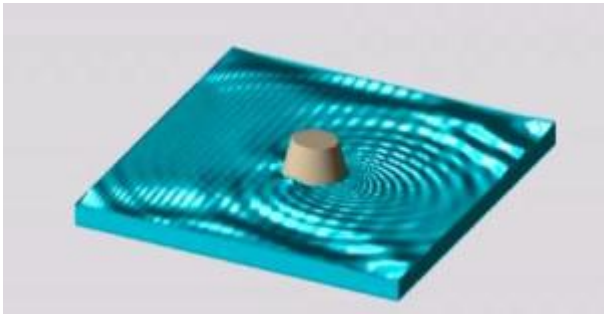
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Michigan Health System**.

Journal Reference:

1. Ulysses J Balis, Jason D Hipp, Jerome Y Cheng, Mehmet Toner, Ronald G Tompkins. **Spatially Invariant Vector Quantization: A pattern matching algorithm for multiple classes of image subject matter including pathology**. *Journal of Pathology Informatics*, 2011; 2 (1): 13 DOI: 10.4103/2153-3539.77175

http://www.sciencedaily.com/releases/2011/02/110228104306.htm

Simulating Breaking Waves



Waves around a conical island. (Credit: Image courtesy of Delft University of Technology)

ScienceDaily (Feb. 28, 2011) — The SWAN (Simulating WAves Nearshore) wave prediction model developed at TU Delft has been a huge international success for many years. This model predicts the distribution of wave heights close to the shore. It was recently expanded to include the SWASH (Simulating WAves till SHore) model, which enables the modelling of wave behaviour right up to the shore, including how they break and overflow.

Over a 1,000 institutes worldwide use the SWAN computer model which is available within the public domain (GNU GPL license, http://www.swan.tudelft.nl). This model was recently expanded to include the SWASH (Simulating WAves till SHore) model, which enables the results of the SWAN model to be continued right up to the shore, including how the waves break and overflow.

Film clips

As this model directly simulates the ocean surface, impressive images and film clips can be generated which are helpful in explaining the complex underlying physics of currents near the shore, and how waves break on the shore. The advent of SWASH means, for instance, that for the first time it is possible to depict how a tsunami flows onto and around an island.

Safe

Dr Marcel Zijlema is the developer and point of contact for SWASH: 'In line with the Flood Defences Act, the Dutch Directorate for Public Works and Water Management needs to ensure that flood defences can withstand the type of storm which only occurs once every 10,000 years. The problem is that we have never experienced this type of storm, and we therefore don't know exactly how high the waves will be or how they will behave. A model like SWASH is excellently suited to giving us a better idea of this type of situation. As we can create a better portrait of the complex processes near the shore, we can better estimate the safe height for our flood defences.'

Story Source:

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

http://www.sciencedaily.com/releases/2011/02/110228104117.htm

Looking for life on Mars? Try the salty bits

- 22 February 2011 by **Alfonso F. Davila**

Magazine issue 2800.

It's over there (Image: NASA)

The main reason we explore Mars is to find out if life ever existed there. But we're looking in the wrong places

WHEN searching for something, the first step is to look in the most likely location. That doesn't always work. Things sometimes show up in unexpected corners. But most of the time the milk is in the fridge, the phone is on the table, and the keys are by the door. Why would searching for life on Mars be any different?

The main reason we explore Mars is to determine if life ever arose on the planet. We have tried for centuries, starting with telescopes and lately with satellites, landers and rovers. We have searched for it directly (the Viking mission) and indirectly (every other Mars mission). No luck so far. Some think life has never been there. Others think it was there in the past but is now gone. Many think why bother, but that's a whole different story. I think we are looking in the wrong places. Here is why.

The surface of Mars is extremely cold and dry. Cosmic and solar radiation reach the surface unimpeded by the thin atmosphere, and the soil contains strong oxidants that destroy organic compounds. Fat chance for life. But it wasn't always so.

Early in its history Mars was warmer and wetter enough for the development of rivers, lakes and perhaps oceans. The atmosphere was thicker and the protective magnetic field was switched on. Mars might be uninhabitable today, but life would have been possible in the past. This is why future missions will focus on the study of ancient sediments, hoping to find fossilised evidence of life.

But first we need to find a promising location, and that means reconstructing Martian history. We need to find out if there was flowing water, the time and extent of the water, what type of minerals formed and if the geochemical conditions were compatible with life. Once promising sites are identified, we need to find out if there are any physical or chemical processes that could have destroyed fossilised evidence, and finally search for that evidence.

This is not easy, and this is why the search is getting more ambitious, sophisticated and expensive. The Mars Science Laboratory will launch this year to study the habitability and environmental history of a region on Mars that contains sediments formed billions of years ago. The MSL is the most advanced robot ever sent to another planet. Around 2018, a joint mission run by NASA and the European Space Agency will send two rovers to the surface to pave the way for a Mars Sample Return mission beyond 2020. It will be the first mission to collect and return samples from another planet. Its scientific value will be enormous, but in the process it might swallow NASA's planetary budget for the decade.

Is this the best strategy? I think not. Let's turn to our own planet for a second. On Earth, life is almost everywhere, but some places seem to be out of bounds. At first glance the Atacama desert in Chile and the Antarctic Dry Valleys appear lifeless, and until recently we thought they were.

Atacama is the driest desert on Earth, with only an occasional shower every 10 years or so. The Antarctic Dry Valleys are the coldest deserts on Earth. Most of the water is frozen in the ground, and the little snow that falls sublimates before it can melt. In both places liquid water, the key ingredient for life, is extremely rare. These deserts are the closest analogues we have to the Martian surface and allow us to study what happens to life as environments become drier and colder.

What happens is that life seeks refuge in niches where liquid water can still form, even if only for a short time every now and then. This occurs in two substrates, salts and ice. Salts absorb water vapour from the atmosphere and form liquid solutions at low relative humidities, a phenomenon called deliquescence. When ice is in contact with sediment particles, it melts and forms thin films of liquid water that are stable even at temperatures well below freezing.

In other words, salts and ice expand the window of physical conditions in which liquid water is stable, and provide small habitable niches even when the environment becomes generally uninhabitable. In the Atacama, where most of the water is in the atmosphere, life is found inside salt rocks, whereas in the Antarctic Dry Valleys it is found at the interface between ice or snow and sediments.

It turns out that salt and ice are also excellent substrates for preserving life. Ancient salt and ice deposits on Earth contain organic compounds, complex biomolecules and even entire cells which have been preserved for millions of years. Hence, the last niches where life can retreat as an environment becomes drier and colder are also the niches where remnants of life are better preserved - a stroke of luck that plays in our favour.

More good news: there are salty and icy environments on Mars. Large deposits of salts are widespread in the southern hemisphere; the northern polar cap has thick sequences of sediments and ice layers, and ground ice is near the surface at latitudes higher than 60° in both hemispheres. If there has ever been life on Mars, these are the niches where it could have retreated as the planet made the transition from wet and warm to cold and dry. These are also the places where fossil life would be best preserved. And these should be the first places we go searching.

This could be done with small, low-cost missions. A small rover or lander could provide unambiguous proof of life, if equipped with technology to detect the complex biomolecules that are only synthesised by living organisms. The technology is readily available. A positive result would be a turning point in history. A negative result would be strong evidence against the presence of life and biomolecules anywhere on the planet. Not a small prize for a comparatively small investment.

Alfonso F. Davila *is at the SETI Institute in Mountain View, California*

http://www.newscientist.com/article/mg20928005.900-looking-for-life-on-mars-try-the-salty-bits.html

Biology Nobelist: Natural selection will destroy us

- 28 February 2011 by **Clint Witchalls**

Magazine issue 2801.

Cautiously optimistic (Image: Licoppe Christophe/Photonews/Gamma/Eyedea Presse)

*We have evolved traits that will lead to humanity's extinction, says **Christian de Duve** – so we must learn to overcome them*

We are the most successful species on the planet, but you think we will ultimately pay the price for this success. Why?

The cost of our success is the exhaustion of natural resources, leading to energy crises, climate change, pollution and the destruction of our habitat. If you exhaust natural resources there will be nothing left for your children. If we continue in the same direction, humankind is headed for some frightful ordeals, if not extinction.

You think that natural selection has worked against us. How?

Because it has no foresight. Natural selection has resulted in traits such as group selfishness being coded in our genes. These were useful to our ancestors under the conditions in which they lived, but have become noxious to us today. What would help us preserve our natural resources are genetic traits that let us sacrifice the present for the sake of the future. You need wisdom to sacrifice something that is immediately useful or advantageous for the sake of something that will be important in the future. Natural selection doesn't do that; it looks only at what is happening today. It doesn't care about your grandchildren or grandchildren's grandchildren.

You call this short-sightedness "original sin". Why did you pick this terminology?

I believe that the writers of Genesis had detected the inherent selfishness in human nature that I propose is in our genes, and invented the myth of original sin to account for it. It's an image. I am not acting as an exegete - I don't interpret scripture.

How can humanity overcome this "original sin"?

We must act against natural selection and actively oppose some of our key genetic traits.

One solution you propose is population control, but isn't this ethically dubious?

It is a simple matter of figures. If you want this planet to continue being habitable for everyone that lives here, you have to limit the number of inhabitants. Hunters do it by killing off the old or sick animals in a herd, but I don't think that's a very ethical way of limiting the population. So what remains? Birth control. We have access to practical, ethical and scientifically established methods of birth control. So I think that is the most ethical way to reduce our population.

You also advocate giving more power to women. Why?

Speaking as a biologist, I think women are less aggressive than men, and they play a larger role in the early education of the young and helping them overcome their genetic heirloom.

Are you optimistic about humankind's future?

I'm cautiously optimistic - very cautiously. I try to be optimistic because I prefer to give a message of hope to young people, to say: you can do something about it. But in the present, there is not much evidence that this is happening.

Profile

Christian de Duve is professor emeritus at the Catholic University of Louvain (UCL), Belgium and Rockefeller University, New York. In 1974 he co-won a Nobel prize for his work on cellular structure. His latest book, *Genetics of original sin*, is published by Yale University Press

http://www.newscientist.com/article/mg20928015.400-biology-nobelist-natural-selection-will-destroy-us.html

Uncertain future for east coast koalas

- 25 February 2011
- Magazine issue 2801.

More forest is not enough (Image: Torsten Blackwood/AFP/Getty)

THE koalas on Australia's eastern coast face a bleak future even if all the deforested land there is replanted to give the tree-dwellers a leg-up.

Faced with the twin threats of disease and urbanisation, koalas (*Phascolarctos cinereus*) are in rapid decline across most of eastern Australia. In the worst-hit areas more than 60 per cent of the koala population has been lost in the past 10 years.

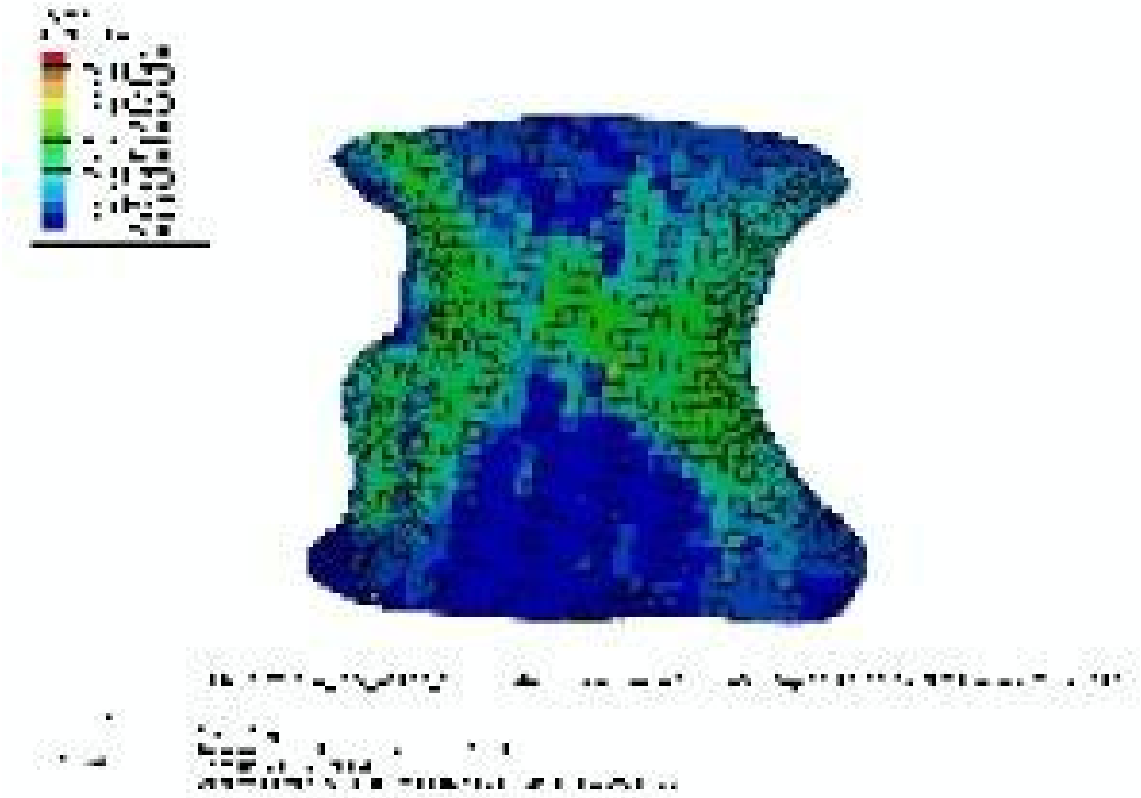
But for conservationists who think that habitat reconstruction could reverse the decline in the region, Jonathan Rhodes and colleagues at the University of Queensland in Brisbane have sobering news. Using data obtained by tracking and tracing 220 koalas for four years, their mathematical model predicts that reforestation alone will not be enough to reverse the marsupials' fortunes.

Neither will focusing solely on eliminating road deaths or preventing attacks by dogs. And while preventing 59 per cent of deaths from disease would halt the decline, there is currently no treatment for the Koala retrovirus that is killing the animals.

All is not lost, though. The east coast koalas could bounce back if the threats from disease, dogs and cars are all tackled at the same time. And once the koala population starts to climb, more trees would help maintain it (*Biological Conservation*, DOI: 10.1016/j.biocon.2010.12.027).

http://www.newscientist.com/article/mg20928013.000-uncertain-future-for-east-coast-koalas.html

Learning from Old Bones to Treat Modern Back Pain



The computerised tomography (CT) scans lead to detailed 3-dimensional computer models of vertebra. (Credit: Image courtesy of Engineering and Physical Sciences Research Council)

ScienceDaily (Feb. 28, 2011) — The bones of people who died up to a hundred years ago are being used in the development of new treatments for chronic back pain. It is the first time old bones have been used in this way.

The research is bringing together the unusual combination of latest computer modelling techniques developed at the University of Leeds, and archaeology and anthropology expertise at the University of Bristol.

With Engineering and Physical Sciences Research Council (EPSRC) funding, spines from up to 40 skeletons housed in museums and university anatomy collections are being analysed in the research.

The data generated, on different spine conditions and on how spines vary in size and shape, is playing a key role in the development of innovative computer models. This will enable the potential impact of new treatments and implant materials (such as keyhole spinal surgery and artificial disc replacements) to be evaluated before they are used on patients.

Ultimately, it will also be possible to use the models to pinpoint the type of treatment best suited to an individual patient.

Minister for Universities and Science David Willetts said: "Back pain is an extremely common condition, but everyone has a slightly different spine so developing new treatments can be a real challenge. This investment could significantly improve quality of life for millions of people around the world, so it's fantastic that the research is being carried out in the UK. It's also truly fascinating that old bones and very new technology can come together to deliver benefits for patients."

This is the first software of its kind designed for the treatment of back conditions. The research will also speed up the process of clinical trials for new treatments, which currently can take up to ten years.

The data provided by the old bones will be used to supplement similar data collected from bodies donated to science, which are limited in number and mainly come from older age groups.

"The idea is that a company will be able to come in with a design for a new product and we will simulate how it would work on different spines. The good thing about computer models is that we can use them over and over again, so we can test lots of different products on the same model," says Dr Ruth Wilcox, from the University of Leeds, who is leading the project. "If we were doing this in a laboratory we would need many new donated spines each time we wanted to test a treatment out."

This computer modelling breakthrough is possible thanks to recent advances in micro-CT (computed tomography) scanning, and to new techniques developed at the University of Leeds enabling data from micro-CT scans to be transformed into sophisticated computer models. Computed tomography (CT) scans use X-rays to build up 3-dimensional images from multiple cross-sectional pictures of body organs or tissues.

"The wider the pool of spinal data at our disposal, the more effective the computer models will be in terms of demonstrating the impact of treatments on different back conditions and back types," says Dr Kate Robson Brown from the University of Bristol's Archaeology and Anthropology Department. "The computer modelling software should be available for testing newly developed products and treatments in the next few years and along the way this cutting-edge research could even provide new insight into how our ancestors evolved!"

Further information

The research community and orthopaedic product manufacturers have only recently started to give spines the same sort of attention that they have traditionally given to hips and knees. This is mainly because getting spinal treatment wrong has much more immediate serious implications for the patient and may even result in legal action against product manufacturers or medical staff. The new computer models will therefore provide the knowledge and confidence needed to develop and apply new types of treatment which can be tested out first by the computer modelling process.

Moreover, once a range of new back-pain treatments have been developed by, for example, product manufacturers, it will also be possible to scan a patient's back and then use the computer models to identify the optimum treatment option in that particular case.

The project team will carry out a micro-CT scan on vertebrae in each of the spines they analyse, producing highly detailed 3-dimensional images of the vertebrae. The bank of images generated will then be used by the computer models to 'virtually' test the effectiveness of a variety of possible back-pain treatment options. Those showing clear potential can then progress to the next stage of development.

Engineering, biology, chemistry and computer science will all make a vital contribution to this multidisciplinary project. In addition, close involvement of orthopaedic product manufacturing companies is being sought.

The 5-year project 'Engineering Solutions to Back Pain: An Interdisciplinary Approach' began last year and is due to run until 2013. It will receive EPSRC funding of nearly £1.1 million.

More effective treatment of back pain would have enormous benefits. Apart from a considerable improvement in the quality of life enjoyed by people suffering from the condition, it would also help the economy by reducing time taken off work. Moreover, it could cut the burden on healthcare resources caused by repeated, ongoing visits to GPs and hospital consultants, for example.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Engineering and Physical Sciences Research Council**.

http://www.sciencedaily.com/releases/2011/02/110228104115.htm

How Bees Learn Which Odors to Follow

Honey bee that extends its proboscis in order to lick up a drop of sugar solution from a pipette. (Credit: Copyright: M. Strube-Bloss)

ScienceDaily (Feb. 28, 2011) — Scientists at Freie Universität Berlin and the Bernstein Center Berlin have traced odor memory to a certain area of the bee brain. How successful bees are in their search for food depends largely on how well they can, based on their odors, detect nectar-rich flowers from a distance and distinguish them from less promising plants. Researchers working withProfessor Randolf Menzel, a neurobiologist at Freie Universität's Department of Biology, Chemistry, and Pharmacy, investigated how and whether bees can recognize a relationship between the odor and nectar of a particular flowers and whether this association is localized in a certain area of the bee brain.

The researchers caught nectar-collecting bees when they were about to swarm out from their hive, and "sent them to school" in their lab. The curriculum contained five different artificial fragrances. First, the bees were introduced to all five odors. Then, in a learning phase, one of the odors was always followed by presentation of a drop of sugar solution, while another odor went unrewarded. This form of classical Pavlovian conditioning is based on the proboscis extension reflex, which is elicited when the bees' antennas get into contact with sweet liquids. The bees quickly learned to extend their probosces and collect the sugar solution whenever the rewarded odor was presented. This response was faithfully maintained for three hours after learning.

To investigate the neural basis of this memory process, as part of his dissertation at Freie Universität, the biologist Martin Strube-Bloss, currently at the Max Planck Institute for Chemical Ecology in Jena, measured electrical reactions of certain nerve cells, namely the output neurons in the mushroom bodies of the bee brain, which had already been raised as candidates for learning. The result was surprising. During the learning phase, the activities in the neurons did not change at all. But three hours after learning, there was a change: more neurons responded to the rewarded stimulus, and the responses to the rewarded stimulus were stronger. So the researchers had actually found a memory trace. Because of its time delay, they could even conclude that it was not due to the learning process itself or to short-term memory, but that they had rather identified the seat of long-term odor memory.

Mathematical analysis by Martin Nawrot, a computational neurobiologist at Freie Universität Berlin, showed that the memory trace in the mushroom body is extremely reliable. Just 150 milliseconds after presentation of an odor, the researchers could already tell, on the basis of the output neurons of the mushroom body, whether it was the rewarded odor or not. So it seems that the bee could safely rely on this group of neurons in order to tell whether an odor is promising, or -- in the wild -- which odor it is worthwhile to follow in order to find a nectar-bearing flower.

On the basis of their results, the researchers are now developing a computer model of the bee brain that can associate virtual odors with rewards and is able to make decisions on the basis of what it has learned. In the near future, such artificial brains are then to be applied in biomimetic robots.

The work was supported by the German Federal Ministry of Education and Research as part of the projects of Bernstein Center Berlin and Bernstein Focus Learning: Memory and Decision Making.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Freie Universitaet Berlin**, via AlphaGalileo.

Journal Reference:

1. M. F. Strube-Bloss, M. P. Nawrot, R. Menzel. **Mushroom Body Output Neurons Encode Odor-Reward Associations**. *Journal of Neuroscience*, 2011; 31 (8): 3129 DOI: 10.1523/JNEUROSCI.2583-10.2011

http://www.sciencedaily.com/releases/2011/02/110228090613.htm

The Deterioration of Mediterranean Farmland Patrimony

Photographs of the Murcia farmland taken from the Cabezo de Monteagudo at the beginning of the past century and in 2008. The most important difference is the intense housing development, as well as the different type of farming: horticulture in the old photo and fruit trees in the more recent one. In short, the photos reveal the graphic chronicle of how an agricultural landscape has become a suburban landscape. (Credit: Image courtesy of Universidad Carlos III de Madrid)

ScienceDaily (Feb. 28, 2011) — The starting point for this research is the recent and relentless transformation processes that the traditional irrigation network in the Mediterranean region has undergone and the subsequent degradation of some of its landscape, of great value from the point of view of productivity, patrimony and identity. The study deals with the relation between water and the agricultural landscape as well as the treatment of patrimonial values in public actions.

"It is vital that hydraulic policy and modernization projects for watering infrastructure be designed based on the principle of the multifunctionality of the old irrigation systems, assuming that economic efficiency not be the only parameter for evaluating public decisions. Cultural, patrimonial and even ecological values must be taken into account," concluded the UC3M Professor, Santiago Fernández Muñoz, who is the author of this study, together with Rafael Mata, Full Professor at the Universidad Autónoma de Madrid.

This research, stemming from the creation of a scientific panel to follow up water policy from an initiative of the *Fundación Nueva Cultura del Agua*, has been recently been published in *Scripta Nova*, the geography journal in the Spanish language. In the article, after carrying out a typology proposal of the traditionally irrigated countryside in Spain, its contemporary evolution is characterized, taking the Murcia *huerta* (farmland) as an example. The researchers have identified a relentless process of transformation of the Mediterranean *huertas* as a consequence of a reduction in the cultivated surface and encroaching housing developments. At the same time, the professors pointed out, the loss of cultural and ecological patrimony of the traditional irrigation and drainage networks carries with it a high risk of the disappearance of a valuable landscape in need of preservation, from a cultural, territorial, productive and even biological perspective.

A landscape with its own identity

The areas with the historic watering system are an excellent example of the agrarian landscape of Mediterranean valleys in dry and semi-arid areas. "They have been real agricultural oases, one of the most representative types in the Spanish Mediterranean area, which should be included among the most significant agriculture spaces in the European scale, together with the Atlantic *bocages* and the *open fields* in the continent's interior," commented Santiago Fernández Muñoz, from the UC3M Humanities Department: History, Geography and Art. "For certain areas, moreover, landscapes such as Valencia's *horta* or the Murcia *huerta* are as much identified with those region as are the Retiro for Madrid and Montserrat for Catalonia."

