Infoteca's E-Journal

An Electronic Compilation of Scientific and Cultural Information by Sistema de Infotecas Centrales, Universidad Autónoma de Coahuila

CONTENTS

Era With No Name

By NICHOLAS THOMPSON

AMERICA BETWEEN THE WARS

From 11/9 to 9/11: The Misunderstood Years Between the Fall of the Berlin Wall and the Start of the War on Terror.

By Derek Chollet and James Goldgeier.

412 pp. PublicAffairs. $27.95.

Bill Clinton desperately wanted a pithy slogan to encapsulate his foreign policy. But nothing worked. "Post cold-war era" was uninspiring. "Democratic enlargement" sounded like an unwelcome medical condition. "Age of hope" was too like the title of a New Age album. "We can litanize and analyze all we want, but until people can say it in a phrase, we're sunk," he snapped at his advisers in the fall of 1994.

The president never succeeded. "Containment" of the Soviet Union described policy through the cold war, helping to make a mortal threat seem manageable. For the past seven years, "war on terror" has made a manageable threat seem mortal. The years between the fall of the Berlin Wall and 9/11 remain nameless.

In "America Between the Wars," Derek Chollet and James Goldgeier argue that anonymity doesn't equal irrelevance. The 12-year period may now look like a patternless jumble — Iraq, Sudan, Haiti, Nafta, Rwanda, Seattle, Kosovo — but we can learn much from it. "The challenges confronting America," the authors write, "did not start on 9/11. They began when the cold war ended a decade earlier."

This statement isn't technically accurate. Islamic terrorists, for example, blew up buildings before 1989. But the general point is a good one.

For example, George W. Bush's unilateralism is clearly rooted in a 1992 policy paper written by the staff of Dick Cheney, who was secretary of defense at the time. More interestingly, Madeleine Albright may have encouraged its growth with her invocations of the "indispensable nation." Russia's current antipathy toward the United States surely derives partly from the decision to expand NATO well east of the old Iron Curtain. America's military presence in Saudi Arabia after Operation Desert Storm inspired Osama bin Laden's first fatwa.

Both authors served in the Clinton administration State Department, but they also show a faint nostalgia for the first Bush presidency. George H. W. Bush didn't seek undeserved credit when the Berlin Wall came down, and he genuinely tried to build international consensus. He even tried (unsuccessfully) to persuade Cuba to support the first Iraq war. The current president may haunt his father's legacy. But if the elder Bush could run again against Bill Clinton — busy much of this year dismantling his own reputation — it's not clear whom the authors would vote for.

The book's flaw is its familiarity. There are no surprising heroes or villains; there are few surprising stories or scenes. Though Chollet and Goldgeier have conducted valuable interviews with many of the key players, little will feel new to people who read the newspapers carefully during the 1990s.

To take one example, while describing the Asian financial meltdown of the mid-1990s, they write,

"Whether the critics were correct" that Treasury Secretary Robert Rubin and his colleagues "had caused the economic disaster, or whether Time was right that they had saved the world, there was no denying that these unelected American officials were shaping the globalization debate." That's true, but we knew so then. And after 10 pages of lucid discussion and description, we don't know whether Chollet and Goldgeier think Rubin saved the world or set it up for future ruin — a question with profound implications for today and tomorrow.

Straight history like this is valuable, particularly for an oft-neglected era. But as hinted at by the ambiguous title, the book doesn't fulfill its promise of reinterpretation. "America Between the Wars," after all, could describe any peaceful era since independence.

At the end, Chollet and Goldgeier seem to be in the same place as President Clinton in 1994. Yes, a lot happened in this era. But no one is exactly sure what it meant — or what it should be called.

Nicholas Thompson is a senior editor at Wired and a fellow at the New America Foundation.

http://www.nytimes.com/2008/08/03/books/review/Thompson-t.html?8bu&emc=bua2

East Village, Before the Gentry

By COLIN MOYNIHAN

Over the last 15 years Q. Sakamaki, a Japanese photographer living in New York, has forged a reputation as a documentarian of conflict and suffering. From the civil war in Liberia to the misery of sex workers in Bangladesh, he creates pictorial narratives of the devastation that unfolds when military or economic forces collide with ordinary human lives.

But his new book, "Tompkins Square Park" (powerHouse Books), returns to his early days in New York, when he was still adjusting to a new home and a new avocation — photography — after giving up a job at an advertising agency in Osaka. Upon arriving in the city in 1986 he settled in the East Village, where he was alternately charmed and horrified by what he found. Dilapidated and abandoned buildings lined the streets. Entire blocks were filled with little more than rubble and bricks. Heroin was sold in candy stores, and gunshots sounded in the night. In the morning he sometimes spotted the bodies of people who had been killed or had died of overdoses.

Even more surprising was the abundance of people living on the sidewalks. "The homeless were spread out all over the neighborhood," Mr. Sakamaki recalled on a recent afternoon while sitting on a bench in Tompkins Square Park. "It was like a third world city."Before long he gravitated toward Tompkins Square, the neighborhood's central gathering spot, where he found a lively mix of people. There were law students, punks, poets and older, lifelong residents who could remember the days of the New Deal.

Twenty years ago this week the neighborhood was also much like a war zone as protesters clashed with police officers seeking to enforce a curfew in the park. Mr. Sakamaki's book is timed to that anniversary and documents the street skirmishes, yet it is also a kind of manifesto."This book focuses on Tompkins Square Park as the symbol and stronghold of the anti-gentrification movement, the scene of one of the most important political and avant-garde movements in New York history," Mr. Sakamaki writes in an introduction.

Strolling through the neighborhood, he elaborated, saying that he favors safe streets and finds no romance in poverty. But, he said, change that is primarily driven by monetary profit "destroys the lives of poor or weak people."

As his black-and-white photographs make clear, Mr. Sakamaki found much that was life-affirming amid the conflict and penury. The energy and camaraderie of people who banded together in adversity appealed to him; so did the desire of East Villagers to create their own social order even as they received little help from mainstream society.

Most of the pictures in "Tompkins Square Park" were created before Mr. Sakamaki began traveling abroad to war zones. But it is fair to make the connection between his later work, for which he has received several awards, and a consciousness formed while documenting the depredations of the East Village in the 1980s, including addiction, AIDS and police violence. The struggles he documented took place against a backdrop of rapid and sometimes rapacious gentrification that took hold in the 1980s and is the unifying theme for the 60 images in the volume. There are also essays on the park and its history by Bill Weinberg, a neighborhood journalist, and by Mr. Sakamaki, who described what the park and the neighborhood meant to him.

Political protests and musical events were also integral to the anti-gentrification movement. Photographs show performances in the Tompkins Square band shell by groups like the band False Prophets and Allen Ginsberg's reading of a poem demanding affordable housing.

Photographs of demonstrations and police responses range from arrests inside the park in 1989 to a clash in May 1991 when bottles flew through the air and police officers in visored helmets formed a line across Avenue B. He documents a major demonstration a week later in which a crowd marched on Avenue A at night to condemn the city's decision to shut the park and bulldoze part of it.

But the bulk of the book focuses on the lives of the homeless people who lived in the park or on the nearby streets. In 1987 Mr. Sakamaki photographed homeless men and women eating a Christmas Day meal at a soup kitchen in a garden on East Ninth Street. In a 1989 image from Tompkins Square Park two men warm themselves next to a fire inside a trash can. A photograph from the same year shows homeless people and their supporters camping in the park with American flags. In a picture from October 1991, after the park's closing, a man sleeps in a bed on Avenue A in the pouring rain.

The streets and park paths depicted in the book still exist, of course, but many of the people who populated that landscape have died or left town. Mr. Sakamaki's photography has always been about people, from the street children of Rio de Janeiro to denizens of an empty lot on Avenue C.

So the absence of that population in today's East Village lends the book a haunted, ghostly air.

In the end Mr. Sakamaki's book is a valediction of sorts to lost people and a lost place that has been supplanted by a neighborhood that he finds rather sterile and uninspiring.

"We lost our culture," he said, "and we lost control of our dreams."

Leaving the park, Mr. Sakamaki, who still lives in the neighborhood, headed out to the surrounding streets, spots he had photographed decades before. Much has changed. Along East Eighth Street, where he once visited men and women in shacks, a six-story building houses a home for the aged. The onetime site of similar shanties on Avenue C is now occupied by a police building and parking lot.

But on Avenue C at East Ninth Street, La Plaza Cultural, a garden where Mr. Sakamaki had photographed the homeless on that Christmas Day 21 years ago, has survived.

"I'm happy that this garden is still here," he said, gazing through the fence at the pastoral spot, where city dwellers sat beneath a willow tree. "But I'm also sad, because the people I knew are not inside anymore."

http://www.nytimes.com/2008/08/05/books/05squa.html?_r=1&th&emc=th&oref=slogin

Lessing Looks Back on Shadows and Parents

By MICHIKO KAKUTANI

ALFRED & EMILY

Doris Lessing

Illustrated. 274 pages. Harper. $25.95.

Doris Lessing once declared that "fiction makes a better job of the truth" than straightforward reminiscence, and while that might well be true of her celebrated and semi-autobiographical Martha Quest novels, it's an observation that doesn't apply at all to her latest book, "Alfred & Emily," an intriguing work that is half fiction, half memoir. The sketchy, insubstantial first half of the book imagines what her parents' lives might have been like if World War I had never occurred. The potent and harrowing second half recounts the real life story of her parents, and the incalculable ways in which the war fractured their dreams and psyches and left them stranded in the bush in Africa, eking out a meager existence on a tiny farm in Rhodesia.

This portrait of her parents is familiar in outline from Ms. Lessing's 1994 autobiography, "Under My Skin," but whereas the author adopted a detached, matter-of-fact tone in that volume, she writes here with a visceral immediacy, conjuring the awful, unrelieved hardship of her parents' lives in Rhodesia, and the aching disappointment that shrouded their daily existence.

Her father, Alfred, had lost a leg in the war and remained haunted by the horror of the trenches, where so many of his comrades had died. Her mother, Emily, a wartime nurse, remained haunted by her wounded patients' cries for morphine and by the loss of the great love of her life, a doctor, who drowned in the English Channel.

At a sort of world's fair called the Empire Exhibition, Alfred and Emily were taken in by the Southern Rhodesian stall, which promised "Get rich on maize," and so had ended up in Africa, spending Alfred's capital of a thousand pounds on farming equipment for a small patch of land. Alfred dreamed of making enough money there to return to England and fulfill his longtime dream of buying a farm in Essex or Suffolk or Norfolk, but it was not to be.

The Rhodesian farm was "too small to achieve anything in the way of serious profit," Ms. Lessing writes, and while her father tried hard to live as if he did not have a wooden leg, he grew increasingly incapacitated, especially after developing diabetes.

"Soon the family would leave the farm," Ms. Lessing recalls. "It would be impossible to keep my father alive there: for one thing there were more comas and crises and rushed visits into town — if you can use the word 'rushed' for a deadly five-hour trip sliding from rut to rut over the difficult roads." They were not able to move back to England but ended up in "a horrid little bungalow" in the suburbs of the capital.

Emily had arrived in Africa with trunks crammed full of clothes and furnishings from Liberty's and Harrods. She'd dreamed of a colonial social whirl, and had taken along garden-party frocks, dinner frocks and black lace frocks, along with feather boas, brocade shoes and satin evening cloaks — none of which she would ever wear in the bush. The dresses would be eaten away by moths, as they sat year after year in a trunk hidden behind a curtain in the bedroom — and they would come to represent, for young Doris, "all the glamour of Never Never Land," a life as far away as possible from anything in Banket, Southern

Rhodesia.

While Ms. Lessing's mother would see birds in front of their mud-and-thatch house and mourn: "Oh, the swallows will be in England soon. They'll get there before us," her father would try to put a brave face on things. Marveling at the clarity of the stars in the African night, he would say: "You'd never see anything like this in Piccadilly, old girl. Sometimes I think it's all worth it, these nights."

Writing with the incandescent clarity of her 88 years, Ms. Lessing — the 2007 Nobel laureate — conveys the appreciation she now feels for the hardship of her parents' lives, and the anger she often felt as a young girl in rebellion against her mother. She also writes about her father and mother's memories of the war, and how those memories affected her own apprehension of the world:

"I think my father's rage at the Trenches took me over, when I was very young, and has never left me. Do children feel their parents' emotions? Yes, we do, and it is a legacy I could have done without. What is the use of it? It is as if that old war is in my own memory, my own consciousness."

In the first half of this book Ms. Lessing tries to give her parents the lives they might have had in a world without that awful war. Alfred becomes the English farmer he dreamed of becoming, marries a woman named Betsy — instead of Emily — and becomes a father not to Doris but to twin sons.

Emily, meanwhile, marries the doctor she thought she loved, but finds this marriage cold and unfulfilling; she never has any children. After her unloved husband dies, she uses the tidy fortune he has left her to establish a charity that sets up schools in impoverished neighborhoods and counties. Although she does not find personal happiness, this Emily goes on to become a beloved figure in society, renowned for her good works.

This fictional portion of the book lacks all the beautiful specificity of the memoir part of the volume, which shimmers with precisely remembered details about the African countryside, Ms. Lessing's parents' house in the bush and her own difficulties negotiating the rocky ground of her girlhood.

The fictional Alfred and Emily are curiously abstract figures, fleshed out with few psychological specifics; like the people in the author's weaker recent books like "The Sweetest Dream," they are spindly line drawings, assigned a single quality or two and sent on generic social peregrinations. These characters suggest that Ms. Lessing has a hard time imagining her mother and father as people other than her parents, or, for that matter, imagining a reality in which she herself did not exist.

http://www.nytimes.com/2008/08/05/books/05kaku.html?th&emc=th

Panel Urges End to Prostate Screening at Age 75

By TARA PARKER-POPE

In a move that could lead to significant changes in medical care for older men, a national task force on Monday recommended that doctors stop screening men ages 75 and older for prostate cancer because the search for the disease in this group was causing more harm than good.

The guidelines, issued by the U.S. Preventive Services Task Force, represent an abrupt policy change by an influential panel that had withheld any advice regarding screening for prostate cancer, citing a lack of reliable evidence. Though the task force still has not taken a stand on the value of screening in younger men, the shift is certain to reignite the debate about the appropriateness of prostate cancer screening at any age.

Screening is typically performed with a blood test measuring prostate-specific antigen, or PSA, levels. Widespread PSA testing has led to high rates of detection. Last year, more than 218,000 men learned they had the disease.

Yet various studies suggest the disease is "overdiagnosed" — that is, detected at a point when the disease most likely would not affect life expectancy — in 29 percent to 44 percent of cases. Prostate cancer often progresses very slowly, and a large number of these cancers discovered through screening will probably never cause symptoms during the patient's lifetime, particularly for men in their 70s and 80s. At the same time, aggressive treatment of prostate cancer can greatly reduce a patient's quality of life, resulting in complications like impotency and incontinence.

Past task force guidelines noted there was no benefit to prostate cancer screening in men with less than 10 years left to live. Since it can be difficult to assess life expectancy, it was an informal recommendation that had limited impact on screening practices. The new guidelines take a more definitive stand, however, stating that the age of 75 is clearly the point at which screening is no longer appropriate.

The task force was created by Congress and first convened in 1984 to analyze current medical research and to make recommendations about preventive care for healthy people. Its guidelines are viewed as highly credible and are often relied on by physicians in making decisions about patient care.

"When you look at screening, you have a chance the screening will help you live longer or better, and you have the chance that screening detection and treatment will harm you," said Dr. Ned Calonge, chairman of the task force and chief medical officer for the Colorado Department of Public Health and Environment. "At age 75, the chances are great that you'll have negative impacts from the screening."

It is estimated that one out of every three men 75 and older is now screened for prostate cancer, although some studies suggest the number is even higher. The Journal of the American Medical Association reported in 2006 that in a group of nearly 600,000 older men treated by the Veterans Administration, 56 percent of those ages 75 to 79 had been screened for prostate cancer. Given the large numbers of men over 75 who are being screened, even a small decline in testing may greatly reduce the number of prostate cancer cases detected.

Dr. Calonge said it was important that the guidelines not be viewed as "giving up" on older men. While the new rules should discourage routine testing of older patients, the recommendations will not prevent a man from seeking screening if he desires it, Dr. Calonge said. The new guidelines are not expected to alter Medicare's current reimbursement for annual PSA screening of older men.

"There will be some men who would say, 'Let's do it anyway,' and other men who say, 'If we don't need

to do it, let's not do it,' " Dr. Calonge said.

The guidelines focus on the screening of healthy older men without symptoms and will not affect treatment of men who go to the doctor with symptoms of prostate cancer, like frequent or painful urination or blood in the urine or the semen.

Studies of the value of prostate cancer screening for younger men have produced mixed results, but a major clinical trial under way in Europe will try to determine whether there is any value, in terms of longer life expectancy, to screening this group for prostate cancer. Those results may be published as early as next year.

While the verdict is still out on younger men, the data for older men are more conclusive, experts say. The American Cancer Society and the American Urological Association both say annual PSA screening should be offered to average-risk men 50 and older, but only if they have a greater than 10-year life expectancy.

Recently, Swedish researchers collected 10 years of data on men whose cancer was diagnosed after the age of 65 and found no difference in survival among those who were treated for the disease and those whose cancers were monitored but treated only if the cancer progressed. The finding suggests that for most men, stopping screening at 75 is a safe option.

"If someone has made it to the age of 75 and they don't have an elevated PSA, the likelihood of them developing clinically significant prostate cancer in the last 10 to 15 years of their life is pretty low," said Dr. Peter C. Albertsen, professor of urology at the University of Connecticut Health Center. "The downside risk begins to outweigh the upside at the age of 75."

Some studies suggest that as many as half of men 75 and older have clinically insignificant prostate cancer that is unlikely to affect their health but may be found through a biopsy. If the disease is detected as a result of screening, the men may be actively treated with radiation or hormone therapies, or may endure the stress of "watchful waiting" to see if the disease progresses.

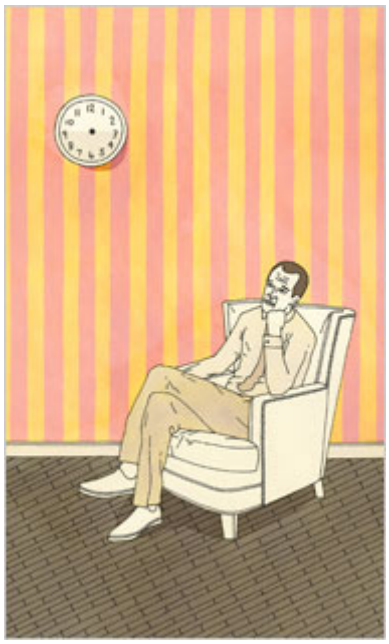
Treatments for prostate cancer can cause significant harm, rendering men incontinent or impotent, or leaving them with other urethral, bowel or bladder problems. Hormone treatments can cause weight gain, hot flashes, loss of muscle tone and osteoporosis.

"I'm very pleased the prevention task force has said, at least for the old guys, 'Leave them alone because our evidence suggests it doesn't help,' " said Dr. Derek Raghavan, director of the Cleveland Clinic Taussig Cancer Institute. "Taking an 80-year-old and telling him he has cancer and telling him he needs radiotherapy or surgery uses up medical resources and puts him at risk. It's a step toward rational thinking."

http://www.nytimes.com/2008/08/05/health/research/05prostate.html?nl=8hlth&emc=hltha1

You're Checked Out, but Your Brain Is Tuned In

By BENEDICT CAREY



Even the most fabulous, high-flying lives hit pockets of dead air, periods when the sails go slack. Movie stars get marooned in D.M.V. lines. Prime ministers sit with frozen smiles through interminable state events. Living-large rappers endure empty August afternoons, pacing the mansion, checking the refrigerator, staring idly out the window, baseball droning on the radio.

Wondering: When does the mail come, exactly?

Scientists know plenty about boredom, too, though more as a result of poring through thickets of meaningless data than from studying the mental state itself. Much of the research on the topic has focused on the bad company it tends to keep, from depression and overeating to smoking and drug use.

Yet boredom is more than a mere flagging of interest or a precursor to mischief. Some experts say that people tune things out for good reasons, and that over time boredom becomes a tool for sorting information — an increasingly sensitive spam filter. In various fields including neuroscience and education, research suggests that falling into a numbed trance allows the brain to recast the outside world in ways that can be productive and creative at least as often as they are disruptive.

In a recent paper in The Cambridge Journal of Education, Teresa Belton and Esther Priyadharshini of East Anglia University in England reviewed decades of research and theory on boredom, and concluded that it's time that boredom "be recognized as a legitimate human emotion that can be central to learning and creativity."

Psychologists have most often studied boredom using a 28-item questionnaire that asks people to rate how closely a list of sentences applies to them: "Time always seems to be passing too slowly," for instance.

High scores in these tests tend to correlate with high scores on measures of depression and impulsivity. But it is not clear which comes first — proneness to boredom, or the mood and behavior problems. "It's

the difference between the sort of person who can look at a pool of mud and find something interesting, and someone who has a hard time getting absorbed in anything," said Stephen J. Vodanovich, a psychologist at University of West Florida in Pensacola.

Boredom as a temporary state is another matter, and in part reflects the obvious: that the brain has concluded there is nothing new or useful it can learn from an environment, a person, an event, a paragraph. But it is far from a passive neural shrug. Using brain-imaging technology, neuroscientists have found that the brain is highly active when disengaged, consuming only about 5 percent less energy in its resting "default state" than when involved in routine tasks, according to Dr. Mark Mintun, a professor of radiology at Washington University in St. Louis.

That slight reduction can make a big difference in terms of time perception. The seconds usually seem to pass more slowly when the brain is idling than when it is absorbed. And those stretched seconds are not the live-in-the-moment, meditative variety, either. They are frustrated, restless moments. That combination, psychologists argue, makes boredom a state that demands relief — if not from a catnap or a conversation, then from some mental game.

"When the external and internal conditions are right, boredom offers a person the opportunity for a constructive response," Dr. Belton, co-author of the review in the Cambridge journal, wrote in an e-mail message.

Some evidence for this can be seen in semiconscious behaviors, like doodling during a dull class, braiding strands of hair, folding notebook paper into odd shapes. Daydreaming too can be a kind of constructive self-entertainment, psychologists say, especially if the mind is turning over a problem. In experiments in the 1970s, psychiatrists showed that participants completing word-association tasks quickly tired of the job once obvious answers were given; granted more time, they began trying much more creative solutions, as if the boredom "had the power to exert pressure on individuals to stretch their inventive capacity," Dr. Belton said.

In the past few years, a team of Canadian doctors had the courage to examine the fog of boredom as it thickened before their (drooping) eyes. While attending lectures on dementia, the doctors, Kenneth Rockwood, David B. Hogan and Christopher J. Patterson, kept track of the number of attendees who nodded off during the talks. They found that in an hourlong lecture attended by about 100 doctors, an average of 16 audience members nodded off. "We chose this method because counting is scientific," the authors wrote in their seminal 2004 article in The Canadian Medical Association Journal.

The investigators analyzed the presentations themselves and found that a monotonous tone was most strongly associated with "nod-off episodes per lecture (NOELs)," followed by the sight of a tweed jacket on the lecturer.

In a telephone interview, Dr. Rockwood, a professor of geriatric medicine at Dalhousie University in Halifax, Nova Scotia, said when the material presented is familiar, as a lot of it was, then performance is everything. "Really, what it comes down to," he said, "is that if you have some guy up there droning on, it drives people crazy."

Dr. Rockwood and his co-authors have followed up with two more related reports and attribute the inspiration for the continuing project to Dr. Patterson.

Early on in one of those first dementia lectures, he went out cold.

http://www.nytimes.com/2008/08/05/health/research/05mind.html?nl=8hlth&emc=hltha2

Patterns: In Older Neighborhoods, Less Weight Gain

By ERIC NAGOURNEY

Can where you live play a role in how much you weigh? A new study finds that it can, and reports that people who live in older neighborhoods appear less likely to be overweight.

The key, the researchers say, is walkability. Older communities are more likely to encourage people to drive less and walk more, which can help keep weight down.

The study, which is to appear in the September issue of The American Journal of Preventive Medicine, looked at the fitness and address information of more than 450,000 residents of Salt Lake County in Utah.

With each extra decade of a neighborhood's age, the researchers said, the risk of obesity was 13 percent lower for men and 8 percent lower for women.

There are several reasons older neighborhoods are more walkable, said the lead author, Ken R. Smith of the University of Utah: better sidewalks, trees to provide shade and intersections at shorter intervals.

But older neighborhoods have something even more basic when it comes to luring someone into heading out on foot.

"You always want to have something to walk to," Dr. Smith said. And unlike many modern residential areas, older communities may have stores and other businesses near houses.

The study found another important predictor of whether a neighborhood's residents tended to be overweight: how many of them walked to work. That does not necessarily affect their weight directly, but it does mean the neighborhood is a good one for walking.

http://www.nytimes.com/2008/08/05/health/research/05patt.html?nl=8hlth&emc=hltha2

The Germs Are Potent. But So Is a Kiss.

By MANOJ JAIN, M.D

"I have been waiting to see you, and I want answers now," my patient said angrily as I entered her hospital room.

Like a silent guard, her husband stood three feet from her, costumed in olive-green gloves and a bright yellow paper gown.

My patient was a 75-year-old retired middle manager with a schoolteacher's voice and air of confidence. She had been hospitalized for more than a month with a failing heart and recurrent hospital-acquired infections that had required multiple rounds of antibiotics.

The night before, a culture from her urine had yielded a drug-resistant germ called VRE, and she had been placed in "contact isolation" — meaning that everyone entering the room had to wear gloves and a gown, even her husband of 57 years. In the tone of an upset customer at a department store, she said, as I recall: "Every morning I get a kiss from my husband, but this morning I didn't. I want an explanation."

Like the better-known MRSA, VRE is a so-called multidrug-resistant organism, able to survive an assault from powerful antibiotics. Half a century ago these bugs did not exist; a decade ago they were rare; today, nearly 30 percent of the Enterococcus bacteria collected from cultures in hospitals are VRE, and 60 percent of the Staphylococcus aureus are MRSA.