The last part of the researcher's study characterized some of the impact of modernization policies on patrimonial values for historic irrigated landscape and point out proposals to manage and safeguard these

areas. "Such conservation has been carried out through the instrument of territorial and urbanistic planning or where appropriate, as in the historical patrimony or preservation of nature model, which might be applied," the researchers pointed out, who also stress "the necessary consideration of certain areas in the traditionally irrigated Mediterranean as "special protected" (as established in the *Reglamento de Planificación Hidrológica (*Hydraulic Planning Regulations) ; article 23) and which should be incorporated in the hydraulic plans currently being drafted in certain areas," the researchers summed up.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Universidad Carlos III de Madrid**.

http://www.sciencedaily.com/releases/2011/02/110228090605.htm

New Hope for One of the World's Rarest Chameleons

Belalanda chameleon. (Credit: Image courtesy of University of Kent)

ScienceDaily (Feb. 28, 2011) — Conservationists from the Durrell Institute of Conservation and Ecology (DICE) at the University of Kent have discovered a new population of Madagascar's Belalanda chameleon.

The discovery took place just days after the team hosted an international conference to assess the conservation status of all Madagascar's reptiles, three of which, including the Belalanda, are already very close to extinction and have been classified as Critically Endangered. The conference took place in Antananarivo, the nation's capital, from 24 to 28 January.

Previously known only from a few trees in two small villages, the Belalanda chameleon is one of 75 species of chameleon that occur only in Madagascar, all of which are threatened by habitat destruction. The new population was discovered in a third village on the south of the main island.

Richard Griffiths, Professor of Biological Conservation at DICE and team leader for the project, described the find as 'very important for this species, which is probably one of the world's rarest reptiles'.

He also explained that DICE is working with the authorities in Madagascar to develop plans to manage chameleons in the wild. 'Habitat loss and degradation is the main threat to chameleons and biodiversity in general in Madagsacar,' he said. 'Our teams are working closely with local communities and our partners to raise awareness of the plight of these amazing creatures.'

DICE's local partner on the project is Madagasikara Voakajy, a Malagasy biodiversity organisation that uses conservation science and community participation to protect endemic Malagasy species -- many of which are highly prized within the pet trade -- and their habitats.

The DICE-Madagascar project is funded by the UK's government's Darwin Initiative and the British Herpetological Society.

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

http://www.sciencedaily.com/releases/2011/02/110228090603.htm

Coral 'whisperers' diagnose reef pollution woes

- 24 February 2011 by **Sonia Van Gilder Cooke**
- Magazine issue 2801.

The doctor will see you now (Image: Carlos Villoch/SplashdownDirect)

A pioneering project applies concepts of personalised medicine to coral reefs to decode signals that corals put out when under stress from poisons

ROBERT RICHMOND never meant to go to court. Yet there he was before a judge on the Micronesian island of Yap in the Pacific Ocean.

The coral forensics expert at the University of Hawaii was testifying in a case brought by Yap's tribal elders against the owner of the Kyowa Violet cargo ship, which in 2002 had slammed into a reef just outside Yap's main harbour, spewing 200,000 litres of oil into the lagoon.

The elders had turned to Richmond to find out whether the spill had damaged the reef even in areas that were not visibly oiled. As a member of Coral Whisperer, a pioneering project which applies the concepts of personalised medicine to coral reefs, he was the perfect choice.

The project uses scientists from five universities to decode the signals that corals put out when they are under stress. So far, the team has shown that when a coral is exposed to a toxic substance, such as oil, it activates particular genes. These in turn increase the production of enzymes that scrub its cells clean. Different toxins activate different genes, producing a different set of enzymes. So by picking up on changes in the enzymes released by this "defensome", the researchers can diagnose the source of stress.

This is what Richmond did in the Yap case. He collected samples of coral from the reef and sent them to Craig Downs at Haereticus Environmental Laboratory in Virginia for analysis. The results showed that the coral had turned on the genes that code for the proteins cytochrome P450 1 and 2 class, and multixenobiotic resistance proteins (MXR) - the enzymatic hallmarks of oil exposure. In part on the strength of this evidence, the judge ruled in favour of the islanders and in 2006 awarded them $861,600 for damage to the reef.

Since the trial, the project has continued apace. In the coming months, it will launch PdamBase, which will make the defensomes of coral species public so that other researchers can use them, starting with the widespread lace coral, *Pocillopora damicornis*.

The Coral Whisperer team eventually hopes to create easy-to-use tests that will allow reef managers as well as researchers to monitor coral. Such a kit will become more useful as reefs come under greater threat from pollutants and climate change.

Sometimes the whisperer tests reveal hidden culprits. When the Yap results came back, for example, Downs found that the oil-free coral that was being used as a control had activated the gene that codes for cytochrome P450 6 class - due to organophosphate pesticide. It turned out a farm had sprung up near the reef, and its run-off was sickening the coral in an area thought to be pristine.

This kind of test is particularly useful when more than one factor is at play. In Maunalua Bay, Hawaii, the reason a reef was declining was unknown. Suspects included overfishing, heavy metal pollution, termiticides, pesticides and sediment. Richmond tested samples from various parts of the reef and offered a three-part diagnosis. Near shore, elevated MXR indicated oil pollution; in the middle of the channel, algae and mud were slowly suffocating the corals; and further out, a biomarker suggested termiticides were damaging coral DNA.

The whispering methods may soon play a role in unpicking the greatest environmental disaster of recent years: last year's Gulf of Mexico oil spill. Iliana Baums of Pennsylvania State University, University Park, is not part of the coral whisperer team, but she is using the approach to look at the effects of crude oil and the dispersant Corexit on deep-water corals in the Gulf.

By chance, Baums had just finished sampling the Gulf's black coral, *Leiopathes glabberima*, when the spill hit. A few months later, she returned to collect more live coral. Her team is now studying the gene expression in both the pre- and post-spill corals. She hopes the results, which should say whether the deep-sea corals were harmed by the oil and dispersants, will be available next year.

These new methods offer some hope in the race to stop the global coral decline. Finding out exactly what is stressing the corals means local people can remove the stressors. This in turn helps the coral cope with more persistent problems like global warming.

Support for this idea came in 2002, when El Niño singed the spectacular corals of the Phoenix Islands in the Pacific Ocean in the worst thermal wipe-out on record. Since then, the reef has made an astonishing comeback thanks to the islands' lack of humans and the pollution they would have imposed. It seems corals can rally against warm waters if they are healthy, which makes a doctor more important than ever.

http://www.newscientist.com/article/mg20928013.400-coral-whisperers-diagnose-reef-pollution-woes.html

The tectonic forces that are shredding New Zealand

- 14:58 24 February 2011 by **Wendy Zukerman**

On the fault (Image: Sarah Ivey/Newspix/Rex Features)

This week the New Zealand city of Christchurch felt the force of a 6.3-magnitude earthquake. The quake came just five months after an even larger one struck 40 kilometres west of Christchurch, near the town of Darfield. In fact New Zealand experiences around 14,000 tremors each year, although most are too small to be felt. They are a sign of the tectonic processes that are gradually shredding the country.

Why is New Zealand so prone to earthquakes?
Regions that lie close to a boundary between tectonic plates tend to feel more quakes than areas in the middle of a plate. New Zealand may have a total land area of just 27,000 square kilometres, but that area happens to coincide with the margin between the Pacific and Australian plates, leaving parts of the island very seismically active.

Which areas are most vulnerable?
Large areas of both North and South Islands have felt earthquakes with a magnitude greater than 5 within the past 200 years. This is because of New Zealand's unique tectonic regime: despite its small size, the country feels the impact of three distinct regions of tectonic activity.

The relatively low-density continental crust of the North Island, which sits on the Australian plate, is forcing the dense oceanic crust on the Pacific plate beneath it in a process called subduction. This creates a so-called destructive plate margin that is nibbling away at the Pacific plate. Earthquakes are common where a subducting plate grinds against the underside of an overriding plate.

Something similar is occurring to the south-west of South Island. But here the sliver of continental crust lies on the Pacific plate, and it is the Australian plate that is being destroyed through subduction.

In between, the continental crust on the Pacific and Australian plates slide past one another on South Island, creating a conservative plate margin where crust is neither created nor destroyed. This area is still prone to earthquakes, most notably along the Alpine fault. Further away from these fault zones the ground is generally more quiescent. Christchurch is over 100 kilometres from the Alpine fault.

So what caused the Christchurch quake?
It was caused by a new fault – or, to be more precise, a previously unrecognised fault.

"The fault is likely to have existed previously – and possibly produced earthquakes before – but they have not ruptured recently, in a geological sense," says John Townend at the Victoria University of Wellington, New Zealand. The unrecognised fault appears to be an offshoot from the Alpine fault. Unfortunately for the residents of Christchurch, that offshoot passes very near South Island's largest city.

Are more quakes on the fault likely?
Earthquake prediction is an inexact science, despite tantalising evidence that early warning systems may be possible in some cases. But some seismologists are cautiously optimistic.

"An earthquake of this magnitude does a good job of releasing stress," says Gary Gibson, a seismologist at the University of Melbourne, Australia. Townend agrees: "My interpretation of what we are seeing near Christchurch is temporary, albeit harrowing, activity in what is generally a relatively low-seismicity part of the broad plate boundary."

What's the long-term prognosis for New Zealand?
Even if Christchurch dodges major seismic activity in the near future, tectonic forces will continue to act on New Zealand. Hamish Campbell at the research consultancy GNS Science in Lower Hutt, New Zealand, says it's "very unlikely" that the newly recognised fault will have any serious effect on the country's geography, but activity on the Alpine fault may well do so.

The rocks on either side of the Alpine fault are grinding past each other quickly – at around 30 millimetres per year. The southern part of South Island has moved at least 480 kilometres relative to the northern part within the past 25 million years. That rate of movement is "colossal", says Campbell – and not far off the displacement seen on the world-famous San Andreas fault in California, which is itself a conservative plate margin.

Fast forward several million years and New Zealand will continue to twist and turn. The activity that is already shredding the country will ultimately see South Island "split in two along the Alpine boundary", says Campbell. The town of Kaikoura would be at the northern tip of one island, with Greymouth at the southern tip of the other, he predicts.

http://www.newscientist.com/article/dn20165-the-tectonic-forces-that-are-shredding-new-zealand.html?full=true&print=true

Germany's coal own goal over carbon permits

- 24 February 2011

Magazine issue 2801.

Double trouble (Image: F1 Online/Rex Features)

EUROPE'S plans for tackling global warming by driving down emissions of carbon dioxide may have backfired in Germany, where they have encouraged energy companies to build coal-fired power stations instead of gas-fired stations, which emit less CO_2.

Launched in 2005, the European Union's Emissions Trading System sets a limit on the combined emissions from Europe's power stations, which gradually declines each year. To encourage clean energy production, European nations issue pollution permits to their individual generators, which they can trade, allowing clean stations to sell any unwanted permits to "dirty" ones.

But a new analysis led by Michael Pahle of the Potsdam Institute for Climate Impact Research in Germany shows that when the German government issued permits in 2005, its allocation rules encouraged a "dash for coal".

Pahle, whose results appear in *Energy Policy* (DOI: 10.1016/j.enpol.2011.01.027), says that the mistake in 2005 was to allocate permits according to demand from existing technology, which meant coal-fired generators got the lion's share. Auctioning the permits or prioritising allocations to the cleanest technologies available would have encouraged investment in gas-fired stations.

The policy resulted in the building of coal-fired power stations with a combined capacity of almost 12 gigawatts - about one-third of peak German demand in 2008. Together, these will emit about 54 megatonnes of CO_2 per year, which Pahle says is roughly double what would have been emitted if gas-fired stations had been built instead.

The European Commission, meanwhile, says that despite the dash for coal in Germany, the carbon trading scheme remains successful overall, with a fall in CO_2 emissions in 2009 of 11 per cent across the EU compared with 2008.

http://www.newscientist.com/article/mg20928012.600-germanys-coal-own-goal-over-carbon-permits.html

Lily Cole: People and elephants can live in harmony

- 23 February 2011 by **Roger Highfield**

Magazine issue 2800

Living in peace with elephants

A visit to India gave the model and actress striking evidence of how humans and elephants can live in peace with each other, with the right planning

You are best known from the world of fashion and film, so how did you come to be involved in elephant conservation?

Through a friend, I got involved with the Emeralds for Elephants campaign for the conservation charity World Land Trust. They invited me to India, where they have been working with the Wildlife Trust of India (WTI) to establish corridors of land along traditional elephant migration routes. These corridors link national parks and other protected areas so that the elephants can walk the routes they have used for hundreds of years. Conflict between humans and animals is reduced by enabling local NGOs to buy land in the corridors and offering the villagers living there houses and larger plots of land nearby.

On your visit to India you saw some of these land corridors. Are you convinced they are a good strategy for conservation?

In Kerala we visited an area within a corridor where a village had recently existed. The evidence of elephants moving through the area - cut markings on the trees, trampled gates - suggested that, ordinarily, there would have been conflict here between villagers and elephants. In India in the past decade, some 3200 people and 1150 elephants have died due to these conflicts.

What about the social implications of moving an entire village? What did you see of this?

We met villagers who used to live in the corridors but who were now resettled locally through a WTI initiative. One man said how glad he was to be able to sleep with his family at night now. Before, he had to keep watch in case elephants came.

Are there any other benefits for conservation from the creation of land corridors?

They are used by other wildlife, such as tigers and monkeys. It was fantastic to see these efforts, which benefit humans but also promote biodiversity and harmony between species. There is no reason for conflict between humans and animals if the wildlife and their patterns of living are understood and respected.

What other memorable things did you see on your visit?

I was particularly affected by the extraordinary landscape of the Himalayas. It took my breath away and made me feel so appreciative of this wonderful planet we live on. I know it sounds hideously hippy, bit it reiterated to me how much trees need protecting. We depend on forests to survive, so it is quite unbelievable, when you consider it logically, how blindly we cut down many forests each day. I say "we", as I think we are globally accountable for deforestation, whether it is happening now or happened in the past.

Celebrity involvement in environmental causes seems to be on the rise. Do you think it can make a difference?

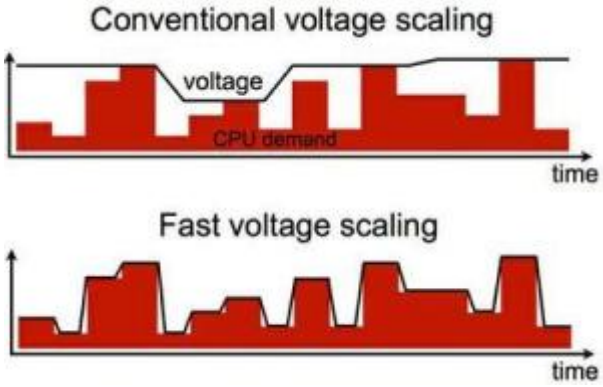
The more paths that can be created towards the same destination - environmental sustainability - the more hopeful it is that we will reach it.

Profile

Actress and model Lily Cole was the youngest English model to appear on the cover of British *Vogue*. Last year she helped to launch the Emeralds for Elephants fund-raising exhibition for the conservation charity World Land Trust. She is studying the history of art at the University of Cambridge

http://www.newscientist.com/article/mg20928006.000-lily-cole-people-and-elephants-can-live-in-harmony.html

Plug-and-Play Multi-Core Voltage Regulator Could Lead to 'Smarter' Smartphones, Slimmer Laptops and Energy-Friendly Data Centers



The multi-core voltage regulator responds almost instantaneously to changes in power demand from each core of the processor. As a result, the power supply matches the demand more closely, conserving energy. (Credit: Image courtesy of Wonyoung Kim, Harvard School of Engineering and Applied Sciences)

ScienceDaily (Feb. 28, 2011) — There was a time when a laptop could weigh 10 pounds and still sell -- a time when a cell phone was larger than a pocket -- and a time when an iPod only played music.

Today's consumers expect mobile devices that are increasingly small, yet ever-more powerful. All the bells and whistles, however, suck up energy, and a phone that lasts only 4 hours because it's also a GPS device is only so much use.

To promote energy-efficient multitasking, Harvard graduate student Wonyoung Kim has developed and demonstrated a new device with the potential to reduce the power usage of modern processing chips.

The advance could allow the creation of "smarter" smartphones, slimmer laptops, and more energy-friendly data centers.

Kim's on-chip, multi-core voltage regulator (MCVR) addresses what amounts to a mismatch between power supply and demand.

"If you're listening to music on your MP3 player, you don't need to send power to the image and graphics processors at the same time," Kim says. "If you're just looking at photos, you don't need to power the audio processor or the HD video processor."

"It's like shutting off the lights when you leave the room."

Kim's research at Harvard's School of Engineering and Applied Sciences (SEAS) showed in 2008 that fine-grain voltage control was a theoretical possibility. This month, he presented a paper at the Institute of Electrical and Electronics Engineers' (IEEE) International Solid-State Circuits Conference (ISSCC) showing that the MCVR could actually be implemented in hardware.

Essentially a DC-DC converter, the MCVR can take a 2.4-volt input and scale it down to voltages ranging from 0.4 to 1.4V. Built for speed, it can increase or decrease the output by 1V in under 20 nanoseconds.

The MCVR also uses an algorithm to recognize parts of the processor that are not in use and cuts power to them, saving energy. Kim says it results in a longer battery life (or, in the case of stationary data centers, lower energy bills), while providing the same performance.

The on-chip design means that the power supply can be managed not just for each processor chip, but for each individual core on the chip. The short distance that signals then have to travel between the voltage regulator and the cores allows power scaling to happen quickly -- in a matter of nanoseconds rather than microseconds -- further improving efficiency.

Kim has obtained a provisional patent for the MCVR with his Ph.D. co-advisers at SEAS, Gu-Yeon Wei, Gordon McKay Professor of Electrical Engineering, and David Brooks, Gordon McKay Professor of Computer Science, who are coauthors on the paper he presented this week.

"Wonyoung Kim's research takes an important step towards a higher level of integration for future chips," says Wei. "Systems today rely on off-chip, board-level voltage regulators that are bulky and slow. Integrating the voltage regulator along with the IC chip to which it supplies power not only reduces broad-level size and cost, but also opens up exciting opportunities to improve energy efficiency."

"Kim's three-level design overcomes issues that hamper traditional buck and switch-capacitor converters by merging good attributes of both into a single structure," adds Brooks. "We believe research on integrated voltage regulators like Kim's will be an essential component of future computing devices where energy-efficient performance and low cost are in demand."

Although Kim estimates that the greatest demand for the MCVR right now could be in the market for mobile phones, the device would also have applications in other computing scenarios. Used in laptops, the MCVR might reduce the heat output of the processor, which is currently one barrier to making slimmer notebooks. In stationary scenarios, the rising cost of powering servers of ever-increasing speed and capacity could be reduced.

"This is a plug-and-play device in the sense that it can be easily incorporated into the design of processor chips," says Kim. "Including the MCVR on a chip would add about 10 percent to the manufacturing cost, but with the potential for 20 percent or more in power savings."

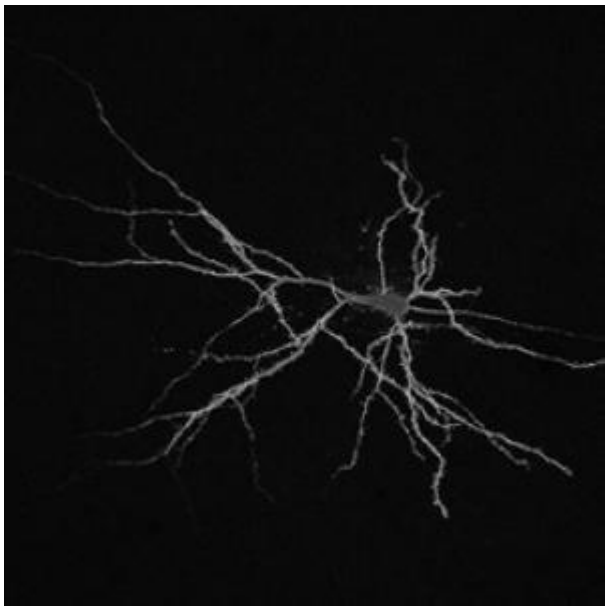
The research was supported by the National Science Foundation's Division of Computer and Network Systems and Division of Computing and Communication Foundations.

Story Source:

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

http://www.sciencedaily.com/releases/2011/02/110228090218.htm

'Round-the-Clock' Lifestyle Could Disrupt Metabolism, Brain and Behavior



Simple minded. Researchers found that disrupting the circadian cycles of mice led to changes in the top part of the complex dendritic tree of cortical neurons (above). These trees were less complex in animals thrown off their schedule. (Credit: Image courtesy of Rockefeller University)

ScienceDaily (Feb. 27, 2011) — In *Civilization and Its Discontents*, Sigmund Freud argued that modern society was hard on human psychology, forcing people to get along in unnaturally close quarters. Now newly published research from The Rockefeller University points out a different discontent in the developed world, namely, the disruption of our natural sleep cycles, thanks to the ubiquity of electric lighting.

Experiments on mice, published this month in *Proceedings of the National Academy of Sciences*, found that throwing off their evolutionarily ancient circadian rhythms by artificially altering the length of their days has a substantial impact on the body and the brain. The work suggests that our modern, round-the-clock lifestyle could disrupt metabolism, interfere with learning and impact behavior in ways that we're just beginning to understand.

Researchers led by Ilia Karatsoreos, a postdoc in Bruce S. McEwen's Harold and Margaret Milliken Hatch Laboratory of Neuroendocrinology, housed mice for 10 weeks in 20-hour light-dark cycles, at odds with their natural 24-hour circadian cycle. They found that after six weeks, the disrupted mice got fatter, showed less mental flexibility and were more impulsive than mice kept on their natural schedule. The findings were originally presented at a Society for Neuroscience's conference in 2009.

Looking ahead, Karatsoreos says, a main goal is to understand how this environmental disruption works at the biochemical level. "We are interested in how the light cycle changes affects 'clock genes' -- the actual molecular gears of the circadian clock within cells -- in different brain regions, particularly the prefrontal cortex, and how this translates to changes in the functioning of the cells in that region."

At the same time, the researchers are working to understand the changes at the cellular and molecular level of peripheral tissues, especially those involved in metabolism and energy usage, such as the liver and the adipose tissues.

"The circadian system is a 'web,' with rhythms at the molecular level driving rhythms at the cellular level, which results in rhythms at the tissue level," Karatsoreos says. "This can lead to a cascading set of effects throughout the whole organism, and we want to understand how exactly that happens."

The researchers believe that this cascade may affect how an individual, whether animal or human, responds to additional challenges to the immune or metabolic systems, such as infection or high fat food, both ubiquitous realities of modern life. They are also working on models to understand the impact of different kinds of light-dark shifting such as those experienced by flight crews, shift workers, military personnel and medical residents. "We want to know how different patterns affect the brain and body, and if they share similar mechanisms of action," says Karatsoreos.

Story Source:

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

Journal Reference:

1. I. N. Karatsoreos, S. Bhagat, E. B. Bloss, J. H. Morrison, B. S. McEwen. **Disruption of circadian clocks has ramifications for metabolism, brain, and behavior**. *Proceedings of the National Academy of Sciences*, 2011; 108 (4): 1657 DOI: 10.1073/pnas.1018375108

http://www.sciencedaily.com/releases/2011/02/110226214132.htm

Clues About Grasshopper Population Explosions

Grasshopper. Grasshoppers and Mormon crickets cause an estimated $1.5 billion (2005 U.S. dollars) in damage to grazing lands in the American West. (Credit: iStockphoto/Christian Uhrig)

ScienceDaily (Feb. 27, 2011) — Literature and films have left us with vivid images of the grasshopper plagues that devastated the Great Plains in the 1870s. Although commonly referred to as grasshoppers, the infestations were actually by Rocky Mountain locusts.

The Rocky Mountain locust became extinct in 1902, but their cousins, grasshoppers and Mormon crickets, today still cause an estimated $1.5 billion (2005 U.S. dollars) in damage to grazing lands in the American West. A long-running research project directed by University of Notre Dame biologist Gary Belovsky, who also is director of the Notre Dame Environmental Research Center (UNDERC), is examining what limits grasshopper populations and the role played by grasshoppers in prairie ecosystems.

Belovsky first started studying grasshopper populations in 1978 at the National Bison Range, now a location for one of UNDERC's national undergraduate programs. Following the last major Western grasshopper outbreak in 1985, the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (UDSA-APHIS) asked Belovsky to help study the grasshopper's feeding preferences and population dynamics in western Montana.