Their emergence is an unintended consequence of our use (and overuse) of antibiotics. Hardy organisms like MRSA evolve to withstand the drugs; then, through vectors like the unwashed hands of health care workers, they hitch a ride from patient to patient, hiding like terrorists among the natural bacteria that all humans harbor.

And when a severely ill patient is further compromised by tubes in a vein, the bladder or the lung, the

bacteria flourish in defiance of the usual treatments, leading to infections of the urinary tract, bloodstream and lungs. The Centers for Disease Control and Prevention estimates that there are 1.7 million hospital infections a year, resulting in nearly 90,000 deaths, costing the health system more than $11 billion.

Contact isolation is part of the battle plan to control the spread of drug-resistant organisms. And it is effective, as long as everyone complies. Remember SARS? In that case, respiratory and contact precautions were credited with stopping the epidemic.

Sadly, studies show that nearly 30 percent of health care workers don't comply. I can understand why such measures are hard to enforce, because isolation precautions create a barrier between patients and their caregivers.

At times, patients in isolation reach out to shake or hold my hand before I've put my gloves on. Sometimes I allow myself to touch patients without gloves, partly because the separation makes me feel I am shunning them, as if the hospital were an ancient leper colony.

And isolation barriers can be dangerous for patients. Two studies showed that doctors and nurses were half as likely to enter the rooms of or to examine patients on contact precautions. One study has even shown that patients in isolation have significantly more preventable adverse events, get less care and are more dissatisfied with their treatment than other patients.

Unlike other treatment, contact isolation does not benefit the patient in isolation; rather, it benefits other hospitalized patients and the community. Our goal is to contain the spread of the resistant organism from one patient to another, through health care workers. But family members, who are also subject to the same glove-and-gown requirements, are not nearly as likely to spread the organisms to other patients. In fact, there are no formal, enforceable recommendations for family members.

In the end, I believe, it is contact precaution and prudent use of antibiotics — and not new antibiotics or advanced technologies — that will save us from multidrug-resistant organisms. So the best I can do is to provide a long explanation to the patient and family, and hope they will comply, within reason. This is exactly what I did.

"Last night," I told my patient, "the lab had called and said that your urine culture was showing a resistant organism. To make sure the organism does not spread to other patients through health care workers, we need to have people wear gloves and gown."

But in this case, I also took some liberty with hospital policy; after all, the isolation recommendations are murky when it comes to family members. I said, "It is O.K. for him to kiss you."

"Now you can kiss me," my patient told her husband. With me standing just a few feet away, he hesitated for a second. And as his yellow gown draped over her and his green gloves held her shoulders, he gave her a long wedding kiss. I felt like a yellow-gowned chaplain who had just remarried a couple.

Manoj Jain is an infectious disease physician in Memphis.

http://www.nytimes.com/2008/08/05/health/views/05case.html?nl=8hlth&emc=hltha8

The Rush to Save Timbuktu's Crumbling Manuscripts

By Matthias Schulz and Anwen Roberts

Fabled Timbuktu, once the site of the world's southernmost Islamic university, harbors thousands upon thousands of long-forgotten manuscripts. A dozen academic instutions from around the world are now working frantically to save and evaluate the crumbling documents.

Susan Vogel / Icarus Films

The Grand Mosque at Djenne, Mali. The area's rich cultural heritage is only being slowly discovered.

Bundles of paper covered with ancient Arabic letters lie on tables and dusty leather stools. In the sweltering heat, a man wearing blue Muslim robes flips through a worn folio, while others are busy repairing yellowed pages.

An astonishing project is underway in Timbuktu, Mali, one of the world's poorest countries. On the southern edge of the Sahara Desert, experts are opening an enchanted Aladdin's Cave, filled with hundreds of thousands of ancient documents.

The Ahmed Baba Library alone contains more than 20,000 manuscripts, including works on herbal medicine and mathematics, yellowed volumes of poetry, music and Islamic law. Some are adorned with gilded letters, while others are written in the language of the Tuareg tribes. The contents remain a mystery.

Manuscript hunters are now scouring the environs of Timbuktu, descending into dark, clay basements and climbing up into attics. Twenty-four family-owned collections have already been discovered in the area. Most of the works stem from the late Middle Ages, when Timbuktu was an important crossroads for caravans. It was home to gold merchants and scholars, and it even boasted a university with 20,000 students. The old saying "the treasures of wisdom are only to be found in Timbuktu" summed up the ancient city's appeal.

But the legacy of the oasis, written with ink made from gallnuts, is beginning to fade. Roughly a dozen academic institutions are now involved in saving and evaluating the documents. The French are developing a database, while the United States has donated a device to digitize the damaged documents. The Norwegian cities of Oslo and Bergen are training locals to become conservators. Shamil Jeppie, a Cape Town historian charged with managing the multinational effort, recently published a book, "The Meanings of Timbuktu," in which he describes the current status of the project. European colonialists suppressed the "intellectual history of West Africa," Jeppie writes, and now it is time to rediscover the

site that some have referred to as an "African Oxford."

Hunting for Mali's Hidden Documents

This is an astonishing assessment, given Timbuktu's status as a desert town in the middle of nowhere. In 1825, a European managed to navigate the difficult route down to a bend in the Niger River, south of the Sahara. By the time he reached the oasis, he had run out of water and was barely alive. Shortly after entering the city he was murdered. Timbuktu was taboo -- off-limits to Christians.

Even today, Timbuktu is not an easy place to get to. From August to February, local riverboats called pinnaces bob their way up the Niger River, landing at the port town of Kabara, 10 kilometers (6 miles) from Timbuktu. The landscape is dominated by sand dunes until shortly before the city's suburbs. The desert wind known as the Harmattan is about as pleasant as a dragon's breath.

And yet the old section of the city is blanketed in an odd, heavy magic, filled with mosques topped by bulbous minarets and wealthy citizens' opulent houses, cube-shaped buildings with meter-thick walls made of baked clay.

According to an employee at the Ahmed Baba Library, Mali was overrun by the French colonial army after 1880. "The French didn't want us to have the manuscripts, and they tried to steal them," says the library worker. The documents were hidden to protect them.

But now the hunt is on. The house of Ismael Haidara, a historian whose ancestors include the Visigoths and jungle kings from southern Mali, has proven to be a treasure trove. Haidara, a private citizen, horded more than 2,000 bundles of papers, passed down through 11 generations of his family. "This is our family history," he says, pointing to a leather slipcase from the year 1519.

Albrecht Hofheinz, an Arabist from Oslo, estimates that there are up to 300,000 forgotten manuscripts in Mali. Insect bites have discolored the pages, he says. "The paper disintegrates, is destroyed by mold or eaten by termites." Time is of the essence. Some of the volumes are being photographed using a digital photo studio provided by the University of Chicago. The first of the documents are expected to be available on the Internet by the end of the year.

The contents of astronomical documents are already being analyzed. "So far 112 texts on astronomy have been discovered," explains Petra Schmidl, a historian of science at the University of Frankfurt am Main. They include calendar calculations, astrology and a depiction of the Ptolemaic world system.

Researchers are now looking forward to studying the tattered archives that contain reports on ancient oases and nomadic societies. The manuscripts also include lists of goods transported by caravans. Will the documents finally shed some light on the mysterious caravan trade?

There are many questions on how the trade thrived in the desert. The world's largest desert stretches 2,000 kilometers (1,242 miles) from north to south. How did the caravans make it through? Archaeologists have not even scratched the surface at the caravans' destinations in Ghana and the Ivory Coast.

But they have uncovered new finds in the Sahara, including traces of an ancient infrastructure. Water storage facilities have been found in the middle of the vast desert, as well as places fed by underground wells. Desert palaces once built by the Tuareg were unearthed in the Essouk oasis in northern Mali.

It is now clear that the Arabs were the first to conquer the inhospitable arid zone. While Rome's legions ventured no further than the edges of the desert, they penetrated far deeper into the Sahara.

There is evidence of a Moorish influence in Ghana by as early as 800 A.D. Vast gold

deposits were found in the Ghanaian rain forest. Their owners, the Soninke kings, ruled a realm that stretched to the banks of the Senegal River.

Point of Departure for Desert Journeys

According to Arab accounts, the black rulers lived in tents guarded by large dogs wearing gold and silver collars and manacles. According to Arab geographer al-Bakir, one of these kings commanded an army of 200,000 soldiers.

The country provided cola nuts, ivory, cotton and semiprecious stones. Local traders loaded their goods onto cargo boats and transported them on the Niger to Timbuktu. The city was the point of departure for journeys into the desert.

Camels stood at Timbuktu's water troughs. Its residents included Arabs, light-skinned Berbers and dark-skinned members of the Malinke tribe. The oasis smelled of lamb dung and fresh spices, and muezzins called out from its minarets. Gold, a form of payment, glistened everywhere -- as dust, nuggets and fist-sized lumps.

In 1324, when Kankan Mussa, one of the kings of Mali, went on a pilgrimage to Mecca, via Cairo, with his ostentatious entourage, he was so generous with the precious metal (he had brought along two tons of it) that gold prices on the Nile plunged. News of the wealthy black monarch even reached faraway Europe. A Catalan map of the world depicts him with thick lips and holding a scepter.

Kankan was so impressed by the palaces of the Orient that he brought home an architect, who created malleable mud-brick imitations of the Arab mosques in Timbuktu. The Djingerber Mosque, with its sugarloaf-shaped towers, still stands in the city today.

There is an even larger mosque in nearby Djenne, part fairytale castle and part termite hill. Each year after the rainy season, when cracks have formed in the outside walls, hundreds of workers participate in what has become a national pastime cum religious service. Men climb up along wooden scaffolding in the outside walls, praying as they climb, to apply fresh mud to the structure.

For many years, such customs were all but unknown in Europe (US ethnologist Susan Vogel filmed the annual mud plaster ceremony last year for the first time). In the past, those traveling to Timbuktu had to traverse seemingly endless volcanic plains and rocky plateaus -- at temperatures of up to 55 degrees Celsius (131 degrees Fahrenheit). The area south of Murzuk, an oasis notorious for its role in the slave trade, consists of a vast, shimmering sand bowl measuring 90,000 square kilometers (34,700 square miles, or about the size of Portugal).

Anyone who lost his way there was literally baked.

The Arabs only managed to complete the journey through the desert with the help of camels. A camel can drink 200 liters of water at a time, and its kidneys retrieve large amounts of water after urination. The Arabs also enlisted the help of the Tuareg tribes, which lived on ridges in the central Sahara.

Even there, surrounded by hyper-arid sand pans, volcanic basalt chimneys and pinnacles, life was possible. The Tuareg drilled deep wells, and they had their black slaves excavate long underground canals with slight inclines to bring in ground water.

Archaeologists have shown that an incredible system of underground canals up to 20,000 kilometers (12,422 miles) long once existed at Wadi al-Hayat in Libya. Thanks to such hydraulic marvels, the desert blossomed and crops sprouted in the fields of the Tuareg. In Essouk, they ate gazelles and dried perch, imported from the Niger River, 240 kilometers away. Murzuk, with its large slave market, was

surrounded by a massive wall with seven gates -- in the middle of the Sahara.

A Source of African Pride

But nothing worked without the blue-robed Tuareg. They provided provisions for the caravans and led them to the oases. At times, they turned to blackmail and looting, and Timbuktu was attacked several times.

Researchers are anxious to discover more about the haggling between ethnic groups and how they divided up the spoils. In the late Middle Ages, Cairo was sending 12,000 camels a year to Mali. There were plenty of fortunes to be made.

The slave trade was especially lucrative. Guards carrying whips drove the slaves through the hot desert. "Only the youngest and strongest survived the two-month desert trek, and they were walking skeletons by the time they reached the Fezzan region, where they were fattened up," writes Austrian geographer Hans Weis.

The Koran also made its way into sub-Saharan Africa along these torturous routes. In its heyday, Timbuktu had 180 Koran schools. "A large library was built, where the fundamental theological and philosophical works were copied," explains Thomas Krings, an Africa expert at the University of Freiburg in southwestern Germany. The many documents that were penned then are now emerging in Mali as crumbling volumes. "Many people consider Timbuktu to be the end of the world," says Mahamoudou Baba Hasseye, the owner of a valuable private collection, "but it was an important center of Islamic scholarship."

Calligraphers once plied their trade in the desert. Some of the manuscripts uncovered in Timbuktu contain gold lettering, and some are written in the unusual Songhai and Fulfulbe tribal languages.

These treasures are still a long way from being saved. The libraries are filled with bits and pieces of paper, evidence of crumbling manuscripts. The government of South Africa promised to build a library in Timbuktu years ago, but nothing ever came of it.

But at least there are many who have come to Timbuktu to help save its ancient manuscripts. The project, which historian Petra Schmidl characterizes as being on the "extreme fringe of the Islamic academic community," is a source of great pride for Africans.

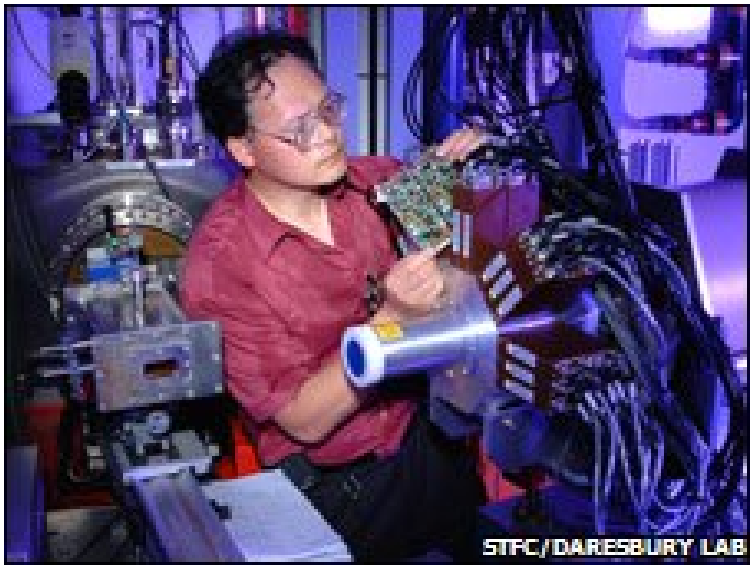
"Africa has repeatedly been portrayed as culturally inferior," says Essop Pahad, South Africa's Minister in the Presidency. "In Timbuktu, we are proving that the opposite is true."

Translated from the German by Christopher Sultan

http://www.spiegel.de/international/world/0,1518,druck-569560,00.html

Light goes out on pioneer machine

The pioneering Synchrotron Radiation Source (SRS) based at the Daresbury Laboratory in Warrington, UK, will be switched off on Monday.



The machine, which probed the structure of materials down to the molecular and atomic level, developed the technology now used in some 60 centres worldwide.

Its X-ray science has been behind new drugs and electronics, and was used in Nobel-winning research on cell energy.

UK synchrotron studies have now moved to the Diamond centre in Oxfordshire.

Daresbury's future is envisioned as an innovation super-centre, where scientific ideas can better make the leap to business.

"Though the SRS has gone, Daresbury Laboratory is growing," said Professor Colin Whitehouse from the Science and Technology Facilities Council (STFC), which runs the facility.

"It is part of a burgeoning national Science and Innovation Campus and the home of the Cockcroft Institute, a national centre for Accelerator Science and Technology, amongst other world-class research facilities."

Synchrotrons are essentially giant X-ray machines. Their brilliant, high-energy light is produced by electrons travelling in a ring at near-light-speed.

As the particles turn through a course of magnets, they lose energy in the form of X-rays which are then focused down beamlines to target samples positioned at experimental stations.

The light is so intense, it can probe just about any material, revealing the precise positions of its atoms and the arrangement of its molecules.

Future science

Over the past 28 years, synchrotron light has supported cutting-edge research in physics, chemistry and materials science, opening up many new areas of research in fields such as medicine, geological and environmental studies, structural genomics and archaeology.

Since it was opened, the SRS has helped develop new medicines by studying the atomic structure of proteins; it has enabled the production of new materials for use in electronics and clothing; and it has led to the development of new detergents - to list just a few of its achievements.

Perhaps the SRS's biggest moment came when it was used by Sir John Walker to map the structure of an important enzyme that catalyses adenosine triphosphate (ATP) - the molecule that carries the chemical energy that operates the body.

The research earned Sir John the Nobel Prize for Chemistry in 1997.

The decision to site the new Diamond Light Source in the south of England rather than at Daresbury led to a huge political row in the late 1990s.

The North West of England felt that the role played by Daresbury in developing synchrotron science meant it should have been given the "third generation" machine.

Instead, the £300m-plus facility was put on the Chilton-Harwell science campus, the home of the ISIS neutron source, another type of machine that can probe matter at the microscopic level.

Daresbury will be involved in developing the technology for so-called "fourth generation" light sources.

These machines will use X-ray lasers to probe matter on time-dependent scales, allowing researchers to see, for example, the moment bonds are broken and made in a chemical reaction.

Europe, as a bloc, is committed to building one such machine at the moment, at the DESY (Deutsches Elektronen Synchrotron) centre in Hamburg. It will be called the X-ray Free-Electron Laser (XFEL).

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/7540719.stm

Published: 2008/08/04 11:29:38 GMT

Microsoft sees end of Windows era

Microsoft has kicked off a research project to create software that will take over when it retires Windows.

Called Midori, the cut-down operating system is radically different to Microsoft's older programs.

It is centred on the internet and does away with the dependencies that tie Windows to a single PC.

It is seen as Microsoft's answer to rivals' use of "virtualisation" as a way to solve many of the problems of modern-day computing.

Tie breaking

Although Midori has been heard about before now, more details have now been published by Software Development Times after viewing internal Microsoft documents describing the technology.

Midori is believed to be under development because Windows is unlikely to be able to cope with the pace of change in future technology and the way people use it.

Windows worked well in an age when most people used one machine to do all their work. The operating system acted as the holder for the common elements Windows programs needed to call on.

"If you think about how an operating system is loaded," said Dave Austin, European director of products at Citrix, "it's loaded onto a hard disk physically located on that machine.

"The operating system is tied very tightly to that hardware," he said.

That, he said, created all kinds of dependencies that arose out of the collection of hardware in a particular

machine.

If Windows ends up being less important over time as applications become more OS agnostic where will Microsoft make its money?
Michael Silver, Gartner

This means, he said, that Windows can struggle with more modern ways of working in which people are very mobile and very promiscuous in the devices they use to get at their data - be that pictures, spreadsheets or e-mail.

Equally, he said, when people worked or played now, they did it using a combination of data and processes held locally or in any of a number of other places online.

When asked about Midori by BBC News, Microsoft issued a statement that said: "Midori is one of many incubation projects underway at Microsoft. It's simply a matter of being too early in the incubation to talk about it."

Virtual machines

Midori is widely seen as an ambitious attempt by Microsoft to catch up on the work on virtualisation being undertaken in the wider computer industry.

Darren Brown, data centre lead at consulting firm Avanade, said virtualisation had first established itself in data centres among companies with huge numbers of servers to manage.

Putting applications, such as an e-mail engine or a database, on one machine brought up all kinds of problems when those machines had to undergo maintenance, needed updating or required a security patch to be applied.

By putting virtual servers on one physical box, companies had been able to shrink the numbers of machines they managed and get more out of them, he said.

"The real savings are around physical management of the devices and associated licensing," he said. "Physically, there is less tin to manage."

Equally, said Mr Brown, if one physical server failed the virtualised application could easily be moved to a separate machine.

"The same benefits apply to the PC," he said. "Within the Microsoft environment, we have struggled for years with applications that are written so poorly that they will not work with others.

"Virtualising this gives you a couple of new ways to tackle those traditional problems," he said.

Many companies were still using very old applications that existing operating systems would not run, he said. By putting a virtual machine on a PC, those older programs can be kept going.

A virtual machine, like its name implies, is a software copy of a computer complete with operating system and associated programs.

Closing Windows

"On the desktop we are seeing people place great value in being able to abstract the desktop from actual physical hardware," said Dan Chu, vice president of emerging products and markets at virtualisation specialist VMWare.

Some virtual machines, he said, acted like Windows PCs to all intents and purposes. But many virtual machines were now emerging that were tuned for a particular industry, sector or job.

"People take their application, the operating system they want to run it against, package it up along with policy and security they want and use that as a virtual client," he said.

In such virtual machines, the core of the operating system can be very small and easy to transfer to different devices. This, many believe, is the idea behind Midori - to create a lightweight portable operating system that can easily be mated to many different applications.

Microsoft's licensing terms for Windows currently prohibited it acting this way within a virtual appliance, said Mr Chu.

Michael Silver, research vice president at Gartner, said the development of Midori was a sensible step for Microsoft.

"The value of Microsoft Windows, of what that product is today, will diminish as more applications move to the web and Microsoft needs to edge out in front of that," he said.

"I would be surprised if there was definitive evidence that nothing like this was not kicking around," he said.

The big problem that Microsoft faced in doing away with Windows, he said, was how to re-make its business to cope.

"Eighty percent of Windows sales are made when a new PC is sold," he said. "That's a huge amount of money for them that they do not have to go out and get.

"If Windows ends up being less important over time as applications become more OS agnostic where will Microsoft make its money?" he asked.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/7540282.stm

Published: 2008/08/04 09:51:46 GMT

Vitamin C 'slows cancer growth'

An injection of a high dose of vitamin C may be able to hold back the advance of cancers, US scientists claim.

The vitamin may start a destructive chain reaction within the cancer cell, they add.

The jab halved the size of brain, ovarian and pancreatic tumours in mice, reported the journal Proceedings of the National Academy of Sciences.

However, Cancer Research UK said other studies suggested large vitamin C doses may interfere with cancer treatment.

> **This is encouraging work but it's at a very early stage because it involves cells grown in the lab and mice**
> Dr Alison Ross
> Cancer Research UK

Earlier research by the team at the National Institutes of Health in Maryland had suggested that the vitamin, also called ascorbate, could kill cancer cells in the laboratory.

After these successful tests in mice, they are now suggesting that the treatment be considered for human use at similar levels.

The dose they employed - up to four grams per kilo of bodyweight - was far greater than any that could be achieved using diet or vitamin pills, as the digestive system does not absorb more than a fixed amount taken orally.

The mice were bred to have malfunctioning immune systems, then injected with human cancer cells, which as a result, grew quickly into large tumours. The vitamin was then injected into their abdominal cavity.

Tumour growth and weight fell by between 41% and 53%, and while in untreated mice, the disease spread rapidly to involve other body parts, no such spread was seen in the vitamin C-treated animals.

The researchers wrote: "These pre-clinical data provide the first firm basis for advancing pharmacologic ascorbate in cancer treatment in humans."

Peroxide bomb

The treatment works because a tumour cell is chemically different to a healthy cell.

The vitamin C reacts with this chemical make-up, producing enough hydrogen peroxide to kill the cell, while leaving healthy cells unscathed.

However, Dr Alison Ross, from Cancer Research UK said that much more work would have to be done to see if vitamin C could be a viable treatment.

"This is encouraging work but it's at a very early stage because it involves cells grown in the lab and mice.

"There is currently no evidence from clinical trials in humans that injecting or consuming vitamin C is an effective way to treat cancer.

"Some research even suggests that high doses of antioxidants can make cancer treatment less effective, reducing the benefits of radiotherapy and chemotherapy."

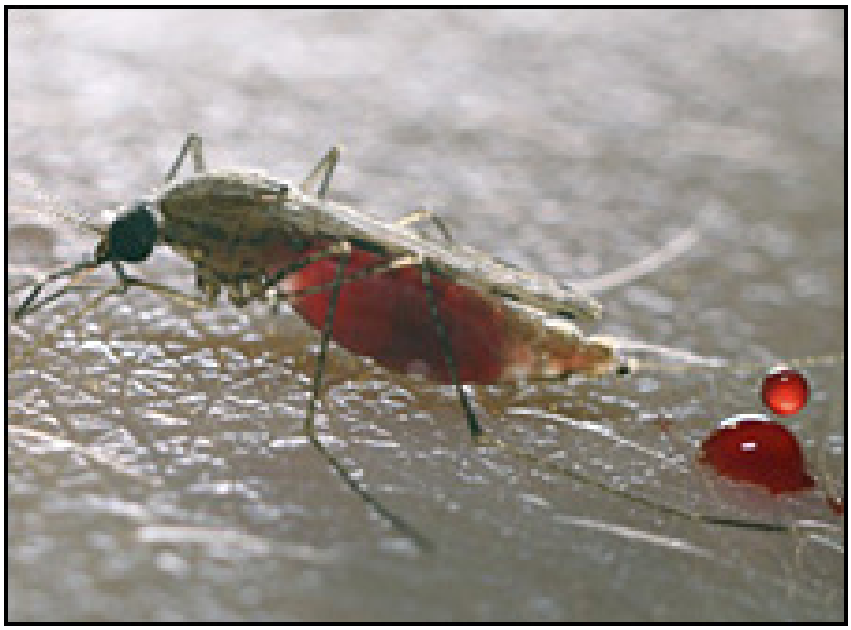
Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/7540822.stm

Published: 2008/08/04 23:03:16 GMT

http://news.bbc.co.uk/2/hi/health/7540822.stm

Human malaria jab tests nearing

A type of malaria vaccine for humans is to be tested, following the success of trials undertaken with animals.



There is currently no vaccine for the illness, which kills between two and three million people every year.

Oxford University scientists, part of an international team, reported, in the journal Nature Medicine, that its virus-based jab worked well in mice.

Initial small-scale human safety trials of the vaccine are now expected to start next year.

In the end, the results were startling
Dr Simon Draper
Oxford University

Other researchers have been working towards an effective malaria vaccine, and some candidates are already in trials in humans in malaria-affected countries.

However, the Oxford scientists say theirs may be more effective against the "blood stage" of the illness, in which parasite numbers rise sharply in the bloodstream after bursting out of cells, causing severe illness, or death.

The scientists behind this vaccine believe that it can trigger a massive immune response against the parasite at this point.

The method involves two viruses, a common cold virus (adenovirus) and a pox virus, both of which have been engineered to be harmless in themselves, but to produce a protein on their surfaces which matches one found on the outside of the malaria parasite.

When an injection of the adenovirus was followed eight weeks later by the pox virus, the results in mice

were clear-cut.

The vaccines produced two separate types of powerful immune response to these malaria "antigens", hopefully priming the immune system to respond aggressively when confronted by the malaria parasite later on.

In mice, it reduced the growth of the parasite by between 70% and 85%.

Easier to produce

Dr Simon Draper, from Oxford University, said: "In the end, the results were startling, and we could use these viruses to induce very high levels of antibodies for the first time."

He said that the viruses did not require any extra chemical to be given at the time of inoculation to boost their function, and were potentially easier to grow, and therefore cheaper to mass-produce.

These latest results, had allowed the team to secure extra funding from the Medical Research Council for next year's safety trials.

If these are successful, the vaccine's effectiveness will be tested, at first again on a small scale, then in a wider population, a process that could take some years.

Professor Alister Craig, from the Liverpool School of Hygiene and Tropical Medicine, said that a working vaccine remained some way off, but the immune response delivered in the mice was an "important step forward".

"It remains to be seen how 'generalised' this delivery system will be using other antigens and in humans but it is a significant addition to the field.

"The results of the phase one test will be of great interest to the community."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/7540838.stm

Published: 2008/08/04 23:15:23 GMT

Memory, Depression, Insomnia -- And Worms?

OMRF scientist Ken Miller, Ph.D. (Credit: Image courtesy of Oklahoma Medical Research Foundation)

ScienceDaily (Aug. 5, 2008) — Researchers have spent decades probing the causes of depression, schizophrenia and insomnia in humans. But a new study may have uncovered key insights into the origins of these and other conditions by examining a most unlikely research subject: worms.

The project, which was led by Oklahoma Medical Research Foundation scientist Kenneth Miller, Ph.D., examined the way eye-less microscopic worms known as C. elegans shy away from certain kinds of light. The researchers made several key findings, chief among them that exposing paralyzed C. elegans to ultraviolet light restored normal levels of movement in the worms.

Miller's group at OMRF traced the light reaction to a tiny molecular sensor, which is encoded

by a gene they named LITE-1. "This sensor doesn't resemble any other light sensors previously discovered," said Miller.

Although humans lack this ultraviolet light sensor, Miller's discovery provides a window for understanding how the molecular signals in our nerve cells allow them to talk to each other to produce perceptions, behaviors, learning and memory.

"That doesn't mean shining an ultraviolet light on people in wheelchairs will suddenly allow them to walk," said Miller. "But it does give us a tool that we can use to solve the mysteries of nerve cell communication and could ultimately help us understand the biology of everything from sleep and memory to depression."

The research appears in the Aug. 5, 2008 edition of the journal PLoS Biology.

"The new work from Ken Miller's lab has identified a new way that organisms can sense light, distinct from the previously known light-sensing mechanism used in the eye," said Michael Koelle, Ph.D., of the Yale University School of Medicine. "It will be interesting to see whether the LITE-1 light-sensing mechanism will also lead to new insights into human sensory perception."

Despite 35 years of intensive research by hundreds of labs studying C. elegans, no one had discovered that eye-less worms can respond robustly to light. Miller's group found the light response when they began studying worms that were paralyzed because of a gene mutation.

In prior studies, Miller and his OMRF colleagues showed that this mutation disrupts a molecular network of pathways that controls how nerve cells send signals to each other at synapses, the points where different neurons touch each other. Those same nerve cell pathways are all present in the human brain, where they are thought to play a role in controlling behaviors, learning and memory, and may also be involved in causing human neurological disorders.

"Without signals from this network, neurons cannot talk to each other or to muscle cells to produce movement, so the mutants just lie paralyzed on the culture plate even if you poke and prod them," Miller said.

But when Miller turned a short wavelength light—like ultraviolet rays—on the worms, it created a new signal in the neurons, allowing the animals to move as long as the light was on them. The same response had not been found previously in normal C. elegans because those worms have no trouble moving.

Miller said he thinks the worms are hardwired to avoid damaging or lethal doses of direct sunlight, which includes UV rays.

"When you are only a few cells thick, getting a sunburn is fatal," he said.

Miller emphasized that the research is still in its early stages. "We're a long way from any treatments based on this research, but I think we've opened up a door that we didn't know was there before," he said. "There's a lot of work left to be done, but I'm excited to see where this discovery leads us."

Research funding was provided through a grant from the National Institute of General Medical Sciences, an arm of the National Institutes of Health, and OMRF.

Journal reference:

1. Edwards et al. **A Novel Molecular Solution for Ultraviolet Light Detection in Caenorhabditis elegans**. *PLoS Biology*, 2008; 6 (8): e198 DOI: 10.1371/journal.pbio.0060198

Adapted from materials provided by Oklahoma Medical Research Foundation.

http://www.sciencedaily.com:80/releases/2008/08/080804222904.htm

Chronic Exposure To Estrogen Impairs Some Cognitive Functions

Veterinary biosciences professor Susan Schantz and graduate student Victor Wang found that rats exposed to estradiol were significantly impaired on tasks involving working memory and response inhibition. (Credit: Photo by L. Brian Stauffer, U. of I. News Bureau)

ScienceDaily (Aug. 5, 2008) — University of Illinois researchers report this week that chronic exposure to estradiol, the main estrogen in the body, diminishes some cognitive functions. Rats exposed to a steady dose of estradiol were impaired on tasks involving working memory and response inhibition, the researchers found.

Their report appears in the journal Behavioral Neuroscience.

The researchers made the discovery when studying the effects of estradiol on activities mediated by the prefrontal cortex, a brain region that is vital to working memory and to the ability to plan, respond to changing conditions and moderate or control one's behavior.

Working memory is the ability to briefly remember information needed for a particular task, said Susan Schantz, a U. of I. professor of veterinary biosciences and principal investigator on the study. An example in humans is a phone number that is forgotten soon after the number is dialed.

"With working memory you're just keeping it active until you use it," she said.

In the new study, rats were trained to press one of two levers to obtain a food reward. Those that alternated between the levers (which were withdrawn from the rat enclosure for a few seconds between trials) received a reward. Those that hit the same lever twice in a row got no reward. Rats exposed to estradiol performed worse than their counterparts on this task, earning significantly fewer rewards.

A second set of tests measured the rats' ability to wait before responding to a stimulus. The rats had to wait 15 seconds before pushing a lever to get a reward. Those exposed to estradiol performed worse on this task than those that were not exposed.

"That's the test where we really saw the most striking effects with estradiol," Schantz said. The estradiol-treated rats "were not as good at waiting," she said.

"Rats treated with estradiol are definitely a lot more active and make a lot more lever presses," said neuroscience graduate student Victor Wang, the lead author on the study. "That's not conducive toward

being rewarded."

The researchers had not expected to see such pronounced results. In fact, the study had been designed to give them baseline information for a separate inquiry into the effects of soybean estrogens on cognitive function. They planned to compare the effects of chronic estradiol exposure to the effects of chronic exposure to genistein, a phytoestrogen found in soybeans. Genistein is believed to have similar effects in the body as natural or synthetic estrogens, although no study has definitively proven that it does.

Schantz and her colleagues had focused on the prefrontal cortex because it is rich in estrogen receptor beta (ER-beta), a protein that spurs gene expression and other activities in the cell when it binds to estradiol. Genistein also activates ER-beta.

Some women take genistein supplements or eat soy-based foods to reduce hot flashes or other symptoms of menopause, Schantz said.

"Women take them thinking they'll be a safe alternative to hormone-replacement therapy and they might help hot flashes," she said.

Those who have heard that hormone replacement can improve cardiac or brain function also hope that eating soy or taking genistein supplements will have the same effects, she said.

The effects of hormone replacement therapy (HRT) are more complex – and problematic – than once thought. A recent large-scale study of HRT in post-menopausal women was stopped because of an increased risk of stroke and blood clots in women taking estrogen alone, and a higher than average incidence of breast cancer, cardiovascular disease, blood clots and stroke in women taking estrogen and progesterone.

Studies of estrogen's effects on cognition have also had mixed results. In earlier studies, for example, psychology professor Donna Korol, a collaborator on the current project, found that estradiol enhances some abilities, such as place or spatial learning, while hindering others, such as learning that relies on stimulus-response associations, considered by some to be akin to "habit" and not fluid thought.

Performance in these tasks involves brain structures outside the prefrontal cortex.

The research indicates that multiple factors influence the effects of estradiol on the brain, Schantz said. The timing of the exposure, the types of brain functions or structures studied and the age of the test subjects can all generate different results, she said.

Adapted from materials provided by University of Illinois at Urbana-Champaign, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2008/08/080801074106.htm

Strategies To Control TB Outdated, Inadequate, Analysis Shows

ScienceDaily (Aug. 5, 2008) — The standard regimens to treat tuberculosis (TB) are inadequate in countries with high rates of multi-drug resistant (MDR) TB. In countries with high rates of MDR-TB, patients are nearly twice as likely to fail their initial treatment than those in countries with low rates, according to a new analysis of World Health Organization (WHO) data. This finding suggests strongly that current TB treatment regimens need to updated and revised to address the shifting landscape of public health in the face of MDR-TB."In countries with low prevalence of initial multi-drug resistance, the standardized treatment regimens for new case appear to be adequate, wrote Dick Menzies, M.D., lead author of the study and director of the respiratory division at McGill University. "However, in countries where the prevalence of initial drug resistance exceeds three percent, we believe it is urgent to strengthen capacity to perform drug sensitivity testing, or to reevaluate these standard treatment regimens, given the unacceptably high rates of failure and relapse."

The study appeared in the first issue for August of the American Thoracic Society's American Journal of Respiratory and Critical Care Medicine.When the current public health strategies to contain TB were conceived, MDR-TB was much less common. "We hypothesized that, in countries using standardized initial and retreatment regimens, the proportion of patients with poor treatment outcomes would be correlated with prevalence of initial and acquired multi-drug resistance," wrote Dr. Menzies.

To determine if that were the case, Dr. Menzies and co-investigators reviewed the WHO's data from 2003 and 2004 for a total of 155 countries, 121 of which reported at least 250 cases annually. They assessed dropout, failure, relapse and death rates with initial treatment, as well as dropout, failure and death rates for retreatment. All rates were analyzed with respect to the prevalence of MDR-TB in each country.

They were right: rates of failed treatment were dramatically higher with increasing prevalence of MDR-TB ($p<0.0001$). In fact, after accounting for age, HIV prevalence, per capita income and treatment regimen, for every one-percent increase in MDR TB prevalence, they saw a 0.30 percent rise in treatment failure among new cases, a 1.1 percent increase in failure rate among RE-treatment cases, and a one percent increase in relapse. "This is striking evidence that MDR-TB is directly linked to the increased failure rates of our current treatment regimens," said Dr. Menzies.

Overall, the proportion of patients requiring retreatment nearly doubled between countries with low and high prevalence of MDR-TB, from 11.9 percent in countries with initial MDR prevalence of less than one percent, to 21.4 percent in countries with MDR prevalence of more than three percent. "In the short term, the higher the failure and relapse rates mean greater morbidity and mortality for patients, with greater social and economic harm for their families and communities. In the long term, these standardized regimens may be contributing to amplification of multi-drug resistance in these countries," wrote Dr. Menzies.

The concern is that with current treatment regimens, many patients fail treatment or relapse later, and by continuing to use those regimens, researchers and public health officials may be unwittingly increasing the problem of drug resistance and multiplying the problem for other future patients. "Unless those with the responsibility to boost control and research efforts increase their commitments and their financial investments by several fold, we may never see elimination of this major scourge in the decades to come," wrote Marcos Espinal, M.D., and Mario C. Raviglione, M.D., both of the WHO, in an accompanying editorial in the same issue of the journal.

Adapted from materials provided by American Thoracic Society, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2008/08/080801074100.htm

Project Aims To Improve Energy Efficiency Of Computing

ScienceDaily (Aug. 4, 2008) — The information technology industry consumes as much energy and has roughly the same carbon "footprint" as the airline industry. Now scientists and engineers at the University of California, San Diego are building an instrument to test the energy efficiency of computing systems under real-world conditions – with the ultimate goal of getting computer designers and users in the scientific community to re-think the way they do their jobs.

The National Science Foundation will provide $2 million over three years from its Major Research Instrumentation program for UC San Diego's GreenLight project. An additional $600,000 in matching funds will come from the UCSD division of the California Institute for Telecommunications and Information Technology (Calit2) and the university's Administrative Computing and Telecommunications (ACT) group.

The GreenLight project gets its name from its plan to connect scientists and their labs to more energy-efficient 'green' computer processing and storage systems using photonics – light over optical fiber.

"As a leader in the field of information technology, UC San Diego has a responsibility to reduce the amount of energy required to run scientific computing systems," said UCSD Chancellor Marye Anne Fox. "Project GreenLight will train a new generation of energy-aware scientists, and it will produce energy consumption data to help investigators throughout the research community make informed choices about energy-efficient IT infrastructure."

The rapid growth in highly data-intensive scientific research has fueled an explosion in computing facilities and demand for electricity to power them. Energy usage per compute server rack is growing from approximately 2 kilowatts (KW) per rack in 2000 to an estimated 30 KW per rack in 2010. Every dollar spent on power for IT equipment requires that another dollar be spent on cooling – equivalent to double the cost of the hardware itself over three years. As a result, cooling and power issues are now becoming a major factor in system design.

"If we are going to continue to allow ourselves the benefits of advances in computing, we need to understand power and cooling requirements much better," said Thomas A. DeFanti, a research scientist at Calit2 and principal investigator of the GreenLight project. "Scientists from all domains will choose more efficient systems as they invest in new cyberinfrastructure, and we expect that GreenLight will give them the data they need. Some scientific computing jobs need more powerful processors, some can do with less memory, some can use specialized processors: these are important requirements to understand so the optimally configured cluster can be chosen and scheduled through virtualization techniques each and every time."

The NSF infrastructure grant allows UCSD to acquire two Sun Modular Datacenter S20s (Sun MD), one that is already installed, the second in year-three of the project. The large shipping containers can accommodate up to 280 servers, with an eco-friendly design that can reduce cooling costs by up to 40 percent when compared to traditional server rooms.

To eliminate the need for air conditioning, each Sun MD's closed-loop water-cooling system uses built-in heat exchanges between equipment racks to channel air flow. This allows the unit to cool 25 kilowatts per rack, roughly five times the cooling capacity of typical datacenters. The industry-standard racks can also be placed close together, further reducing the structure's overall eco-footprint and increasing energy efficiency by eliminating dead space.

"Using the Sun Modular Datacenter as a core technology and making all measurements available as open data will form a unique, Internet-accessible resource that will have a dramatic impact on academic,

government and private-sector computing," said Emil J. Sarpa, Director of External Research at Sun Microsystems, Inc. "By placing experimental hardware configurations alongside traditional rack-mounted servers and then running a variety of computational loads on this infrastructure, GreenLight will enable a new level of insight and inference about real power consumption and energy savings."

The GreenLight Instrument will use sensors in the controlled datacenter environment to measure temperature (at 40 points in the air stream), humidity, energy consumption and other variables, in addition to monitoring the internal measurements of the servers. Researchers hope to use the data to find ways to minimize the power needed to run computers, to make use of novel cooling sources, and to develop software that automates the optimizing of power strategies for each given computing process.

The facility will provide computing and storage services to large-scale projects in five diverse scientific areas: metagenomics; ocean observing; microscopy; bioinformatics; and digital media. Researchers from these fields will be able to carry out quantitative explorations into energy-efficient cyberinfrastructure in a real-world environment.

"We will be running full-scale applications on full-scale computing platforms, so we will be able to draw conclusions about the comparative amount of energy that is consumed by one workload versus another," said Calit2 Director Larry Smarr, co-principal investigator on GreenLight and PI of the Community Cyberinfrastructure for Advanced Marine Microbial Ecology Research and Analysis (CAMERA) metagenomics project. "We expect that this new approach will re-define the fundamentals of computer systems engineering and accelerate adoption of a transformative concept for the computer industry – green cyberinfrastructure."

Other co-PIs on the project include UCSD Center for Networked Systems Director Amin Vahdat; Philip Papadopoulos of the San Diego Supercomputer Center (SDSC); as well as Computer Science and Engineering professor Ingolf Krueger. Other faculty members on the project include CSE faculty Pavel Pevzner, Falko Kuester, Tajana Simunic Rosing and Rajesh Gupta, as well as Biology professor Steve Briggs, and Electrical and Computer Engineering professor Bhaskar Rao.

Some of the research groups participating in GreenLight will re-locate servers, switches, computer clusters and related equipment to be deployed inside the first Sun Modular Datacenter. The scientists will continue to operate their equipment virtually and remotely over UCSD's high-performance network, just as if the computers were still in their labs. Indeed, many researchers may not even know where the computers are located.

"If the networking is transparent, the scientists won't care where the computers are as long as the data gets from their devices and back to their screens without delay," said DeFanti. "The full-scale GreenLight Instrument will measure, monitor and make publicly available real-time sensor outputs using a service-oriented architecture methodology, empowering researchers anywhere to study the energy cost of at-scale scientific computing."

Although the IT industry has begun to develop strategies for 'greening' major corporate data centers, most of the cyberinfrastructure on a university campus involves a complex network of ad hoc and suboptimal energy environments, with clusters placed in small departmental facilities.

According to DeFanti, the project decided to build the GreenLight Instrument around the Sun Modular Datacenter because, "it's the fastest way to construct a controlled experimental facility for energy research purposes." The modular structure also means the GreenLight Instrument can be cloned – unlike bricks-and-mortar computer rooms that cannot be ordered through purchasing.

The GreenLight Instrument will enable an experienced team of computer-science researchers to make deep and quantitative explorations in advanced computer technologies, including graphics processors,

solid-state disks, photonic networking, and field-programmable gate arrays (FPGAs). Jacobs School of Engineering computer science professor Rajesh Gupta and his team will explore alternative computing fabrics from array processors to custom FPGAs and their respective models of computation to devise architectural strategies for efficient computing systems.

"Computing today is characterized by a very large variation in the amount of effective work delivered per watt, depending upon the choice of the architecture and organization of functional blocks," said Gupta. "The project seeks to discover fundamental limits of computing efficiency and device organizing principles that will enable future system builders to architect machines that are orders-of-magnitude more efficient modern-day machines, from embedded systems to high-performance supercomputers."

The computing and systems research will yield new quantitative data to support engineering judgments on comparative "computational work per watt" across full-scale applications running on full-scale computing platforms.

Researchers in GreenLight advocated for full-scale computational and storage configurations in order to entice faculty and graduate students to run their computational work through GreenLight. "We are asking 25 faculty and researchers to work with us with no money for students, summer salary or even system administrative support," said DeFanti. "We wouldn't be able to retain them and get usable data if we were only offering toy-scale computation."

Computer scientists will use GreenLight to study topics ranging from virtualization for optimizing resource utilization, to power and thermal management. Jim Hollan, a professor of cognitive science at UCSD, will study how access to energy costs may influence the behavior of scientists in using shared computational resources – especially when the energy use is visible to the wider community.

Rather than give scientists physical access to the GreenLight Instrument, OptIPortal tiled display systems will serve as visual termination points – allowing researchers to "see" inside the instrument. Users will also be able to query and visualize all sensor data in real time and correlate it interactively and collaboratively in this immersive, multi-user environment.

Once a virtual environment of the system has been created, scientists will be able to walk into a 360-degree virtual reality version in Calit2's StarCAVE. Users will be able to zoom into the racks of clusters as well as see and hear the power and heat, from whole clusters of computers down to the smallest instrumented components, such as computer processing and graphics processing chips.

The GreenLight project aims to reach out to other campuses, including Indiana University. IU professor of computer science, informatics and physics and director of the Community Grids Laboratory Geoffrey Fox will organize a workshop in the next year, under the auspices of MSI-CIEC – the Minority Serving Institutions Cyberinfrastructure Empowerment Coalition – which reaches over 335 minority-serving institutions. "The workshop will feature lectures on the frontiers of green cyberinfrastructure, the hardware, software and middleware of the GreenLight Instrument," said Fox, "and participants will engage in working groups to provide feedback on the project's development and outreach plans going forward."

In addition to Sun Microsystems, other industry partners in GreenLight include San Jose, CA-based Cisco Systems, Inc. Cisco is contributing use of its CiscoWave network on the National LambdaRail (NLR) on an as-available basis.

Adapted from materials provided by University of California - San Diego.

http://www.sciencedaily.com/releases/2008/07/080728193231.htm

Tracking Down Abrupt Climate Changes: Rapid Natural Cooling Occurred 12,700 Years Ago

Mont Blanc, as seen from Samoëns, in the French Alps. Researchers believe that an extremely fast climate change occurred in Western Europe within a short number of years 12,700 years ago. (Credit: iStockphoto)

ScienceDaily (Aug. 4, 2008) — Researchers in Germany, Switzerland, and the United States have shown, for the first time, that an extremely fast climate change occurred in Western Europe. This took place long before human-made changes in the atmosphere, and is causatively associated with a sudden change in the wind systems.

The research, which appears in the journal Nature Geoscience, was conducted by geoscientists Achim Brauer, Peter Dulski and Jörg Negendank (emeritus Professor) from the GFZ German Research Centre for Geosciences, Gerald Haug from the DFG-Leibniz Center for Surface Processes and Climate Studies at the University of Potsdam and the ETH in Zurich, and Daniel Sigman from Princeton University.

The proof of an extreme cooling within a short number of years 12,700 years ago was attained in sediments of the volcanic lake Meerfelder Maar in the Eifel region of Germany. The seasonally layered deposits allow to precisely determine the rate of climate change. With a novel combination of microscopic research studies and modern geochemical scanner procedures, the scientists were able to successfully reconstruct the climatic conditions even for individual seasons. In particular, the changes in the wind force and direction during the winter half-year caused the climate to topple over into a completely different mode within one year after a short instable phase of a few decades.

Up to now, it was assumed that the attenuation of the Gulf Stream alone was responsible for the strong cooling in Western Europe.

The examined lake deposits show, however, that the atmospheric circulation, probably in connection with

the spreading of sea-ice, most likely played a very important role. At the same time, these new results show that the climate system is still not well understood, and that especially the mechanisms of short-term change and the time of occurrence still hold many puzzles. Micro-layered lake deposits represent particularly suitable geological archives, with which scientists want to track down climate change.

Scientists from the Helmholtz Centre Potsdam – German Research Centre for Geosciences (GFZ) and other institutions are in search of such archives worldwide, with the hope of obtaining area-wide information on the dynamics of climate and possible regional variations in the future.

Journal reference:

1. Brauer et al. **An abrupt wind shift in western Europe at the onset of the Younger Dryas cold period**. *Nature Geoscience*, 2008; 1 (8): 520 DOI: 10.1038/ngeo263

Adapted from materials provided by Helmholtz Association of German Research Centres, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2008/08/080801152137.htm

Genetically Modified Root Systems Result In Plants That Survive With Little Water

TAU research doctoral student Tal Sherman handles sample laboratory specimens. (Credit: Image courtesy of Tel Aviv University)

ScienceDaily (Aug. 4, 2008) — A part of the global food crisis is the inefficiency of current irrigation methods. More irrigated water evaporates than reaches the roots of crops, amounting to an enormous waste of water and energy.

Tel Aviv University researchers, however, are investigating a new solution that turns the problem upside-down, getting to the root of the issue. They are genetically modifying plants' root systems to improve their ability to find the water essential to their survival.

The Root Cause of Wasting Water

When it comes to water, every drop counts. "Improving water uptake by irrigated crops is very important," says Prof. Amram Eshel, the study's co-researcher from Tel Aviv University's Plant Sciences Department. His team, with that of Prof. Hillel Fromm, hope to engineer a plant that takes advantage of a newly discovered gene that controls hydrotropism, a plant's ability to send its roots towards water.

Scientists in TAU's lab are observing plants that are grown on moist air in the University's lab, making it possible to investigate how the modified plant roots orient themselves towards water. Until now,

aeroponics (a method of growing plants in air and mist) was a benchtop technique used only in small-scale applications. The current research is being done on the experimental model plant Arabidopsis, a small flowering plant related to cabbage and mustard.

Environmental Consequences Have Economic Consequences Too

"Our aim is to save water," explains Prof. Eshel. "We are increasing a plant's efficiency for water uptake. Plants that can sense water in a better fashion will be higher in economic value in the future."

There can be significant water-saving consequences for farmers around the world. "We are developing plants that are more efficient in sensing water," says research doctoral student Tal Sherman, who is working under Prof. Amram Eshel and Prof. Hillel Fromm. The project is funded by a grant from the Israeli Ministry of Agriculture and Rural Development to Prof. Fromm and Prof. Eshel.

Ideas Planted in Darwin's Time

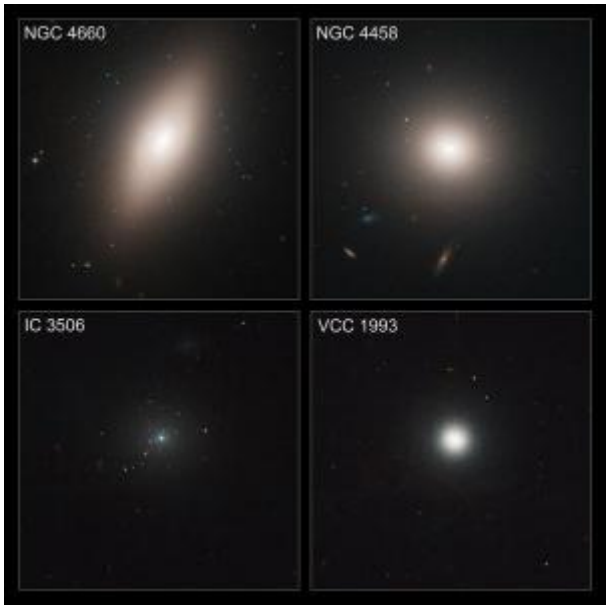
In the nineteenth century, scientists were already observing that plant roots naturally seek out the wetter regions in soil.

Although the phenomenon is well documented, scientists until recently had no clue as to how the mechanism worked, or how to make it better. New insights from the Tel Aviv University study could lead to plants that are super water seekers, say researchers.