Belovsky's research demonstrates that no single factor leads to a grasshopper outbreak, but, rather, multiple interacting factors are necessary. This requires sound understanding of how food and predators influence these native insects in combination with varying climate.

One of his key discoveries is that grasshoppers have a major impact on plants by changing the way nitrogen cycles in grasslands. Where grasshoppers speed up the process of nitrogen recycling by selectively feeding on plants that take longer to decompose, plant production increases. However, if they selectively feed on plants that decompose quickly, nitrogen becomes less available to the soil and plant production decreases.

Belovsky's findings helped change the way USDA/APHIS carries out its mandate to control grasshoppers on federal rangeland. Previously, the agency sprayed large swaths of land with insecticides, including areas where grasshoppers were actually befitting plant growth by speeding up nitrogen recycling. USDA/APHIS now relies on more restricted spraying, focusing on those areas where grasshoppers are damaging plants.

Belovsky also used National Science Foundation funding to develop mathematical models to help predict significant spikes in grasshopper populations based on the number of grasshopper eggs. If egg numbers are low in the spring, grasshopper predators like birds and spiders can usually keep the populations under control. However, when eggs in the spring are especially numerous, more grasshoppers hatch and predators are unable

to keep the populations under control, which can signal significant problems for rangeland ecosystems. However, if grasshoppers are very abundant, the young grasshoppers may actually compete for the rarer highly nutritious food plants and starve to death before they can grow up and cause damage to the range.

Belovsky's research is now the longest running experimental study at a site examining what controls grasshopper numbers and, as such, Belovsky continues to acquire an unusually detailed and rich database of scientific information about Western rangelands. Additionally, UNDERC undergraduates, including a number of Native Americans, learn about this striking ecosystem and some participate in the research.

His research has the potential to make grasshopper plagues, like the Rocky Mountain locust, but a memory.

Story Source:

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

http://www.sciencedaily.com/releases/2011/02/110225142832.htm

Floating Solar Panels: Solar Installations on Water

Floating solar panels (Credit: Image courtesy of Eureka)

ScienceDaily (Feb. 27, 2011) — Most of the solar energy systems on the market today bare two major weaknesses: they require vast land areas in order to be built, and the costs related to solar cells fabrication and maintenance are high. A new technology is about to overcome these challenges and many more: floating solar power plants.

Developed by a Franco-Israeli partnership,* this innovative solar power technology introduces a new paradigm in energy production. Solar power plays a dominant role in the world-wide effort to reduce greenhouse gases, it is considered a clean energy and is an efficient source of electricity. Yet several obstacles have been undermining the expansion of this sector and many of its actors are looking for a new approach towards the markets.

A win-win Situation

Soon after the design phase was over, at the end of March 2010, the fabrication of a prototype began and the team is now aiming to launch the implementation phase in September 2011. The tests will take place at Cadarache, in the South East of France, the site having a privileged position on the French electric grid and being close to a local hydro-electric facility providing the water surface to be used for the installation of the system. It will operate on-site during a period of nine months, while assessing the system's performances and productivity through seasonal changes and various water levels. The research team members believe that by June 2012, they will have all the information required to allow the technology's entry on the market.

As even leading photovoltaic companies struggle to find land on which to install solar power plants, the project team identified the almost untouched potential of solar installations on water. The water basins, on which the plants could be built, are not natural reserves, tourists' resorts or open sea; rather they are industrial water basins already in use for other purposes. By that, it is assured that the new solar plants will not have a negative impact on natural landscapes. "It's a win-win situation," declares Dr. Kassel, "since there are many water reservoirs with energy, industrial or agricultural uses that are open for energy production use."

After solving the question of space, the team also took on the problem of cost. "It sounds magical to combine sun and water to produce electricity, but we also have to prove that it carries a financial logic for the long run," explains Dr. Kassel. The developers were able to reduce the costs linked to the implementation of the technology by two means. First they reduced the quantity of solar cells used thanks to a sun energy concentration system based on mirrors, while keeping steady the amount of power produced.

Made of modules

Secondly, the team used a creative cooling system using the water on which the solar panels are floating. Thanks to this efficient cooling method, the photovoltaic system can use silicon solar cells, which tend to experience problems linked to overheating and need to be cooled down in order to allow the system to work correctly, unlike standard type more expensive cells. The particular type of solar cell used also allows a higher efficiency than the standard ones, achieving both reliability and cost reduction.

Still for the purpose of making the technology efficient and ready to market, the system is designed in such way that on a solar platform it is possible to assemble as many identical modules as needed for the power rating desired. Each module produces a standard amount of 200 kiloWatt electricity, and more power can be achieved by simply adding more modules to the plant.

The team also worked on the environmental impact of the technology. It works in fact as a breathing surface through which oxygen can penetrate to the water. This feature ensures that sufficient oxygen will maintain the underwater life of plants and animals. Dr. Kassel adds: "One of the implementation phase's goals is to closely monitor the possible effects of this new technology on the environment with the help of specialists" and "a preliminary check shows no detrimental environmental impact on water quality, flora or fauna. Our choices of materials were always made with this concern in mind."

*The project results from a collaboration between Solaris Synergy from Israel and the EDF Group from France. EUREKA provided the supporting platform which allowed to enhance both companies' partnership. After receiving the "EUREKA label" the project, called AQUASUN, found also support from the Israeli Ministry of Industry, Trade and Labor.

Story Source:

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

http://www.sciencedaily.com/releases/2011/02/110225123026.htm

When the mind's eye processes language

- 20:00 28 February 2011 by **Ferris Jabr**

The mind's eye can develop a knack for language in people who have been blind since birth.

Functional magnetic resonance imaging (fMRI) measures blood flow in the brain to determine which neurons are most active. Since the 1990s the technology has shown, surprisingly, that the visual cortex flares up even in blind people. More puzzlingly, this activity occurs when they were carrying out language tasks.

Rebecca Saxe at the Massachusetts Institute of Technology says the result seemed implausible, because the visual cortex isn't thought to be useful for language tasks. So to investigate, Saxe's team invited both sighted adults and those who had been blind since birth to listen to speech while lying inside an fMRI scanner.

The team found that the language processing centres in the brains of all participants behaved almost identically, but the visual cortices of blind participants buzzed with far more activity than those of sighted people.

"This was kind of crazy," says team member Evelina Fedorenko, also at MIT. "You have a portion of the brain which is there from birth to do something, but apparently it can acquire a new high-level function like language, which involves super complex cognitive processing."

Linguistic boost

Fedorenko thinks that blind people who get a linguistic boost from their visual cortex might be better at language tasks than sighted people.

Amir Amedi of the Hebrew University of Jerusalem in Israel, who also studies how blind people use their visual cortices for other sensory functions, points out that this kind of brain flexibility is not unprecedented. Previous studies show that the brain can take a neural region devoted to one sense – sight, smell, hearing – and use it for another.

"Although that is amazing, the bottom line of this paper is that the brain can do something even more sensational than turning one sense into another," he says. "A part of the brain spontaneously transforms just by the fact that one was born without vision. It's very elegant."

Journal reference: *Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.1014818108

º http://www.newscientist.com/article/dn20177-when-the-minds-eye-processes-language.html?full=true&print=true

Fish oil prevents weight loss during chemotherapy

- 15:16 28 February 2011 by **Catherine de Lange**

Magazine issue 2802.

No weight-loss pill (Image: Max Mumby/Alamy)

Fish oil may soon be on the menu for people with cancer to prevent weight loss during chemotherapy.

Weight loss is common during chemotherapy for aggressive tumours, both because treatment may reduce appetite and because tumours lead to muscle wasting. "This leaves patients unable to be given other treatments, such as radiation," says Rachel Murphy of the University of Alberta in Edmonton, Canada.

Trial studies suggested that fish oil could help, but larger clinical trials proved inconclusive – possibly because the trials involved people with advanced cancers that were difficult to treat.

Now, Murphy and colleagues have shown that 16 people newly diagnosed with lung cancer who were given 2.2 grams of fish oil a day maintained their weight during chemotherapy. A control group that went without the oil lost an average of 2.3 kilograms over the same period.

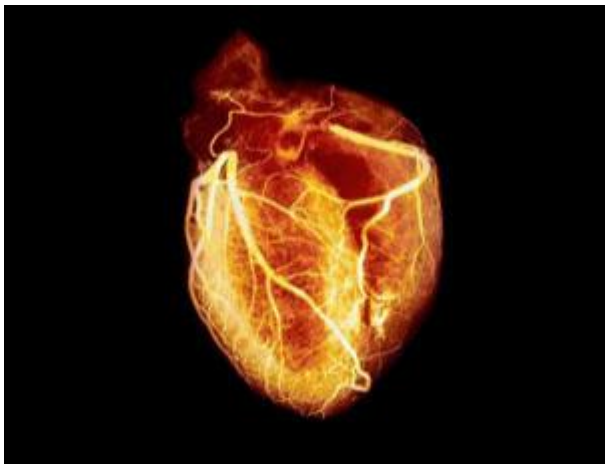
Fish oil may help prevent weight loss by reducing the inflammation response that causes muscle degradation, Murray says.

Journal reference: *Cancer*, DOI: 10.1002/cncr.25709

http://www.newscientist.com/article/dn20176-fish-oil-prevents-weight-loss-during-chemotherapy.html?full=true&print=true

Newborn mice can mend a broken heart

- 19:00 24 February 2011 by **Jessica Hamzelou**



Get 'em young (Image: SPL)

Why is a newborn mouse like a zebrafish? Because their hearts can heal – something impossible for adult mammals. The findings could lead to new treatments for heart disease in people.

Some fish and amphibians – zebrafish, for example – can regenerate heart tissue when it is damaged. They can do this throughout their life, whereas adult mammals can't: only mammalian embryos were known to have the ability. Intriguingly, before the heart of a developing mammalian embryo separates into four chambers, it looks similar to the two-chambered zebrafish heart.

To find out if mammals retain this heart-healing ability after birth, Enzo Porrello and colleagues at the University of Texas Southwestern Medical Center in Dallas turned to newborn mice.

They cut out a chunk of heart tissue – around 15 per cent of the left ventricle – from 1-day-old mice. When the group removed the whole organ 21 days later, they found that 99 per cent of the hearts had completely regenerated.

To find out whether regenerated hearts work properly, the team compared other heart-damaged newborn mice with mice that had been given a sham operation that did not touch the heart. Two months after the surgery, an echocardiogram showed that the regenerated hearts were functioning as well as the undamaged ones.

Early loss

When the group repeated the surgery in 7-day-old mice, the hearts did not heal, suggesting that the regenerative ability was lost by this age.

The team don't yet understand how regeneration occurs, but when they studied the newborn mice heart cells under a microscope, they saw that the damaged 1-day-old cells kept dividing – when the adult heart is damaged, by contrast, cells swell and tissue scars.

The adult mammalian heart can replace damaged cells to some degree, Porrello says, but it cannot replace the billion or so lost after a heart attack. "Our study is the first to experimentally demonstrate that the mammalian heart can completely regenerate heart muscle during a defined window of development."

It's possible that newborn human hearts might also be able to regenerate, Porrello says. "There is some evidence that the newborn human heart does not scar following injury, suggesting that it might also be capable of regenerating during early life."

Porrello's team are now trying to pin down how the regeneration works in the hope of developing a treatment for adult heart disease. "We need to turn back the clock on the adult human heart to the days just after birth," says Richard T. Lee of the Harvard Stem Cell Institute in Cambridge, Massachusetts, who was not involved in the study.

Journal reference: *Science*, DOI: 10.1126/science.1200708

http://www.newscientist.com/article/dn20168-newborn-mice-can-mend-a-broken-heart.html

Scientists Generate Pluripotent Stem Cells from Horses

In a world first, pluripotent stem cells have been generated from horses. (Credit: iStockphoto/Stanislav Fadyukhin)

ScienceDaily (Feb. 27, 2011) — In a world first, pluripotent stem cells have been generated from horses by a team of researchers led by Dr. Andras Nagy at the Samuel Lunenfeld Research Institute of Mount Sinai Hospital and Dr. Lawrence Smith at the University of Montreal's Faculty of Veterinary Science. The findings will help enable new stem-cell based regenerative therapies in veterinary medicine, and because horses' muscle and tendon systems are similar to our own, aid the development of preclinical models leading to human applications.

The study was published in the February 28 issue of the leading journal *Stem Cell Reviews and Reports*.

These induced pluripotent stem (iPS) cells can develop into most other cell types and are a source of great hope for use in regenerative medicine and the development of new drugs to prevent and treat various illnesses. One aspect of regenerative medicine is the process of creating living, functional tissues to repair or replace tissue or organ function lost due to damage or disease. "To date, iPS cells have been established from several species, but our study is the first to report the derivation of these changeable cells from horses," Dr. Smith explained.

The research represents a breakthrough for both human and animal health alike. "Equine iPS cells bring new therapeutic potential to the veterinary field, and open up the opportunity to validate stem-cell based therapies before clinical studies in humans," Dr. Nagy said. "As well, stem-cell based studies using the horse as a model more closely replicate human illnesses, when compared with studies in mice."

After two months of reprogramming equine somatic cells, the resulting iPS cell lines expressed hallmark markers of pluripotency, contained a correct set of horse chromosomes, and were able to form a full spectrum of cell types and tissues fulfilling the criteria of pluripotency. The term pluripotency refers to the ability of a

stem cell to become any of the vast number of different cell types found in the body. "This means that the cell lines passed all the tests available to us for determining if they truly are what we think they are: pluripotent and a good source for future regenerative applications," said Kristina Nagy, research associate in the Nagy laboratory and lead author of the study.

"The horse is an excellent model for a range of human degenerative diseases, especially those involving joints, bones, tendons and ligaments, such as arthritis," said Dr. Sheila Laverty, a professor in the Faculty of Veterinary Medicine at the University of Montreal. "Bone fracture, as well as damaged cartilage, tendons and ligaments heal poorly in horses. Therefore, the use of iPS cells in these animals may help enhance long-term tissue repair." Further research will be required to develop clinical treatments.

Dr. Andras Nagy is a senior investigator at the Lunenfeld, the Canada Research Chair in Stem Cells and Regeneration and McEwen investigator. He received support from the Canadian Stem Cell Network of Canada for this research. Dr. Smith is the Canadian Research Chair in Animal Cloning and Stem Cells and received support from the Canadian Arthritis Network. His lab plays a key role in the University of Montreal's Animal Reproduction Research Centre.

Story Source:

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

Journal Reference:

1. Kristina Nagy, Hoon-Ki Sung, Puzheng Zhang, Simon Laflamme, Patrick Vincent, Siamak Agha-Mohammadi, Knut Woltjen, Claudio Monetti, Iacovos Prodromos Michael, Lawrence Charles Smith, Andras Nagy. **Induced Pluripotent Stem Cell Lines Derived from Equine Fibroblasts**. *Stem Cell Reviews and Reports*, 2011; DOI: 10.1007/s12015-011-9239-5

http://www.sciencedaily.com/releases/2011/02/110228090232.htm

Diabetics: is it time to bin the insulin?

- 24 February 2011 by **Andy Coghlan**
- Magazine issue 2801.

An end to insulin shots? (Image: Michael Donne/SPL)

A PIONEERING hormone treatment may be the secret to an easy life for diabetics, consigning insulin shots and regular glucose monitoring to the medical history books.

Most people associate diabetes with insulin, the pancreatic hormone that dictates how much glucose circulates in blood. Type 1 diabetics have to inject the hormone because they can't make it themselves. Now, the spotlight is turning on insulin's lesser-known pancreatic twin, glucagon, as a treatment that could control blood glucose levels without the need for daily monitoring.

Whereas insulin clears surplus glucose from the blood after meals, squirrelling it away in the liver, muscles and elsewhere, glucagon does the opposite when we are hungry, ordering the liver to release stores of glucose "fuel" into the blood or to make more if none is available.

To investigate glucagon's role, Roger Unger at the University of Texas Southwestern Medical Center in Dallas and colleagues engineered mice to lack glucagon receptors so they couldn't respond to the hormone. Surprisingly, the mice had normal levels of blood glucose. Then, when the team used a toxin to destroy the pancreatic beta cells that make insulin, the mice remained diabetes-free.

"The bottom line is that without glucagon, you can't get diabetes," says Unger. Even more mystifying, when the mice consumed huge amounts of sugar in so-called "glucose tolerance" tests, their blood glucose levels remained normal, irrespective of whether or not they could make insulin (*Diabetes*, DOI: 10.2337/db10-0426).

"The implication for humans is that [without glucagon] you could drink 10 bottles of sugary drinks and your blood sugar would remain the same, with or without insulin," he says. "This was a huge surprise."

So theoretically, if glucagon could be safely neutralised in people with type 1 diabetes, their blood glucose levels would stay normal without them having to take insulin or constantly check that level. "The only potential downside is too little glucose in the blood, or hypoglycaemia," says Unger. But this would only likely become an issue if a person was due to run a marathon, or do something equally energy-sapping. "The answer would be to take a sugary drink with you," he says.

The results in mice are so encouraging that a trial has already begun to see if suppressing glucagon has similar benefits in people with diabetes. Amylin Pharmaceuticals of San Diego, California, is attempting to do this with leptin, a hormone that controls fat uptake by cells but which also dampened the action of glucagon in studies on mice by Unger's team in 2008.

"It's the first time that researchers will test leptin, in the form of an analogue called metreleptin, in people with type 1 diabetes to see if it can improve glucose control," a company spokeswoman told *New Scientist*. The volunteers will not go without insulin, but will receive the minimum safe amount.

Other diabetes researchers are encouraged, but cautious about the developments. "If you get rid of the glucagon receptor, you get these dramatic changes," says Alan Cherrington of Vanderbilt University School of Medicine in Nashville, Tennessee. "But is it more relevant in rodents than in humans?" he asks.

Cherrington says that the study leaves important questions unanswered. Firstly, where does surplus glucose go in the mice lacking glucagon and insulin? Unger agrees that this urgently needs investigation and says that tracer studies are under way with labelled glucose so its fate in the animals can be tracked. The most likely destination, according to Cherrington, is the liver, but if so, what happens when it is "full up"?

The key question is: how are the mice managing to regulate glucose if insulin is not involved? Cherrington's hunch is that glucagon-like peptide-1 (GLP-1), a hormone made in the gut, may be deputising. "GLP-1 may affect the liver and muscle in an insulin-like way, ordering them to store glucose," he says.

Daniel Drucker at the Samuel Lunenfeld Research Institute in Toronto, Canada, who investigates GLP-1 and glucagon, agrees. "Animal models show elimination of glucagon is associated with increased circulation of GLP-1, so this hormone may certainly be playing a role," he says.

Drucker also says that suppressing glucagon levels, as expected in the leptin treatment, is probably safer than completely blocking the receptors. That's because blocking causes the cells that make glucagon to multiply rapidly to increase glucagon output, potentially resulting in the development of a pancreatic tumour. This shouldn't happen if glucagon action is only dampened.

Another question, of course, is how the finding will translate to people with type 1 diabetes, says Robert Henry of the University of California at San Diego, who is head of medicine and science for the American Diabetic Association. "The animals don't have any glucagon activity from birth, so would blocking the hormone have different effects in animals or humans already producing it?" he says.

Although cautious, most commentators were confident that the finding could lead to new treatments, or at the very least to new insights challenging the historical pre-eminence of insulin. "It raises a large number of issues challenging the classic dogma that insulin is the most important hormone in diabetic control," says Henry.

http://www.newscientist.com/article/mg20928013.600-diabetics-is-it-time-to-bin-the-insulin.html

Most 'locked-in' people are happy, survey finds

- 23:30 23 February 2011 by **Andy Coghlan**

Imagine that you are totally paralysed but still have all your mental faculties. You can communicate only through rudimentary speech or limited movements such as blinking or moving your eyes. You wouldn't be happy, would you? It turns out that you probably would: contrary to most people's assumptions, happiness is the norm among people with locked-in syndrome (LIS).

In the largest survey ever of the feelings and emotions of people with LIS, 72 per cent communicated that they were happy with their lot.

"Many rated their quality of life as higher than I would have done," says Steven Laureys at the Coma Science Group at the University of Liège in Belgium, head of the survey team.

"That may seem surprising to us looking from the outside, but some patients show enormous capacity to adapt to their new condition," says Laureys. "They don't so much open a new chapter in their lives, as an entire new book," he says.

Desperate desire

However, not all the respondents were satisfied. The remaining 28 per cent expressed unhappiness with their situation, and of these, 86 per cent said they'd prefer not to be resuscitated after a heart attack, compared with just under half of the "happy" respondents.

The other cautionary note is that although Laureys invited 168 people to respond, only 91 did so, potentially biasing the results to those who were most motivated in the first place since they were eager to participate. Volunteers also had to complete their questionnaires in cooperation with their carers, which may have meant that they held back on criticism out of loyalty.

Laureys accepts these caveats, but says the results are still representative. "My message is: listen to what these patients have to say," he says.

Of all the respondents, only 7 per cent craved euthanasia. Also, those who were unhappy tended to be relatively new to their situation, suggesting that given time, people with LIS adapt to and become more accepting of their fate.

For this reason, Laureys calls for a moratorium when new patients request euthanasia [in countries that allow it], until they stabilise, both physically and psychologically.

More socialising

Despite the overall message of happiness, the survey picked up considerable dissatisfaction. Only 21 per cent said they were engaged most of the day in worthwhile activities. A further 40 per cent wanted more social activity and 12 per cent more recreational opportunities.

Those expressing unhappiness wanted more interaction and mobility in their community, more recreation and better recovery of speech. They also suffered more from anxiety than "happy" respondents.

Laureys says that finding out these shortcomings is important, because they can all be rectified. "Now we've identified some factors we can improve, such as access to mobility in the community, recovery of speech and treatments for anxiety," he says.

Looking further ahead, Laureys believes that improvements in technology-aided communication such as brain-computer interfaces and eye-tracking devices would make life more bearable. "I predict that in coming years, our view of this disease is really going to change," he says. "It makes a huge difference to be able to read a book or go onto the internet at will," he says.

Finding meaning

Joseph Fins, a professor of medicine and authority on the neuroethics of consciousness disorders at Weill Cornell Medical College in New York, agrees. "The results show that contrary to opinion, people adapt and adjust, and with help from their carers they can find meaning even in this state," he says. "They have the potential to move beyond the usual caricature, showing they're real people."

Fins cautions, however, that all the participants were members of a particularly active French association that supports people with the condition. This meant that about two-thirds of the respondents were able to live at home, adding to their comfort and sense of belonging. He wonders whether the responses would have been so positive in other countries without such robust support networks. "One of the major challenges is to reduce the isolation of these people," he says.

Adrian Owen of the Center for Brain and Mind at the University of Western Ontario in London, Canada, said that the study challenges preconceptions about life in a lifeless body. "We cannot and should not presume to know what it must be like to be in one of these conditions, because many patients can find happiness in ways we simply cannot imagine."

Journal reference: *BMJ Open*, DOI: 10.1136/bmjopen-2010-000039

http://www.newscientist.com/article/dn20162-most-lockedin-people-are-happy-survey-finds.html

The man who gets into the minds of psychopaths

- 21 February 2011 by **Samantha Murphy**

Magazine issue 2800.

Delving inside the minds of psychopaths (Image: Mark Peterman for *New Scientist*)

*When **Kent Kiehl** visits some of the most dangerous prisoners in US jails, he doesn't just go to talk. He's there to find out what's different about the way their brains work. He tells **Samantha Murphy** what insights this has revealed about the origins of psychopathic behaviour - and what they could mean for future treatment*

How did you become interested in working with psychopathic criminals?

I wanted to know how some individuals come to be psychopaths. One thing that motivated me was that I grew up just down the street from the serial killer Ted Bundy. I was always fascinated that a person with a seemingly normal background - if there is such a thing - could end up on that sort of trajectory.

What symptoms lead to someone being classified a psychopath?

A lack of empathy, guilt and remorse; callousness, impulsivity, promiscuity, hot-headedness and pathological lying, among others. Each of these traits is scored on the Hare Psychopathy Checklist, which is compiled from an interview and an extensive background report. The scale goes from 0 to 40. The average prisoner scores 22. We consider a score of about 30 as indicating that someone meets the criteria for the disorder.

When someone scores 34 or higher, we find that we are dealing with a person who is fundamentally out of the ordinary. It is palpable in their clinical presentation. They are completely different from other inmates. And it turns out that their brains are different too, both in structure and in function.