Adapted from materials provided by Tel Aviv University.

http://www.sciencedaily.com/releases/2008/07/080730155346.htm

Thousands Of Globular Clusters Identified In Virgo Cluster Of Galaxies



These images taken by the NASA/ESA Hubble Space Telescope show four members of the Virgo cluster of galaxies, the nearest large galaxy cluster to Earth. They are part of a survey of globular star clusters in 100 of Virgo's galaxies. (Credit: NASA, ESA and Eric Peng (Peking University, China))

ScienceDaily (Aug. 6, 2008) — The NASA/ESA Hubble Space Telescope has identified thousands of globular clusters -- more than 5 billion years old -- in the Virgo cluster of galaxies. One of the results of these discoveries led astronomers to understand more about the life and evolution of cannibal galaxies.

Globular star clusters, dense bunches of hundreds of thousands of stars, contain some of the oldest surviving stars in the Universe. A new international study of globular clusters outside our Milky Way Galaxy has found evidence that these hardy pioneers are more likely to form in dense areas, where star birth occurs at a rapid rate, instead of uniformly from galaxy to galaxy.

Astronomers used the NASA/ESA Hubble Space Telescope to identify over 11 000 globular clusters in the Virgo cluster of galaxies, most of which are more than 5 billion years old. Comprised of over 2 000 galaxies, the Virgo cluster is located about 54 million light-years away and is the nearest large galaxy cluster to Earth. Along with Virgo, the sharp vision of Hubble's Advanced Camera for Surveys (ACS) resolved the star clusters in 100 galaxies of various sizes, shapes, and brightness – even in faint, dwarf galaxies.

"It's hard to distinguish globular clusters from stars and galaxies using ground-based telescopes", explained Eric Peng of Peking University in Beijing, China, and lead author of the Hubble study.

Hubble's "eye" is so sharp that it was able to pick out the fuzzy globular clusters from stars in our galaxy and from faraway galaxies in the background. "With Hubble we were able to identify and study about 90 percent of the globular clusters in all our observed fields. This was crucial for dwarf galaxies that have only a handful of star clusters".

The team found a bounty of globular clusters (from a few dozen to several dozen) in most of the dwarf galaxies within 3 million light-years of the cluster's centre. This happens to be the same region where the

giant elliptical galaxy Messier 87 resides. These numbers were surprisingly high considering the low masses of the dwarfs they inhabited. By contrast, dwarfs in the outskirts of the cluster had fewer globulars.

"Our study shows that the efficiency of star cluster formation depends on the environment", said Patrick Cote of the Herzberg Institute of Astrophysics in Victoria, Canada. "Dwarf galaxies closest to Virgo's crowded centre contained more globular clusters than those farther away".

Astronomers have long known that the giant elliptical galaxy at the cluster's centre, Messier 87, also hosts a larger than predicted population of globular star clusters. However, the origin of so many globulars has been a long-standing mystery. Astronomers have theorised that many of the clusters may have been snatched from smaller galaxies that ventured too close to it.

"We found few or no globular clusters in galaxies within 130 000 light-years from Messier 87, suggesting the giant galaxy stripped the smaller ones of their star clusters", Peng said. "These smaller galaxies are contributing to the buildup of Messier 87".

Evidence of Messier 87's galactic cannibalism comes from an analysis of the globular clusters' composition. "In Messier 87 there are three times as many globulars deficient in heavy elements, such as iron, than globulars rich in those elements", Peng said. "This suggests that many of these 'metal-poor' star clusters may have been stolen from nearby dwarf galaxies, which also contain globulars deficient in heavy elements".

Studying globular star clusters is critical to understanding the early, intense star-forming episodes that mark galaxy formation. They are known to reside in all but the faintest of galaxies.

"Star formation near the core of Virgo is very intense and occurs in a small volume over a short amount of time", Peng noted. "It may be more rapid and more efficient than star formation in the outskirts. The high star-formation rate may be driven by the gravitational collapse of dark matter, an invisible form of matter, which is denser and collapses sooner near the cluster's centre. Messier 87 sits at the centre of a large concentration of dark matter, and all of these globulars near the centre probably formed early in the history of the Virgo cluster."

The smaller number of globular clusters in the dwarf galaxies sitting farther away from the centre may be due to the masses of the star clusters that formed, Peng said. "Star formation farther away from the central region was not as robust, which may have produced only less massive star clusters that dissipated over time", he explained.

The astronomers also obtained accurate distances to 84 of the 100 galaxies in the Hubble study.

Journal reference:

1. Peng et al. **The ACS Virgo Cluster Survey. XV. The Formation Efficiencies of Globular Clusters in Early Type Galaxies: The Effects of Mass and Environment**. *The Astrophysical Journal*, 2008; 681 (1): 197 DOI: 10.1086/587951

Adapted from materials provided by ESA/Hubble Information Centre.

http://www.sciencedaily.com:80/releases/2008/08/080805124054.htm

Revolutionary Technique Could Reduce Lifelong Drugs For Transplant Patients

ScienceDaily (Aug. 6, 2008) — Researchers have developed a ground-breaking procedure that could avoid the need for transplant patients to spend the rest of their lives taking a cocktail of drugs to stop their system from rejecting their new organ, according to a series of papers in the August issue of Transplant International.

The team, led by Professor Fred Fandrich from the University of Schleswig-Holstein in Kiel, Germany, has developed a technique based on tailor-made regulatory cells.

This involves taking infection-fighting white cells from the blood of the transplant recipient and subjecting them to a highly complex procedure involving cells taken from the living or deceased donor. The tailor-made cells are then administered back to the patient.

In the two clinical trials described in Transplant International this was done in two ways, either after the transplant, as an addition to the traditional drug therapy to stop the patient's immune system rejecting the kidney, or before the transplant surgery was carried out.

"Until now the only option for transplant patients has been to take a cocktail of drugs for the rest of their lives" explains lead author Dr James A Hutchinson from the University's Division of Transplantation Medicine and Biotechnology.

"These drugs can cause severe side effects and cannot always prevent the slow destructive process of chronic rejection which often leads to the failure of the transplanted organ.

"That is why our use of transplant acceptance-inducing cells (TAICs) in kidney transplant patients is such an exciting development, as it could eventually offer patients who have had transplant surgery a much higher quality of life, free from complex drug regimes.

"Although our use of TAICs is still in the preliminary stages, the results of our clinical trials on 17 kidney transplant patients are promising."

During stage one of the clinical trials 12 patients received kidneys from deceased donors and were give the TAICs in addition to the traditional drug therapy used to prevent organ rejection. Nine men and three women aged between 30 and 61 took part in the trial.

Ten of the 12 patients were weaned off conventional immunosupression drugs over a period of eight weeks, starting in the fourth week after transplantation. Medical staff were then able to wean six of them down to low-dose tacrolimus monotherapy, which is a much less intrusive drug regime with fewer side effects.

"We concluded that although the stage one trial showed that TAIC therapy was both safe and clinically practicable, the trial was unable to provide evidence that postoperative TAIC administration has a beneficial effect" says Dr Hutchinson.

Stage two comprised five patients who were transplanted with kidneys from live donors and received TAICs before their surgery was carried out.

Four men and one woman aged between 39 and 59 took part in the trial. Two received a kidney from their brother, one from his daughter and two from a spouse.

One patient was able to go eight months without any immunosuppression drugs and a further three were successfully weaned from a conventional immunosuppression regime to low-dose tacrolimus monotherapy.

"Although our stage two clinical trial did not provide conclusive evidence of a beneficial effect of pre-operative TAICs treatment, the results were encouraging" says Dr Hutchinson.

"They suggest that TAICs promote a physical state that might allow us to minimise the drugs we use to stop the patient's immune system from rejecting their new organ."

None of the patients in either trial experienced acute or delayed adverse events as the result of the TAIC infusion.

"Our research clearly shows that infusing TAICs into patients before they have a kidney transplant, or after the procedure has been carried out, is a practical and safe clinical option.

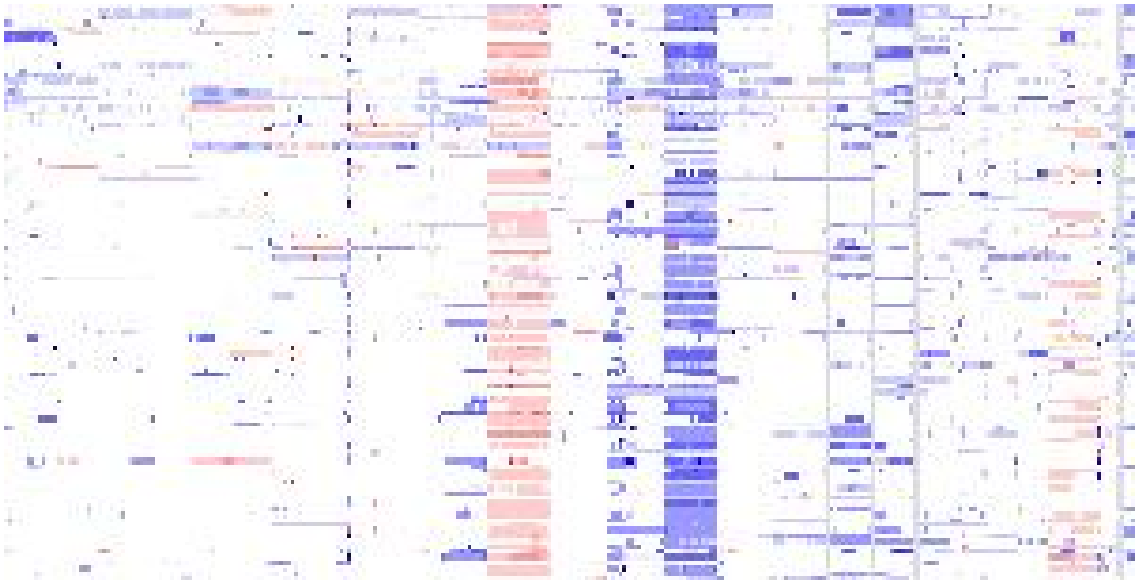
"Although this procedure is still being developed and refined, it poses an exciting possibility for clinicians and patients alike."

Four papers on the research are included in the August issue of Transplant International – the results of the first and second clinical trials, a detailed case study of a living-donor kidney transplant and an expert commentary by Professor Lucienne Chatenoud from Universite Paris Descartes.

Adapted from materials provided by Wiley - Blackwell, via AlphaGalileo.

http://www.sciencedaily.com/releases/2008/08/080805075606.htm

Next Generation Tool For Visualizing Genomic Data Introduced



A genome-wide view of DNA copy number variations in patients with a form of brain cancer. (Credit: Image courtesy of Wendy Winckler, Broad Institute)

ScienceDaily (Aug. 6, 2008) — Researchers are collecting vast amounts of diverse genomic data with ever-increasing speed, but effective ways to visualize these data in an integrated manner have lagged behind the ability to generate them.

To address this growing need, researchers at the Broad Institute have developed the Integrative Genomics Viewer (IGV), a novel and freely available visualization tool that helps users simultaneously integrate and analyze different types of genomic data, and gives them the flexibility to zoom in on a specific genomic region of interest or to pan out for a broad, whole genome view.

"This new tool offers a Google Maps-like view of integrative genomic data," said Jill Mesirov, Chief Informatics Officer and Director of Computational Biology and Bioinformatics at the Broad Institute. "It brings together different kinds of genomic data into a single, holistic view. I'm incredibly proud of our computational scientists for responding so rapidly and effectively to the critical needs of the growing genomics research community."

With IGV, researchers can still choose a Google Maps-like "street view" of the As, Cs, Ts, and Gs that make up the genome, but they can also simultaneously visualize additional layers of complex information about gene expression as well as sequence alterations, or mutations, in the genetic code. Other genomic details, such as copy number variation, chromatin immunoprecipation data, and epigenetic modifications, can also be viewed in IGV. Moreover, all these data types can be overlaid or superimposed to determine how changes at one level will affect another. Users can choose from a variety of display options, viewing their data as a heat map, histogram, scatter plot, or other formats of their choice. This new visualization tool is free and publicly available to researchers via the web.

"Other tools offer detailed, localized views of genomic data, and a few tools are equipped to provide a whole genome view," said Senior Software Engineer Jim Robinson, one of the program's creators. "IGV was designed to integrate both and to provide smooth zooming and panning across all resolution scales. "

"Most visualization tools are limited in their ability to handle multiple types of genomic data and are

typically 'retrofitted' to accommodate new data types as they have arisen," said Michael Reich, Director of Cancer Informatics Development at the Broad Institute. "IGV was designed from the ground up to integrate all of these data, and to provide a strong platform for future growth and refinement."

Broad Associate Member John Rinn, an assistant professor at Harvard University and Beth Israel Deaconess Medical Center, has used a variety of visualization tools to sift through different types of genomic data. "Before I was introduced to IGV, I had to use three different programs to visually integrate my data," Rinn said. "But now this one, universal browser allows me to rapidly scan the entire genome and identify promising regions, which has revolutionized my work."

IGV promises to increase the flow of discovery in many areas of biomedical research. "This tool is designed to enable researchers to view many types of genomic data, especially those relevant to human disease," said Reich. "We're particularly excited about its already groundbreaking use in ongoing studies of the cancer genome."

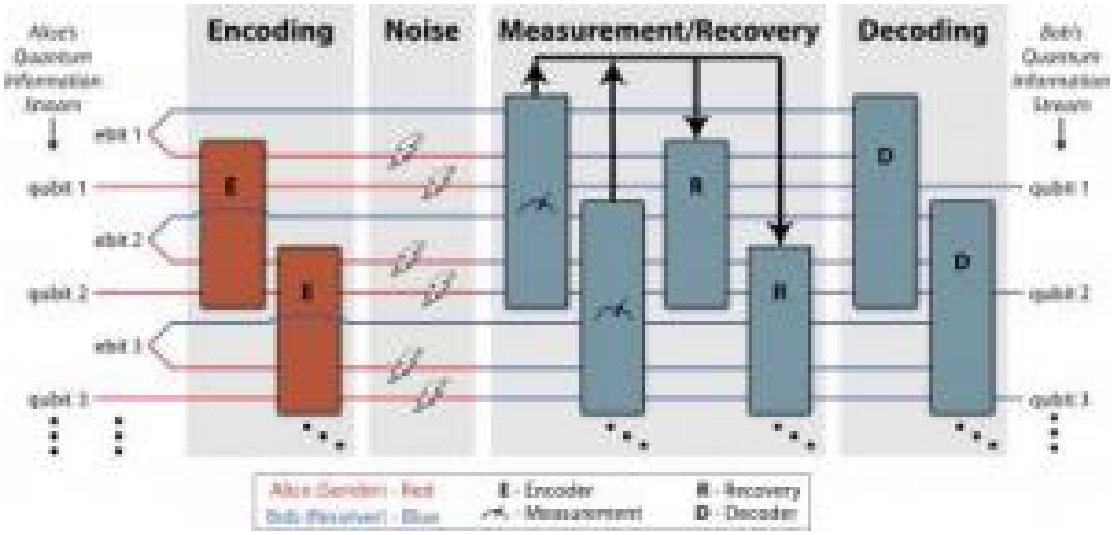
IGV is made publicly available to researchers worldwide and can be accessed at: http://www.broad.mit.edu/igv

---

Adapted from materials provided by Broad Institute of MIT and Harvard.

http://www.sciencedaily.com/releases/2008/08/080804111644.htm

Viterbi Algorithm Goes Quantum



Alice would like to transmit a stream of quantum information to Bob. She shares entanglement in the form of ebits before quantum communication begins. Red qubits belong to Alice and blue qubits belong to Bob. She repeatedly performs a series of encoding operations and transmits her qubits as soon as they are encoded. The noisy quantum communication channel corrupts her transmitted qubits. Bob receives her qubits and combines them with his half of the ebits. He performs measurements and Viterbi processing of the measurement results to diagnose the channel errors and performs recovery operations based on the results of the Viterbi algorithm. He then performs a decoding circuit and finally possesses the qubits that Alice first sent. (Credit: USC Viterbi School of Engineering)

ScienceDaily (Aug. 6, 2008) — The Viterbi Algorithm, the elegant 41-year-old logical tool for rapidly eliminating dead end possibilities in data transmission, has a new application to go alongside its ubiquitous daily use in cell phone communications, bioinformatics, speech recognition and many other areas of information technology.

In a recent set of papers two investigators from the University of Southern California school that bears the name of the algorithm's inventor say it can play a key role in quantum communication. Mark Wilde, a graduate student in the USC Viterbi School of Engineering, collaborated with his faculty advisor Todd Brun on the work. The research is also his thesis, for which he will receive a PhD from the School's Ming Hsieh Department of Electrical Engineering in August.

Brun, an associate professor in the Hsieh Department, is also deputy director of the USC Center for Quantum Information Science & Technology.

The quantum communication applications Wilde and Brun explored are for an environment in which a sender "Alice" (the traditional sender name) is trying to send a quantum message to a receiver named (again by tradition) "Bob" using a stream of pairs of "entangled" photons.

"Such [entangled] photons," in the words of the recent New Scientist story, "obey the strange principles of quantum physics, whereby disturbing the state of one will instantly disturb the other, no matter how much distance there is in between them."

Use of such a system has been proposed for a variety of uses, including space based communication, and progress is being made on the physical devices that might create entanged photons for messages. But

noise is created in the transmission of quantum data, an issue the USC work addresses using the time-hallowed Viterbi algorithm.In the system considered by Wilde and Brun, Alice encodes each quantum bit of the message with the help of an ebit, an entangled qubit. She sends her part of the encoded quantum message over a noisy quantum communication channel, a process that can introduce errors.

From his side, Bob receives what Alice sent and combines her transmitted qubits with his half of the ebits. He measures all of the qubits, processes the results of the measurements, performs recovery operations, and finally decodes them, receiving the message qubits Alice sent. At the conclusion of the process Bob will have the transmitted quantum information error-free.The above description is a condensed and simplified paraphrase of what is in fact a much more complex process, a ballet in which Alice and Bob can exploit ancilla or helper qubits, gauge or noisy qubits, and ebits to transmit both quantum and classical information.

But the bottom line question coming out remains, how does Bob know that the dancers were following the music, that the message he now has was transmitted correctly?The fact that the noisy quantum communication channel can be modeled as a sequential process of steps, each step of which changes the state of the system, offers an opening. The Viterbi algorithm is, precisely, a way of analyzing the products of such progressions, called "Markov processes."

In Wilde and Brun's analysis, Bob watches the step coming out of his measurement process, testing them against statistical probabilities, using standard Viterbi tools.Cell phones use similar programming to correct for errors in the transmission of digital voice data.

The result: Bob can reliably spot errors, and knows which message qubits are bogus before he opens the message - crucial, because opening it destroys it; and if it is garbled, he has nothing.Wilde plans to work on future extensions of these ideas with researchers at NEC Laboratories in Princeton, NJ, the Center for Quantum Technologies in Singapore, and the Quantum Institute at Los Alamos National Laboratory.

The research was funded by NSF.

References:

M.M. Wilde and T.A. Brun, "Unified quantum convolutional coding," in IEEE International Symposium on Information Theory (arXiv:0801.0821), July 2008.

M.M. Wilde, Quantum Coding with Entanglement, Ph.D. Thesis, University of Southern California, arXiv:0806.4214, August 2008.

M.M. Wilde and T.A. Brun, Quantum convolutional coding with shared entanglement: general structure, submitted to IEEE Transactions on Information Theory (arxiv:0807.3803), 2007.

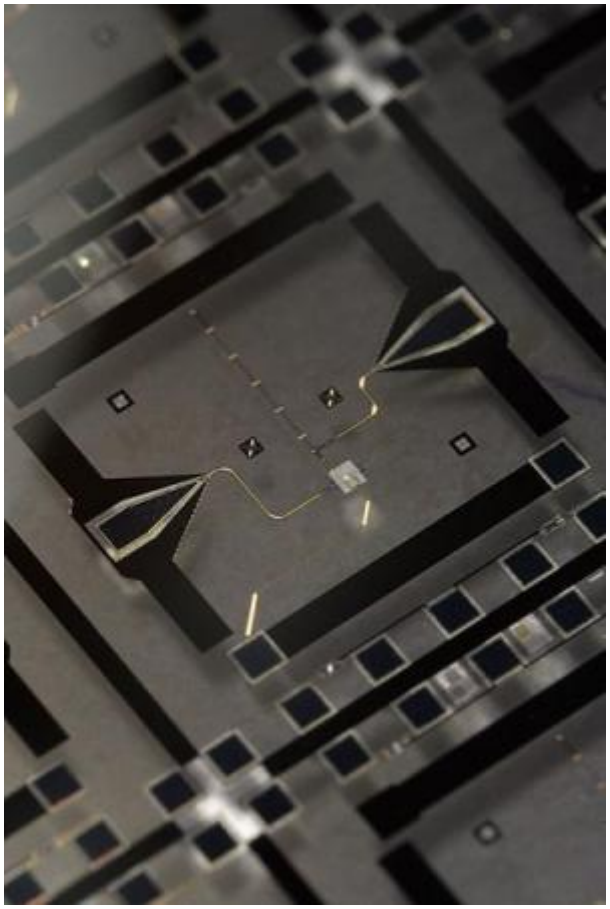
M.M. Wilde and T.A. Brun, Entanglement-Assisted Quantum Convolutional Coding, submitted to IEEE Transactions on Information Theory (arXiv:0712.2223), 2007.

M.M. Wilde, H. Krovi and T.A. Brun, Convolutional Entanglement Distillation, submitted to IEEE Transactions on Information Theory (arxiv:0708.3699), 2007.

Adapted from materials provided by University of Southern California, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2008/07/080731173129.htm

Breakthrough In Quantum Mechanics: Superconducting Electronic Circuit Pumps Microwave Photons



A close-up of one of the circuits used in the quantum mechanics experiment. (Credit: UCSB photo)

ScienceDaily (Aug. 5, 2008) — Researchers at UC Santa Barbara have recently reached what they are calling a milestone in experimental quantum mechanics.

In a paper published in the July 17 issue of the journal Nature, UCSB physicists Max Hofheinz, John Martinis, and Andrew Cleland documented how they used a superconducting electronic circuit known as a Josephson phase qubit, developed in Martinis's lab, to controllably pump microwave photons, one at a time, into a superconducting microwave resonator.

Up to six photons were pumped into and stored in the resonator, and their presence was then detected using the qubit, which acts like an electronic atom, as an analyzer. The photon number states, known as Fock states, have never before been controllably created, said Cleland.

"These states are ones you learn about in introductory quantum mechanics classes, but no one has been able to controllably create them before," Cleland said.

Using the same technique, the researchers also created another type of special state, known as a coherent state, in the superconducting resonator. These states are relatively easily generated, and appear to behave in a completely non-quantum mechanical fashion, but by using the same analysis technique, the UCSB

researchers were able to demonstrate the expected underlying quantum behavior.

Hofheinz, a postdoctoral researcher from Germany who's been at UCSB for the past year working on this project, explained how the resonator works.

"The resonator is the electrical equivalent of a pendulum," Hofheinz said. "In quantum mechanics the energy, or amplitude of motion of this pendulum, only comes in finite steps, in quanta. We first carefully prepared the resonator in these quantum states, and showed we could do this controllably and then measure the states. Then we 'kicked' the pendulum directly, a method where the amplitude can take on any value, and appears to not be limited to these quanta. But when we look at the resonator with our qubit, we see that the amplitude does come in steps, but that the resonator is actually in several such states at the same time, so that on average it looks like it is not limited to the quantum states."

Hofheinz spent several months in the UCSB Nanofabrication cleanroom fabricating the device used for the experiment. "This resonator, once you excite it, has to 'swing' for a very long time," he explained. "The first samples I fabricated stopped oscillating very quickly. We had to work to rearrange the fabrication method to get the resonator to oscillate longer."

He then fine-tuned the microwave electronics built by Martinis's group to emit the precisely shaped signals necessary to produce these exciting results.

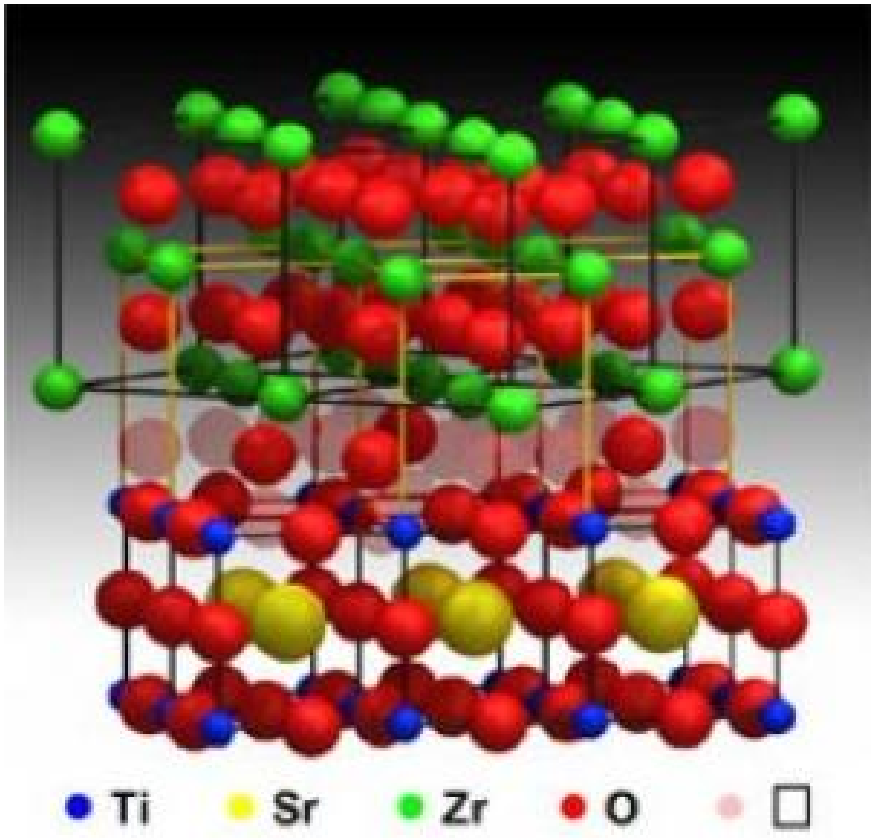
Martinis, Cleland, and Hofheinz say that their research could help in the quest to build a possible quantum computer, which both the government and industry have been seeking for a long time. A quantum computer could be used to break – or make – the encryption codes most heavily used for secure communication.

"Harmonic oscillators might allow us to get a quantum computer built more quickly," Cleland said.

"I think if they really build one of these quantum computers, there will definitely be resonators in them," Hofheinz said.

Adapted from materials provided by University of California - Santa Barbara.
http://www.sciencedaily.com/releases/2008/08/080805150812.htm

Fuel Cell Efficiency May Be Improved With Material With 'Colossal Ionic Conductivity'



The molecular model of the ion-conducting material shows that numerous vacancies at the interface between the two layers create an open pathway through which ions can travel. (Credit: Image courtesy of DOE/Oak Ridge National Laboratory)

ScienceDaily (Aug. 5, 2008) — A new material characterized at the Department of Energy's Oak Ridge National Laboratory could open a pathway toward more efficient fuel cells.

The material, a super-lattice developed by researchers in Spain, improves ionic conductivity near room temperature by a factor of almost 100 million, representing "a colossal increase in ionic conduction properties," said Maria Varela of ORNL's Materials Science and Technology Division, who characterized the material's structure with senior researcher Stephen Pennycook.

The analysis was done with ORNL's 300 kilovolt Z-contrast scanning transmission electron microscope, which can achieve aberration-corrected resolutions near 0.6 angstrom, until recently a world record. The direct images show the crystal structure that accounts for the material's conductivity.

"It is amazing," Varela said. "We can see the strained, yet still ordered, interface structure that opens up a wide pathway for ions to be conducted."

Solid oxide fuel cell technology requires ion-conducting materials -- solid electrolytes -- that allow oxygen ions to travel from cathode to anode. However, existing materials have not provided atom-scale voids large enough to easily accommodate the path of a conducted ion, which is much bigger than, for

example, an electron.

"The new layered material solves this problem by combining two materials with very different crystal structures. The mismatch triggers a distortion of the atomic arrangement at their interface and creates a pathway through which ions can easily travel," Varela said.

Other fuel cell materials force ions to travel through tight pathways with few spaces for the ions to occupy, slowing their progress. Rather than forcing the ions to jump from hole to hole, the new material has "lots of vacant spaces to be occupied," said Varela, so the ions can travel much more quickly.

Unlike previous fuel cell materials, which have to achieve high temperatures to conduct ions, the new material maintains ionic conductivity near room temperatures. High temperatures have been a major roadblock for developers of fuel cell technology.

The research team with Spain's Universidad Complutense de Madrid and Universidad Politécnica de Madrid produced the material and observed its outstanding conductivity properties, but the structural characteristics that enable the material to conduct ions so well were not known until the material was put under the ultra-high resolution microscopes at ORNL.

The paper, a collaboration between researchers at the Universities of Madrid and at ORNL, was published August 1 in Science.

Adapted from materials provided by DOE/Oak Ridge National Laboratory.

http://www.sciencedaily.com/releases/2008/07/080731173133.htm

Lowering Cholesterol Early In Life Could Save Lives

This image of the abdominal aorta of a 32-year old male shows large areas affected by early, fat-rich lesions of atherosclerosis (the intense red areas at the outer edges of the aorta). (Credit: Image courtesy of University of California - San Diego)

ScienceDaily (Aug. 5, 2008) — With heart disease maintaining top billing as the leading cause of death in the United States, a team of University of California, San Diego School of Medicine physician-researchers is proposing that aggressive intervention to lower cholesterol levels as early as childhood is the best approach available today to reducing the incidence of coronary heart disease.

In a review article published in the August 5, 2008 issue of the American Heart Association journal Circulation, pioneering lipid researcher Daniel Steinberg, M.D., Ph.D., professor emeritus of medicine at UC San Diego, and colleagues Christopher Glass, M.D., Ph.D. and Joseph Witztum, M.D., both UC San Diego professors of medicine, call current approaches to lowering cholesterol to prevent heart disease "too little, too late."

They state that with a large body of evidence proving that low cholesterol levels equate with low rates of heart disease, "...our long-term goal should be to alter our lifestyle accordingly, beginning in infancy or early childhood" and that "…instituting a low-saturated fat, low-cholesterol diet in infancy (7 months) is perfectly safe, without adverse effects…"

According to Steinberg, progress has been made in the treatment of coronary heart disease in adults with cholesterol lowering drugs like statins. However, while studies show a 30% decrease in death and disability from heart disease in patients treated with statins, 70% of patients have cardiac events while on statin therapy. Promising new therapies are under development, but with an alarming rate of coronary heart disease in the U.S. today, action to curtail the epidemic is needed today.

In fact, they propose that lowering low-density lipoproteins (the so-called "bad cholesterol") to less than

50 mg./dl. even in children and young adults is a safe and potentially life-saving standard, through lifestyle (diet and exercise) changes if possible. Drug treatment may also be necessary in those at very high risk.

"Our review of the literature convinces us that more aggressive and earlier intervention will probably prevent considerably more than 30% of coronary heart disease," said Steinberg. "Studies show that fatty streak lesions in the arteries that are a precursor to atherosclerosis and heart disease begin in childhood, and advanced lesions are not uncommon by age 30. Why not nip things in the bud?" Such early signs of heart disease should be taken as seriously as early signs of cancer or diabetes, he said.

Physicians have been slow to measure cholesterol, much less prescribe cholesterol lowering regimens in children and young adults who are otherwise healthy. However, the UC San Diego team notes that studies of Japanese men in the 1950s showed that consuming a low-fat diet from infancy resulted in lifelong low cholesterol levels, and their death rate from heart disease was only 10% of the rate of cardiac-related death in the U.S. Even with risk factors such as cigarette smoking and diabetes, heart disease deaths remained significantly lower in Japanese men with lifetime levels of low cholesterol. This protective effect was lost in Japanese who migrated to the United States and adopted a Western diet leading to higher blood cholesterol levels.

Interventions today typically begin in adults diagnosed with high cholesterol levels or other risk factors or symptoms of coronary artery disease. However, initiating cholesterol-lowering interventions in 50-year-old adults, even if successful, is unlikely to reverse established arterial disease and will therefore have limited impact on the occurrence of adverse events related to coronary heart disease.

Citing the success of lowering cholesterol levels in children diagnosed with familial hypercholesterolemia, the UC San Diego team suggests that programs to lower cholesterol in the population at large from childhood on, with the ideal LDL level set at 50 mg./dl. or less (in those at highest risk), will have a long-term beneficial effect and lower the nationwide rates of coronary artery disease. They do not advocate using drug therapy to reach these levels, especially in children with no other risk factors, but to achieve these low levels through "TLC," or "therapeutic lifestyle changes," such as diet and exercise.

The National Institutes of Health (NIH) has declared "war" against the parallel epidemics of obesity and diabetes. The researchers conclude that "The weapons for those wars—education and behavior modification—are the same as those needed for a 'war' on coronary heart disease."

They propose that "A concerted national effort might dramatically reduce morbidity and mortality due to three major chronic diseases…It would take generations to achieve and it would require an all-out commitment of money and manpower to reeducate and modify the behavior of a nation. Is that impossible? No. We have already shown that even a frankly addictive behavior like cigarette smoking can be overcome (eventually)."

Adapted from materials provided by University of California - San Diego.

http://www.sciencedaily.com/releases/2008/08/080804190637.htm

Turning Those Old Electronic Circuit Boards Into New Park Benches

ScienceDaily (Aug. 5, 2008) — Scientists in China have developed a new recycling method that could transform yesterday's computer into tomorrow's park bench.

Their study, which focuses on decreasing environmental pollution through resource preservation, reuses fibers and resins of waste printed circuit boards (PCBs) that were thought worthless to produce a variety of high-strength materials.

Zhenming Xu and colleagues point out that as more electrical and electronic equipment has become obsolete, the issue of electronic-waste removal has intensified. PCBs account for about 3 percent by weight of all electronic waste, Xu says. Although metals from the circuit boards, such as copper and aluminum, are recycled, landfill disposal has been the primary method for treating their nonmetallic materials, which have been difficult to recycle, the paper says.

In the study, the researchers developed a process to recycle those nonmetallic materials, which they say could be used to produce diverse items like sewer grates, park benches and fences. The recycled material could also be a substitute for wood and other materials since it is almost as strong as reinforced concrete. "There is no doubt that the technique has potential in the industry for recycling nonmetallic materials of PCBs," Xu says.

Journal reference:

1. Guo et al. **A Plate Produced by Nonmetallic Materials of Pulverized Waste Printed Circuit Boards**. *Environmental Science & Technology*, 2008; 42 (14): 5267 DOI: 10.1021/es800825u

Adapted from materials provided by American Chemical Society.

http://www.sciencedaily.com/releases/2008/08/080804100148.htm

Happiness Lengthens Life

ScienceDaily (Aug. 5, 2008) — Happiness does not heal, but happiness protects against falling ill. As a result, happy people live longer. The size of the effect on longevity is comparable to that of smoking or not.

This is concluded from an analysis of 30 follow-up studies published in a recent issue of the Journal of Happiness Studies.

There have been more reports of happy people living longer, but for long it was unclear whether happiness causes longevity, since it can also be that good health add both to happiness and longevity.

Scientists assess causality using long-term follow-up studies, taking initial health into account. The results of such studies seemed contradictory; several studies found the expected causal effect of happiness on longevity, but other studies found no effect and some observed even earlier death among the happy. The analysis of 30 follow-up studies showed that the difference is in the people under investigation.

Happiness does not lengthen the life of seriously ill people, but it does prolong the life of healthy people. Happiness appears to protect against falling ill. One of the mechanisms behind that effect seems to be that chronic unhappiness causes stress, which on its turn reduces immune response.

Another possible mechanism is that happiness adds to the chance of adopting a healthy life style.

An implication of this finding is that public health can also be promoted by policies that aim at greater happiness for a greater number.

Journal reference:

1. Veenhoven et al. **Healthy happiness: effects of happiness on physical health and the consequences for preventive health care**. *Journal of Happiness Studies*, 2008; 9 (3): 449 DOI: 10.1007/s10902-006-9042-1

Adapted from materials provided by Erasmus University Rotterdam.

http://www.sciencedaily.com/releases/2008/08/080805075614.htm

Arctic Map shows dispute hotspots

VIEW THE MAP
Most computers will open this document automatically, but you may need Adobe Reader

British scientists say they have drawn up the first detailed map to show areas in the Arctic that could become embroiled in future border disputes.

A team from Durham University compiled the outline of potential hotspots by basing the design on historical and ongoing arguments over ownership.

Russian scientists caused outrage last year when they planted their national flag on the seabed at the North Pole.

The UK researchers hope the map will inform politicians and policy makers.

"Its primary purpose is to inform discussions and debates because, frankly, there has been a lot of rubbish about who can claim (sovereignty) over what," explained Martin Pratt, director of the university's International Boundaries Research Unit (IBRU).

"To be honest, most of the other maps that I have seen in the media have been very simple," he added.

"We have attempted to show all known claims; agreed boundaries and one thing that has not appeared on any other maps, which is the number of areas that could be claimed by Canada, Denmark and the US."

Energy security is driving interest, as is the fact that Arctic ice is melting more and more during the summer
Martin Pratt,
Durham University

The team used specialist software to construct the nations' boundaries, and identify what areas could be the source of future disputes.

"All coastal states have rights over the resources up to 200 nautical miles from their coastline," Mr Pratt said. "So, we used specialist geographical software to 'buffer' the claims out accurately."

The researchers also took into account the fact that some nations were able to extend their claims to 350 nautical miles as a result of their landmasses extending into the sea.

Back on the agenda

The issue of defining national boundaries in the Arctic was brought into sharp relief last summer when a team of Russian explorers used their submarine to plant their country's flag on the seabed at the North Pole.

A number of politicians from the nations with borders within the Arctic, including Canada's foreign minister, saw it as Moscow furthering its claim to territory within the region.

Mr Pratt said a number of factors were driving territorial claims back on to the political agenda.

"Energy security is driving interest, as is the fact that Arctic ice is melting more and more during the summer," he told BBC News. "This is allowing greater exploration of the Arctic seabed."

Data released by the US Geological Survey last month showed that the frozen region contained an estimated 90 billion barrels of untapped oil.

Mr Pratt added that the nations surrounding the Arctic also only had a limited amount of time to outline their claims.

"If they don't define it within the timeframe set out by the UN Convention on the Law of the Sea, then it becomes part of what is known as 'The Area', which is administered by the International Seabed Authority on behalf of humanity as a whole."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/staging_site/in_depth/the_green_room/7543837.stm

Published: 2008/08/05 23:15:02 GMT

Sleep on It: How Snoozing Makes You Smarter

During slumber, our brain engages in data analysis, from strengthening memories to solving problems

By Robert Stickgold and Jeffrey M. Ellenbogen

In 1865 Friedrich August Kekulé woke up from a strange dream: he imagined a snake forming a circle and biting its own tail. Like many organic chemists of the time, Kekulé had been working feverishly to describe the true chemical structure of benzene, a problem that continually eluded understanding. But Kekulé's dream of a snake swallowing its tail, so the story goes, helped him to accurately realize that benzene's structure formed a ring. This insight paved the way for a new understanding of organic chemistry and earned Kekulé a title of nobility in Germany.

Although most of us have not been ennobled, there is something undeniably familiar about Kekulé's problem-solving method. Whether deciding to go to a particular college, accept a challenging job offer or propose to a future spouse, "sleeping on it" seems to provide the clarity we need to piece together life's puzzles. But how does slumber present us with answers?

The latest research suggests that while we are peacefully asleep our brain is busily processing the day's information. It combs through recently formed memories, stabilizing, copying and filing them, so that they will be more useful the next day. A night of sleep can make memories resistant to interference from other information and allow us to recall them for use more effectively the next morning. And sleep not only strengthens memories, it also lets the brain sift through newly formed memories, possibly even identifying what is worth keeping and selectively maintaining or enhancing these aspects of a memory. When a picture contains both emotional and unemotional elements, sleep can save the important emotional parts and let the less relevant background drift away. It can analyze collections of memories to discover relations among them or identify the gist of a memory while the unnecessary details fade—perhaps even helping us find the meaning in what we have learned.

Not Merely Resting

If you find this news surprising, you are not alone. Until the mid-1950s, scientists generally assumed that the brain was shut down while we snoozed. Although German psychologist Hermann Ebbinghaus had evidence in 1885 that sleep protects simple memories from decay, for decades researchers attributed the effect to a passive protection against interference. We forget things, they argued, because all the new information coming in pushes out the existing memories. But because there is nothing coming in while we get shut-eye, we simply do not forget as much.

Then, in 1953, the late physiologists Eugene Aserinsky and Nathaniel Kleitman of the University of Chicago discovered the rich variations in brain activity during sleep, and scientists realized they had been missing something important. Aserinsky and Kleitman found that our sleep follows a 90-minute cycle, in and out of rapid-eye-movement (REM) sleep. During REM sleep, our brain waves—the oscillating electromagnetic signals that result from large-scale brain activity—look similar to those produced while we are awake. And in subsequent decades, the late Mircea Steriade of Laval University in Quebec and other neuroscientists discovered that individual collections of neurons were independently firing in between these REM phases, during periods known as slow-wave sleep, when large populations of brain cells fire synchronously in a steady rhythm of one to four beats each second. So it became clear that the sleeping brain was not merely "resting," either in REM sleep or in slow-wave sleep. Sleep was doing something different. Something *active*.

Sleep to Remember

The turning point in our understanding of sleep and memory came in 1994 in a groundbreaking study. Neurobiologists Avi Karni, Dov Sagi and their colleagues at the Weizmann Institute of Science in Israel

showed that when volunteers got a night of sleep, they improved at a task that involved rapidly discriminating between objects they saw—but only when they had had normal amounts of REM sleep. When the subjects were deprived of REM sleep, the improvement disappeared. The fact that performance actually rose overnight negated the idea of passive protection. Something had to be happening within the sleeping brain that altered the memories formed the day before. But Karni and Sagi described REM sleep as a permissive state—one that *could* allow changes to happen—rather than a necessary one. They proposed that such unconscious improvements could happen across the day or the night. What was important, they argued, was that improvements could only occur during *part* of the night, during REM.

It was not until one of us (Stickgold) revisited this question in 2000 that it became clear that sleep could, in fact, be necessary for this improvement to occur. Using the same rapid visual discrimination task, we found that only with more than six hours of sleep did people's performance improve over the 24 hours following the learning session. And REM sleep was not the only important component: slow-wave sleep was equally crucial. In other words, sleep—in all its phases—does something to improve memory that being awake does not do.To understand how that could be so, it helps to review a few memory basics. When we "encode" information in our brain, the newly minted memory is actually just beginning a long journey during which it will be stabilized, enhanced and qualitatively altered, until it bears only faint resemblance to its original form. Over the first few hours, a memory can become more stable, resistant to interference from competing memories. But over longer periods, the brain seems to decide what is important to remember and what is not—and a detailed memory evolves into something more like a story.

In 2006 we demonstrated the powerful ability of sleep to stabilize memories and provided further evidence against the myth that sleep only passively (and, therefore, transiently) protects memories from interference. We reasoned that if sleep merely provides a transient benefit for memory, then memories after sleep should be, once again, susceptible to interference. We first trained people to memorize pairs of words in an A-B pattern (for example, "blanket-window") and then allowed some of the volunteers to sleep. Later they all learned pairs in an A-C pattern ("blanket-sneaker"), which were meant to interfere with their memories of the A-B pairs. As expected, the people who slept could remember more of the A-B pairs than people who had stayed awake could. And when we introduced interfering A-C pairs, it was even more apparent that those who slept had a stronger, more stable memory for the A-B sets. Sleep changed the memory, making it robust and more resistant to interference in the coming day.But sleep's effects on memory are not limited to stabilization. Over just the past few years, a number of studies have demonstrated the sophistication of the memory processing that happens during slumber. In fact, it appears that as we sleep, the brain might even be dissecting our memories and retaining only the most salient details. In one study we created a series of pictures that included either unpleasant or neutral objects on a neutral background and then had people view the pictures one after another. Twelve hours later we tested their memories for the objects and the backgrounds. The results were quite surprising. Whether the subjects had stayed awake or slept, the accuracy of their memories dropped by 10 percent for everything. Everything, that is, except for the memory of the emotionally evocative objects after night of sleep. Instead of deteriorating, memories for the emotional objects actually seemed to improve by a few percent overnight, showing about a 15 percent improvement relative to the deteriorating backgrounds. After a few more nights, one could imagine that little but the emotional objects would be left. We know this culling happens over time with real-life events, but now it appears that sleep may play a crucial role in this evolution of emotional memories.

Precisely how the brain strengthens and enhances memories remains largely a mystery, although we can make some educated guesses at the basic mechanism. We know that memories are created by altering the strengths of connections among hundreds, thousands or perhaps even millions of neurons, making certain patterns of activity more likely to recur. These patterns of activity, when reactivated, lead to the recall of a memory—whether that memory is where we left the car keys or a pair of words such as "blanket-window." These changes in synaptic strength are thought to arise from a molecular process known as long-term potentiation, which strengthens the connections between pairs of neurons that fire at the same time. Thus, cells that fire together wire together, locking the pattern in place for future recall.

During sleep, the brain reactivates patterns of neural activity that it performed during the

day, thus strengthening the memories by long-term potentiation. In 1994 neuroscientists Matthew Wilson and Bruce McNaughton, both then at the University of Arizona, showed this effect for the first time using rats fitted with implants that monitored their brain activity. They taught these rats to circle a track to find food, recording neuronal firing patterns from the rodents' brains all the while. Cells in the hippocampus—a brain structure critical for spatial memory—created a map of the track, with different "place cells" firing as the rats traversed each region of the track [see "The Matrix in Your Head," by James J. Knierim; Scientific American Mind, June/July 2007]. Place cells correspond so closely to exact physical locations that the researchers could monitor the rats' progress around the track simply by watching which place cells were firing at any given time. And here is where it gets even more interesting: when Wilson and McNaughton continued to record from these place cells as the rats slept, they saw the cells continuing to fire in the same order—as if the rats were "practicing" running around the track in their sleep.As this unconscious rehearsing strengthens memory, something more complex is happening as well—the brain may be selectively rehearsing the more difficult aspects of a task. For instance, Matthew P. Walker's work at Harvard Medical School in 2005 demonstrated that when subjects learned to type complicated sequences such as 4-1-3-2-4 on a keyboard (much like learning a new piano score), sleeping between practice sessions led to faster and more coordinated finger movements. But on more careful examination, he found that people were not simply getting faster overall on this typing task. Instead each subject was getting faster on those particular keystroke sequences at which he or she was worst.

The brain accomplishes this improvement, at least in part, by moving the memory for these sequences overnight. Using functional magnetic resonance imaging, Walker showed that his subjects used different brain regions to control their typing after they had slept. The next day typing elicited more activity in the right primary motor cortex, medial prefrontal lobe, hippocampus and left cerebellum—places that would support faster and more precise key-press movements—and less activity in the parietal cortices, left insula, temporal pole and frontopolar region, areas whose suppression indicates reduced conscious and emotional effort. The entire memory got strengthened, but especially the parts that needed it most, and sleep was doing this work by using different parts of the brain than were used while learning the task.

Solutions in the Dark

These effects of sleep on memory are impressive. Adding to the excitement, recent discoveries show that sleep also facilitates the active analysis of new memories, enabling the brain to solve problems and infer new information. In 2007 one of us (Ellenbogen) showed that the brain learns while we are asleep. The study used a transitive inference task; for example, if Bill is older than Carol and Carol is older than Pierre, the laws of transitivity make it clear that Bill is older than Pierre. Making this inference requires stitching those two fragments of information together. People and animals tend to make these transitive inferences without much conscious thought, and the ability to do so serves as an enormously helpful cognitive skill: we discover new information (Bill is older than Pierre) without ever learning it directly.

The inference seems obvious in Bill and Pierre's case, but in the experiment, we used abstract colored shapes that have no intuitive relation to one another, making the task more challenging. We taught people so-called premise pairs—they learned to choose, for example, the orange oval over the turquoise one, turquoise over green, green over paisley, and so on. The premise pairs imply a hierarchy—if orange is a better choice than turquoise and turquoise is preferred to green, then orange should win over green. But when we tested the subjects on these novel pairings 20 minutes after they learned the premise pairs, they had not yet discovered these hidden relations. They chose green just as often as they chose orange, performing no better than chance.

When we tested subjects 12 hours later on the same day, however, they made the correct choice 70 percent of the time. Simply allowing time to pass enabled the brain to calculate and learn these transitive inferences. And people who slept during the 12 hours performed significantly better, linking the most distant pairs (such as orange versus paisley) with 90 percent accuracy. So it seems the brain needs time after we learn information to process it, connecting the dots, so to speak—and sleep provides the maximum benefit.

In a 2004 study Ullrich Wagner and others in Jan Born's laboratory at the University of Lübeck in Germany elegantly demonstrated just how powerful sleep's processing of memories can be. They taught subjects how to solve a particular type of mathematical problem by using a long and tedious procedure and had them practice it about 100 times. The subjects were then sent away and told to come back 12 hours later, when they were instructed to try it another 200 times.What the researchers had not told their subjects was that there is a much simpler way to solve these problems. The researchers could tell if and when subjects gained insight into this shortcut, because their speed would suddenly increase. Many of the subjects did, in fact, discover the trick during the second session. But when they got a night's worth of sleep between the two sessions, they were more than two and a half times more likely to figure it out—59 percent of the subjects who slept found the trick, compared with only 23 percent of those who stayed awake between the sessions. Somehow the sleeping brain was solving this problem, without even knowing that there was a problem to solve.

The Need to Sleep

As exciting findings such as these come in more and more rapidly, we are becoming sure of one thing: while we sleep, our brain is anything but inactive. It is now clear that sleep can consolidate memories by enhancing and stabilizing them and by finding patterns within studied material even when we do not know that patterns might be there. It is also obvious that skimping on sleep stymies these crucial cognitive processes: some aspects of memory consolidation only happen with more than six hours of sleep. Miss a night, and the day's memories might be compromised—an unsettling thought in our fast-paced, sleep-deprived society.

But the question remains: Why did we evolve in such a way that certain cognitive functions happen only while we are asleep? Would it not seem to make more sense to have these operations going on in the daytime? Part of the answer might be that the evolutionary pressures for sleep existed long before higher cognition—functions such as immune system regulation and efficient energy usage (for instance, hunt in the day and rest at night) are only two of the many reasons it makes sense to sleep on a planet that alternates between light and darkness. And because we already had evolutionary pressure to sleep, the theory goes, the brain evolved to use that time wisely by processing information from the previous day: acquire by day; process by night.Or it might have been the other way around. Memory processing seems to be the only function of sleep that actually requires an organism to truly sleep—that is, to become unaware of its surroundings and stop processing incoming sensory signals. This unconscious cognition appears to demand the same brain resources used for processing incoming signals when awake. The brain, therefore, might have to shut off external inputs to get this job done. In contrast, although other functions such as immune system regulation might be more readily performed when an organism is inactive, there does not seem to be any reason why the organism would need to lose awareness. Thus, it may be these other functions that have been added to take advantage of the sleep that had already evolved for memory.

Many other questions remain about our nighttime cognition, however it might have evolved. Exactly how does the brain accomplish this memory processing? What are the chemical or molecular activities that account for these effects? These questions raise a larger issue about memory in general: What makes the brain remember certain pieces of information and forget others? We think the lesson here is that understanding sleep will ultimately help us to better understand memory.

The task might seem daunting, but these puzzles are the kind on which scientists thrive—and they can be answered. First, we will have to design and carry out more and more experiments, slowly teasing out answers. But equally important, we are going to have to sleep on it.

Note: This article was originally published with the title, "Quiet! Sleeping Brain at Work."

http://www.sciam.com:80/article.cfm?id=how-snoozing-makes-you-smarter&print=true

How magicians control your mind

Magic isn't just a bag of tricks - it's a finely-tuned technology for shaping what we see. Now researchers are extracting its lessons.