What exactly have you found that makes them so different?

We have now done more than 1500 scans of prisoner volunteers, using a mobile fMRI (functional magnetic resonance) scanner. In general, what we find in the brains of individuals with psychopathy is that one or more aspects of the paralimbic system - part of the brain involved in the processing of emotions and impulse control - is abnormal.

Finding out that the brains of psychopaths are different shouldn't surprise anybody. Only now, with the help of the imaging studies, we have been able to describe how they are different.

Why do you use prisoners as your subjects?

Individuals with psychopathy have a large impact on the criminal justice system. Between 15 and 35 per cent of prisoners in US jails meet criteria for the disorder, compared with about 1 per cent in the general population.

Why is it so important to study psychopaths?

In most places in the US, the way we treat psychopaths is to incarcerate them. We put antisocial people with antisocial peers, and guess what happens? They get more antisocial. It's a system that doesn't work. The estimated social cost of crime in the US is $2.3 trillion a year, and psychopaths are thought to be responsible for 20 to 40 per cent of that. Imagine if you could treat or remediate psychopathy. You would be able to save billions of dollars per year.

The goal here is to use the very best science to understand and treat some of the most enigmatic and complex personality disorders that are associated with the worst crimes, to hopefully be able to prevent them.

Have you ever found yourself afraid of someone you worked with?

I wouldn't say I've been afraid, but there certainly are a few occupational hazards. There was one time I worked with an inmate who had killed people before and he still had a crew that was out in the community killing for hire. He was on a life sentence for one murder, but he told me in our interview about all the other people he had killed. A while later, he was charged with another murder and he told his cellmate that he suspected me of breaking confidence and ratting on him. So the police came to my house and said they wanted to put me in protective custody until everything got sorted out. It made for an interesting day.

Eventually, his lawyer told him that one of his crew had squealed on him, so he told his cellmate that I could be trusted. Things like that can happen, but I'm generally comfortable working with prisoners.

I've heard that psychopaths such as Ted Bundy are likeable people. Do you find this as well?

Well, most psychopaths have a glibness and a superficial charm to them. It does sometimes happen that, if we don't get a chance to read a case file before we do an interview, we might walk away thinking, "Wow, what a nice guy! I can't believe he's in here," because, basically he hasn't told you the truth about anything that has happened in his entire life.

Then when we actually do get a chance to look at the file, it's like you are reading about a completely different person. When you see the person again, they'll often say: "I didn't want to talk about the old me; I thought I'd tell you about the new me." So, I definitely find them clinically interesting and sometimes even entertaining, but not somebody I'd want to be friends with.

Are all psychopaths dangerous?

No. There are probably many psychopaths out there who are not necessarily violent, but are leading very disruptive lives in the sense that they are getting involved in shady business deals, moving from job to job, or relationship to relationship, always using resources everywhere they go but never contributing. Such people inevitably leave a path of confusion, and often destruction behind them.

Is this true of all people with psychopathy? What about those who manage to forge successful careers?

Psychopathy, as I understand it, is not typically associated with long-term success. Rather, psychopaths normally get into so much trouble, are so impulsive and fail to consider how their behaviour impacts others, that it is unlikely they would become highly successful. Nevertheless, I don't think it is impossible for an individual with psychopathy to have a "successful" career.

When one pictures a psychopath, the image is almost always of a man. What do we know about psychopathic behaviour in women?

My lab is undertaking the first ever brain-imaging study of female psychopathy to be funded by the National Institute of Mental Health. Clinically, we are finding that they do tend to present very similarly to the men, but that it is just so much less common to see it in females. It's estimated to be one-tenth as common. We don't yet have a good understanding why it is so rare, but we're in the throes of finishing our first 100 brain scans of female offenders, so hopefully we'll be able to say more soon.

How is a better understanding of psychopathy going to help us do something about it?

That's exactly the question: what medicines and/or therapies are likely to help? We certainly know that some forms of therapy have been shown to make psychopaths worse. Group therapy, for instance, in some studies has been shown to actually make psychopaths more likely to reoffend than if you didn't treat them at all. So it's critical that we identify the psychopathic offenders and put them in a treatment programme that is made for them.

Do you have hope that psychopathy can be cured?

Absolutely. Brain imaging is just one tool to help us understand things. I don't think it's a panacea but it does help us to know that, yes, behaviour originates in the brain and yes, it's malleable and treatable. So there's a lot of hope.

Profile

Kent Kiehl is a principal investigator at the non-profit Mind Research Network and an associate professor of psychology and neuroscience at the University of New Mexico, Albuquerque. His research focuses on the neuroscience of mental illnesses, particularly criminal psychopathy

http://www.newscientist.com/article/mg20928001.300-the-man-who-gets-into-the-minds-of-psychopaths.html

Faulty testosterone cycle may explain male autism bias

- 15:04 17 February 2011 by **Ferris Jabr**

More men than women have autism – now we may know why. Sex hormones regulate a gene linked with the condition, making it more likely that males will accumulate testosterone in the dangerous amounts that are thought to lead to autism.

For every female that has autism there are four males. To better understand this sex bias, Valerie Hu at the George Washington University Medical Center in Washington DC and colleagues studied a gene implicated in autism called *retinoic acid-related orphan receptor-alpha* (*RORA*). This gene controls a molecule that switches many subsequent genes on and off.

Previous research has shown that *RORA* is important for development of the cerebellum and that the brains of people with autism expressed less of it than normal. Mice that likewise express less *RORA* than normal display symptoms that resemble autism in humans, such as repetitive behaviours and deficits in spatial learning.

Hormone bath

To find out how *RORA* is affected by hormones, Hu's team bathed human brain cells expressing the gene in either oestradiol – a form of the major female sex hormone oestrogen – or the male sex hormone dihydrotestosterone (DHT), which is derived from testosterone. They found that oestradiol enhanced the gene's expression, whereas DHT suppressed it.

The team also discovered that *RORA* regulates another gene which controls aromatase, an enzyme that converts testosterone to oestrogen. If *RORA* is under-expressed, then aromatase cannot function properly and testosterone will accumulate.

In a whole organism, this excess testosterone may in turn further repress the expression of *RORA*, making matters worse.

Elevated levels of testosterone in the womb are thought to contribute to the development of autism. However, if the *RORA* gene is faulty in a female fetus, it would be less susceptible to a build-up of testosterone because the fetus has higher levels of oestrogen to begin with. What's more, female sex hormones are likely to promote any *RORA* that is expressed, rather than further repress it.

"For a long time elevated fetal testosterone has been a proposed as risk factor for autism, but the problem is that there has been no molecular explanation," says Hu. "Now we have evidence for a really exacerbating situation. What we have identified is an inhibitory feedback loop. That is what makes this so fascinating."

Male break

Brett Abrahams, who studies autism at the Albert Einstein College of Medicine in New York, says the study is "very cool". He says that the commonness of autism in males is one of the key and unexplored areas of research into the condition.

"Elaborating a means of exploring this question is really to [this team's] credit. They have made an important contribution because although there have been previous attempts to look at relationship between genes known to modulate sex differences and autism, not much has come out of that."

Joseph Buxbaum at the Seaver Autism Center at the Mount Sinai School of Medicine in New York is also impressed by the study, but cautions that there is still limited evidence for the "extreme male brain" hypothesis. Furthermore, he says, the nature of autism varies from person to person: "It is very unlikely there will be a single pathway."

Journal reference: *PLoS One*, DOI: 10.1371/journal.pone.0017116

http://www.newscientist.com/article/dn20143-faulty-testosterone-cycle-may-explain-male-autism-bias.html

Does the comfort of conformity ease thoughts of death?

- 25 February 2011 by **Jessica Hamzelou**

Magazine issue 2801.

Looking for lightness of being (Image: Sipa Press/Rex Features)

AS THE light at the end of the tunnel approaches, the need to belong to a group and be near loved ones may be among your final thoughts.

So say Markus Quirin and his colleagues at the University of Osnabrück in Germany. The team prompted thoughts of death in 17 young men with an average age of 23 by asking them whether they agreed or disagreed with a series of statements such as "I am afraid of dying a painful death". At the same time, the men's brain activity was monitored using a functional MRI scanner.

To compare the brain activity associated with thoughts of death with that coupled to another unpleasant experience, the team also prompted thoughts of dental pain using statements like "I panic when I am sitting in the dentist's waiting room". Although the threat of dental pain is unpleasant, "it's not a threat of death", Quirin says.

Quirin's team found that thoughts of death, but not of dental pain, triggered heightened activity in brain regions such as the right amygdala, which is associated with fear and anxiety. More surprisingly, the team also saw increased activity in the caudate nucleus when the men thought of death - an area of the brain associated with performing habitual behaviours (*Social Cognitive and Affective Neuroscience*, DOI: 10.1093/scan/nsq106).

Quirin thinks the work of German philosopher Martin Heidegger could explain the unexpected result. Heidegger said that doing what everyone else does is a defence against anxiety. According to Quirin, performing culturally learned habitual behaviours to fit in with the crowd could be a strategy to reduce the anxiety associated with death.

Intriguingly, activity in the caudate nucleus is also associated with feeling in love. The solace found when thinking about a loved one could also alleviate the stress associated with being close to death, says Mario Mikulincer at the Interdisciplinary Center in Herzliya, Israel, who was not involved with the study. "This

neural finding fits with our behavioural findings that thoughts of mortality activate the attachment system, motivating us to seek love and protection from significant others," he says.

Helen Fisher, an anthropologist at Rutgers University in New Jersey, disagrees. "The brain seems to be a mix-and-match system, in which regions are activated in endlessly different combinations to create different nuances of emotion," she says. "Thoughts of death, like thoughts of romantic passion, are strong and profound. One would expect at least some of the same activation patterns."

Quirin's team now hopes to investigate brain activity in older people to find out whether the same thoughts occur to a person nearing the end of their life.

http://www.newscientist.com/article/mg20928013.800-does-the-comfort-of-conformity-ease-thoughts-of-death.html

Child cremation gives glimpse of first North Americans

- 19:00 24 February 2011 by **Jeff Hecht**

The child was probably dead before it was put in the firepit and cremated. Later, the pit – which had previously been used to cook food and dispose of waste – was filled with soil and the house abandoned.

This is the extraordinary scene that archaeologists have reconstructed from the 11,500-year-old remains of a child found inside an indoor firepit in central Alaska. They have dubbed the child Xaasaa Cheege Ts'eniin, which means "Upward Sun River Mouth Child", after the region's name in the indigenous language.

The bones are the oldest human remains yet discovered in northern North America, and provide a remarkable glimpse into the lives of the earliest North American settlers.

Alaska is a key to the puzzle of how humans migrated from eastern Asia into North America more than 13,000 years ago. Low ice-age sea levels exposed the floor of the Bering Strait between Russia and Alaska, creating Beringia – a land that once bridged Asia and America.

Older human remains and temporary hunting camps and work sites have been found, but longer-term habitations are rare. Yet the child's young age – it was about 3 years old – and the type of food remains found at the new site, suggest it was the summer home for a group that comprised at least women and young children.

Squirrel barbecue

Near the centre of the house, its occupants had dug a firepit – an oval depression 45 centimetres deep and 130 centimetres long. Beneath the child's bones, archaeologists led by Ben Potter of the University of Alaska in Fairbanks found others belonging to salmon, ground squirrels and other small animals.

This suggests the pit had been used for cooking before the child's body was laid there on its back and cremated. Potter estimates the fire burned for a couple of hours, leaving about 20 per cent of the skeleton. Then the pit was filled and the house abandoned: very few artefacts were found on top of the pit.

"The nearest similar site is in Kamchatka", a peninsula in Russia across the Bering Sea from Alaska, where two children have been found buried inside houses of similar age, says Potter.

The teeth show distinctive features of Native Americans and north-eastern Asians, says his colleague Joel Irish. They also give an indication of the child's age: between 2 and 4 years.

First Americans

No single discovery can tell us who reached the Americas first, or where they came from. By the time the Alaskan child was born, rising sea levels were putting an end to migration from Asia, says Dave Meltzer of Southern Methodist University in Dallas, Texas. Yet with no other well-dated early human remains from Alaska, "this is going to be important", says Ted Goebel, associate director of the Center for the First Americans at Texas A&M University in College Station.

The site was discovered only in the middle of last year; excavation began in August and continued through the autumn. As a result, Potter and his team are still unsure what it can tell us about early American settlers.

The team, which has been working closely with Native Alaskans, now hopes to carry out DNA tests to determine how the settlers were related to modern peoples. This should help them trace how early settlers spread across the Americas.

Journal reference: *Science*, vol 331, p 1058

http://www.newscientist.com/article/dn20170-child-cremation-gives-glimpse-of-first-north-americans.html

Keeping up e-ppearances: How to bury your digital dirt

- 23 February 2011 by **Sally Adee**
- Magazine issue 2800.

Protecting your reputation (Image: Paul Blow)

Embarrassed by what search engines report about you? The answer is to reveal more about yourself, not less

THE mistake that left my online reputation in tatters began with some innocent office banter. It was 2003, and I was working as an office drone. Bored out of our minds, a colleague and I gossiped over email about the goings-on in the women's restroom. (I'll spare you the details.) Tickled by the exchanges, my partner in crime published the emails on her friend's website. We soon forgot about it.

Four years later, I qualified as a journalist and began to build what I hoped would be a Pulitzer-studded career. Then, one day, in an act of narcissism all too common among journalists: I googled myself. And my heart stopped. Instead of links to stories I had written, I saw a list of pornographic websites. Further investigation revealed that our juvenile exchange about the women's restroom had proved titillating to an unexpected audience, and had found its way onto a coterie of fetish sites. Goodbye Pulitzer.

My situation was uniquely humiliating, but I am not alone in feeling helpless about how my identity is presented online. Most people have stumbled across nasty surprises about themselves on the internet, be it an embarrassing photo, a record of a youthful indiscretion or even an entirely false claim.

Thankfully, there are ways to restore your online reputation. While you might think that reducing your internet presence is the way to go, you'd be wrong. The key to managing your reputation is to spend more time online, not less. The advocates of this approach argue that polishing your online persona could soon join healthy eating and exercise in your arsenal of everyday life-maintenance chores. So how exactly do you go about it?

We have been cultivating our social status ever since our primate ancestors picked bugs off each others backs to curry favour. The advent of the internet has made managing our reputation a lot harder, however, not least because it has transformed the way information about us circulates within our social circles and beyond.

Consider, for example, an experiment designed to explore how much information people are willing to share online, which was conducted by a team led by Bernardo Huberman of the Information Dynamics Laboratory at Hewlett-Packard Laboratories in California. He set up a mock auction, but with a twist. Participants had to bid to persuade others in their group to reveal their true weight - something which many people would rather not confess to freely. Huberman found that low bids were more likely to be accepted when the bidder was a similar weight (*IEEE Security and Privacy*, DOI: 10.1109/MSP.2005.137).

The message? If you think you are among peers, you will share details you might normally consider private. Though Huberman's experiment wasn't online, it is salient for online social networks, where it can feel like you are only conversing with close peers. Yet this is often illusory.

Many of us share highly personal information over the internet without appreciating that it could reach a much wider audience, and is very often permanent. In the real world, we can compartmentalise our separate identities: you can have one identity at work and another when socialising at the pub with friends, for example. Such boundaries disappear online, however. The cross-pollination of all our different selves is known as context collapse among social scientists, says Alice Marwick of Microsoft Research New England in Cambridge. We are losing the ability to present these separate selves online, something many of us haven't adapted to yet. For some very unlucky folk, the fallout has been public and unpleasant (see "Bad Reputation").

Maybe the solution is to stay anonymous online. After all, if you hide behind a pseudonym like Spacegirl, you are safe, right? Not always, says Paul Resnick, a computer scientist at the University of Michigan in Ann Arbor who studies online reputations.

Digital trail

Resnick set up an experiment where participants could converse online under pseudonyms. He found that if people were told they were speaking anonymously, they were more willing to share extremely personal information - the kind that would negatively affect their reputation were it attached to their name. "They shared their weight, pictures of all the food they had eaten, and a lot of their struggles," he says.

But such information can easily be linked to you, says Resnick. Consider the fate of the customers of Netflix, a US online video rental firm. Film suggestions are Netflix's bread and butter; their movie recommendation program anticipates the wishes of customers. In 2006, the company launched a contest with a $1 million prize to find the best improvement to its system. Netflix gave the 51,000 entrants a database of half a million customers, which included people's rental history. Don't worry about customer privacy, said Netflix, we have anonymised it.

To show Netflix's folly, Arvind Narayanan and Vitaly Shmatikov at the University of Texas, Austin, got the database and cross-referenced it with reviews posted on the Internet Movie Database (IMDb). This allowed them to identify almost all of the names of specific individuals, and then infer things like political affiliation and sexuality from their movie choices. "Netflix wanted to make a better recommender engine," says Michael Fertik, who runs Reputation.com, a firm based in Redwood City, California, that manages online reputations. "And they just knocked a bunch of people out of the closet."

Such gathering and cross-referencing of personal information is increasingly being automated. For example, a company called Spokeo in Mountain View, California, uses a program called a scraper to scour the web for information about you, and combines what it finds with public records. For a fee, anybody can then view a single profile about you sucked from online social networks, photo albums and mailing lists, very often next to your address, census data and even the value of your house (visit spokeo.com/privacy to remove your profile if you don't want it there).

Teenage tricks

So what can be done to seize back control of your rep? Perhaps surprisingly, the first place to look for inspiration is the social network profiles of the younger generations. While often portrayed as having a carefree attitude to privacy, many teenagers are using social networking to actively promote themselves. Marwick and Danah Boyd of Harvard University's Berkman Center for Internet and Society are midway through a study of the Facebook profiles of high-school students, and have so-far found that many teenagers adapt their profiles to appeal to prospective universities. Instead of stereotypical teenage pursuits, these students are highlighting wholesome events such as their tennis matches. "They're revealing only their most college-friendly selves," Marwick says.

It is not just teenagers who are actively promoting their online selves. Marwick believes personal PR is becoming more common among all age groups. It is well known that public figures and corporations use social networking to market their brand, and now many private individuals are doing the same. There has been "a huge rise in people using advertising and marketing techniques to promote themselves", she says.

Reputation.com is one of the many companies that have emerged over the past few years promising to wrestle back control of your online self. The firm says it can remove your name from objectionable sites, but its real focus is to improve the choice real estate - the first few pages of your search results. The main way they do this is by flooding search engines with more information.

Their tactics take advantage of the vagaries of search engine algorithms, but, more importantly, they trade on human laziness. When most of us do a web search, we don't often look beyond the first few pages of results. This is known as the Law of Surfing, and has been verified many times since it was first described in 1998 (*Science*, vol 280, p 95).

The upshot is that managing your online reputation is often as easy as manipulating the first page of search results. Reputation.com does that by "writing a comprehensive biography of someone's life story", says Fertik, essentially extending their résumé and perhaps adding employer-friendly activities. Then they publish that narrative to websites such as the professional network LinkedIn. In fact, Reputation.com has ties with about 500 such sites, and uses them to cross-pollinate links in order to push each other's content up the search results chain. In a matter of weeks, these sites displace the flotsam and jetsam making up your current online reputation.

Here's why that works. The first page of a web search is determined to a large extent by a bit of algorithmic magic, which in Google's case is called PageRank. This essentially counts links from other sites as votes when determining where to rank a website. To push up your page in the search results, the pages that link to yours must be deemed important. A link from nytimes.com will carry more weight than, say, kittensinunderpants.com. Without any "important" sites linking to a page with your name on it, you are at the mercy of the internet gods. In my case, for example, nothing competed with my name on those fetish sites. But when you associate your name with a more important site, such as Facebook, LinkedIn or Twitter, it ploughs those less popular pages down the search results.

"Own as much of your name as possible," says Judith Lewis of Beyond, a reputation tracking firm based in London. "I have my own website, my Twitter, my LinkedIn page. If there's some random mention of me, it's not even going to make it into the top 100 search results."

Over the past few years, several companies have emerged to help the uninitiated do just that. One of these, a San Francisco-based startup called About.me, offers a single, free "hub" web page with links to all the aspects of your online identity that you wish to promote. Your own web page could become the first port of call for potential employers, stopping them from having to trawl the internet to piece together a picture of you, warts and all.

Of course, not everybody will relish the idea that we should tailor our online identities to the employer's demanding eye. "Why should the culture and norms of the workplace dominate our social life?" asks Marwick. "Most of us have parts of our lives that we don't want to bring up at work." Happily, employers may eventually be forced to adapt to a world where nobody has a perfect reputation.

As for me, I'm just happy that pornographic websites no longer feature in my search results. My online activity has long since driven that content far into Google's backwaters. With any luck, the publication of this article on the web will push it a little further into obscurity.

Bad reputation

Facebook's Mark Zuckerberg famously said that anyone who needs more than one identity lacks integrity. Tell that to these poor souls, who saw their lives suffer thanks to the public and viral nature of the internet

Lawsuit in 140 characters

A Chicago tenant used Twitter to vent her frustration at her landlord. "Who said sleeping in a moldy apartment was bad for you?" she tweeted to her 22 followers. "Horizon Realty thinks it's okay." The landlord in question noted her complaint and responded swiftly - by hitting her with a libel lawsuit. Luckily for her, the judge dismissed the case.

MySpace behaving badly

A trainee teacher in Lancaster, Pennsylvania, was pictured at a party on MySpace holding a cup on which had been written "Drunken Pirate". Though she was of legal drinking age, when her supervisor spotted it, the school removed her from the programme, according to *The New York Times*.

Tale of the Star Wars kid

If this schoolkid had recorded himself practising his light saber swing in 1975, the VHS tape might have resurfaced at a garage sale, if ever. But he did it in 2002, and when classmates uploaded the footage to YouTube, it went viral. His humiliation escalated into a worldwide taunt, and he dropped out of school. He sued his classmates, who settled out of court, and is now at law school.

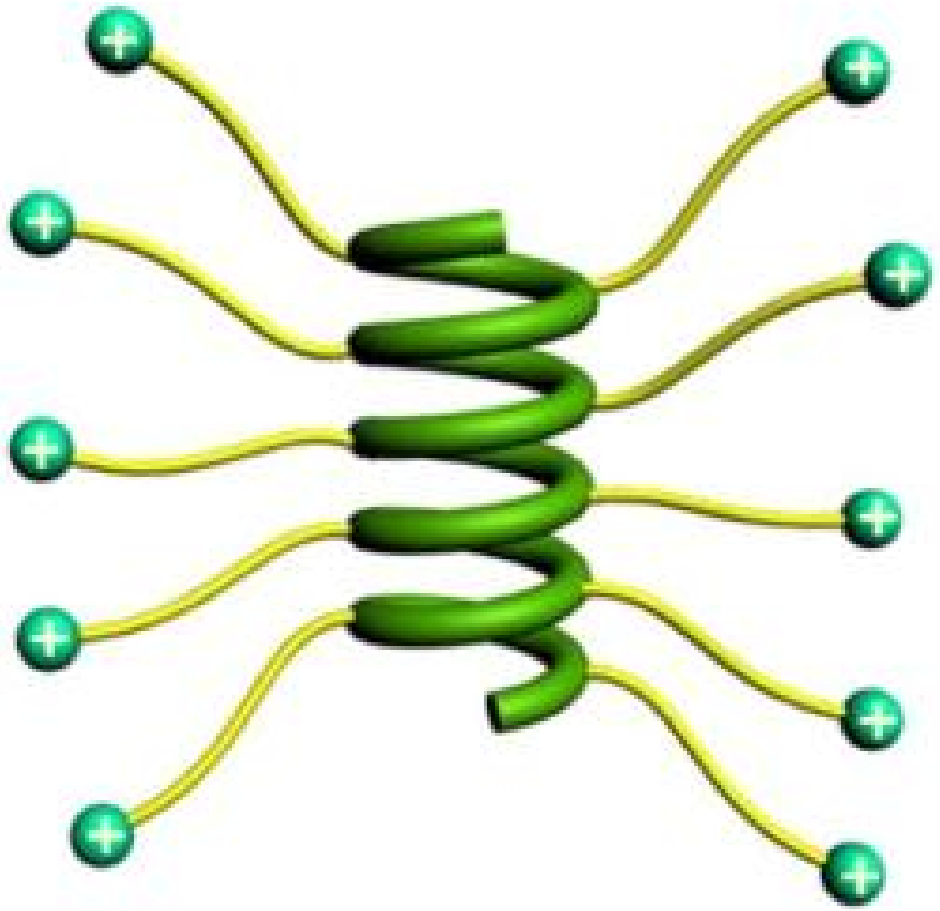
De-tag this photo

A nursing student in Kansas decided to amuse her friends by taking a picture of herself with a placenta. Her school was not amused and dismissed her. Though a judge later reversed the decision, the youthful indiscretion might still come back to haunt her. Google her name and there is no search result on the first page without the word "placenta".