By Drake Bennett | August 3, 2008

In September of 1856, in the face of a growing rebellion, Napoleon III dispatched Jean-Eugene Robert-Houdin to Algeria. Robert-Houdin was not a general, nor a diplomat. He was a magician - the father, by most accounts, of modern magic. (A promising young escape artist named Ehrich Weiss would, a few decades later, choose his stage name by adding an "i" to "Houdin.") His mission was to counter the Algerian marabouts, conjurers whose artful wizardry had helped convince the Algerian populace of Allah's displeasure with French rule.

A French colonial official assembled an audience of Arab chieftains, and Robert-Houdin put on a show that, in its broadest outlines, would be familiar to today's audiences: he pulled cannonballs out of his hat, he plucked lit candelabra out of the air, he poured gallon upon gallon of coffee out of an empty silver bowl.

Then, as he recounted in his memoirs, Robert-Houdin launched into a piece of enchantment calculated to cow the chieftains. He had a small wooden chest with a metal handle brought onto the stage. He picked a well-muscled member of the audience and asked him to lift the box; the man did it easily. Then Robert-Houdin announced, with a menacing wave of his hand, that he had sapped the man's strength. When the volunteer again took hold of the box, it would not budge - an assistant to Robert-Houdin had activated a powerful magnet in the floor of the stage. The volunteer heaved at the box, his frustration shading into desperation until Robert-Houdin's assistant, at a second signal, sent an electric shock through the handle, driving the man screaming from the stage. The chieftains were duly impressed, and the rebellion quelled.

The story of Robert-Houdin's diplomacy by legerdemain is well-established in magic lore, in large part because it is the only documented instance, at least since antiquity, in which a conjurer changed the course of world affairs. Stage magic, after all, isn't statecraft, but spectacle and entertainment.

In the past year, though, a few researchers have begun to realize that magic represents something more: a deep and untapped store of knowledge about the human mind.

At a major conference last year in Las Vegas, in a scientific paper published last week and another due out this week, psychologists have argued that magicians, in their age-old quest for better ways to fool people, have been engaging in cutting-edge, if informal, research into how we see and comprehend the world around us. Just as studying the mechanisms of disease reveals the workings of our body's defenses, these psychologists believe that studying the ways a talented magician can short-circuit our perceptual system will allow us to better grasp how the system is put together.

"I think magicians and cognitive neuroscientists are getting at similar questions, but while neuroscientists have been looking at this for a few decades, magicians have been looking at this for centuries, millennia probably," says Susana Martinez-Conde, a neuroscientist at the Barrow Neurological Institute and coauthor of one of the studies, published online last week in Nature Reviews Neuroscience. "What magicians do is light-years ahead in terms of sophistication and the power of these techniques."

As magicians have long known and neuroscientists are increasingly discovering, human perception is a jury-rigged apparatus, full of gaps and easily manipulated. The collaboration between science and magic is still young, and the findings preliminary, but interest among scholars is only growing: the New York Academy of Science has invited the magician Apollo Robbins to give a presentation in January on the science of vision, and a team of magicians is scheduled to speak at next year's annual meeting of the

Society for Neuroscience, the world's largest organization of brain researchers.

And in a world where concentration is a scarce resource, a better understanding of how to channel it would have myriad uses, from safer dashboard displays to more alluring advertisements - and even, perhaps, to better magic.

BREAK

A great deal of the success of a piece of magic is simply getting the audience's attention and sending it to the wrong place - to a right hand flourishing a wand while the left secrets a ball away in a pocket or plucks a card from a sleeve. Magic shows are masterpieces of misdirection: they assault us with bright colors and shiny things, with puffs of smoke and with the constant obfuscatory patter that many magicians keep up as they perform.

For years, cognitive scientists thought of perception as like a movie camera, something that reproduced the world in its panoply of detail. Over the past decade, though, that model has been increasingly questioned. For one thing, people have a pronounced tendency to miss things that are happening right in front of them. Daniel Simons, a psychologist at the University of Illinois, did a series of now-famous studies in the late 1990s that showed the extent of this cognitive blindness. In one, people were approached by someone asking them for directions, only to have, in the middle of the conversation, that person replaced by another. Only half noticed the change.

In another study, people were shown a movie clip of two teams, one in black shirts and one in white, each passing a basketball around. The subjects were asked to count the number of passes one of the teams made. Half said afterward that they hadn't noticed the woman in a gorilla suit who, midway through the clip, strolled through, paused, and beat her chest.

Because of work like this, a new model has arisen over the past decade, in which visual cognition is understood not as a camera but something more like a flashlight beam sweeping a twilit landscape. At any particular instant, we can only see detail and color in the small patch we are concentrating on. The rest we fill in through a combination of memory, prediction and a crude peripheral sight. We don't take in our surroundings so much as actively and constantly construct them.

"Our picture of the world is kind of a virtual reality," says Ronald A. Rensink, a professor of computer science and psychology at the University of British Columbia and coauthor of a paper on magic and psychology that will be published online this week in Trends in Cognitive Sciences. "It's a form of intelligent hallucination."

The benefit of these sorts of cognitive shortcuts is that they allow us to create a remarkably rich image of our environment despite the fact that our two optic nerves have roughly the resolution of cell-phone cameras. We don't have to, for example, waste time making out every car on the highway to understand that they are, indeed, cars, and to make sense of how they are moving - our minds can simply approximate from the thousands of cars we have already seen in our lives.

But because this method relies so heavily on expectation - not only to fill in the backdrop around us but to determine where to send what psychologists call our "attentional spotlight" - we are especially vulnerable to someone who knows our expectations and can manipulate them, someone like a magician.

"In magic," says Teller, half of the well-known duo Penn & Teller and one of five magicians credited as coauthors of the Nature Reviews Neuroscience paper, "we tend to take the things that make us smart as human beings and turn those against us."

Misdirection is, in a sense, the conjurer's tool that is easiest to understand - we miss things simply because

we aren't looking at them. Martinez-Conde is particularly interested in misdirection, and the question of what it is about certain movements that attract and hold our attention. Robbins, a performing pickpocket and another of the magicians to coauthor the Nature Neuroscience paper, has found, he says, that semi-circular gestures draw people's attention better than straight ones. "It engages them more," he says. "I use them when I'm actually coming out of the pocket."

Martinez-Conde is intrigued by this distinction, and has hypothesized that the particular magnetism of curved motions might spring from the fact that they don't map as easily onto the quick, straight movements, or saccades, that our eyes instinctively use to focus on objects. As a result, she suggests, curved motions might require more sustained attention and concentration to follow.

Other effects, though, are more befuddling. Often eye-tracking studies show that subjects can be looking right at an object without seeing it - car accident survivors report a similar paradox. Or, with just a little encouragement, a person can be made to see something where there's nothing.

The vanishing ball illusion is one of the most basic tricks a magician can learn: a ball is thrown repeatedly into the air and caught. Then, on the final throw, it disappears in midair. In fact, the magician has merely mimed the last throw, following the ball's imagined upward trajectory with his eyes while keeping it hidden in his hand.But if the technique is easily explained, the phenomenon itself is not. If done right, the trick actually makes observers see the ball rising into the air on the last toss and vanishing at its apex. As Rensink points out, this is something more powerful than merely getting someone to look in the wrong direction - it's a demonstration of how easy it is to nudge the brain into the realm of actual hallucination. And cognitive scientists still don't know exactly what's causing it to happen.

For the moment, the cognitive scientists looking at magic are confining themselves to these sorts of simple effects, and the fundamental questions they raise. Eventually, though, Rensink envisions a sort of periodic table of attention effects: methods for getting someone's attention, methods for deflecting it, methods for causing someone to be blind to something they're looking directly at. Such a taxonomy, he argues, wouldn't just be helpful to magicians. The control and management of attention is vital in all sorts of realms. Airplane cockpits and street signs would be designed better, security guards would be trained to be more alert, computer graphics would feel more natural, teaching less coercive.

Still, even if none of this came to pass, there's a value in simply coming to grips with the gaps and limits in our awareness. Like Robert-Houdin's audience, awed by a magnet, we are more easily manipulated and more likely to put ourselves in compromising situations if we don't know what we don't know.

"The main thing is knowing that you've got limitations," says the cognitive researcher Daniel Simons. "Most people don't understand the extent to which talking on a cellphone affects their driving."

According to Teller, magic, more than anything else, serves as that reminder. And that explains why, despite its comparatively humble effects, it continues even in the age of Imax to attract practitioners and audiences. "The fundamental thing we do every day is ascertain what is reality, it's this diagnosis of what the signals coming into our eyes are supposed to mean," he says. "We say, 'That's a fence, I must not walk into it,' or, 'Is that a car coming around the corner? How much can I see of it? Oh, no, it's only a bicycle.' "

What draws people to magic, he believes, is an appreciation of how slippery that seemingly simple diagnosis can be.

"They realize," he says, "that the best way to grasp the power of deception is to do it themselves."

Drake Bennett is the staff writer for Ideas. E-mail drbennett@globe.com. ■

http://www.boston.com/bostonglobe/ideas/articles/2008/08/03/how_magicians_control_your_mind/

The Innumeracy of Intellectuals

By Chad Orzel

I know nothing about art or music.

OK, that's not entirely true — I know a little bit here and there. I just have no systematic knowledge of art or music (by which I mean fine art and classical music). I don't know Beethoven from Bach, Renaissance from Romantics. I'm not even sure those are both art terms.

Despite the sterling reputation of the department, I never took an art history class when I was an undergraduate at Williams College, nor did I take any music classes. They weren't specifically required, and I was a physics major. My schedule was full of math and science classes, and I didn't feel I had time for six hours a week of looking at slides. It's a significant gap in my education.

Given my line of work, this is occasionally ... it doesn't rise to the level of a liability, but it's awkward. I'm a professor at a liberal arts college, putting me solidly in the "Intellectual" class, and there's a background assumption that anyone with as much education as I have will know something about history and philosophy and literature and art and classical music. I read enough to have literature covered, even if my knowledge is a little patchy, and I took enough classes in college to have a rough grasp of history and philosophy, but art and music are hopeless. When those subjects come up in conversation, I just smile and nod and change the topic as soon as possible. On those occasions when I'm forced to admit my ignorance (or, worse yet, the fact that I don't even like classical music), my colleagues tend to look a little sideways at me, and I can feel myself drop slightly in their estimation. Not knowing anything about those subjects makes me less of an Intellectual to most people in the academy.

I was reminded of this by a recent blog posting at Republic of T, which puts into stark relief what is missing from that list of background assumptions: math and science.

Intellectuals and academics are just assumed to have some background knowledge of the arts, and not knowing those things can count against you. Ignorance of math and science is no obstacle, though. I have seen tenured professors of the humanities say — in public faculty discussions, no less — "I'm just no good at math," without a trace of shame. There is absolutely no expectation that Intellectuals know even basic math.

Ignorance of math can even be a source of a perverse sort of pride— the bit of the blog post that reminded me of this is a call-back to an earlier post in which he relates his troubles with math, and how he exploited a loophole in his college rules to graduate without passing algebra. To me that anecdote reads as more proud than shameful— less "I'm not good at math" and more "I'm clever enough to circumvent the rules."

It's not entirely without shame, of course. In the paragraph immediately after the algebra anecdote, the author gets a little defensive:

Or is it worth considering that perhaps not everyone can "do" algebra, trig or calculus? Is it worth considering that perhaps there are even some smart people who aren't great at math and/or science?.. [A]re we to force every peg, round or square, into that hole at the expense of forcing students, who may be gifted in other equally important subjects, to drop out after a long series of demoralizing failures?

This is the exact same chippiness I hear from physics majors who are annoyed at having to take liberal arts classes in order to graduate. The only difference is that students seeking to avoid math or science classes can expect to get a sympathetic hearing from much of the academy, where the grousing of physics majors is written off as whining by nerds who badly need to expand their narrow minds.

In fairness, it's worth noting that some academics are against mandatory liberal arts instruction for science majors, and so are consistent in allowing the educated to avoid some subjects. But the avoidance

of math and science is a common and accepted part of many core curricula, and this attitude gets my back up.

I'm not exaggerating when I say that I think the lack of respect for math and science is one of the largest unacknowledged problems in today's society. And it starts in the academy — somehow, we have moved to a place where people can consider themselves educated while remaining ignorant of remarkably basic facts of math and science. If I admit an ignorance of art or music, I get sideways looks, but if I argue for taking a stronger line on math and science requirements, I'm being unreasonable. The arts are essential, but Math Is Hard, and I just need to accept that not everybody can handle it.

This has real consequences for society, and not just in the usual "without math, we won't be able to maintain our technical edge, and the Chinese will crush us in a few years" sense. You don't need to look past the front section of the paper. Our economy is teetering because people can't hack the math needed to understand how big a loan they can afford. We're not talking about vector calculus or analytical geometry here — we're mired in an economic crisis because millions of our citizens can't do arithmetic. And that state of affairs has come about in no small part because the people running the academy these days have no personal appreciation of math, and thus no qualms about coddling innumeracy.

I'm not entirely sure what to do about it, alas. I half want to start calling bullshit on this — to return the sideways looks when colleagues in the humanities and social sciences confess ignorance of science. I want to get in people's faces when they off-handedly dismiss math and science, in the same way that they get in people's faces for comments that hint at racial or gender insensitivity. I suspect that all this would accomplish is to get me a reputation as "that asshole who won't shut up about math," though, and people will stop inviting me to parties.

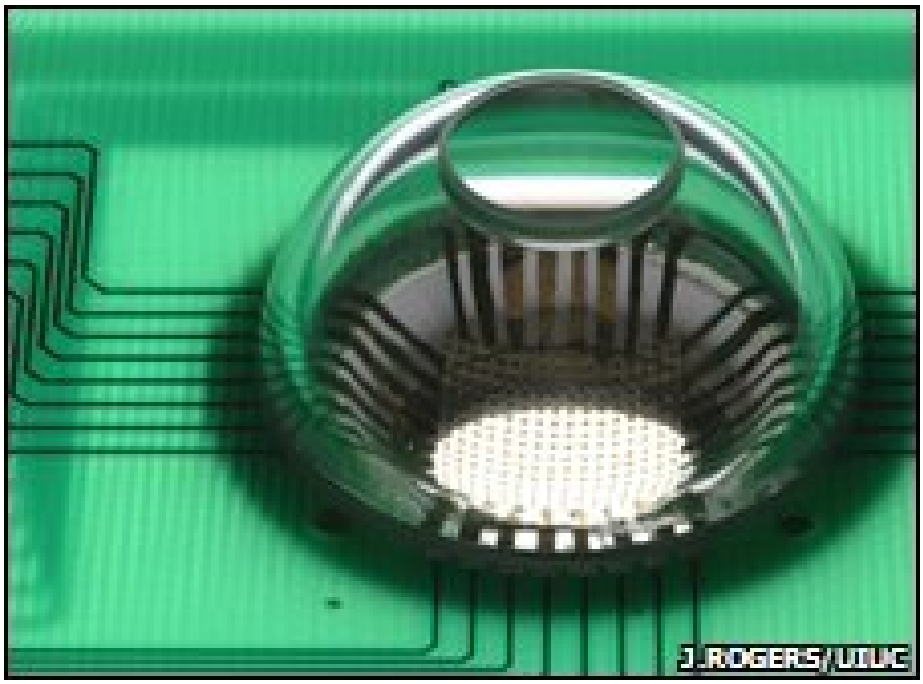
Sadly, I don't know what other solution there is. It simply should not be acceptable for people who are ignorant of math and science to consider themselves Intellectuals. Somehow, we need to move away from where we are and toward a place where confusing Darwin with Dawkins or Feynman with Faraday carries the same intellectual stigma as confusing Bach with Beethoven or Rembrandt with Reubens.

Chad Orzel is an associate professor of physics at Union College, in Schenectady, N.Y. This essay is adapted from a posting on his blog, Uncertain Principles. He is currently working on a book explaining quantum mechanics to a general audience — through imaginary conversations with his dog.

The original story and user comments can be viewed online at
http://insidehighered.com/views/2008/08/04/orzel.

Elastic electronics see better

By Jennifer Carpenter
Science reporter, BBC News



A new camera designed with a curved detection surface allows imaging devices to see as animals do.

The camera, inspired by the human eye, relies on the ability to construct silicon electronics on a stretchable membrane.

In the future, these electronic membranes could be wrapped around human organs to act as health monitoring devices, say US-based developers.

The new technology is described in a paper in the journal Nature.

Photosensitive displays - like the ones used in digital cameras - are made up of thousands of pixels and are usually formed on a flat, rigid, semiconductor wafer, explained Dr John Rogers from the University of Illinois at Urbana-Champaign, US, who led the team of researchers.

"No animal's eyes are like that; the retina is curved," Dr Rogers said.

"This curvature allows animals to see the world without distortion - unlike the images produced from cameras, which lose focus at the periphery."

Hoping to improve digital imaging, the Illinois-based researcher and his team, joined up with a group of mechanical engineers from Northwestern University, to make a camera shaped more like an eye.

The challenge was to import the thin, brittle wafer-based camera technology to a curved surface. The result was a 2cm-wide camera with a single, simple lens and a concave light detection system.

Wafer-thin

The team approached the initial problem by dicing up the surface of the silicone wafer into "chiplets" - tiny pieces of silicone that detect incoming light.

Then, the world's smallest cables, only one micron thick - the equivalent of 1/100 of the thickness of a human hair - provided the electrical connections between the adjacent chiplets to make a circuit.

Dr Rogers explained that if you squeeze the circuit, the cables allow the chiplets to move relative to each other.

Next, the team developed a curved elastic membrane.

Dr Rogers said that they had grabbed the edges of the membrane, pulling it in all directions, until taut and flat. Then the researchers dropped the mesh-like circuit of "photoreceptors" onto its surface.

"We released the membrane, let it snap back and saw that it puts all the photosensitive chips into compression," Dr Rogers said.

"The ribbons pop-up, forming bridges between the chiplets, and so maintain the electrical connections."

Flexible imaging

He added: "The interconnected mesh allows you to stretch, deform and reshape the circuit of photoreceptors [giving you an undistorted image]."

This is the first time anyone has moved electronics off rigid semiconductor wafers on to a fully flexible surface. The applications for this "flexible, stretchable" technology are vast, Dr Rogers told BBC News.

The photoreceptors could be swapped for any other type of receptor, and the whole circuit integrated into the human body for health monitoring.

"Look at the human body; there is nothing rigid about it," says Dr Rogers.

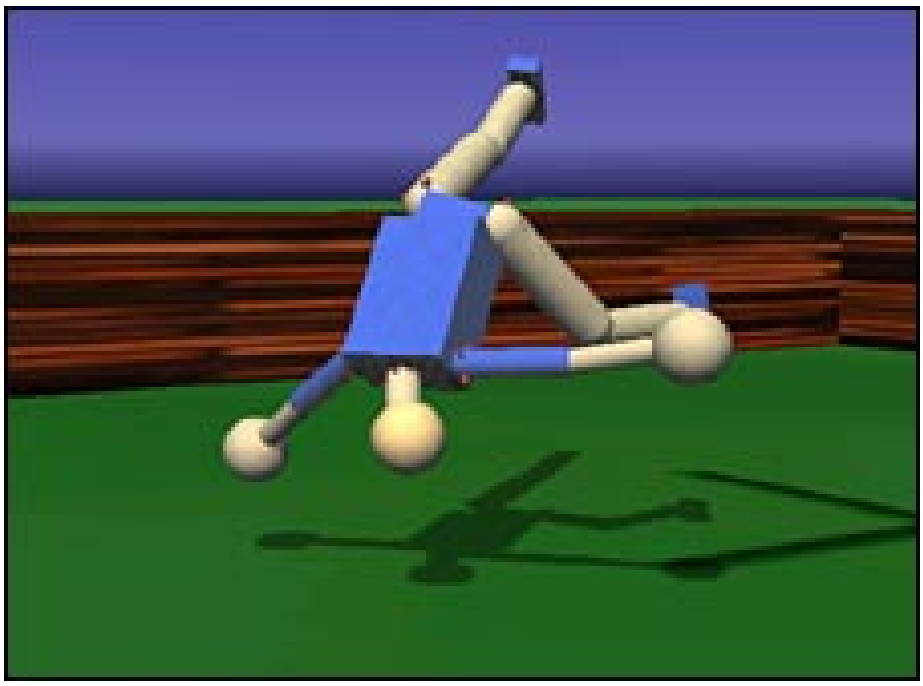
His team is already developing circuits that contain electrodes, housed in the same membrane, to wrap around portions of the brain in people suffering from epilepsy, to act as an early warning system for seizure.

This technology could also be used in the heart to emit tiny electrical signals, acting as a very advanced pacemaker.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/7543987.stm

Published: 2008/08/06 18:00:19 GMT

Robots learn to move themselves



Simulated characters that learn to use their limbs

Researchers in Leipzig have demonstrated software designed for robots that allows them to "learn" to move through trial and error.

The software mimics the interconnected sensing and processing of a brain in a so-called "neural network".

Armed with such a network, the simulated creatures start to explore.

In video demonstrations, a simulated dog learns to jump over a fence, and a humanoid learns how to get upright, as well as do back flips

Newborn baby

Ralf Der at the Max Planck Institute for Mathematics in the Sciences has also applied the software to simulated animals and humans.

The only input to the network is the types of motion that the robot can achieve; in the case of a humanoid, there are 15 joints and the angles through which they can move. No information about the robot's environment is given.

The network then sends out signals to move in a particular way, and predicts where it should end up, based on that movement.

If it encounters an obstacle such as itself, a wall or the floor, the prediction is wrong, and the robot tries different moves, learning about itself and its environment as it does so.

"In the beginning, we just drop a robot into a space. But they don't know anything, so they don't do anything," Professor Der said. The neural network eventually picks up on electronic noise, which causes small motions.

It eventually tries larger motions as it learns about its range of movement. "It's like a newborn baby—it doesn't know anything but tries motions that are natural for its body. Half an hour later, it's rolling and jumping," Professor Der said.

Autonomous

> **I call it a plug-and-play brain**
> Professor Der

This approach is far more flexible than traditional programming, in which movements are painstakingly planned out in a well-defined space. As conditions change, so can the robot's behaviour.

Moreover, the software can be used with any kind of robot, and Professor Der has tried the system on simple wheeled systems. "I call it a plug-and-play brain," he said.

"The classic thing in robotics is 'bring this' or 'play this chess game and win'—the task is given," says Daniel Polani of the University of Hertfordshire. "Ralf Der's system is only defined by what it perceives and does, but there's no goal. It's a very good approach."

For now, the network learns behaviours such as how to stand up, but promptly forgets them. Der and his colleagues are working to create a long-term memory, so that when the robot finds itself in similar situations, it knows what to do.

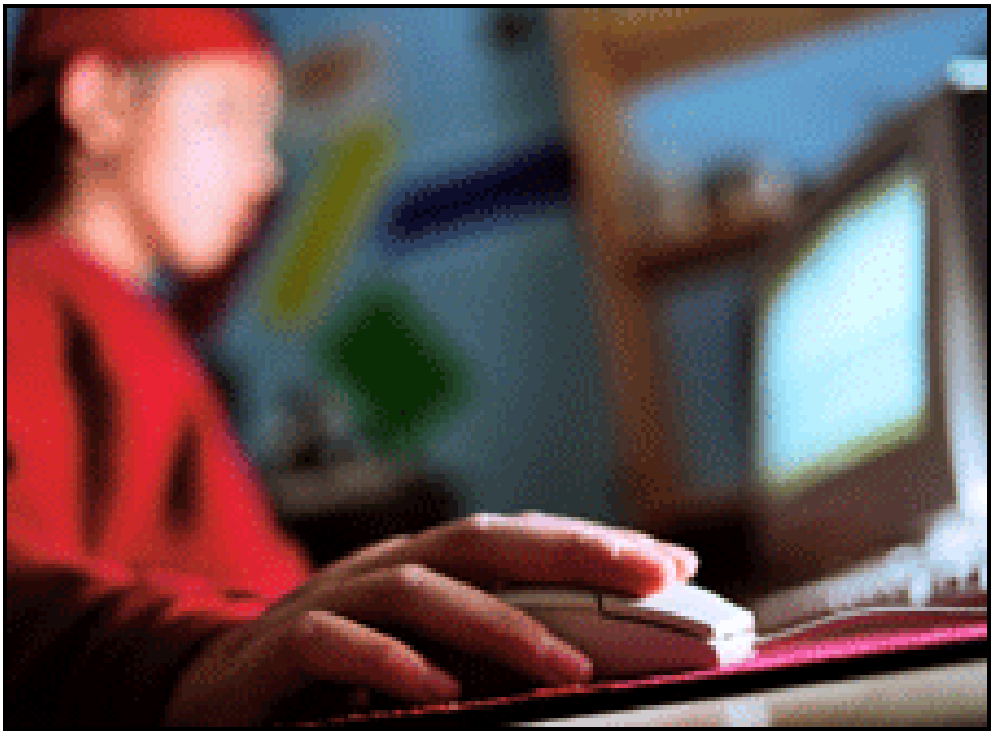
He will present the video demonstrations at the Artificial Life XI conference in Winchester this week.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/7544099.stm

Published: 2008/08/06 11:44:33 GMT

Children 'meet online strangers'

One in five British children has met a stranger they first encountered online, a survey suggests.



And as many as one in four 8-12 year olds ignore age restrictions to use social networking sites, such as Facebook, MySpace and Bebo.

The study of 1,030 parents and 1,000 children by online identity experts also found 72% of parents checked their offspring's web surfing habits.

Social networking sites have age restrictions of 13 or 14.

Identity firm Garlik found that a quarter of the parents surveyed said they secretly log into their child's networking page, to check they aren't befriending strangers.

And some 89% of parents interviewed spoke to their children about the dangers posed by social networking sites, and more than half - 58% - said they were more vigilant online now than a year ago.

Busy parents can't be expected to monitor their children's activities all the time

Tom Ilube
Garlik

More than a quarter of eight to 15-year-olds questioned admitted they have strangers as friends on social

networking sites and one in five say they have met up with strangers they first encountered online.

And two-thirds of the youngsters interviewed said they have posted personal information on their pages, including details of the school they attend and their mobile telephone number.

Tom Ilube, chief executive officer of Garlik, said "children are at the vanguard of the social networking phenomenon", using such sites such "in the same way other generations used the telephone".

"What you find with young people is that they tend to be a lot looser with their personal information than more canny older people.

"That can be OK if they are in a fairly tightly-controlled environment, but when they are in an environment where they're mixing with people much older than them, then that's something to be quite cautious about."

He said the summer holidays meant children will be spending hours on the internet, adding: "Busy parents can't be expected to monitor their children's activities all the time. What are Facebook, Bebo, MySpace and the others doing to help?"

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/7546482.stm

Published: 2008/08/07 03:44:31 GMT

Neurobiologists Discover Individuals Who 'Hear' Movement

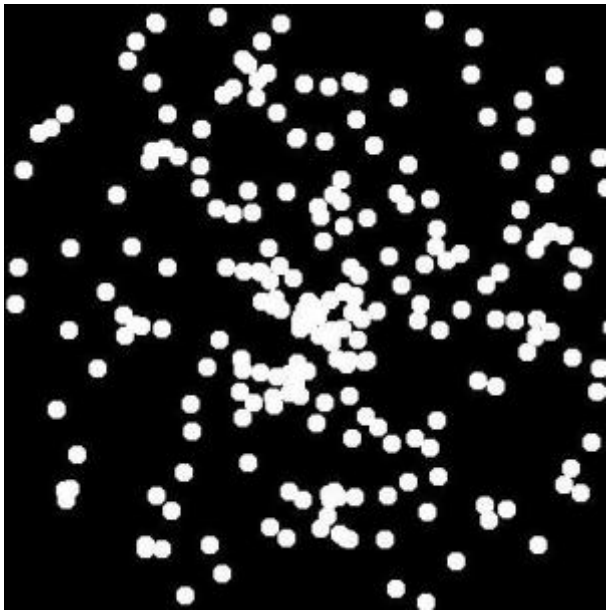


Image from a short video of moving dots. Some people hear sound when watching the video. (Link to full video at end of story.) (Credit: Image courtesy of California Institute of Technology)

ScienceDaily (Aug. 7, 2008) — Individuals with synesthesia perceive the world in a different way from the rest of us. Because their senses are cross-activated, some synesthetes perceive numbers or letters as having colors or days of the week as possessing personalities, even as they function normally in the world.

Now, researchers at the California Institute of Technology have discovered a type of synesthesia in which individuals hear sounds, such as tapping, beeping, or whirring, when they see things move or flash. Surprisingly, the scientists say, auditory synesthesia may not be unusual--and may simply represent an enhanced form of how the brain normally processes visual information.

Psychologists previously reported visual, tactile, and taste synesthesias, but auditory synesthesia had never been identified. Caltech lecturer in computation and neural systems Melissa Saenz discovered the phenomenon quite by accident.

"While I was running an experiment at the Caltech Brain Imaging Center, a group of students happened to pass by on a tour, and I volunteered to explain what I was doing," explains Saenz, who, along with Christof Koch, the Lois and Victor Troendle Professor of Cognitive and Behavioral Biology at Caltech and professor of computation and neural systems, reports the finding in the August 5 issue of the journal Current Biology.

"As part of the experiment, a moving display was running on my computer screen with dots rapidly expanding out, somewhat like the opening scene of Star Wars. Out of the blue, one of the students asked, "Does anyone else hear something when you look at that?" After talking to him further, I realized that his experience had all the characteristics of a synesthesia: an automatic sensory cross-activation that he had experienced all of his life," says Saenz.

A search of the synesthesia literature revealed that auditory synesthesia--of any kind--had never been reported. Intrigued, Saenz began to look for other individuals with the same ability, using the original movie seen by the student as a test. "I queried a few hundred people and three more individuals turned

up," she says. Having that specific example made it easy to find more people. That movie just happens to be quite "noisy" to the synesthetes and was a great screening tool. When asked if it made a sound, one of the individuals responded, "how could it not?" I would have been less successful had I just generally asked, "Do you hear sounds when you see things move or flash?" because in the real environment, things that move often really do make a sound," for example, a buzzing bee.

This may be why auditory synesthesia hadn't been detected by neurobiologists. "People with auditory synesthesia may be even less likely than people with other synesthetic associations to fully realize that their experience is unusual. These individuals have an enhanced soundtrack in life, rather than a dramatically different experience, compared to others," says Saenz. However, when asked, all of the synesthetes could name examples of daily visual events that caused sounds that they logically knew to be only in their minds, such as seeing a fluttering butterfly or watching television with the sound turned off.

Saenz and Koch found that the four synesthetes outperformed a group of nonsynesthetes on a simple test involving rhythmic patterns of flashes similar to visual Morse code. Normally, such patterns are easier to identify with sound (beeps) than with vision (flashes), so the researchers predicted that synesthetes would have an advantage with visual patterns because they actually heard a sound every time they saw a flash.

In the test, the subjects saw a series of flashes and had to guess if a second sequence, played afterward, represented the same temporal pattern or not. As a baseline measurement, a similar test was given using sequences of beeps. Both the synesthetes and the control group performed equally well when given beeps. However, with visual flashes synesthetes were much more accurate, responding correctly more than 75 percent of the time, compared to around 50 percent--the level predicted by chance--in the control group. "Synesthetes had an advantage because they not only saw but also heard the visual patterns," Saenz says.

Saenz and Koch suspect that as much as 1 percent of the population may experience auditory synesthesia. In fact, she and Koch think that the brain may normally transfer visual sensory information over to the auditory cortex, to create a prediction of the associated sound. "This translation might result in actual sound perception in synesthetes, perhaps due to stronger than normal connections, says Saenz, who has begun brain imaging experiments to study this connectivity in synesthetes and nonsynesthetes.

"We might find that motion processing centers of the visual cortex are more interconnected with auditory brain regions than previously thought, even in the 'normal' brain," Saenz says. "At this point, very little is known about how the auditory and visual processing systems of the brain work together. Understanding this interaction is important because in normal experience, our senses work together all the time."

The work was supported by the Mind Science Foundation, the Gordon and Betty Moore Foundation, the Mathers Foundation, and the National Institute of Mental Health.

View the video used to identify auditory synesthetes, in a quiet location, at http://www.klab.caltech.edu/~saenz/movingdots.html.

Adapted from materials provided by California Institute of Technology.

http://www.sciencedaily.com:80/releases/2008/08/080806140209.htm

How Bacteria Attach To Human Tissues During Infection Process: New Clues

ScienceDaily (Aug. 7, 2008) — Scientists at the University of York have helped to reveal more about the way bacteria can attach to human tissues. The study could help in the development of new treatments for serious heart conditions such as infective endocarditis.

The researchers studied the way a protein found on the surface of the bacteria Staphylococcus aureus binds to a human protein called fibronectin. Their discovery is an important step in understanding how bacteria attach to the surface of blood vessels during infection.

The high-resolution structures of parts of the bacterial protein in complex with multiple fibronectin domains reveals the efficiency with which the bacterial molecule can bind several copies of the human protein, a feature thought to play a role in infection.

Dr Jennifer Potts of the Departments of Biology and Chemistry at York, who led the research said: "Interactions of S. aureus with fibronectin were first reported more than 30 years ago, and yet we still don't understand precisely how and why the bacteria target this human protein.

"Our studies provide a significant step toward solving that issue and could help the future development of new treatments for rare but serious conditions such as infective endocarditis, an infection of the lining or valves of the heart."

The work, which was funded by the British Heart Foundation, the Biotechnology and Biological Sciences Research Council, and the Wellcome Trust, was undertaken by Dr Richard Bingham and Dr Nicola Meenan (Biology, York) in collaboration with other scientists at the Universities of York, Oxford, St Andrews, UNAM and the TAMU Health Science Centre, Institute of Biosciences and Technology, Houston.

The research used the York Structural Biology Laboratory (YSBL) at the University of York and facilities at the European Synchrotron Radiation Facility (ESRF) in Grenoble.

Journal reference:

1. . **Crystal structures of fibronectin-binding sites from Staphylococcus aureus FnBPA in complex with fibronectin domains**. *Proceedings of the National Academy of Sciences*, (in press)

Adapted from materials provided by University of York.
http://www.sciencedaily.com/releases/2008/08/080806113143.htm

Voluntary Exercise Does Not Appear To Alleviate Anxiety And Depression

ScienceDaily (Aug. 7, 2008) — Voluntary physical activity does not appear to cause a reduction in anxiety and depression, but exercise and mood may be associated through a common genetic factor, according to a new article.

In the general population, regular exercise is associated with reduced anxious and depressive symptoms, according to background information in the article. Experiments involving specific clinical populations have suggested that exercise causes this reduction in anxiety and depression. However, it is unclear whether this causal effect also occurs in the larger population or whether there is a third underlying factor influencing both physical activity and the risk for mood disorders.

Marleen H. M. De Moor, M.Sc., of VU University Amsterdam, the Netherlands, and colleagues studied 5,952 twins from the Netherlands Twin Register, along with 1,357 additional siblings and 1,249 parents. Participants, all aged 18 to 50, filled out surveys about leisure-time exercise and completed four scales measuring anxious and depressive symptoms.Associations observed between exercise and anxious and depressive symptoms "were small and were best explained by common genetic factors with opposite effects on exercise behavior and symptoms of anxiety and depression," the authors note. "In genetically identical twin pairs, the twin who exercised more did not display fewer anxious and depressive symptoms than the co-twin who exercised less." Exercise behavior in one identical twin predicted anxious and depressive symptoms in the other, meaning that if one twin exercised more, the other tended to have fewer symptoms.

However, the same was not true of dizygotic (fraternal) twins or other siblings, who share only part of their genetic material. In addition, analyses over time showed that individuals who increased their level of exercise did not experience a decrease in anxious and depressive symptoms.

"It is unknown which genes might be involved in voluntary exercise behavior and in the risk for anxiety and depression," the authors write, but genes involved in the brain pathways that process dopamine, norepinephrine, opioids or serotonin are likely candidates.

The results do not mean that exercise cannot benefit those with anxiety or depression, the authors note, only that additional trials would be needed to justify this type of therapy. "Only voluntary leisure-time exercise is influenced by genetic factors, whereas the other type of exercise [directed and monitored by someone else] is environment-driven. The absence of causal effects of voluntary exercise on symptoms of anxiety and depression does not imply that manipulation of exercise cannot be used to change such symptoms," they write. "The antidepressant effects of exercise may only occur if the exercise is monitored and part of a therapeutic program."

This study was supported by grants from the Netherlands Organization for Scientific Research.

Journal reference:

1. Marleen H. M. De Moor; Dorret I. Boomsma; Janine H. Stubbe; Gonneke Willemsen; Eco J. C. de Geus. **Geus Testing Causality in the Association Between Regular Exercise and Symptoms of Anxiety and Depression**. *Arch Gen Psychiatry*, 2008;65(8):897-905 [link]

Adapted from materials provided by JAMA and Archives Journals.

http://www.sciencedaily.com/releases/2008/08/080804165318.htm

'Exercise Pill' Is No Replacement For Real Exercise, Expert Cautions

ScienceDaily (Aug. 6, 2008) — Recently, researchers at the Salk Institute for Biological Studies, a research organization focused on biology and its relation to health, published a study in the journal Cell on the results of a substance that increased exercise endurance without daily exertion when tested in mice. Media reports have described this substance as an "exercise pill," potentially eliminating the need for exercise.

Frank Booth, a University of Missouri expert on the science of inactivity, says the "exercise pill" study did not test all of the commonly known benefits of exercise and taking the pill cannot be considered a replacement for exercise.

In the Cell paper "Exercise Mimetics" the researchers demonstrated that AMPK-PPARδ pathways, which is a cellular messenger system, can be targeted by orally active drugs to enhance training adaptation or even to increase endurance without exercise. However, Booth cautions that some of the commonly known benefits of exercise were not tested in the Cell paper including:

- Decreased resting and submaximal exercise heart rate
- Increased heart stroke volume at all exercise work loads
- Increased maximal exercise cardiac output
- Lower blood pressure and arterial stiffness
- Increased aerobic capacity

A complete list of the 26 benefits not tested in the paper is included below.

The prevention of the increased risk of chronic disease produced by lifelong physical inactivity also was not tested in the Cell paper. According to Katzmarzyk & Janssen (Can J Appl Physiol 29:90, 2004), human physical activity decreases the risk of:

- Coronary artery disease (decreases risk by 45 percent)
- Stroke (decreases risk by 60 percent)
- Hypertension (decreases risk by 30 percent)
- Colon cancer (decreases risk by 41 percent)
- Breast cancer (decreases risk by 30 percent)
- Type 2 diabetes (decreases risk by 50 percent)
- Osteoporosis (decreases risk by 59 percent)

Until targeting AMPK-PPARδ pathways by drugs is shown to have all the above listed exercise benefits in humans, it is premature to use the term "exercise mimetics" from the very limited observations of the Cell paper, Booth said. Booth's expectation, based upon his more than 40 years of research experience in exercise and physical inactivity adaptations, is that the drugs in the Cell paper will only partially imitate exercise. In order for any "exercise pill" to counter physical inactivity, the pill must be polygenic, or control many genes at once; therefore the Cell drugs are not likely to provide all of the benefits of comprehensive physical activity. In Booth's opinion, the drugs used in the Cell paper were not conclusively proven to mimic exercise, contrary to media reports.

Booth has more than 40 years of research experience in physiological, biochemical, molecular and genetic adaptations that occur during exercise. He is a professor in the MU College of Veterinary Medicine and the MU School of Medicine and a research investigator in the Dalton Cardiovascular Research Center. He is a member of the editorial boards of Journal of Applied Physiology, American

Journal of Physiology: Cell Physiology, Physiological Genomics and CardioMetabolic Syndrome.

Commonly known benefits of exercise not tested in the Cell paper were:

- Decreased resting and submaximal exercise heart rate
- Increased heart stroke volume at all exercise work loads
- Increased maximal exercise cardiac output
- Lower blood pressure and arterial stiffness
- Increased aerobic capacity
- Increased strength and cross-sectional area of skeletal muscle
- Delayed loss of muscle mass and strength with aging and physical frailty
- Improved balance and coordination
- Improved flexibility
- Reduced osteoporosis
- Reduced joint stress and back pain
- Decreased gallstone disease
- Improved endothelial function
- Decreased incidence of myocardial ischemia
- Less myocardial damage from ischemia
- Decreased oxidative stress
- Decreased inflammation
- Improved immune function
- Decreased liver steatosis and fatty liver disease
- Improved insulin sensitivity and reduced risk of type 2 diabetes
- Less likelihood of depression, anxiety, stress and poor psychological well-being
- Ameliorating hyperlipidemia: lower total cholesterol, higher HDL, and decreased blood triglycerides
- Improved cognitive function in the elderly
- Increased blood flow and neurogenesis in the dentate gyrus of the hypothalamus
- Prevention of the loss of brain volume in the elderly
- Delay in decline of physiological reserve in organ systems with aging

---

Adapted from materials provided by University of Missouri-Columbia.

http://www.sciencedaily.com/releases/2008/08/080805124013.htm

Rock Art Marks Transformations In Traditional Peruvian Societies

Most rock paintings and rock carvings or petroglyphs were created by ancient and prehistoric societies. (Credit: IRD Jean Guffroy)

ScienceDaily (Aug. 6, 2008) — Most rock paintings and rock carvings or petroglyphs were created by ancient and prehistoric societies. Archaeologists have long used them to gain clues to the way of life of such peoples. Certain rock frescos − such as the renowned Lascaux and Chauvet cave paintings or the petroglyphs of Scandinavia and North America − have already yielded substantial information on our ancestors' daily lives.

However, for other regions of the world like Latin America studies are still fragmentary. In Peru, where many sites have already been located, mystery still cloaks the signification and role of these concentrations of cave paintings and petroglyphs. One of these sites, Toro Muerto, in the South of the country, contains over 4000 carved blocks scattered over several dozen hectares.

Discoveries made in different areas of the country over recent years by Peruvian and international researchers are keys to improved understanding of the meaning behind these artistic representations which were realized over a long period from 10 000 BP to the arrival of the first Spanish Conquistadors in the XVIth Century, or even beyond that time, as in the Cuzco area.

Analysis of the distribution and characteristics of these sites brought out a distinction between the art produced in the coastal valleys from that of the Andean Cordillera uplands. The extensive sites with rocks carved in the open air are concentrated mainly on the Pacific facing slopes, whereas the scenes painted in

caves or under shelters predominate in the high regions and on the Amazon side.

These preferences as to the supports and techniques used reflect associated ritual practices which are probably rather different. Study of the oldest rock paintings and their dating by indirect methods (carbon 14 dating of remains of in situ burnt charcoal) showed them to be the work of hunter-gatherers who occupied the region between 7000 and 3000 BC The motifs are small and most often painted in red. They depict hunting scenes involving wild camelid species, such as the guanaco, and also human-like silhouettes. The latter are portrayed with animal-like rather than human faces. Such figures are usually armed with sticks, bows or assegais and sometimes carry nets.

The most ancient sites show a predominance of naturalistic representations of dead or wounded animals. However, a second set dated at 4000 to 5000 years BC eulogizes fertility. This time the images are large, drawn with the abdomen enormously swollen, sometimes containing a foetus. This stylistic development, which seems to coincide with the beginnings of animal husbandry in the high upland regions of Peru, appear to symbolize the emergence of pastoralism and the change in man—animal relationships that came along with this practice.

These research studies also brought into relief periods that were quite distinct in terms of stylistic evolution of carved figures. Whereas the most ancient motifs, associated with the rise of the first great Andean civilizations (2500-300 BC) essentially reproduced complex figures bearing high symbolic and spiritual content, depicting mythical, often monster-like, animals and supernatural beings, the later carvings characteristically appear in abundance and testify to a simplification of morphological features. The simplicity and relative abundance of these petroglyphs, which depict animals of the local fauna and also scenes from daily life, suggest a degree of generalization of rock carving practices to further sections of the society.

The largest sites dating from this era, which contain several hundred carved rocks with dozens of motifs, probably played a significant role in societies' cultural and social life, both at local and regional level. Their location, and some of the rituals that took place, may have been linked to areas of production and trade routes of prized commodities such as coca or salt. Other, geographical, factors like the confluence of two rivers or the proximity to communication routes also appear to have significantly influenced the context and purpose of these artistic representations.

A more extensive study of these archaeological sites, still strongly subjected to vandalism and erosion, is paramount. These vestiges testify to the ideological and social changes that occurred over a period of almost 8000 years, and can further understanding of the way of life and beliefs of peoples who were among the New World's first settlers.

Reference: Guffroy, J., New research into rock art in Peru (2000-2004), In :G. Bahn, A. Fossati (eds), Rock art studies. News of the world III, 2008, Oxbow: p 239-247

Adapted from materials provided by Institut de Recherche Pour le Développement, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2008/08/080804111634.htm

Why Some Smokers Become Addicted With Their First Cigarette

ScienceDaily (Aug. 6, 2008) — New research from The University of Western Ontario reveals how the brain processes the 'rewarding' and addictive properties of nicotine, providing a better understanding of why some people seemingly become hooked with their first smoke.

The research, led by Steven Laviolette of the Department of Anatomy and Cell Biology at the Schulich School of Medicine & Dentistry could lead to new therapies to prevent nicotine dependence and to treat nicotine withdrawal when smokers try to quit.

"Nicotine interacts with a variety of neurochemical pathways within the brain to produce its rewarding and addictive effects," explains Laviolette. "However, during the early phase of tobacco exposure, many individuals find nicotine highly unpleasant and aversive, whereas others may become rapidly dependent on nicotine and find it highly rewarding. We wanted to explore that difference."

The researchers found one brain pathway in particular uses the neurotransmitter 'dopamine' to transmit signals related to nicotine's rewarding properties. This pathway is called the 'mesolimbic' dopamine system and is involved in the addictive properties of many drugs of abuse, including cocaine, alcohol and nicotine.

"While much progress has been made in understanding how the brain processes the rewarding effects of nicotine after the dependence is established, very little is known about how the mesolimbic dopamine system may control the initial vulnerability to nicotine; that is, why do some individuals become quickly addicted to nicotine while others do not, and in some cases, even find nicotine to be highly aversive."

The scientists identified which specific dopamine receptor subtype controlled the brain's initial sensitivity to nicotine's rewarding and addictive properties and were able to manipulate these receptors to control whether the nicotine is processed as rewarding or aversive.

"Importantly, our findings may explain an individual's vulnerability to nicotine addiction, and may point to new pharmacological treatments for the prevention of it, and the treatment of nicotine withdrawal," says Laviolette. The research was funded by the Canadian Institutes of Health Research and the Canadian Psychiatric Research Foundation.

The paper is published in the August 6th Journal of Neuroscience.

Adapted from materials provided by University of Western Ontario, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2008/08/080805192727.htm

Wind Powered Vehicle, Ventomobile, Ready To Race In The Netherlands

Students of the Team InVentus at Stuttgart University constructed a vehicle that is solely powered by wind energy, the Ventomobile. (Credit: Tobias Klaus)

ScienceDaily (Aug. 6, 2008) — Students of the Team InVentus at Stuttgart University constructed a vehicle that is solely powered by wind energy, the Ventomobile. It took them many months of intense construction work to reach this goal.

The first wind tunnel testing produced very promising results. The stylish three-wheeler features a two-bladed rotor on top, with a diameter of two meters. The efficiency of this setup proved to be extremely good.

On August, 23rd the InVentus Ventomobile will compete in the Aeolus Race in Den Helder (Netherlands) on a three kilometre track with five teams from different universities and research institutes from all over Europe. In this first edition of RACING AEOLUS©, an event that is unique around the world, the teams are challenged to sail straight into the wind, solely driven by the power of wind.

Before the Ventomobile is sent on its way to the Netherlands, we would like to invite you to a presentation at the University campus in Vaihingen on Tuesday, the 12th of August. Attending journalists will get the opportunity to observe the vehicle during wind tunnel tests, to see the braiding of a drive shaft, and the laminating of a rotor blade.

InVentus was created by avid students of Aerospace Engineering in cooperation with the Endowed Chair of Wind Energy. “The Ventomobile is another proof of what can be done with renewable energies”, explains Prof Martin Kühn, Endowed Chair of Wind Energy at Stuttgart University, recalling the time when solar powered vehicles were in their first stages of development.

Adapted from materials provided by University of Stuttgart.

http://www.sciencedaily.com/releases/2008/08/080804123039.htm

One In Ten Children Using Cough, Cold Medications

ScienceDaily (Aug. 6, 2008) — Researchers from Boston University's Slone Epidemiology Center have found that approximately one in ten U.S. children uses one or more cough and cold medications during a given week.

Pediatric cough and cold medications are widely marketed in the U.S. but surprisingly little is known about just how often they are used in children. This information is especially important in light of recent revelations that cough and cold medications are responsible for serious adverse events and even deaths among children.

To define the frequency and patterns of use, the researchers analyzed data between 1999 and 2006 from the Slone Survey, a national telephone survey of medication use in a representative sample of the U.S. population. The authors considered all oral medicines that are approved by the FDA to treat children's coughs and colds.

The researchers found that in a given week, at least one cough and cold medication was used by 10.1 percent of U.S. children. In terms of active ingredients contained in these medications, exposure was highest to decongestants and antihistamines (6.3 percent each), followed by anti-cough ingredients (4.1 percent) and expectorants (1.5 percent).

Exposures to cough and cold medications was highest among 2- to 5-year olds and children under 2 years of age.

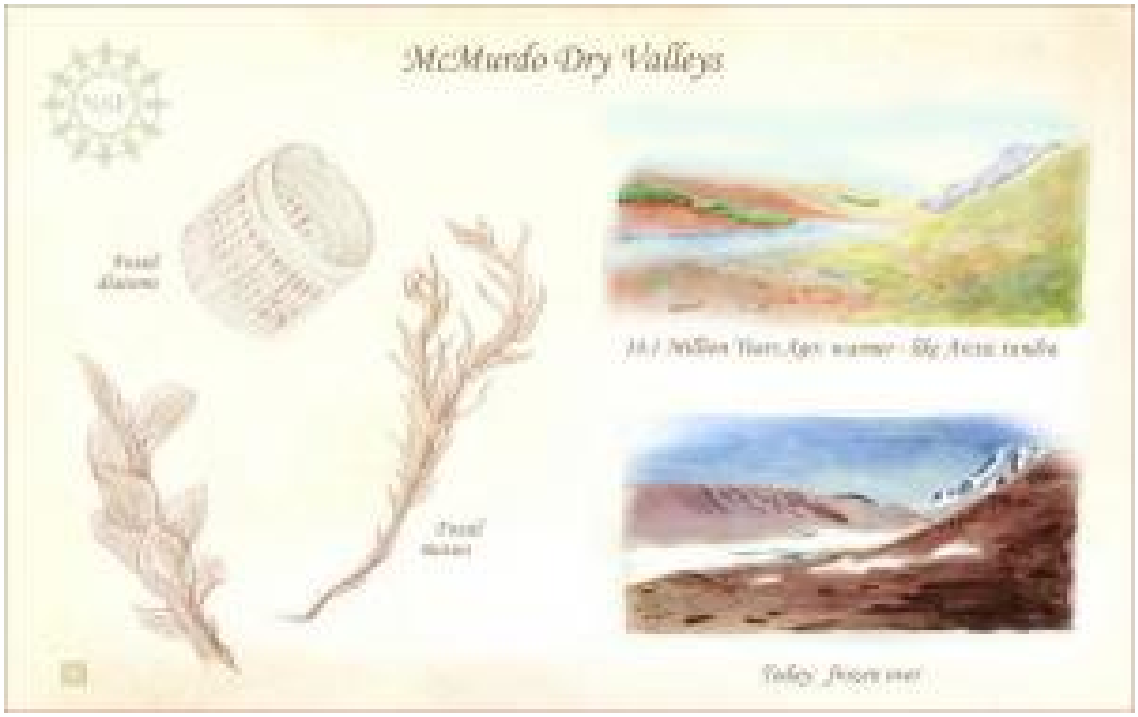
Among all the products used, 64.2 percent contained more than one active ingredient. The most commonly used product types were single-ingredient antihistamines, antihistamine/decongestant combinations and antihistamine/decongestant/anti-cough combinations. The researchers also found the use of cough and cold medications declined from 12.3 percent in 1999-2000 to 8.4 percent in 2005-2006.