Sally Adee *is a feature editor at New Scientist*

http://www.newscientist.com/article/mg20928001.600-keeping-up-eppearances-how-to-bury-your-digital-dirt.html

Simpler Way of Making Proteins Could Lead to New Nanomedicine Agents



Researchers found that elongating side chains with charged ends enabled short proteins to coil into a stable helix. | *(Credit: Image courtesy Jianjun Cheng)*

ScienceDaily (Feb. 25, 2011) — Researchers have developed a simple method of making short protein chains with spiral structures that can also dissolve in water, two desirable traits not often found together. Such structures could have applications as building blocks for self-assembling nanostructures and as agents for drug and gene delivery.

Led by Jianjun Cheng, a professor of materials science and engineering at the University of Illinois, the research team will publish its findings in the Feb. 22 edition of the journal *Nature Communications.*

Materials scientists have been interested in designing large polymer molecules that could be used as building blocks for self-assembling structures. The challenge has been that the molecules generally adopt a globular, spherical shape, limiting their ability to form orderly aggregates. However, polypeptides -- chains of amino acids such as proteins -- can form helical structures. Short polypeptide chains that adopt a spiral shape act like cylindrical rods.

"If you have two rigid rods, one positive and one negative, right next to each other, they're going to stick to each other. If you have a way to put the charge on the surface then they can pack together in a close, compact way, so they form a three-dimensional structure," Cheng said.

However, it is difficult to make helical polypeptides that are water-soluble so they can be used in solution. Polypeptides gain their solubility from side chains -- molecular structures that stem from each amino acid link in the polypeptide chain. Amino acids with positive or negative charges in their side chains are needed to make a polypeptide disperse in water.

The problem arises when chains with charged side chains form helical structures. The charges cause a strong repulsion between the side chains, which destabilizes the helical conformation. This causes water-soluble polypeptides to form random coil structures instead of the desired helices.

In exploring solutions to the riddle of helical, water-soluble polypeptides, researchers have tried several complicated methods. For example, scientists have attempted grafting highly water-soluble chemicals to the side chains to increase the polypeptides' overall solubility, or creating helices with charges only on one side.

"You can achieve the helical structure and the solubility but you have to design the helical structure in a very special way. The peptide design needs a very specific sequence. Then you're very limited in the type of polypeptide you can build, and it's not easy to design or handle these polypeptides," Cheng said.

In contrast, Cheng's group developed a very straightforward solution. Since the close proximity of the charges causes the repulsion that disrupts the helix, the researchers simply elongated the side chains, moving the charges farther from the backbone and giving them more freedom to keep their distance from one another.

The researchers observed that as they increased the length of the side chains with charges on the end, the polypeptides' propensity for forming helices also increased.

"It's such a simple idea -- move the charge away from the backbone," Cheng said. "It's not difficult at all to make the longer side chains, and it has amazing properties for winding up helical structures simply by pushing the distance between the charge and the backbone."

The group found that not only do polypeptides with long side chains form helices, they display remarkable stability even when compared to non-charged helices. The helices seem immune to temperature, pH, and other denaturing agents that would unwind most polypeptides.

This may explain why amino acids with large hydrophobic side chains are not found in nature. Such immutability would preclude dynamic winding and unwinding of protein structures, which is essential to many biological processes. However, rigid stability is a desirable trait for the types of applications Cheng's group explores: nanostructures for drug and gene delivery, particularly targeting cancerous tumors and stem cells.

"We want to test the correlation of the lengths of the helices and the circulation in the body to see what's the impact of the shape and the charge and the side chains for clearance in the body," Cheng said. "Recent studies show that the aspect ratio of the nanostructures -- spherical structures versus tubes -- has a huge impact on their penetration of tumor tissues and circulation half-lives in the body."

Cheng plans to create a library of short helical polypeptides of varying backbone lengths, side chain lengths and types of charge. He hopes to simplify the chemistry even further and make the materials widely accessible. His lab already has demonstrated that helical structures can be effective gene delivery and

membrane transduction agents, and building the library of soluble helical molecules will allow further investigation of tailoring such nanostructures for specific biomedical applications.

The National Science Foundation and the National Institutes of Health supported this work. Illinois co-authors were graduate students Hua Lu and Yugang Bai and undergraduate student Jason Lang. "Hua Lu, a fifth year graduate student in my group, is the first author of the publication and made the most significant contribution to this work," Cheng said. Yao Lin and Jin Wang, of the University of Connecticut, and professor Shiyong Liu, of the University of Science and Technology of China, also collaborated with Cheng's group on the paper.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Illinois at Urbana-Champaign**.

Journal Reference:

1. Hua Lu, Jing Wang, Yugang Bai, Jason W. Lang, Shiyong Liu, Yao Lin, Jianjun Cheng. **Ionic polypeptides with unusual helical stability**. *Nature Communications*, 2011; 2: 206 DOI: 10.1038/ncomms1209

http://www.sciencedaily.com/releases/2011/02/110223092402.htm

Tweeting Teenage Songbirds Reveal Impact of Social Cues on Learning

Zebra finches. (Credit: Photo by Satoshi Kojima)

ScienceDaily (Feb. 26, 2011) — In a finding that once again displays the power of the female, UCSF neuroscientists have discovered that teenage male songbirds, still working to perfect their song, improve their performance in the presence of a female bird.

The finding sheds light on how social cues can impact the process of learning, the researchers said, and, specifically, could offer insights into the way humans learn speech and other motor skills. It also could inform strategies for rehabilitating people with motor disorders or brain injuries.

The study was reported in a recent early online edition of *Proceedings of the National Academy of Sciences.*

Like humans, songbirds learn to sing by first listening to adult birds and then mimicking those sounds through a process of trial-and-error. Their initial vocalizations are akin to the babbling of babies.

Until now, scientists and bird watchers alike have thought that young birds could only produce immature song. However, in a process that involved recording and studying male zebra finch song, the scientists discovered that, in the presence of a female, the birds sang much better than when they were practicing their song alone.

"We were very surprised by the finding," said senior author Allison Doupe, MD, PhD, a professor of psychiatry and physiology and a member of the Keck Center for Integrative Neuroscience at UCSF. "The birds picked the best version of the song that they could possibly perform and they sang it over and over again. They sounded almost like adults. It turns out that teenagers know more than they're telling us."

Normally, the young birds' song is quite poor because they are practicing their vocalization through the trial-and-error process, said the first author of the study, Satoshi Kojima, PhD, a postdoctoral fellow in the Doupe lab. "Something must be happening in response to a reinforcing social cue that allows them to pick out and produce their best possible performance. This demonstrates the power of social cues to shape brain behavior."

The finding could lead to a better understanding of the brain mechanisms supporting language acquisition as well as many other learned behaviors, said Doupe.

"We know that variation by trial and error is an important part of the learning process," said Doupe. "But discovering precisely how social cues influence motor production during song learning in birds could shed light on the brain mechanisms that underlie similar processes in humans learning how to speak, and

potentially allow scientists and clinicians to harness these mechanisms when learning is not progressing properly."

Social cues are well known to powerfully influence the processing and production of human speech. A 2003 study by Michael Goldstein and colleagues showed that, in the presence of their mothers, babies' babbling improves. The current study underscores the usefulness of songbirds as a model for understanding the brain mechanisms underlying social modulation of language learning and other motor skills.

Like other songbirds, when they are fully adult, zebra finches sing two types of tunes: undirected, which they sing when alone, and directed, which is slightly more precise, and is favored by females. Adolescent male songbirds, which are just becoming sexually mature, usually sing undirected song, which at that stage is highly variable and immature and sounds like vocal practice.

In their study, the UCSF scientists coaxed the adolescent males to sing directed, courtship song towards females, and analyzed these songs using quantitative computer software. In the undirected context, the birds' song was variable, with low similarity to their final recorded adult song. In the directed context, the song was similar in syllable structure and sequence to that of the adult song.

The finding points to the importance of trial and error in motor learning as a means of perfecting vocalizations, said Doupe. "In the process of learning song, birds must develop their motor neurons to effectively mimic what they've heard. The variability that characterizes the imperfect youthful song of teenage birds is generated by basal ganglia circuits, and it's what allows birds to experiment to find what works best.

"Our finding suggests that, though teenage birds have the ability to produce more complex songs, they are only able to do so on a social cue. "It's possible that the social cue somehow turns off the variability that is responsible for improving vocal learning," she said.

The research was supported by the National Institutes of Health.

Story Source:

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

Journal Reference:

1. S. Kojima, A. J. Doupe. **Social performance reveals unexpected vocal competency in young songbirds**. *Proceedings of the National Academy of Sciences*, 2011; 108 (4): 1687 DOI: 10.1073/pnas.1010502108

http://www.sciencedaily.com/releases/2011/02/110225214720.htm

Happy Children Make Happy Adults

Being a 'happy' teenager is linked to increased well-being in adulthood, new research finds. (Credit: iStockphoto/Christopher Futcher)

ScienceDaily (Feb. 26, 2011) — Being a 'happy' teenager is linked to increased well-being in adulthood, new research finds.

Much is known about the associations between a troubled childhood and mental health problems, but little research has examined the affect of a positive childhood. For the first time, researchers from the University of Cambridge and the MRC Unit for Lifelong Health and Ageing have analysed the link between a positive adolescence and well-being in midlife.

Using information from 2776 individuals who participated in the 1946 British birth cohort study, the scientists tested associations between having a positive childhood and well-being in adulthood.

A 'positive' childhood was based on teacher evaluations of students' levels of happiness, friendship and energy at the ages of 13 and 15. A student was given a positive point for each of the following four items -- whether the child was 'very popular with other children', 'unusually happy and contented', 'makes friends extremely easily' and 'extremely energetic, never tired'. Teachers also rated conduct problems (restlessness, daydreaming, disobedience, lying, etc) and emotional problems (anxiety, fearfulness, diffidence, avoidance of attention, etc).

The researchers then linked these ratings to the individuals' mental health, work experience, relationships and social activities several decades later. They found that teenagers rated positively by their teachers were significantly more likely than those who received no positive ratings to have higher levels of well-being later in life, including a higher work satisfaction, more frequent contact with family and friends, and more regular engagement in social and leisure activities.

Happy children were also much less likely than others to develop mental disorders throughout their lives -- 60% less likely than young teens that had no positive ratings.

The study not only failed to find a link between being a happy child and an increased likelihood of becoming married, they found that the people who had been happy children were actually more likely to get divorced. One possible factor suggested by the researchers is that happier people have higher self-esteem or self-efficacy and are therefore more willing and able to leave an unhappy marriage.

"The benefits to individuals, families and to society of good mental health, positive relationships and satisfying work are likely to be substantial," said Professor Felicia Huppert, one of the authors of the paper

and Director of the Well-being Institute at the University of Cambridge. "The findings support the view that even at this time of great financial hardship, policymakers should prioritise the well-being of our children so they have the best possible start in life."

Dr Marcus Richards, co-author of the paper from the MRC Unit for Lifelong Health and Ageing, said: "Most longitudinal studies focus on the negative impact of early mental problems, but the 1946 birth cohort also shows clear and very long-lasting positive consequences of mental well-being in childhood."

For the study, the researchers adjusted for social class of origin, childhood intelligence and education.

Story Source:

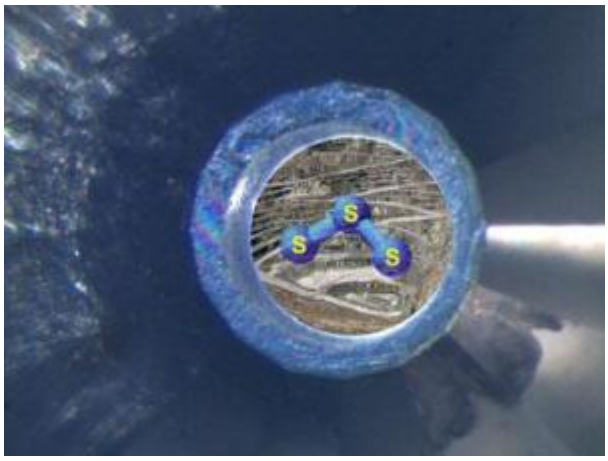
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Cambridge**.

Journal Reference:

1. Marcus Richards, Felicia Huppert. **Do positive children become positive adults? Evidence from a longitudinal birth cohort study**. *The Journal of Positive Psychology*, 2011; 6 (1): 75 DOI: 10.1080/17439760.2011.536655

http://www.sciencedaily.com/releases/2011/02/110225094936.htm

New Form of Sulfur Discovered in Geological Fluids



Artist's impression of the S_3^- molecule in a diamond anvil cell. This form of sulfur may well be one of the key factors in the formation of veins of gold and copper (represented here by a photo of a mine in the background of the image). (Credit: Copyright Pokrovski & Dubrovinsky)

ScienceDaily (Feb. 25, 2011) — Sulfur is the sixth most abundant element on Earth and plays a key role in many geological and biological processes. A French-German team including CNRS[1] and the Université Paul Sabatier has identified, on the basis of laboratory measurements, a novel form of sulfur present in geological fluids: the S_3^- ion. The discovery calls existing theories about the geological transport of sulfur into question, and could provide ways of identifying new deposits of precious metals such as gold and copper.

These findings are published in the Feb. 25, 2011 issue of the journal *Science*.

Until now, geochemists believed that inside Earth, only two forms of molecules contained sulfur: sulfides (based on H_2S or S^{2-}) and sulfates (based on H_2SO_4 or SO_4^{2-}). Yet they had no way of directly plunging a probe into the hydrothermal fluids[2] that flow through rocks to verify this theory. To get round this problem and test their hypothesis, the French-German team first created fluids similar to those in Earth's crust and mantle, i.e. aqueous solutions containing elementary sulfur (S) and thiosulfates (molecules containing the $S_2O_3^{2-}$ ion). They then used a diamond anvil cell to bring the fluids to the temperatures and pressures found at depths of several kilometers (several hundred degrees and tens of thousands of atmospheres).

The researchers used an optical method known as Raman spectroscopy to identify the chemical species, and they were astounded to discover not two, but three forms of sulfur, the third being the trisulfur ion S_3^-. This was a double surprise: although S_3^- was already known to chemists (it is found in sulfur-containing silicate glass and ultramarine pigments for instance), it had never been observed in an aqueous solution.

The detection of S_3^- during these experiments means that sulfur must be considerably more mobile in hydrothermal fluids in Earth's crust than was previously thought. This is because, unlike sulfides and sulfates, which attach to minerals as soon as they appear in fluids, S_3^- proves to be extremely stable in the aqueous phase. In other words, below ground these ions must flow for long distances in dissolved form, taking with them the noble metals to which they may be bound. This chemical species may therefore be the main metal transporting agent in two major types of gold and copper deposits: Archaean greenstone belts[3] and subduction zone magmas.

This discovery could provide additional indicators in the search for new deposits, by helping geologists to identify the pathways along which metals travel prior to forming veins. In addition, the presence of S_3^- in

hydrothermal fluids could affect sulfur isotope fractionation models (a sort of equivalent to the carbon-14 dating technique), which until now have taken no account of this chemical species. These new findings could for instance help scientists to find out more about the geological conditions in Earth's crust and on its surface shortly after the appearance of life.

Notes

1. Laboratoire 'Géosciences Environnement Toulouse' (CNRS/Université Paul Sabatier/IRD) and Bayerisches Geoinstitut/University of Bayreuth.
2. A hydrothermal fluid is a natural hot, aqueous fluid whose temperature usually exceeds 100°C.
3. These rocks formed during the Archaean era, between -4 and -2.5 billion years ago.

Story Source:

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

Journal Reference:

1. G. S. Pokrovski, L. S. Dubrovinsky. **The S_3^- Ion Is Stable in Geological Fluids at Elevated Temperatures and Pressures**. *Science*, 2011; 331 (6020): 1052 DOI: 10.1126/science.1199911

http://www.sciencedaily.com/releases/2011/02/110225091019.htm

Bamiyan Buddhas Once Glowed in Red, White and Blue

The illustration shows the colored appearance of the Bamiyan Buddhas' robes at the end of the 10th century. Parts damaged in later periods, which cannot be reconstructed, are made visible. (Credit: Copyright Arnold Metzinger/Courtesy of TU Muenchen)

ScienceDaily (Feb. 25, 2011) — The world watched in horror as Taliban fanatics ten years ago blew up the two gigantic Buddha statues that had since the 6th century looked out over the Bamiyan Valley in what is now Afghanistan. Located on the Silk Road, until the 10th century the 55 and 38 meter tall works of art formed the centerpiece of one of the world's largest Buddhist monastic complexes. Thousands of monks tended countless shrines in the niches and caves that pierced a kilometer-long cliff face.

Since the suppression of the Taliban regime, European and Japanese experts, working on behalf of UNESCO and coordinated by the International Council on Monuments and Sites (ICOMOS), have been endeavoring to secure the remains and restore access to the statues. The fragments are being very carefully examined, as prior to the explosion the Buddha statues had barely been researched. For a year and a half now, scientists from the Chair of Restoration, Art Technology and Conservation Science have been studying several hundred fragments at the TUM.

Their findings not only contribute to our understanding of this world cultural heritage site, they may also enable the parts recovered to be reassembled:

- **Coloration**: "The Buddhas once had an intensely colorful appearance," says Professor Erwin Emmerling. His team discovered that prior to the conversion of the region to Islam, the statues were overpainted several times, presumably because the colors had faded. The outer robes, or sangati, were painted dark blue on the inside and pink, and later bright orange, on top. In a further phase, the larger Buddha was painted red and the smaller white, while the interior of the robes was repainted in a paler blue. The graphic reconstruction undertaken by the TUM researchers confirms ancient traditions: sources as far back as the 11th century speak of one red Buddha and one moon-white. The other parts of the figures may possibly have had a white priming coat, but that can no longer be proven beyond doubt.
- **Construction technique**: The statues themselves were hewn out of the cliff; however, the flowing garments were formed by craftsmen using clay, which was applied in two or three layers. The remains display an astonishing degree of artistic skill. "The surfaces are perfectly smooth -- of a

quality otherwise only found in fired materials such as porcelain," says Professor Emmerling. In the clay, the TUM conservators found straw and chaff which absorb moisture, animal hairs which stabilize the plaster like fine glass fibers, and quartz and other additives which prevent shrinkage. The bottom layer of plaster was held in place with ropes attached to small wooden pegs. This allowed the craftsmen of old to apply unusually thick layers of up to eight centimeters. "These have survived not only nearly 1500 years of history, but even the explosion in some parts," adds Professor Emmerling in amazement.

- **Dating**: Previous attempts to determine when the statues originated were estimates based on the style of the Buddha's robes or similar criteria. Now mass spectrometer tests at the ETH Zurich and the University of Kiel have determined the age of the organic material in the clay layers. The TUM scientists have, as a result, been able to date the construction of the smaller Buddha to between 544 and 595 and the larger Buddha between 591 and 644.
- **Conservation**: How can the fragments at this world heritage site be conserved for the future? The ICOMOS teams have in the meantime stacked the ruins in temporary warehouses in the Bamiyan Valley. Larger pieces have been covered over in situ. "However, that will only last for a few years, because the sandstone is very porous," Professor Emmerling explains. Conventional methods of conservation are out of the question. "On this scale, under the climatic conditions in the Bamiyan Valley, the behavior of the synthetic resins usually used would vary too widely relative to the natural rock." Expert conservator Professor Emmerling has therefore joined forces with Consolidas, a company founded by a TUM graduate, to refine a process recently developed by the latter for possible use on the Buddha fragments: instead of synthetic resins, it might be possible to inject an organic silicon compound in the stone.

In addition, the TUM conservators are also working on a 3D model of the cliff face that shows all of the pieces in their former position. Professor Emmerling considers a reconstruction of the smaller Buddha to be fundamentally possible -- he argues in favor of reassembling the recovered parts, rather than attempting to reconstruct the original condition in antiquity. As far as the larger Buddha is concerned, in view of its depth of around 12 meters, Professor Emmerling is more skeptical. The smaller figure with a depth of around two meters was more along the lines of a relief. However, even to restore this figure, there are political and practical obstacles to overcome. Conservation of the fragments would require the construction of a small factory in the Bamiyan Valley -- alternatively some 1400 rocks weighing up to two tons each would have to be transported to Germany. A conference to be held in Paris in early March will consider the continuing fate of the Buddhas.

Story Source:

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

http://www.sciencedaily.com/releases/2011/02/110225122816.htm

Newborn Heart Muscle Can Grow Back by Itself, Study Shows

Researchers led by (from left) Drs. Eric Olson, Hesham Sadek and Enzo Porrello found in an animal study that newborn heart tissue was able to repair itself within weeks of being damaged. (Credit: Image courtesy of UT Southwestern Medical Center)

ScienceDaily (Feb. 25, 2011) — In a promising science-fiction-meets-real-world juxtaposition, researchers at UT Southwestern Medical Center have discovered that the mammalian newborn heart can heal itself completely.

Researchers, working with mice, found that a portion of the heart removed during the first week after birth grew back wholly and correctly -- as if nothing had happened.

"This is an important step in our search for a cure for heart disease, the No. 1 killer in the developed world," said Dr. Hesham Sadek, assistant professor of internal medicine and senior author of the study available online in the Feb. 25 issue of *Science*. "We found that the heart of newborn mammals can fix itself; it just forgets how as it gets older. The challenge now is to find a way to remind the adult heart how to fix itself again."

Previous research has demonstrated that the lower organisms, like some fish and amphibians, that can regrow fins and tails, can also regrow portions of their hearts after injury.

"In contrast, the hearts of adult mammals lack the ability to regrow lost or damaged tissue, and as a result, when the heart is injured, for example after a heart attack, it gets weaker, which eventually leads to heart failure," Dr. Sadek said.

The researchers found that within three weeks of removing 15 percent of the newborn mouse heart, the heart was able to completely grow back the lost tissue, and as a result looked and functioned just like a normal heart. The researchers believe that uninjured beating heart cells, called cardiomyocytes, are a major source of the new cells. They stop beating long enough to divide and provide the heart with fresh cardiomyocytes.

Dr. Eric Olson, chairman of molecular biology and co-senior author of the study, said that this work is fascinating.

"The inability of the adult heart to regenerate following injury represents a major barrier in cardiovascular medicine," said Dr. Olson, who directs the Nancy B. and Jake L. Hamon Center for Basic Research in Cancer and the Nearburg Family Center for Basic and Clinical Research in Pediatric Oncology. "This work demonstrates that cardiac regeneration is possible in the mammalian heart during a window of time after birth,

but this regenerative ability is then lost. Armed with this knowledge, we can next work to discover methods to reawaken cardiac regeneration in adulthood."

The next step, the researchers said, is to study this brief window when the heart is still capable of regeneration, and to find out how, and why, the heart "turns off" this remarkable ability to regenerate as it grows older.

Other UT Southwestern researchers involved in the study were Dr. Enzo Porrello, postdoctoral research fellow in molecular biology and the paper's lead author; Ahmed Mahmoud, graduate research assistant in internal medicine; Emma Simpson, research assistant in pathology; Dr. Joseph Hill, chief of cardiology; and Dr. James Richardson, professor of pathology and molecular biology.

The study was funded by the National Health and Medical Research Council, the National Heart Foundation of Australia and the American Heart Association.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **UT Southwestern Medical Center**.

Journal Reference:

1. E. R. Porrello, A. I. Mahmoud, E. Simpson, J. A. Hill, J. A. Richardson, E. N. Olson, H. A. Sadek. **Transient Regenerative Potential of the Neonatal Mouse Heart**. *Science*, 2011; 331 (6020): 1078 DOI: 10.1126/science.1200708

http://www.sciencedaily.com/releases/2011/02/110224145600.htm

Low Vitamin D Levels Linked to Allergies in Kids

Epipen for allergy over nuts and granola bar. A study of more than 3,000 children shows that low vitamin D levels are associated with increased likelihood that children will develop allergies. (Credit: iStockphoto/Mario Loiselle)

ScienceDaily (Feb. 25, 2011) — A study of more than 3,000 children shows that low vitamin D levels are associated with increased likelihood that children will develop allergies, according to a paper published in the February 17 online edition of the *Journal of Allergy and Clinical Immunology*. Researchers from Albert Einstein College of Medicine of Yeshiva University headed the study.

Researchers looked at the serum vitamin D levels in blood collected in 2005-2006 from a nationally representative sample of more than 3,100 children and adolescents and 3,400 adults. The samples are derived from the National Health and Nutrition Examination Survey (NHANES), a program of studies designed to assess the health and nutritional status of adults and children in the United States. The survey is unique in that it combines interviews, physical examinations and laboratory studies. One of the blood tests assessed was sensitivity to 17 different allergens by measuring levels of Immunoglobulin E (IgE), a protein made when the immune system responds to allergens.

When the resulting data was analyzed by Einstein researchers, no association between vitamin D levels and allergies was observed in adults. But for children and adolescents, low vitamin D levels correlated with sensitivity to 11 of the 17 allergens tested, including both environmental allergens (e.g., ragweed, oak, dog, cockroach) and food allergens (e.g., peanuts). For example, children who had vitamin D deficiency (defined as less than 15 nanograms of vitamin D per milliliter of blood), were 2.4 times as likely to have a peanut allergy than were children with sufficient levels of vitamin D (more than 30 nanograms of vitamin D per milliliter of blood).

The research shows only an association and does not prove that vitamin D deficiency causes allergies in children, cautioned Michal Melamed, M.D., M.H.S., assistant professor of medicine and of epidemiology & population health at Einstein and senior author of the study. Nevertheless, she said, children should certainly consume adequate amounts of the vitamin. "The latest dietary recommendations calling for children to take in 600 IU of vitamin D daily should keep them from becoming vitamin-D deficient," she said.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Albert Einstein College of Medicine**.

Journal Reference:

1. Shimi Sharief, Sunit Jariwala, Juhi Kumar, Paul Muntner, Michal L. Melamed. **Vitamin D levels and food and environmental allergies in the United States: Results from the National Health and Nutrition Examination Survey 2005-2006**. *Journal of Allergy and Clinical Immunology*, 2011; DOI: 10.1016/j.jaci.2011.01.017

http://www.sciencedaily.com/releases/2011/02/110224103244.htm

Much of Mississippi River Sediment Comes from Stream Bank Collapse, Rather Than Field Runoff

An example of seepage erosion from a section of Goodwin Creek in Mississippi. (Credit: Photo by Glenn Wilson.)

ScienceDaily (Feb. 25, 2011) — Much of the Mississippi River's sediment load doesn't come from field runoff, according to work by scientists at the U.S. Department of Agriculture (USDA). Instead, the scientists with USDA's Agricultural Research Service (ARS) have confirmed that stream bank collapse and failure can be chief contributors to high sediment levels in the silty streams and rivers that flow into the Mississippi.

The U.S. Environmental Protection Agency lists sediment as the most common pollutant of rivers, streams, lakes and reservoirs in the United States. Trapped sediment can reduce the useful lifespan of dams and reservoirs, exacerbate flooding, harm aquatic plants and animals, and transport other pollutants downstream. Over the years, billions of dollars have been spent on stream bank protection and restoration efforts to stem erosion and reduce sedimentation loads.

The source of this sediment load is often attributed to erosion and runoff from farm fields. But ARS hydrologist Glenn Wilson, who works at the agency's National Sedimentation Laboratory in Oxford, Miss., spent several years looking more closely at the causes of stream bank erosion. His studies focused on how seepage -- the lateral movement of water through the ground -- could prompt conditions that led to stream bank failure.

Wilson and others confirmed for the first time that a stable stream bank can quickly become unstable when seepage erosion is added to the mix of factors that promote bank failure. They found that seepage from stream

banks was eroding layers of soil that subsequently would wash down the face of the stream bank and into the stream itself. This added to the sediment load in the stream and also left the bank itself weakened and vulnerable to collapse.

The researchers concluded that stream bank failure may stem as much -- or more -- from the effect of seepage erosion undercutting the stream banks as from the added weight of the waterlogged stream banks.

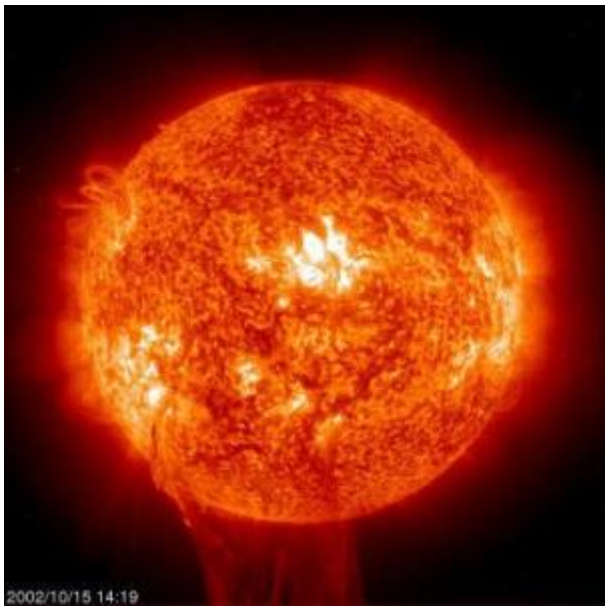
Results from this work were published in the *Journal of Hydrologic Engineering* and *Earth Surface Processes and Landforms*.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **USDA/Agricultural Research Service**.

http://www.sciencedaily.com/releases/2011/02/110223151939.htm

Solar Experts Detect Waves in Giant Magnetic Holes the Size of the UK



This shows the chromosphere of the solar atmosphere. Bright patches correspond to concentrated magnetic flux. (Credit: SOHO)

ScienceDaily (Feb. 25, 2011) — Massive waves in giant magnetic holes on the surface of the Sun have been discovered for the first time by solar scientists from the University of Sheffield and Queen´s University Belfast, something that will bring experts a step closer to unlocking the secrets of the Sun.

The Sun is interwoven by a complex network of magnetic field lines that are responsible for a large variety of fascinating features that can be seen in the solar atmosphere. Large, dark regions, which look like holes on the Sun´s surface, mark out areas where the magnetic field breaks through from the Sun´s deep, boiling interior and rises into the very hot solar atmosphere, which is over a million degrees. The largest of these dark regions are often called sunspots and have been studied since their discovery from as early as 364 BC.

Led by Professor Robertus von Fay-Siebenburgen, Head of the Solar Physics and Space Plasma Research Centre (SP2RC) at the University of Sheffield, the team studied a magnetic region of the Sun much smaller than a sunspot, however its size was still many times greater than the size of the UK.

Their research, which was published this week in *Astrophysical Journal*, has shown that the magnetic hole they observed, which is also known as a pore, is able to channel energy generated deep inside the Sun, along the magnetic field to the Sun´s upper atmosphere. The magnetic field emerging through the pore is over 1,000 times stronger than the magnetic field of Earth.The energy being transported is in the form of a very special form of waves, known as `sausage waves´ which the scientists were able to observe using a UK-built solar imager known as ROSA (Rapid Oscillations of the Solar Atmosphere), which was designed by Queen´s University Belfast and is in operation at the Dunn Solar Telescope, Sacramento Peak, USA. This is the first direct observation of `sausage waves´ at the solar surface. The magnetic hole is seen to increase and decrease in size periodically which is a characteristic feature of the `sausage wave.´

The team of experts, including Dr Richard Morton from the University of Sheffield, as well as Professor Mihalis Mathioudakis and Dr David Jess from Queen´s University Belfast, hope these giant magnetic holes will play an important role in unveiling the longstanding secrets behind solar coronal heating.

This is because the solar surface has a temperature of a few thousand degrees but the solar corona -- the outermost, mysterious, and least understood layer of the Sun's atmosphere -- is heated to temperatures often a thousand times hotter than the surface. Why the temperature of the Sun´s atmosphere increases as we move further away from the centre of energy production, which lies under the surface, is a great mystery of astrophysics. The findings, which demonstrate the transfer of energy on a massive scale, offer a new explanation for this puzzle.

The team now hope to use further similar solar images from ROSA to understand the fine substructure of these massive magnetic holes by reconstructing the images to view what is inside the holes.

Professor Robertus von Fay-Siebenburgen, said: "This is a fascinating new discovery in line with a number of discoveries made in recent years by the team. It is the first time that `sausage waves´ have been detected in the Sun with such detail. Analysing these waves may bring us closer to understanding the physical mechanisms in the atmosphere of a star.

Story Source:

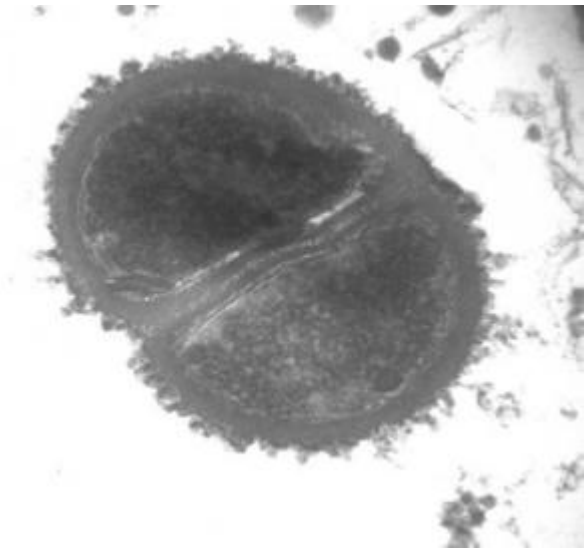
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Sheffield**.

Journal Reference:

1. R. J. Morton, R. Erdélyi, D. B. Jess, M. Mathioudakis. **Observations Of Sausage Modes In Magnetic Pores**. *The Astrophysical Journal*, 2011; 729 (2): L18 DOI: 10.1088/2041-8205/729/2/L18

http://www.sciencedaily.com/releases/2011/02/110224103041.htm

Chemical Compounds in Trees Can Fight Deadly Staph Infections in Humans



Methicillin-resistant Staphylococcus aureus (MRSA), a "superbug" that is resistant to most medications, sickened more than 94,000 people in 2005 and killed more than 19,000 in the US, according to a report from the Centers for Disease Control. (Credit: George Stewart/University of Missouri)

ScienceDaily (Feb. 25, 2011) — Most people would never suspect that a "trash tree," one with little economic value and often removed by farmers due to its ability to destroy farmland, could be the key to fighting a deadly bacterium. Now, a University of Missouri researcher has found an antibiotic in the Eastern Red Cedar tree that is effective against methicillin-resistant *Staphylococcus aureus* (MRSA), a "superbug" that is resistant to most medications.

"I wanted to find a use for a tree species that is considered a nuisance," said Chung-Ho Lin, research assistant professor in the MU Center for Agroforestry at the College of Agriculture, Food and Natural Resources. "This discovery could help people fight the bacteria as well as give farmers another cash crop."

MRSA is an evolving bacterium that is resistant to most medications. For most people, the infection is isolated to the skin. However, it can spread to vital organs causing toxic shock syndrome and pneumonia, especially in people with weakened immune systems. The incidence of disease caused by MRSA bacteria is increasing worldwide. Thirty years ago, MRSA accounted for 2 percent of all staph infections. By 2003, that number had climbed to 64 percent. In 2005, more than 94,000 people developed life-threatening MRSA infections in the United States, according to a Centers for Disease Control report. Nearly 19,000 people died during hospital stays related to these infections.

While the Eastern Red Cedar has few commercial uses, it is present in the U.S. in large numbers and its range extends from Kansas to the eastern United States. An estimated 500 million trees grow in Missouri. Lin began his investigation by building on existing research showing the anti-bacterial potential of chemical compounds derived from the tree.

Lin, George Stewart, professor and department chair of Pathobiology in the College of Veterinary Medicine, and Brian Thompson, postdoctoral fellow in the Bond Life Sciences Center, identified, isolated and tested 17 bioactive compounds and has plans to analyze more compounds. Scientists found that a relatively small concentration of a chemical compound found in the Eastern Red Cedar- 5 micrograms per milliliter -- was effective against MRSA. The team tested the compound's effectiveness against many versions of MRSA in a test tube with promising initial results.

"We found this chemical from the cedar needles, an abundant and renewable resource that can be collected annually," co-researcher Brian Thompson said. "Because the compound is in the needles, we don't have to cut down the trees."

In addition to its potential use in fighting MRSA, researchers found that some chemical compounds in the tree are able to fight and kill skin cancer cells present in mice. It may also be effective as a topical acne treatment. Stewart said the compounds are years away from commercial use, as they must go through clinical trials. The team's research was presented recently at the International Conference on Gram-Positive Pathogens.

Story Source:

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

http://www.sciencedaily.com/releases/2011/02/110222122715.htm

Premature Aging Replicated in the Lab

Left: Juan Carlos Izpisúa Belmonte, Ph.D. a professor in the Salk Institute's Gene Expression Laboratory. Right: Guang-Hui Liu, Ph.D., a postdoctoral researcher in the Belmonte lab. (Credit: Image courtesy of Salk Institute)

ScienceDaily (Feb. 25, 2011) — The current pace of population aging is without parallel in human history but surprisingly little is known about the human aging process, because lifespans of eight decades or more make it difficult to study. Now, researchers at the Salk Institute for Biological Studies have replicated premature aging in the lab, allowing them to study aging-related disease in a dish.

In the February 23, 2011 advance online edition of the journal *Nature*, Juan Carlos Izpisúa Belmonte, Ph.D. a professor in the Salk Institute's Gene Expression Laboratory, and his team report that they have successfully generated induced pluripotent stem (iPS) cells from skin cells obtained from patients with Hutchinson-Gilford Progeria Syndrome -- who age eight to 10 times faster than the rest of us -- and differentiated them into smooth muscle cells displaying the telltale signs of vascular aging.

"The slow progression and complexity of the aging process makes it very hard to study the pathogenesis of cardiovascular and other aging-related disorders," says Izpisúa Belmonte. "Having a human model of accelerated aging will facilitate the development of treatments and possibly a cure for Progeria and give us new insights into how we age. It may also help prevent or treat heart disease in the general aging population."

Progeria's striking features resemble the aging process put on fast-forward and afflicted people rarely live beyond 13 years. Almost all of the patients die from complications of arteriosclerosis -- the clogging or hardening of arteries or blood vessels caused by plaques -- which leads to heart attack and stroke.

Scientists are particularly interested in Progeria in the hopes that it might reveal clues to the normal human aging process. However, the disease is exceedingly rare and only 64 children living with Progeria are known making access to patients very difficult.

Hutchinson-Gilford Progeria Syndrome is caused by a single point mutation in the gene encoding lamin A, which forms a protein scaffold on the inner edge of the nucleus that helps maintain chromatin structure and organize nuclear processes such as RNA and DNA synthesis. The mutation creates an alternative splice site that leads to the production of a truncated version of the protein known as progerin. Unlike the full-length protein, progerin does not properly integrate into the nuclear lamina, which disrupts the nuclear scaffold and causes a host of problems.

"There is also evidence that defective lamin A accumulates during the normal aging process via the sporadic use of the alternative splice site, " explains Izpisua Belmonte. "Therefore we are very keen on using our in vitro iPS cell-based model to identify new aging markers and explore other aspects of human premature and physiological aging."

Compared to normal skin fibroblasts, cells from Progeria patients have misshapen nuclei and a range of other nuclear defects, including a disorganized nuclear lamina, loss of super-condensed DNA, telomere shortening and genomic instability. Yet, despite their "old" appearance and characteristics, these cells could be readily converted into iPS cells.

"The reprogramming process erased all nuclear and epigenetic defects and the rejuvenated pluripotent cells looked and acted like perfectly normal healthy cells," says first author Guang-Hui Liu, Ph.D., a postdoctoral researcher in the Belmonte lab.

Since lamin A is only expressed in differentiated cells but is absent from embryonic stem cells, he wondered whether iPS cells produce lamin A and/or progerin, which should follow the same expression pattern as lamin A. In his experiments, he couldn't detect either one. "The biological clock is reset in these cells because lamin A is silenced," explains Liu.

As soon as the Salk researchers differentiated Progeria-derived iPS cells, progerin expression was reactivated. "This reversible suppression of progerin expression by reprogramming and subsequent reactivation during differentiation, provides a unique model system to study human premature aging pathologies," says Izpisúa Belmonte.

Progerin accumulates mainly in smooth muscle cells found within the walls of arterial blood vessels, and vascular smooth muscle cells degeneration is one of the hallmarks of Hutchinson-Gilford Progeria Syndrome-associated arteriosclerosis. In fact, vascular smooth muscle cell senescence also plays a role in advanced arteriosclerosis within the normal aging population.

Upon directed differentiation of Progeria-derived iPS cells into smooth muscle cells the premature aging phenotype, including misshapen nuclei, the loss of gene silencing marks and compromised proliferation, reappeared. Genetically modifying progeria-derived iPS cells to shut down the expression of progerin staved off the premature appearance of aging phenotypes after differentiation. "Transplantation of the progenitor cells derived from the "corrected" progeria iPS cells might hold the promise to treat these progeria children in the future." says Liu.

Other researchers contributing the study include Basam Z. Barkho, Sergio Ruiz, Jing Qu, Scheng-Liang Yang, Athanasia D. Panopoulos, Keiichiro Suzuki, Leo Kuraian, Christopher Walsh and Ignacio Sancho-Martinez in the Gene Expression Laboratory at the Salk Institute, Dinh Diep and Ho Lim Fung in the Department of Engineering at the University of California, San Diego, James Thompson and John Yates III in the Department of Cell Biology at the Scripps Research Institute and Stephanie Boue at the Center for Regenerative Medicine in Barcelona.

The study was supported by the California Institute of Regenerative Medicine, the AFAR/Ellison Medical Foundation, the G. Harold and Leila Y. Mathers Charitable Foundation, Sanofi-Aventis, MICINN, the Fundacion Cellex and grants from the National Institutes of Health.

Story Source:

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

Journal Reference:

1. Guang-Hui Liu, Basam Z. Barkho, Sergio Ruiz, Dinh Diep, Jing Qu, Sheng-Lian Yang, Athanasia D. Panopoulos, Keiichiro Suzuki, Leo Kurian, Christopher Walsh, James Thompson, Stephanie Boue, Ho Lim Fung, Ignacio Sancho-Martinez, Kun Zhang, John Yates III, Juan Carlos Izpisua Belmonte. **Recapitulation of premature ageing with iPSCs from Hutchinson–Gilford progeria syndrome**. *Nature*, 2011; DOI: 10.1038/nature09879

http://www.sciencedaily.com/releases/2011/02/110223133844.htm

New Bird to Science Emphasizes the Critical Need to Conserve the Remaining Dry Forests of Madagascar

Mentocrex beankaensis is a new species of forest-dwelling rail. (Credit: Illustrations by Velizar Simeonovski; Copyright The Field Museum)

ScienceDaily (Feb. 25, 2011) — In a recent issue of the scientific journal *Zootaxa,* researchers from Madagascar and the United States described a new species of forest-dwelling rail. The new bird was named *Mentocrex beankaensis,* with the genus *Mentocrex* being endemic to Madagascar and the new species beankaensis being coined after the type locality, the Beanka Forest in western central Madagascar. This species was distinguished from another in the same genus, known from the eastern portion of the island, based on aspects of size, plumage, and DNA.

The project resulting in this description was the joint efforts of scientists from the University of Antananarivo and Association Vahatra in Madagascar and the Pritzker Laboratory for Molecular Systematics and Evolution at The Field Museum in Chicago. Marie Jeanne Raherilalao and Steve Goodman conducted the morphological portion of the study, and the molecular genetics aspects by Nicholas Block, a graduate student with the University of Chicago's Committee on Evolutionary Biology who is based at The Field Museum.

The dry forests of western Madagascar have been drastically reduced in size. Estimates proposed by the World Wildlife Fund (WWF) indicate that 97 percent of the original forest cover in this portion of the island has disappeared since humans arrived some 2,500 years ago. Over the past decades these remaining dry forest areas have been the sites of numerous discoveries of plant and animal species new to science. The Beanka Forest is a largely intact area resting on exposed limestone formation with razor-sharp pinnacle like structures, which are known in Malagasy, the language of Madagascar, as *tsingy.*

The Beanka Forest in a remote portion of the island is managed since late 2007 by the Association Biodiversity Conservation Madagascar (BCM) and funded by Bioculture (Mauritius) Ltd., which has started programs for the socio-economic development of surrounding communities, forest restoration, and the conservation of the site. The director of BCM, Mr. Aldus Andriamamonjy, notes, "We [BCM] have taken an approach to the conservation of the Beanka Forest resting on working in unison with local people to fulfill aspects of their economic and development needs and bestowing a sense of natural patrimony of the organisms that live in their forest. These are aspects critical for any long-term successful project. The discovery of this new species of bird and other organisms during the late 2009 expedition underlines the importance of our mission and the uniqueness of the Beanka Forest."

In late October to early November 2009, the Association Vahatra, in collaboration with BCM and several other research groups working on the flora and fauna of Madagascar, organized a large-scale biotic inventory

of the Beanka Forest, a zone of about 14,000 hectares. This is the period when a specimen of the new rail was obtained and that led to the naming of this new species.

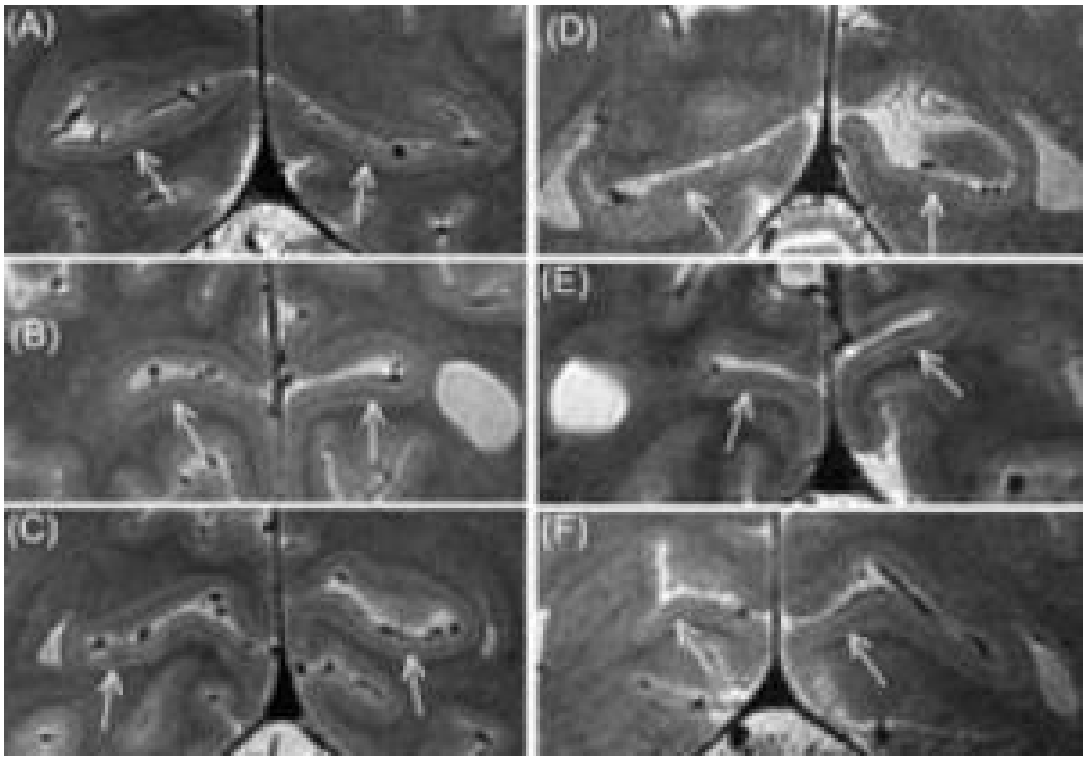
Several new species of plants, invertebrates and vertebrates were discovered and *Mentocrex beankaensis* is the first of a series from the expedition to be named. Dr. Marie Jeanne Raherilalao, Professor at the University of Antananarivo and Association Vahatra, mentioned, "that even after many decades of research, nature is always full of surprises, even for organisms such as birds that have been intensively studied. The recent rediscovery in the northern portion of the island of the Madagascar Pochard, a species that was thought to be extinct and the discovery of this new species of rail, are cases in point. This underlies the importance of field research and biotic inventories."

Story Source:

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

http://www.sciencedaily.com/releases/2011/02/110223163609.htm

Nerve Bundles in Visual Cortex of the Brain in Blind People May Process Sense of Touch



The Stripe of Gennari (right: subjects with normal vision, left: blind subjects) shows up as a thin dark line in the sulcus calcinarus (white) which surrounds the primary visual cortex. (Credit: Copyright Max Planck Institute for Human Cognitive and Brain Sciences)

ScienceDaily (Feb. 25, 2011) — The Stripe of Gennari develops even in those who are blind from birth and does not degenerate, despite a lack of visual input. This was discovered by Robert Trampel and colleagues from the Max Planck Institute for Human Cognitive and Brain Sciences using magnetic resonance imaging. This bundle of nerve fibers, which is approximately 0.3 mm thick, is not exclusively responsible for optic information.

In the blind, it might play a greater role in processing tactile stimuli. This could contribute to an enhanced sense of touch and support fast reading of Braille. (*Cerebral Cortex*, Online 10. 02. 2011)

The Stripe of Gennari -- also known as the 'Stria of Gennari' -- transverses the gray matter of the primary visual cortex as a distinct white line. "Although the visual cortex is one of the best-studied parts of the brain, and the Stripe of Gennari is a rather obvious structure, why it develops and what its function is has not previously been studied in detail," explains Robert Trampel from the Max Planck Institute for Human Cognitive and Brain Sciences. "An obvious connection with sight was assumed."

However, as is now clear, this cannot be the only function of the stripe of Gennari: In a functional magnetic resonance imaging (fMRI) study, the researchers found the stripe of Gennari in the brains of congenitally blind subjects. "This brain structure therefore can't exclusively be involved in vision and must be capable of carrying out other tasks," says Trampel. In the blind, the Stripe of Gennari could play a role in supporting the sense of touch, the scientists speculate. "This faculty is essential in reading Braille and the region carrying the Gennari-Stripe is known to show an increased activity in the blind when performing this task." All

participants in the present study were highly proficient in reading Braille, having responded to an advertisement written in Braille in a newspaper for the visually impaired.

However, since the stripe of Gennari is already present in the first years of life and does not degenerate, it is likely to have an important role already in early infancy. In blind people, the brain uses tactile and acoustic stimuli to construct a rough spatial representation of the surroundings in the absence of visual information. The stripe of Gennari might play a role in this process and could later support highly demanding tactile tasks, like Braille-reading. In future studies with fMRI, the researchers aim to learn more about the work of this versatile nerve bundle in the human brain.

Story Source:

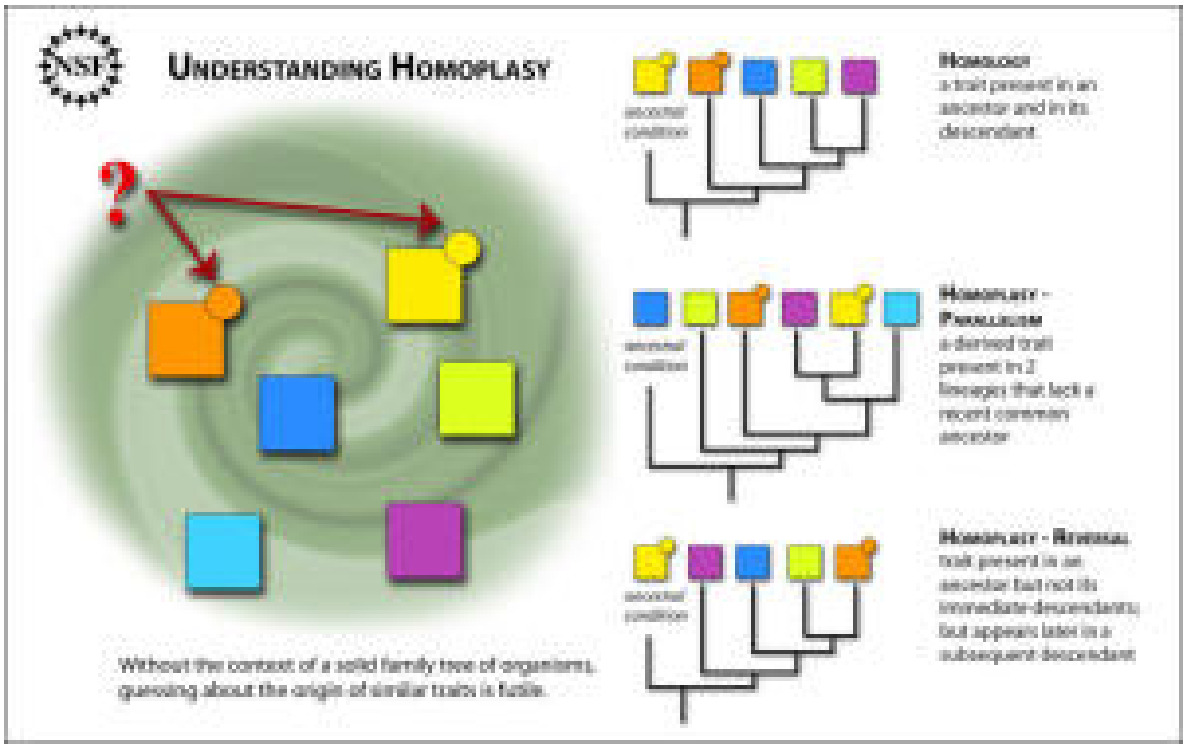
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Max-Planck-Gesellschaft**.

Journal Reference:

1. R. Trampel, D. V. M. Ott, R. Turner. **Do the Congenitally Blind Have a Stria of Gennari? First Intracortical Insights In Vivo**. *Cerebral Cortex*, 2011; DOI: 10.1093/cercor/bhq282

http://www.sciencedaily.com/releases/2011/02/110222140544.htm

Homoplasy: A Good Thread to Pull to Understand the Evolutionary Ball of Yarn



Homoplasy is a fascinating and unusual occurrence in evolution. It is the independent acquisition of the same trait in unrelated lineages. To understand whether multiple organisms share the same trait because of homoplasy, their places in the evolutionary tree of life must be defined. Parallelism/convergence homoplasy occurs when the same trait is present in two lineages that lack a recent common ancestor. Reversal homoplasy occurs when a trait is present in an ancestor but not its immediate descendants; but appears later in a subsequent descendant. (Credit: Zina Deretsky)

ScienceDaily (Feb. 25, 2011) — With the genetics of so many organisms that have different traits yet to study, and with the techniques for gathering full sets of genetic information from organisms rapidly evolving, the "forest" of evolution can be easily lost to the "trees" of each individual case and detail.

A review paper recently published in *Science* by David Wake, Marvalee Wake and Chelsea Specht, all currently National Science Foundation grantees, suggests that studying examples of homoplasy can help scientists analyze the overwhelming deluge of genetic data and information that is currently being generated.

For example, studying situations where a derived trait surfaces in two lineages that lack a recent common ancestor, or situations where an ancestral trait was lost but then reappeared many generations later, may help scientists identify the processes and mechanisms of evolution.

The authors provide many fascinating examples of homoplasy, including different species of salamanders that independently, through evolution, increased their body-length by increasing the lengths of individual vertebrae. By contrast, most species grow longer by adding vertebrae through evolution.

The authors also explain how petals in flowers have evolved on six separate occasions in different plants. A particularly striking example of homoplasy cited by the authors is the evolution of eyes, which evolved many

times in different groups of organisms--from invertebrates to mammals--all of which share an identical genetic code for their eyes.

These kinds of examples of genetic and developmental biology help scientists elucidate relationships between organisms, as well as develop a fuller picture of their evolutionary history.

Story Source:

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

Journal Reference:

1. D. B. Wake, M. H. Wake, C. D. Specht. **Homoplasy: From Detecting Pattern to Determining Process and Mechanism of Evolution**. *Science*, 2011; 331 (6020): 1032 DOI: 10.1126/science.1188545

http://www.sciencedaily.com/releases/2011/02/110224161512.htm

Cod Fish With Mini-Thermometers

Tagged Cod. (Credit: Stefan Neuenfeldt, DTU Aqua)

ScienceDaily (Feb. 25, 2011) — Hundreds of cod equipped with high-tech mini-thermometers have helped determine which water temperatures the fish can handle. Cod are traditionally regarded as fish that thrive in cold water, and therefore represent a species that might find things hard going in a future climate change with rising sea temperatures.

Now for the first time and using modern advanced technology, it is possible to examine exactly at which temperatures cod are found in the Northeast Atlantic.

Researchers from several European universities, among them the National Institute of Aquatic Research in Denmark (DTU Aqua), equipped more than 2000 cod from eight different North Atlantic stocks, including the Baltic, the Skagerrak and the North Sea, with advanced temperature gauges. For over a year the gauges registered and stored water temperatures around the fish at fixed regular intervals. The results have just been published as a feature article in the "Marine Ecology Progress Series."

"It's absolutely unique to have data from such a large and comprehensive study," says Professor Ken Haste Andersen, one of four DTU Aqua researchers who participated in the international project.

The project has concentrated on cod because it is such an important fish commercially; at the same time, it is a large fish which can easily carry the electronic tag without being bothered by it.

Spawning is the cod's Achilles' heel The results indicate that adult cod can handle much warmer water than was originally thought.

"Some fish were found at temperatures as cold as -1.5 degrees, while others swam quite happily in water that was nearly 20 degrees above zero. This shows that cod are relatively adaptable fish that can tolerate higher temperatures than was previously thought. However, while this is true for adult cod, they appear to be somewhat more conservative in their choice of water temperature when they spawn. During this period, all the fish stocks studied consistently sought out water that had a temperature of between one and eight degrees. This indicates that the egg and larvae stages of a cod's life may constitute a particularly vulnerable time with regard to the effects of climate change," says Professor Andersen.

Subzero temperatures However, the fact that cod in the Northeast Atlantic can survive in water temperatures which fluctuate up to 20 degrees does not mean that all adult cod can tolerate all temperatures. If you took a

cod from the North Sea and moved it to the -1.5 degree water north of Iceland, the coldest water measured in the survey, it would be seriously challenged.

"Each fish stock in each area is well-adapted to the local conditions. It is widely known that cod can live in water at subzero temperatures, because they can produce antifreeze proteins which protects them," says Professor Andersen from DTU Aqua.

About the survey

The research teams tagged a total of 3000 cod in different locations in the North Atlantic with electronic temperature gauges that measured and stored information about the temperature of the water around the fish about once an hour for a year. So far, 902 of the cod have been re-caught through fishing, and the tags holding the stored data sent back to the researchers.

To ensure that only information from fish whose tags worked long enough to give a real picture of the water temperatures the fish live in, short data series were discarded. Data from a total of 384 tagged cod from eight different populations are collated in the article's results, including cod from the Baltic Sea, the North Sea and the Skagerrak. The project Codyssey was funded by the EU and was coordinated by Professor David Righton from CEFAS (Centre for Environment, Fisheries and Aquacultural Science) in the UK.

Story Source:

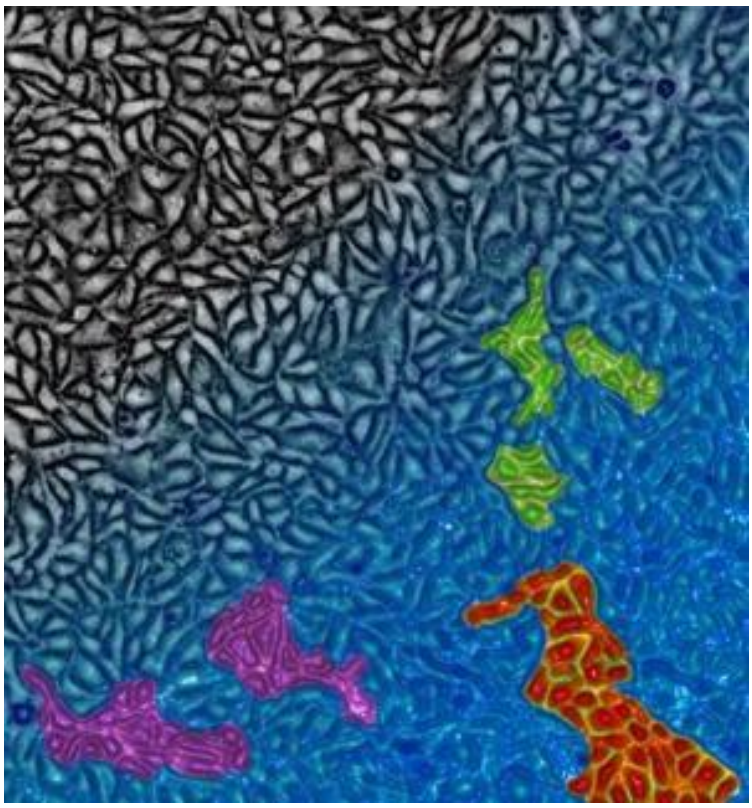
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Technical University of Denmark (DTU)**, via AlphaGalileo.

Journal Reference:

1. DA Righton, KH Andersen, F Neat, V Thorsteinsson, P Steingrund, H Svedäng, K Michalsen, HH Hinrichsen, V Bendall, S Neuenfeldt, P Wright, P Jonsson, G Huse, J van der Kooij, H Mosegaard, K Hüssy, J Metcalfe. **Thermal niche of Atlantic cod Gadus morhua: limits, tolerance and optima**. *Marine Ecology Progress Series*, 2010; 420: 1 DOI: 10.3354/meps08889

http://www.sciencedaily.com/releases/2011/02/110224091749.htm

Migrating Cells Flow Like Glass: Research Advances Understanding of Wound Healing, Cancer Metastasis, and Embryonic Development



This is an artist's representation of epithelial cells (black) approaching the glass transition (blue). Increasingly large groups of cells (green, purple, red) are able to move together more rapidly than the surrounding cells. (Credit: Image courtesy of Thomas E. Angelini, University of Florida)

ScienceDaily (Feb. 25, 2011) — By studying cellular movements at the level of both the individual cell and the collective group, applied physicists have discovered that migrating tissues flow very much like colloidal glass.

The research, led by investigators at Harvard's School of Engineering and Applied Sciences (SEAS) and the University of Florida, advances scientists' understanding of wound healing, cancer metastasis, and embryonic development.

The finding was published online Feb. 14 in *Proceedings of the National Academy of Sciences*.

Cells often move from one part of the body to another. In a developing embryo, for example, cells in the three germ layers have to arrange themselves spatially so that the cells that will become skin are all on the outside. Similarly, as a cancerous tumor expands, the cells proliferate and push others aside. In wound healing, too, new cells have to move in to replace damaged tissue.

It is well known that cells accomplish these movements through internal cytoskeletal rearrangements that allow them to extend, retract, and divide. At some point during the migration, though, the new tissue settles into place and stops.

"We're trying to understand it from a fundamental point of view," says principal investigator David Weitz, Mallinckrodt Professor of Physics and Applied Physics at SEAS. "What we're really trying to get at is, why do things stop moving?"

The glass under discussion here is not the kind used in windows -- though that is part of the larger category. Glasses include any amorphous materials that are viscous enough to remain solid for a reasonable period of time (often considered to be 24 hours) but which flow over longer periods (see sidebar).

Cream that is churned into butter goes through a sort of glass transition, as the increasing density of particles in the fatty emulsion forces it to become solid. Like any glass, butter will lose its form if the temperature rises.

As supercooled fluids and colloids (like cream) become more dense and approach the glass transition, the particles exhibit certain characteristic motions.

"We study this extensively," says Weitz, who leads the Experimental Soft Condensed Matter Group at SEAS. "We take small particles, and we increase their concentration more and more until they stop moving and they become a glass -- and we understand how that behaves very well."

Living cells, though, add several levels of complexity to the system: they vary in size, shape, and rigidity; they divide; they sense their environment; and they exert their own forces on their surroundings.

"What is really surprising to us in this research with tissues," says Weitz, "is that many of the features that inert particles exhibit as their concentration increases are also exhibited by cells. The real qualitative difference is that small particles move only because of thermal motion, whereas cells actually move themselves."

To simulate and study the migration of living tissue, Weitz's team deposited thousands of epithelial cells -- specifically, canine kidney cells -- onto a polyacrylamide gel containing the protein collagen. The researchers watched them grow and move under a microscope while measuring the individual and collective cellular movements, as well as the changes in density caused by proliferation.

The researchers found that when the cells are in a confluent layer (meaning that the cells are close enough to be touching), they flow like a liquid. However, when cell density increases past a certain threshold, the tightly packed cells begin to inhibit each other's movement. As a result, some cells are able to travel in groups, while others hardly get to move at all.

In other words, they behave just like a supercooled fluid or colloidal suspension transitioning into a glass.

"The implications for biological processes are very surprising," says lead author Thomas E. Angelini, formerly a postdoctoral researcher at SEAS and now an Assistant Professor at the University of Florida.

"Imagine a model wound in which a large group of cells are removed from the middle of a confluent layer," he says. "Cells will migrate inward to fill the void. Our results demonstrate that the low density of cells in the center of the wound is analogous to a raised temperature in the center of a molecular glass, causing flow within the hotter region."

"You could say that a wound is melted glass."

Weitz and Angelini's co-authors include Edouard Hannezo, of the Ecole Normale Superieure, in France; Xavier Trepat, of the Institut de Bioenginyeria de Catalunya, the Universitat de Barcelona, and Ciber

Enfermedades Respiratorias, in Spain; Manuel Marquez, of YNano, LLC; and Jeffrey J. Fredberg, of the Harvard School of Public Health.

The research was supported by the National Science Foundation's Division of Materials Research, the Harvard Materials Research Science and Engineering Centers, and the University of Malaga.

Story Source:

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

Journal Reference:

1. Thomas E. Angelini, Edouard Hannezo, Xavier Trepat, Manuel Marquez, Jeffrey J. Fredberg, David A. Weitz. **Glass-like dynamics of collective cell migration**. *Proceedings of the National Academy of Sciences*, 2011; DOI: 10.1073/pnas.1010059108

http://www.sciencedaily.com/releases/2011/02/110222092658.htm

Semporna Area on Island of Borneo, Malaysia, May Have Richest Marine Biodiversity in the World

Dr Bert with a rare species of mushroom coral. (Credit: Image courtesy of NCB Naturalis)

ScienceDaily (Feb. 25, 2011) — The preliminary results of the Semporna Marine Ecological Expedition (December 2010) indicate that Semporna may have the world's highest marine biodiversity. The expedition yielded a record number of 43 species of mushroom corals. Furthermore, some new species were discovered, among which at least two shrimps and possibly a number of gall crabs.

The health of the reefs was judged to be relatively poor: 36% of the transects had fair, another 36% had poor live coral cover. Eighteen scientists from Malaysia, the Netherlands and the USA spent three weeks examining the reefs of Semporna, Sabah, Malaysia, situated at the apex of the Coral Triangle. A biodiversity team documented the species richness for mushroom corals, reef fish, shrimps, gall crabs, ovulid snails, and algae. A reef status team documented the health of the coral reefs.

Mushroom corals are a family of corals of which most species live freely on the sea bed, from the shallow reef flat down to the sandy reef base. The expedition documented a record number of 43 species of mushroom corals in Semporna. The previous highest recorded richness of this family was 40 species at several sites in Indonesia and Papua New Guinea. "Mushroom corals can be used as a proxy for other coral richness. Where we find high richness of mushroom corals, we usually find extremely high richness of other corals," says Dr Bert Hoeksema, Head of Department of Marine Zoology, NCB Naturalis. Hoeksema was leader of the biodiversity team. Team member Dr Charles Fransen discovered two new shrimp species and PhD student Sancia van der Meij found at least one gall crab species new to science.

The count of fish species clearly demonstrates that Semporna is one of the richest areas within the Coral Triangle. Dr Kent Carpenter, Professor at Department of Biological Sciences, Old Dominion University states, "At some of the more diverse reefs, fish species counts rivalled the highest counts that the fish team found in the Philippines and were greater than what they have encountered in Indonesia." The fish team encountered 844 species of fish in Semporna.

The coral reef status team used a modified ReefCheck methodology to assess the health of the reefs. 12 kilometres of transects were laid in the course of 60 dives. The preliminary results show that the reef status ranged from poor to excellent condition. 5% of the transects had "excellent" live coral cover, 23% had "good," 36% had "fair," and another 36% had "poor" live coral cover. Signs of coral bleaching and suspected coral disease were observed at various sites. While Semporna has several sites with good coral cover, nearly all sites showed significant human impacts including fish bombs, discarded fishing gear, and solid waste.

With the expedition's conclusions that the coral reef diversity is extremely high, while the health of the reefs is relatively poor, a good basis can be provided for sustainable management of the reefs of Semporna. Not only is Semporna a world class diving destination, it may well be one of the Coral Triangle's top hotspots for marine biodiversity, and hence, the world's. Many thousands of local people also rely on these rich reefs for their livelihoods and income.

Story Source:

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

http://www.sciencedaily.com/releases/2011/02/110223092400.htm

Catalogue of Sustainable Design Resources Developed

Materials from Rematerialise, Kingston University London (Credit: Image courtesy of Kingston University)

ScienceDaily (Feb. 25, 2011) — After 17 years of research sustainable design expert Jakki Dehn is launching Rematerialise, a catalogue of eco-friendly materials for use in the construction industry.

From insulation made from mushrooms to kitchen tops created from recycled glass, Kingston University has catalogued more than 1,000 different sustainable materials for use in the construction industry. The result is a materials library, Rematerialise, which is being launched at EcoBuild, the world's largest event for showcasing sustainable design and construction practices.

Reader in sustainable design, Jakki Dehn has been developing Rematerialise at Kingston University's Faculty of Art, Design and Architecture for 17 years and believes designers will find it invaluable when planning new products. "They can come and touch and feel a whole range of materials all in one place -- materials which, otherwise, they might have to spend weeks investigating themselves," she said.

Several firms have already drawn on Dehn's expertise to help with ongoing projects. Product design company Jedco, based in Weybridge in Surrey, has developed a scaffolding board made from recycled polymers and a solar-powered bus-stop. "The scaffolding boards have proved useful on oil rigs, because unlike wood, they don't absorb water. So, in this case, the sustainable product is actually better than the material it's replacing," Dehn said.

Dehn began her research into sustainable materials in 1994 and received Arts and Humanities Research Council funding in 2003. Rematerialise now houses more than 1,200 materials from 15 different countries. It contains recycled materials, products made from resources that are very plentiful and easy to re-grow and

products made from resources that are not generally used very much. The University hopes eventually to put the entire library online so planners can do initial research before making an appointment to view the materials themselves at Kingston University's Knights Park campus.

As word about the resource has spread, new products have started arriving on an almost daily basis. "We recently received a new type of insulation material made from mushrooms. The piece we were sent was only an inch thick but, apparently, you could put your hand on one side of it and take a blow-torch to the other side and you wouldn't be able to feel the heat," said Dehn, who admitted she was yet to put it to the test. Another eye-catching material is resilica, which is used to make kitchen worktops as an alternative to granite or formica. It's made mainly of glass recycled from cars and building sites.

Story Source:

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

http://www.sciencedaily.com/releases/2011/02/110224145805.htm

Successful Tech Transfer Leads to More Hawaiian Exports

Hawaii growers can now export more fruits and vegetables like the dragon fruit to the U.S. mainland, thanks to generic irradiation protocols developed by ARS scientists to prevent the spread of pests like exotic fruit flies. (Credit: Image courtesy of United States Department of Agriculture - Research, Education and Economics)

ScienceDaily (Feb. 25, 2011) — Hawaii growers can now export more fruits and vegetables to the U.S. mainland, thanks to technology advanced by U.S. Department of Agriculture (USDA) scientists and cooperators.

Delicious tropical fruits and vegetables such as papaya, rambutan, longan, dragon fruit and purple-fleshed sweet potato are gaining popularity in the continental United States. But just five years ago, it would have been difficult to find these tropical delicacies in grocery stores. That's because strict quarantine restrictions and phytosanitary measures are in place to ensure agricultural pests like fruit flies don't invade the mainland.

Entomologist Peter Follett and food technologist Marisa Wall, both with the Agricultural Research Service's (ARS) U.S. Pacific Basin Agricultural Research Center in Hilo, HI, were the first to apply generic irradiation protocols to control a wide variety of quarantine insect pests found on fresh commodities. ARS is the principal intramural scientific research agency of the USDA, and this research supports the USDA priority of promoting international food security.

Working closely with colleagues from the USDA's Animal and Plant Health Inspection Service (APHIS), Hawaii Pride LLC and local growers and exporters, Follett found that a generic dose of 150 grays (Gy) of radiation is suitable for controlling the three species of tephritid fruit flies found in Hawaii. He also demonstrated a generic dose of 400 Gy is broadly effective against many other pests. These results contributed to APHIS approval of using generic doses for treatment of Hawaiian produce.

Wall examined product quality after irradiation. Her tests helped establish the maximum dose levels the fruit and vegetables could withstand while ensuring consumers receive a high-quality product.

Thanks to Follett and Wall's research, it is now easier and less costly for Hawaiian growers to share their produce with mainland consumers. As a result of their efforts, the scientists received a 2010 Federal Laboratory Consortium Award for Excellence in Technology Transfer.

This research has also helped facilitate the world-wide adoption of this technology. A handful of countries -- including Mexico, India and Thailand -- are currently using generic protocols on a variety of commodities.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **United States Department of Agriculture - Research, Education and Economics**. The original article was written by Sean Adams.

http://www.sciencedaily.com/releases/2011/02/110225200833.htm

Storytelling Program Improves Lives of People With Alzheimer's

A sample image from TimeSlips. TimeSlips was developed by Anne Basting, director of the Center on Age & Community at the University of Wisconsin-Milwaukee. (Credit: Image courtesy of University of Missouri-Columbia)

ScienceDaily (Feb. 25, 2011) — Nearly 16 million Americans will be diagnosed with Alzheimer's disease or another type of dementia by 2050, according to the Alzheimer's Association. Symptoms include mood and behavior changes, disorientation, memory loss and difficulty walking and speaking. The effects of anti-dementia drugs on patients' emotions and behaviors are inconsistent. Now, University of Missouri researchers have found that participation in TimeSlips, a drug-free, creative storytelling intervention, improves communication skills and positive affect in persons with dementia.

TimeSlips is a nationally recognized storytelling program for people with dementia that encourages participants to use their imaginations to create short stories as a group. Rather than relying on factual recall, participants respond verbally to humorous images presented by facilitators who record the responses and read narratives to further develop or end the stories.

"TimeSlips provides rich, engaging opportunities for persons with dementia to interact with others while exercising their individual strengths," said Lorraine Phillips, assistant professor in the Sinclair School of Nursing. "It encourages participants to be actively involved and to experience moments of recognition, creation and celebration. Meaningful activities, such as TimeSlips, promote positive social environments that are central to person-centered care."

The storytelling program is an easy and affordable activity for long-term care facilities to implement and allows caregivers to interact with multiple residents at a time, Phillips said.

"TimeSlips offers a stimulating alternative to typical activities in long-term care facilities," Phillips said. "It is an effective and simple option for care providers, especially those who lack resources or skills required for art, music or other creative interventions."

In the study, Phillips and her colleagues delivered the TimeSlips intervention in one-hour sessions, held twice weekly for six consecutive weeks. The results included increased expressions of pleasure and initiation of social communication. Improvements in participants' affect lasted several weeks following the final session. The intervention is acceptable for people with mild to moderate dementia, Phillips said.

Phillips worked with Stephanie Reid-Arndt, assistant professor of health psychology in the School of Health Professions, and Youngju Pak, assistant professor of health management and informatics in the School of Medicine.

Story Source:

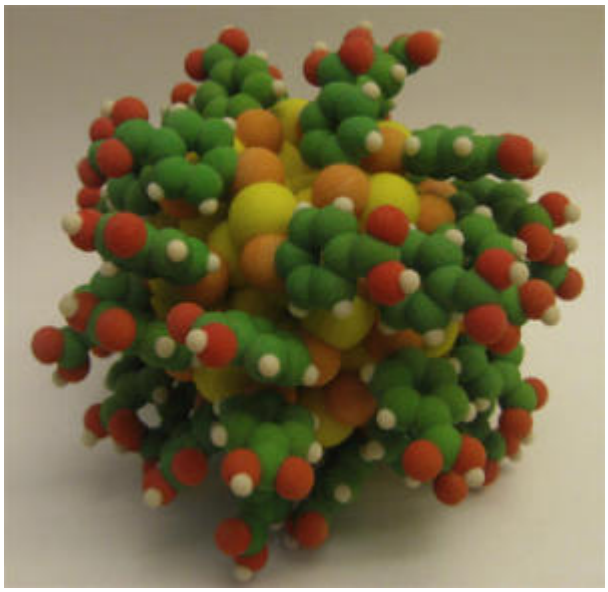
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Missouri-Columbia**.

Journal Reference:

1. Lorraine J. Phillips, Stephanie A. Reid-Arndt, Youngju Pak. **Effects of a Creative Expression Intervention on Emotions, Communication, and Quality of Life in Persons With Dementia**. *Nursing Research*, 2010; 59 (6): 417 DOI: 10.1097/NNR.0b013e3181faff52

http://www.sciencedaily.com/releases/2011/02/110225142828.htm

Fingerprints of a Gold Cluster Revealed



An atomistic model of the Au102(p-MBA)44 particle. Gold: yellow, sulfur: orange, carbon: green, oxygen: red, hydrogen: white (Credit: Image courtesy of Academy of Finland)

ScienceDaily (Feb. 25, 2011) — Nanometre-scale gold particles are currently intensively investigated for possible applications in catalysis, sensing, photonics, biolabelling, drug carriers and molecular electronics. The particles are prepared in a solution from gold salts and their reactive gold cores can be stabilised with various organic ligands. Particularly stable particles can be synthesised by using organothiolate ligands that have a strong chemical interaction to gold. The chemical process of preparing such particles has been known since the mid-1990s and many different stable sizes and compositions are known.

However, the first definite information of their atomic structure became available only in 2007 when the group of Roger Kornberg (Chemistry Nobel Laureate 2006) at Stanford University succeeded in making single crystals for X-ray diffractometry containing only one type of a particle having 102 gold atoms and 44 thiolate ligands, the so called Au102(p-MBA)44 particle. The structure was reported in *Science* in late 2007 [1]. The theoretical analysis of this and other thiolate-protected gold clusters, led by Professor Hannu Häkkinen at the University of Jyväskylä in Finland, resulted in a theoretical framework that can be used to understand the stability and electronic structure of these particles. This work was reported in the *Proceedings of the National Academy of Sciences* in 2008 [2].

Now, researchers in the Department of Chemistry and the Nanoscience Center (NSC) at the University of Jyväskylä, in collaboration with the Kornberg group, report the first full spectroscopic characterisation of the absorption of electromagnetic radiation by the Au102(p-MBA)44 particle in solution and solid phases. The study was published in the *Journal of the American Chemical Society* on 24 February 2011 [3]. The spectroscopic study was performed in a large range of electromagnetic spectrum from mid-infrared ("heat absorption") to ultraviolet light.

"The study was technically demanding and could only be made now when the Stanford group has succeeded in refining the synthesis to produce pure Au102(p-MBA)44 product in large quantities," explains Adjunct Professor Mika Pettersson, who led the experimental work at the NSC. "We document clear "fingerprint" features in the absorbance spectrum that can be used in the future to benchmark chemical modifications of this particle for various applications. The work also establishes the molecular nature of the clusters by the

observation of a band gap of 0.45 eV, in excellent agreement with theory. We were able to analyse these features from large-scale computations using the known structure of Au102(p-MBA)44 and thus fully understand the absorption characteristics of this particle," says Professor Häkkinen.

The other researchers involved in the work are Eero Hulkko, Jaakko Koivisto and Olga Lopez-Acevedo from the University of Jyväskylä. The pure samples of the Au102(p-MBA)44 particle were made by Yael Levi-Kalisman in the Kornberg group. The work at the NSC and the Department of Chemistry at the University of Jyväskylä is funded by the Academy of Finland. The massively parallel computations, using up to 2048 processor cores, were made in the Louhi supercomputer at CSC -- the IT Center for Science.

Story Source:

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

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http://www.sciencedaily.com/releases/2011/02/110225093915.htm

Large Forest Animals Contribute to Plant Diversity

Wild boar (Sus scrofa) with piglets. Due to its morphology and behaviour, the wild boar is a champion seed disperser. (Credit: iStockphoto/Warwick Lister-Kaye)

ScienceDaily (Feb. 25, 2011) — Over several decades, the growth in deer, roe deer and wild boar populations has spread to all of France. Cemagref researchers have shown that in spite of the damage caused, notably to bushes and young trees in forests and to crops, these animals also help in increasing plant diversity.

They studied the floristic surveys carried out from 1976 to 2006 at Arc-en-Barrois (Haute-Marne department), a unique observation site in France due to its long-term monitoring data. A plant, the gypsy flower (Cynoglossum officinale), was not found during the first survey, but then appeared in 1981 and has since spread widely. It is now present in the zones where large, forest mammals are most frequently found.

How did this plant, though threatened by predators, make such great strides? By hanging on tight! Its seeds can latch on to the fur of animals thus ensuring dissemination (epizoochory) and it is also a plant with a circular arrangement of leaves (rosette) that is not consumed by fauna because it contains toxic substances. These characteristics provide significant advantages enabling the plant to settle far and wide.

A brush with the boars

Wild boars are an excellent dispersal agent. Their fur comprises two strata, an undercoat of often curly hair and stiff bristles, that can easily lock in and transport seeds over many kilometres, contrary to deer and roe deer with their shorter hair.

Their behaviour is also a decisive factor in seed dispersal. When wallowing, their fur picks up seeds in the mud that are then transported to dryer ground when the boars scratch themselves, rub against trees or dig up the topsoil looking for food.

After brushing boars killed by hunters, scientists counted a total of almost 40 different seed species. Thanks to its morphology and behaviour, the wild boar is a champion seed disperser.

Cemagref is the coordinator of the Diplo project to quantify the role of common low-land ungulates (deer, roe deer and wild boar) as long-distance seed-dispersal agents. The researchers evaluate the impact of animal movements on the success of seeds from the time they are picked up to their release to the soil.

The project is funded by the Water and biodiversity department at the Ecology ministry for the period 2009 to 2011. Partners include the National veterinary school in Maisons-Alfort, INRA in Toulouse, the National agency for hunting and wildlife (ONCFS) and Animal contact (Loiret department).

Further information: http://cemadoc.cemagref.fr/cemoa/PUB00029836

Story Source:

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

http://www.sciencedaily.com/releases/2011/02/110225091011.htm

'Decadent' Russian Art, Still Under the Boot's Shadow
By ELLEN BARRY

Savitsky Collection
"Crimson Autumn" (1931), by Ural Tansykbaev, at the Nukus Museum in Uzbekistan. The museum is the subject of a documentary, "The Desert of Forbidden Art,"

MOSCOW — Later this week moviegoers in New York will learn the strange story of Igor V. Savitsky, an obsessive collector credited with saving tens of thousands of avant-garde artworks from Soviet authorities who forced artists toward Socialist Realism in the 1930s.
"The Desert of Forbidden Art," an American-made documentary, will try to draw international attention to Mr. Savitsky's life's work: a museum in the parched hinterland of Uzbekistan that is home to one of the world's largest collections of Russian avant-garde art. Until now the museum has been known chiefly to journalists and art lovers who returned from the remote city of Nukus with a dazed look and a remarkable tale, as if they had stumbled into Ali Baba's cave.
It would not seem the time for an official crackdown.
But late last year Uzbek officials abruptly gave the Nukus Museum 48 hours to evacuate one of its two exhibition buildings, so staff members ended up stacking hundreds of fragile canvases and paper works on the floor of the other space. The building has since stood empty, its fate unknown, and more than 2,000 works are no longer on view at the museum, more formally known as the Karakalpakstan State Museum of Art. The museum's director, Marinika M. Babanazarova, who has fiercely guarded the collection for 27 years, was not permitted to travel to the United States for a trip that was to include a screening of the documentary at the National Gallery of Art in Washington.
And over the last year Ms. Babanazarova's staff members have undergone 15 government audits, in which they have repeatedly been asked to explain their travels overseas and the nature of their contacts with foreigners, she said.

"We have to prove that we are doing something good for the country, that we are not a gang of bandits," said Ms. Babanazarova, 55, who has run the museum since Mr. Savitsky's death in 1984. "It's a great satisfaction that we are getting international recognition. On the other hand, it complicates our lives, to be honest."
Officials from the Foreign Ministry and Culture Ministry in Uzbekistan did not respond to written questions submitted last month by The New York Times.
In the 1990s, when Western journalists and diplomats first happened upon the museum, it seemed like the beginning of an art-world fairy tale. Hanging in crude frames were vivid, saturated works that ran the gamut of early-20th-century styles, from Fauvism and Expressionism to Futurism and Constructivism. The Savitsky collection promised to fill in a missing chapter of art history, chronicling mostly forgotten Soviet artists who were exploring new directions before the early 1930s, when the Stalin regime condemned "decadent bourgeois art" in favor of idealized paintings of factory and farmworkers.
Some of the artists complied; some were locked up as dissidents; their work wound up in attics and storerooms. It might have remained there except for Mr. Savitsky, who persuaded their families to entrust him with the canvases and carried them back in massive rolls to Nukus, the city he made his home after visiting it as part of an archaeological expedition.
"It's an extraordinary collection because it really does tell the story of the twilight zone of the Russian avant-garde," said John E. Bowlt, director of the Institute of Modern Russian Culture at the University of Southern California in Los Angeles. "It's a kind of diary, and a very sad one."
The outside world took notice of the discovery. In 1998, after The New York Times ran a lengthy article about the museum, a group of 85 artists and scholars chartered a flight from New York to see the collection. Curators in Germany and France arranged to exhibit parts of it in Europe, and museums in the United States and Russia seemed to be next in line.
"The collectors from the West started to come in their private planes, bringing bags of money, showing this to us," Ms. Babanazarova told the filmmakers. "Of course, they had very good taste, we understood this immediately — they wanted the best pieces."
Her friends urged her to sell a few paintings, if only to provide better conditions for the rest of the collection. But Ms. Babanazarova refused, partly out of fear that one sale would prompt the government to auction off the best works.
More than a dozen years later the collection remains intact. But it also remains hidden from the public. After exhibitions in Germany and France in the 1990s, the Uzbek Ministry of Culture has consistently refused invitations to display the collection overseas, Ms. Babanazarova said. (One exception was three paintings now on view in the Netherlands.)
There has been no clear explanation for this policy, but it may reflect Uzbeks' lasting ambivalence toward Russia's imperial influence. Independent since 1991, Uzbekistan vigorously promotes native art forms like weaving and engraving. The works in Mr. Savitsky's collection — many made by ethnic Russians — have no place in that campaign.
"Despite all the publicity, it's dormant," Mr. Bowlt said. "It's a shame — there are so many extraordinary paintings by virtually unknown artists that deserve to be talked about, written about. It hasn't happened."
Uzbek authorities have shown bursts of support for the collection. In 2003 President Islam A. Karimov himself came to Nukus to inaugurate a new museum building, which Ms. Babanazarova called "one of the best buildings in the country," and Mr. Savitsky received a posthumous state honor. And last year the Foreign Ministry of Uzbekistan financed its own documentary on the Savitsky Collection, which will be shown in Uzbek embassies in a bid to attract tourists to Nukus.
Nevertheless, one day last November when Ms. Babanazarova was out of town, officials backed up trucks to the museum's old exhibition building and ordered workers to remove all the artworks, saying the building, which dates to the 1950s, would be demolished as part of an urban renewal project. David Pearce, chairman of the Friends of the Nukus Museum, a nongovernmental organization, said a deputy minister of culture assured him late last year that the state planned to build new space to replace what was lost, and that it would be ready by this fall. But months have passed with no evident progress.
Museum supporters — who include current and former Western diplomats — say they have no idea what the government is planning. Some suggested that Ms. Babanazarova had run afoul of officials because of her fierce defense of the collection or her independent contacts with foreigners.

"I think it's sort of ignorance and circling the wagons, it's fear," said Amanda Pope, a director of the new American documentary, with Tchavdar Georgiev. "No one will explain."
"The Desert of Forbidden Art" outlines various threats facing the collection, including the fear that the best paintings will disappear into private hands, but it does not include the most recent developments. The directors said they especially worried about what would happen without the efforts of Ms. Babanazarova, a tenacious woman whose grandfather served as the leader of the region. They also hoped that their film would revive efforts to exhibit the works in the West.
But on the eve of the film's New York release on Friday at Cinema Village, in Greenwich Village, officials in Uzbekistan were questioning Ms. Babanazarova repeatedly — asking her "to prove that we are not doing anything bad," as she put it.
Asked what prompted the scrutiny, Ms. Babanazarova said she had no idea. But she speculated that officials' wariness might simply reflect the nagging strangeness of the Savitsky story — the sequence of events that resulted in a collection of extraordinary value being housed in the middle of nowhere.
"They don't believe it — that some oddball Savitsky put it together, and then a new group of oddballs are preserving the collection," she said. "Something about it doesn't make sense to some officials."

http://www.nytimes.com/2011/03/08/arts/design/desert-of-forbidden-art-igor-savitsky-collection-in-nukus.html?_r=1&ref=arts

The Heyday of Mansard Roofs
By CHRISTOPHER GRAY

Office for Metropolitan History
A stereo view of the Grand Hotel at Broadway and 31st Street, as it looked around 1870, when mansard roofs were an architectural craze.

IT was a craze, a fad, just like Art Deco, Permastone and swoopy titanium-skin buildings. The mansard mania of 1868 to 1873 swept over New York with a peculiar incandescence, but then went out like a guttering candle. Traces of the mansard bubble somehow survived, and that on the 1868 Grand Hotel, at Broadway and 31st Street, is getting a particularly loving restoration.

The mansard roof, where the topmost stories pitch back at an angle, takes its name from François Mansart, the 17th-century French architect who used it extensively.

In America mansards first appeared in quantity in the mid-19th century villa movement, and in New York one of the earliest is that on the dollhouse-cute wooden dwelling at 17 East 128th Street, built in 1864. George Woodward's 1867 book "Architecture and Rural Art" gives a clue as to the attraction of the new form in urban settings: for an architect, he said, it is difficult "to treat successfully the city cornices and flat roofs, and to him the Mansard roof is a real blessing."

The Grand Hotel was among the first really good-sized buildings to go up with a mansard. It allowed the architect, Henry Engelbert, to use the model of a six-story masonry building, but give it more presence. On the Broadway side, the Grand's two-story-high mansard is an ingenious thing, divided by three pavilions. Those on the ends curve inward; that in the center has an ebullient outward-swelling roof, like the bustle on the scarlet dress of a saloon floozy.

In 1868, the year the Grand was built, The Real Estate Record and Guide was already tiring of the phenomenon, saying it had been "so overdone that sheer nausea begets a change." There must have been queasy stomachs all over New York, because the mansard movement was not even half over. It took in some small houses, also from 1868, on 60th Street from Lexington to Third; their slate- and iron-crested roofline is made all the more delicious today by their apparent disappearance into the shadow of Bloomingdale's, for which they labor as a loading dock.

In 1871 the mansard found its most fulsome expression at the Gilsey Hotel, on Broadway and 29th. Even though it was not the largest, the three-story Gilsey mansard remains the most intoxicating stately pleasure dome of the period. Because it wraps the obtuse angle of Broadway, and then indents along the side street, it

calls to mind one of those wobbly dragons held up by a dozen marchers, weaving and bobbing, in a Chinese New Year parade.

In the Gilsey's case, The Record and Guide overcame its allergy to mansards, saying that the curved-in roof was good because "to have raised the front walls any higher would have made them appear painfully lofty."

It was the Great Fire of Boston, in November 1872, that relegated the mansard to the architectural doghouse. Although there were many causes for the blaze, which consumed 65 acres of downtown Boston and killed at least 20 people, the wooden construction of cheaply made mansard roofs took the blame — a few days later the preacher Henry Ward Beecher called them "conflagration caps."

The Brooklyn Daily Eagle noted that, by substituting wood framing for iron, "we are caught in our own vanity and insincerity and itching for cheap show." Vanity and insincerity are rarely disqualifiers in New York real estate development, but money has always carried a big stick, and in 1873 insurance companies raised premiums drastically.

Thus the old Manufacturers' and Builders' Bank, built in 1874 and standing until last year at the northeast corner of Third Avenue and 57th Street, was originally intended to carry a "bold and striking" mansard roof. But that was nixed in 1873 before completion, in favor of the more expensive vertical wall. In 1875 The Record and Guide stuck in the knife with a twist: "If the owner is penurious or the architect barren, there is one immediate way to make it known: let them concoct a mansard."

The mansard periodically rose from its slumber, especially during the Beaux-Arts period. In the more recent era of historic preservation it proved particularly helpful to designers adding on to buildings, like the architects Butler Rogers Baskett with their seamless mansard addition of the mid-1980s for the town house of the Episcopal School, at 35 East 69th Street. But it never truly relived its moment after the Civil War.

Ray Pepi's firm, Building Conservation Associates, has been at work since 2003 on the Grand Hotel's roof, which presented a mess of broken slate, rotten wood and failing marble. The mansard used to look like a shack near collapse, but now its humps and curves are bright and crisp. The silvery polished sheet-metal trim has not yet been painted, and it reflects light from various angles, gray, blue, pink; one of the oldest mansards in New York, but also one of the newest.

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http://www.nytimes.com/2011/03/06/realestate/06streetscapes-mansard-roofs.html?ref=design

A Source of Food, and of Artistic Fuel
By SYLVIANE GOLD

Bruce Museum
INSPIRED BY GRAIN An Apache basket is among the items on display

WHEN Europeans arrived in the Americas, they found the natives growing more than 150 varieties of the plant that we call corn and science calls Zea mays. Dried, pounded, roasted, ground, boiled and baked, its kernels became bread, mush, soup, stew and even a kind of coffee. Occasionally, as a special treat, it was eaten fresh, on the cob.

Corn was so central to the existence of Native Americans that they considered it sacred. The Iroquois tribes of the Northeast personified it as one of the Three Sisters — the other two were beans and squash — and planted them together to sustain both life and spirit. But they could also hunt, forage and fish for other food. In the Southwestern desert, without such rich options, the Hopi, Zuni and Navajo looked to the Corn Maiden, symbol of corn and life, to keep them from starvation.

So the Bruce Museum in Greenwich, Conn., calls its exhibition on the subject "Three Sisters and Corn Maidens: Native American Maize Cultivation and Customs." And it crams a lot of food for thought into a single gallery.

A mix of science, anthropology and art — sorry, no recipes — this pithy show explains how corn spread north and south and across two continents from its beginnings in central Mexico some 8,000 years ago. We see the simple tools (a wood handle with a clamshell tip, a mortar made from a tree trunk) and the beautiful objects (a coiled-willow urn, a yucca-grass platter) that were used to grow, store, prepare and serve it. Best of all, we see how the corn cob, the corn stalk, the corn tassel and the corn kernel worked their way into the visual language of the various tribes, decorating baskets, pottery, textiles and ceremonial items.

A Hopi "bull roarer," used to imitate the sound of thunder at rain dances, is painted pumpkin orange and decorated with crescent-shaped gray and yellow clouds showering on a long, crosshatched elliptical shape: a corncob. That crosshatching becomes a more abstract checkerboard on a colorful Zuni "tableta," a wooden headdress worn by dancers representing the Corn Maiden. And the design woven into a Navajo rug, which at

first glance seems to be purely geometrical, soon reveals itself as a stylized corn stalk sprouting equally stylized ears and tassels.
Corn symbolism also permeates the display of vivid kachina dolls, on loan from a private collection in New York. These religious figurines are often painted in corn colors — not just the familiar yellow, but the purples, reds and blues of some of those 150 varieties — and decorated with representations of rain and plants.
Beyond their undeniable visual appeal, the objects on view also carry a reminder that the cultures from which they sprang are still alive outside the museum. Some were made for use in the latter half of the 20th century. And even if we assume that our corn is produced without the intervention of the Corn Maiden or the Three Sisters, the show reminds us that the United States grows about nine billion bushels a year, and that we put it not just in our bellies but also in our livestock, our plastics, our fabrics and our fuel. We are part of a corn culture, too.
“Three Sisters and Corn Maidens: Native American Maize Cultivation and Customs,” Bruce Museum, 1 Museum Drive, Greenwich, Conn., through July 3. (203) 869-0376; brucemuseum.org.

http://www.nytimes.com/2011/03/06/nyregion/06exhibitct.html?ref=design