According to the researchers the especially common use of cough and cold medications among young children is noteworthy. "Given concerns about potential harmful effects and lack of evidence proving that these medications are effective in young children, the fact that one in ten U.S. children is using one of these medications is striking," said lead author Louis Vernacchio, MD, MSc, an assistant professor of epidemiology and pediatrics at Boston University School of Medicine.

These findings appear in the August issue of the journal Pediatrics. Funding for this study was provided by the Slone Epidemiology Center at Boston University.

Adapted from materials provided by Boston University, via EurekAlert!, a service of AAAS.
http://www.sciencedaily.com/releases/2008/08/080804111648.htm

Antarctic Fossils Paint Picture Of Much Warmer Continent



Examples of fossils found in the McMurdo Dry Valleys. (Credit: Zina Deretsky/National Science Foundation)

ScienceDaily (Aug. 6, 2008) — National Science Foundation-funded scientists working in an ice-free region of Antarctica have discovered the last traces of tundra--in the form of fossilized plants and insects--on the interior of the southernmost continent before temperatures began a relentless drop millions of years ago.

An abrupt and dramatic climate cooling of 8 degrees Celsius, over a relatively brief period of geological time roughly 14 million years ago, forced the extinction of tundra plants and insects and transformed the interior of Antarctica into a perpetual deep-freeze from which it has never emerged.

The international team of scientists headed by David Marchant, an earth scientist at Boston University and Allan Ashworth and Adam Lewis, geoscientists at North Dakota State University, combined evidence from glacial geology, paleoecology, dating of volcanic ashes and computer modeling, to report a major climate change centered on 14 million years ago. The collaboration resulted in a major advance in the understanding of Antarctica's climatic history.

NSF, in its role as the manager of the United States Antarctic Program, supported Ashworth's, Lewis', and Marchant's research as well as U.S. researchers from Lamont-Doherty Earth Observatory, Ohio State University and the University of Montana.

Their findings appear in the Aug. 4 edition of the Proceedings of the National Academy of Sciences.

"To me, the most interesting part of the whole story is that we've documented the timing and the magnitude of a tremendous change in Antarctic climate: the transition marks a shift from warm, temperate glaciers with patches of fringing tundra to today's cold-polar glaciers set within in a barren polar desert," said Marchant. "The contrast couldn't be more striking. It is like comparing

Tierra del Fuego today with the surface of Mars--and this transition took place over a geologically short interval of roughly 200,000 years."

The discovery of lake deposits with perfectly preserved fossils of mosses, diatoms and ostracods, a type of small crustacean, is particularly exciting to scientists, noted Lewis. Fossils are extremely rare in Antarctica, especially those of terrestrial and freshwater plants and animals.

"They are the first to be found even though scientific expeditions have been visiting the Dry Valleys since their discovery during the first Scott expedition in 1902-1903," said Lewis. Robert Falcon Scott was a British Antarctic explorer who perished during an attempt to the first to reach the South Pole in 1912.

For Ashworth the fossils are a scientific treasure trove.

He said he was particularly struck that some species of diatoms and mosses are indistinguishable from living creatures. Today, these species occur throughout the world, except in Antarctica.

"To be able to identify living species amongst the fossils is phenomenal. To think that modern counterparts have survived 14 million years on Earth without any significant changes in the details of their appearances is striking. It must mean that these organisms are so well-adapted to their habitats that in spite of repeated climate changes and isolation of populations for millions of years they have not become extinct but have survived" said Ashworth, the principal paleoecologist in the research.

What makes the fossils especially valuable is that their context is known following years of detailed mapping of ancient glacial deposits in the western Olympus and Asgard mountain ranges of Antarctica by Marchant and Lewis. As part of their research, they discovered volcanic ashes which have been dated at Lamont-Doherty geochronology labs by researchers Sidney Hemming and Malka Machlus, coauthors in the study.

Lewis added that the fossils are the best dated so far to come from Antarctica.

The fossil location today high in the mountains is a completely frozen landscape.

Marchant, Lewis and Ashworth, who often spend months living in tents in the Dry Valleys doing their research, all said that the fossil finds stretch their imagination about how the Antarctic continent once looked.

"The fossil finds allow us to examine Antarctica as it existed just prior to climate cooling at 13.9 million years ago. It is a unique window into the past. On land, there are very few places on Earth that contain sediment of this age, and none are as well preserved as those found in the Dry Valleys," Marchant said. "The sediments allow reconstructions of alpine glaciers, tundra and lakes, all in remarkable detail. To study these deposits is akin to strolling across the Dry Valleys 14.1 million years ago."

"What we're basically looking at," Lewis added "is the last hint of vegetation in the Dry Valleys." "The fossil finds and dating of volcanic ash show that roughly 14.1 million years ago, the area was home to tundra, "wet" glaciers typical of those of the mountains of Tierra Del Fuego in the high southern latitudes, and seasonally ice-free lakes. The beds of those long-gone lakes contain layers of sediments where detritus such as dying plants and insects would have settled and been preserved."

"And it's within these ancient lake beds that we found the fossils," said Lewis.

Ashworth's and the other paleoecologists' research shows that the lakes supported mosses and diatoms,

and the surrounding margins were ‘minimally colonized' by insects and shrubby vegetation."

At 14.1 million years ago, the Dry Valleys were relatively warm. By 13.9 million years ago, everything was different. The transition brought the Dry Valleys from a climate like that of South Georgia to one that has Mars as a close analog.

Tom Wagner, program director for Antarctic Earth Sciences in NSF's Office of Polar Programs, added that "Lewis, Marchant and Ashworth discovered the last bit of life on the Antarctic continent. It was hanging on by its fingernails--just a few simple plants and bugs in a small pond, everything else around them frozen over--and then, wham!, they went too. And it must have happened quickly because these fossils are literally freeze dried. When I visited the scientists in the field, they showed me how the moss was still green and leafy."

"It is one of the most dramatic and long-lasting changes that one can imagine," Marchant said. "I don't know of any other place on Earth where such an enduring change has been documented; the fact that it is associated with the extinction of tundra plants and insects helps provide quantitative estimates for the magnitude of this change."

The mean summertime temperatures would have dropped in that period by as much as 8 degrees Celsius. On average, the summertime temperatures in the Valleys during this temperate period would have been as much as 17 degrees warmer than the present-day average. What caused the change, Marchant said, "Is really a big unknown", though theories abound and include phenomena as different as the levels of carbon dioxide in the atmosphere and tectonic shifts that affected ocean circulation.

According to Lewis, the freshness of the crystals and glass in the volcanic ash and the preservation of cellular detail in the fossils argues that they have been permanently frozen since 13.9 million years ago. The climate changed during those millions of years but the temperatures in the mountains never rose high enough to allow groundwater to flow and microorganisms to become active.

This conclusion suggests that even when global atmospheric temperatures were warmer than they are now, as occurred--approximately 3.5 million years ago during the Pliocene Epoch--and as might occur in the near future as a consequence of global warming, there was no significant melting of the East Antarctic ice sheet inland of the Dry Valleys, nor were there dramatic changes in environmental conditions in the fossil region.

If this conclusion stands the test of time, it suggests a very robust ice sheet in this sector of Antarctica, and stresses the complex and potentially non-uniform response of Antarctica's ice sheets to global change.

Wagner also noted, "Other scientists had been to this area before, but hadn't noticed anything unusual. It took the trained eye of this team to make the discovery."

Journal reference:

1. Lewis et al. **Mid-Miocene cooling and the extinction of tundra in continental Antarctica**. *Proceedings of the National Academy of Sciences*, 2008; 105 (31): 10676 DOI: 10.1073/pnas.0802501105

Adapted from materials provided by National Science Foundation.

http://www.sciencedaily.com/releases/2008/08/080805124052.htm

Bernini, the Man of Many Heads

By HOLLAND COTTER

LOS ANGELES — Whoosh! You can practically hear the sound of satin flung over papal shoulders and the rustle and creak of silk against silk brocade in "Bernini and the Birth of Baroque Portrait Sculpture" at the J. Paul Getty Museum here.

You may imagine other sounds, too — murmurs, commands, sick-bed sighs and a single, startled intake of breath — as you walk past the 28 bronze and marble busts in this exhibition, which has to be one of the outstanding displays of 17th-century European sculpture in the United States in recent decades.

As the largest show yet of Gian Lorenzo Bernini's portraits, it couldn't be otherwise. Just look at the guest list: Scipione Borghese has come from Rome, Costanza Bonarelli from the Bargello in Florence, Cardinal Richelieu from the Louvre and Thomas Baker, he of the Steven Tyler mop, from the Victoria and Albert in London.

These people almost never travel, yet here they are in Los Angeles, cleanly installed and plexi-free, thanks in part to some upper-level deal cutting. (The Getty returned 40 works from its collection to Italy last year and was given the green light on the Italian loans in return.)

Although there are works in the show by artists other than Bernini, he is at its center just as he was at the center of the art we call Italian Baroque, a period style defined by virtuosic naturalism, kinetic emotionalism and high-flying formal glamour. It was an aesthetic of large personalities, and Bernini had

one.

In fact he had it all: not just talent, ego and energy, but also brains (unhampered by troubling introspection), looks (evident in two 20-something self portraits, one painted, one drawn, in the show) and a careerist's savvy that seldom let him down.

Born in 1598 and raised in Rome, he turned out preposterously sophisticated work when barely into his teens and continued to produce at peak form until his death in 1680. He adhered to the Renaissance model of the artist as polymath. In addition to being a sculptor, painter and draftsman, he had a major career as an architect; was a poet, playwright and stage designer; and still found time for a scandalous love life.

Like other successful artists of his day he was both a master and a servant, a celebrity and a functionary. He could be innovative to the point of sacrilege — one thinks of his orgasmic St. Teresa, or the crazed immensity of the baldacchino over the tomb of St. Peter in the Vatican — yet his invention was almost always at the service of a conservative political and religious elite. He pushed the spiritual potential of art in radical directions but was a propagandist for hire to the Church Triumphant.

A blend of novelty and caution marks many of the portrait busts by him in the Getty show, which was organized with the National Gallery of Canada in Ottawa. Almost all of his sitters were tied, through election or blood, to the ecclesiastical bureaucracy in Rome. One of his earliest commissions, from 1621, was for matched bronze portraits of two successive popes, Paul V, who had recently died, and Gregory XV, who had succeeded him.

The portraits are alike in being dense and compact, doing nothing special with sculptural space. Paul V, bullet-headed and blandly benign, seems locked in his mountainous cape. He is a monument. Gregory feels more alive. Aged and ill — he would be dead in two years — he leans forward within his armorlike vestments. His lips are parted as if hanging slack or caught in mid-utterance, an effect that Bernini would repeat, to dynamic effect, many times.

The naturalism that animates this sculpture is more pronounced in Bernini's portraits in marble. A glance at them will tell you how much he loved this material, which he approached as a plastic, malleable substance, like wet clay or raw dough.

In his best marble portraits, every inch of the surface has been touched and touched again: chiseled and smoothed, tapped, scraped and brushed. Every facial feature sings, every fall of cloth is a luscious little aria. Each detail — the freshly shaved cheek, rolls of flesh under eyes, moisture gathered at the corners of lips — adds to the vivacious ensemble

This illusion of vivacity is remarkable given that, as often as not, Bernini lacked a live model to work from. A number of portraits were executed after — sometimes years after — the subject had died. Features had to be based on portraits or death masks, or on verbal descriptions. Yet the goal was always the same: to give an abstract, dimming memory the immediacy of life.

Certain subjects were very much alive but unavailable. Charles I of England ordered a portrait sculpture from Bernini and sent a painting of himself to Rome to serve as a model. The picture, which is in the Getty show, was custom made for the job: a triple portrait of the king seen face-on, in three-quarters view and in profile.

It was also painted by no less an artist than Anthony van Dyck. And its image of Charles as Trinitarian dandy wearing three silk outfits and a pearl-drop earring is a fabulous thing in itself. It is all that survives of the commission. Although Bernini shipped the requested bust to England, it was lost in a fire there.

Anyway, long-distance portraiture wasn't his style. When possible he liked having his subjects in front of

him, chattering, gesturing, carrying on, being whoever they were. The pleasure he took in on-the-spot observation shines through in chalk drawings as vivid as snapshots of unidentified but clearly unfancy sitters, each of whom received his close and loving attention.

Only one drawing seems to be a study for a sculptural portrait bust, but for a great one, the bust of Scipione Borghese, a cardinal with intimate links to the Vatican. A nephew of Paul V, he had given Bernini the nod for the 1621 papal bronzes, and to this commission he quickly added others, including a series of mythological and biblical tableaus — "Apollo and Daphne," "David" — that caused a sensation.

If any of Bernini's portraits can be said to convey affection, the one of Scipione does. Or maybe it's just a sense of relaxation. He presents his old friend as he saw him — corpulent, loquacious, hat tipped back, lips pursed in a quip — but also as he envisioned him: the rock-solid source of stability he had been for a young artist making his way. And this blend of realism and idealism, of fleeting impressions and monumentality, instantly expanded the possibilities of sculptural portraiture.

The expansion is taken to an extreme in the bust of Costanza Bonarelli, done four years later, in 1636. The young woman was Bernini's mistress at the time, and the likeness was a self-commission: Bernini kept it for private contemplation. If Scipione's portrait is candid, this one is an exercise in psychological exposure, distilled in the look on the woman's face: startled, feral, lips parted as if with a gasp.

Apparently she had cause to be on the alert. When Bernini suspected her of infidelity — the third party involved being his younger brother — he ordered a servant to slash her face.

But by the 1630s Bernini's involvement with portraiture was sporadic. He had acquired an exacting new papal patron in Urban VIII and was deep into the decoration of St. Peter's. In his absence other artists — Alessandro Algardi, Giuliano Finelli, François Duquesnoy — commandeered the portrait field. Examples of their work flesh out the show, which has been organized by Catherine Hess of the Getty, Andrea Bacchi of the University of Trento in Italy and Jennifer Montagu of the Warburg Institute, London. But Bernini himself has the final word.

The last gallery documents his apotheosis as artist to the rich and famous. His portrait of Richelieu is here, as are those of two additional popes and, in bronze replica, his bust of Louis XIV. And then there is Thomas Baker, a British nobody with a huckster's mouth, a head of unruly hair and a ton of money. When he offered to pay Bernini more than Charles I had paid for a portrait, the artist agreed. And so it is with the sight of Baker's blank eyes and absurd coiffure, and the clink of coins in the air, that we leave the Baroque portrait behind.

"Bernini and the Birth of Baroque Portrait Sculpture" remains at the J. Paul Getty Museum, Getty Center, Los Angeles, through Oct. 26. It travels to the National Gallery of Canada in Ottawa, from Nov. 28 to Mar. 8.

http://www.nytimes.com/2008/08/08/arts/design/08bern.html?_r=1&th&emc=th&oref=slogin

Where the Devils Are in the Details

By KEN JOHNSON

Had Albrecht Dürer lived in the 20th century, he might have been a great filmmaker — imagine a blend of Ingmar Bergman, Stanley Kubrick and Steven Spielberg. Instead he was born in the 15th century, and he remains the greatest printmaker — rivaled only by Rembrandt — the Western world has ever seen.

If you study the 106 prints in "Albrecht Dürer: Art in Transition," an enthralling exhibition at the Museum of Biblical Art in Manhattan, you may discover the hallmarks of a proto-cinematic genius: fantastic stories, beautiful men and women, hideous villains and demons.

Sex, violence and pageantry; tragedy, comedy and cosmic vision: Dürer made all this and more visible with a grasp of pictorial space and composition that is as powerfully muscular as it is delicately intimate. And he did it all in a new, small-scale, mechanically reproducible medium.

Organized by the Hessisches Landesmuseum in Darmstadt, Germany, which owns one of the world's finest collections of Dürer's graphic works, the show offers connoisseurs and neophytes a not-to-be-missed opportunity to examine pristine examples of his most famous images.

Here is "Nemesis (The Large Fortune)," the vision of a monumental, voluptuously corpulent naked angel in the sky over a miniature, panoramic townscape from 1501. There is the sexy picture of a hunky Adam; a long-haired, wide-hipped Eve; and the insinuating snake in a Northern European forest from 1504. The hair-raising scene of wonderfully repulsive demons menacing an armored man on horseback titled "The Knight, Death and the Devil" (1513) tells an epic quest story in one richly packed frame.

"Melancholia" (1514), the mysteriously saturnine picture of a morose seated angel in a luxuriantly rumpled dress surrounded by a bewildering panoply of mystical symbols, is as spellbinding for its enigmatic imagery as it is for the velvety textures and smoldering luminosity yielded by Dürer's engraving tool. (Don't be shy about borrowing one of the magnifying glasses at the museum's front desk; many Dürer prints are too finely made for naked eyes.)

Much of the exhibition is devoted to selections from major suites of woodcuts and engravings addressing biblical themes of the Apocalypse and the Passion. Like most religious art of the day, these programmatic sets of pictures ostensibly served a didactic function, illustrating for a largely illiterate audience the basic stories and symbols of Christianity.

But Dürer's art does far more than just teach. It brings spectacularly to life the terrifying Four Horsemen of the Apocalypse charging through the air and mowing down the impenitent underfoot. It renders viscerally palpable the heartbreaking moment when Jesus, surrounded by followers and abusers, collapses under the weight of his rough cross.

The exhibition's rather flat subtitle, "Art in Transition," alludes to a larger historical perspective. Dürer was a transitional man in a transitional time, when the age of faith was starting to give way to the age of reason. He had a Renaissance mind and a Gothic soul. Deeply religious and omnivorously curious — see his fantastically detailed but zoologically inaccurate 1515 woodcut of a rhinoceros based on reports of one shipped to Lisbon — he hobnobbed with the most advanced scientists and the most sophisticated philosophers of his day. He worked for Roman Catholic churches and was a follower of Martin Luther. The son of a goldsmith, he was an artist of traditional if vast ambition, who specialized in a seemingly modest and relatively young technology.

It can reasonably be claimed that Dürer was more alive to the complexities and contradictions of his time and place than any other artist of his day, including Leonardo da Vinci. The beauty of his art is not only in its aesthetic brilliance but also in its wildly pluralistic range of imagination.

One of the exhibition's most arresting prints is an engraving from around 1498 called "The Sea Monster." In the watery foreground a curvaceous nude woman wearing an elaborate jeweled headdress is carried away by a bearded and antlered merman. On the far shore panicked little naked women climb out of the sea, as a man in an Oriental costume runs to the water's edge, throwing up his arms in desperate alarm. Drawn with miniaturist precision, a rocky, partly forested mountain on which sprawling stone chateaus are built fills the background, giving this bizarre abduction scene a spacious, naturalistic setting.

What a weirdly mismatched combination of motifs: the mythic kidnapping, the classical nude, the medieval monster, the beautiful landscape, the comic vignette onshore. And each element is sharply drawn with equally attentive exactitude, as if Dürer meant, like a 20th-century Surrealist, to challenge himself to see what disparate images he could make cohere in a single picture.

One way to explain the fecundity and elasticity of Dürer's imagination is to see printmaking as a liberating medium. Unlike the more public forms of his day, painting and sculpture, which tended to be subject to orthodox hierarchical strictures, prints appealed to private delectation and permitted idiosyncratic, freely experimental and even heretical expressions. It was the perfect medium for the Protestant Reformation.

Dürer was the most modern artist of his time. The first prolific European self-portraitist, he spoke not to a public, undifferentiated collective consciousness but to the inner, complexly varied experience of the individual. Long before Freud and Jung, he instinctively understood the multiplicity within the human psyche, and he mirrored it in a printed oeuvre of mind-expanding scope and profundity.

"Albrecht Dürer: Art in Transition" runs through Sept. 21 at the Museum of Biblical Art, 1865 Broadway, at 61st Street; (212) 408-1500, mobia.org.

http://www.nytimes.com/2008/08/08/arts/design/08dure.html?ref=arts

The Mythic Imagination of Beckmann in Exile

By KEN JOHNSON

Max Beckmann's "Self-Portrait With Horn" is one of the finest treasures of the Neue Galerie, the sumptuous Upper East Side bastion of modern German and Austrian art. Painted in brusque, brushy strokes in high-contrast darks and lights, it depicts the artist in a black-and-orange striped dressing gown holding up a silver hunter's horn in one sausage-fingered hand. He looks sideways with an intent expression as though he had sounded a note and was awaiting an answering response. Or he may be listening for the hounds of war.

It was 1938, and Beckmann was nearing his mid-50s when he made "Self-Portrait With Horn." The year before he and his wife, Quappi, fled Germany, where he had been one of the country's most esteemed and successful artists until the Nazis rose to power and declared him a degenerate. In his painting he portrays himself as an artist in exile who fears that his art will no longer be "heard."

The story behind Beckmann's self-portrait is told in a brief, illuminating book by the art historian Jill Lloyd recently published by the Neue Galerie. The museum has celebrated the occasion by assembling a small exhibition of portraits by other German artists centered around "Self-Portrait With Horn" and two other Beckmanns from the 1920s, a self-portrait and a small political allegory.

Perusing the reproductions in Ms. Lloyd's book — which includes numerous other self-portraits and examples of the late allegorical triptychs — you can imagine a great exhibition focusing on Beckmann in exile. The exhibition now at the Neue Galerie is not so exciting. Along with the three Beckmanns it presents a seemingly random selection of paintings and drawings by Otto Dix, George Grosz, Christian Schad and others identified with the so-called New Objectivity (Neue Sachlichkeit). Half-baked as it is, however, the show does have the virtue of highlighting what is distinct about Beckmann's art and suggesting what made him so much better than his contemporaries.

The New Objectivists were social satirists who delighted in exposing in exacting and often prurient detail the tawdry, corrupt and hypocritical aspects of life in Weimar-era Germany. Favorite motifs were corpulent naked women and scrawny prostitutes, several examples of which are included in the present exhibition. Along with an elegant picture by Schad of two beautiful, lightly clad young women masturbating, there are some willfully grotesque paintings of less conventionally attractive nude or partly nude women by Dix and Otto Griebel.

The more respectful portraits and self-portraits of the artists and their friends that make up the bulk of the show are comparatively boring. See, for example, Dix's insipid Northern Renaissance-style painting of the overweight, bald-headed Johann Edwin Wolfensberger, a Zurich printer. Since all the portraits in the show are of identifiable men, and all the nudes or partial nudes represent anonymous women, there also is a sexist tinge.

It is instructive to note how Beckmann departs from the New Objectivity with which he was associated earlier in his career. The most obvious difference is in his generalizing style, which favors a sensuous, painterly physicality and a more gestural urgency. The deeper difference is in Beckmann's more expansive, mythic imagination.

He envisions people and society in terms of archetypal costume dramas of good and evil and heroism and villainy. In his self-portraits he may play an aging king, a prophet in the wilderness or, as in a wonderful self-portrait from 1923 included in the exhibition, a tough-looking man about town in black tie and bowler hat posing before a theater curtain with a cigar wedged between two fingers.

In Beckmann's dynamically jumbled multifigure narratives there is often an appealing sweetness that calls to mind a sophisticated sort of children's book illustration. His themes are anything but juvenile, however. "Galleria Umberto" from 1925 is a bewildering, nightmarish scene in which a man with amputated arms hangs upside down over a group of people engulfed by flood waters. Only the colors of a partly submerged Italian flag hint that the painting is a meditation on the rise of Fascism in Italy.

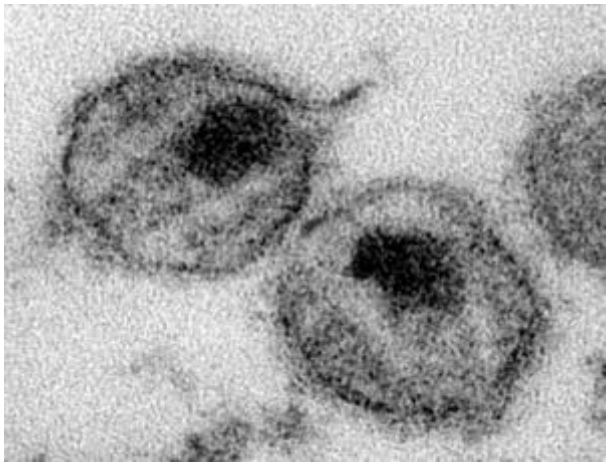
As it turned out, things did not go too badly for Beckmann after he left Germany. Living in Amsterdam for the next decade, he continued to work prolifically, and his paintings continued to be bought and exhibited secretly by powerful friends in Germany. His work was much admired in the United States too. In 1942 the Museum of Modern Art acquired his triptych "Departure" (1932-35), which remains one of the most resonant works in its collection.

In 1947 Beckmann moved to the United States, where he took a teaching position at Washington University in St. Louis. He also taught at the art school of the Brooklyn Museum. He enjoyed three happy and productive years before his death in 1950. He never again set foot in his native land.

"Max Beckmann: Self-Portrait With Horn" is on view through Sept. 1 at Neue Galerie, 1048 Fifth Avenue, at 86th Street, (212) 628-6200, neuegalerie.org.

http://www.nytimes.com/2008/08/08/arts/design/08beck.html?ref=arts

Researchers Halt Spread Of HIV With RNAi In Animal Model



This thin-section transmission electron micrograph shows the ultrastructural details of two human immunodeficiency virus (HIV) particles. (Credit: CDC/Dr. A. Harrison; Dr. P. Feorino)

ScienceDaily (Aug. 8, 2008) — Hopes languished last September when a promising candidate HIV vaccine failed to work. Despite this setback, many researchers still believe immunization is possible, and a new study suggests they're correct—at least at the cellular level.

Working in mice infected with HIV, a team used a method called RNA interference to knock down three genes in T cells, protecting them from the virus. This method seemed to prevent HIV from jumping between cells in the mice.

"For the first time, we've used RNAi to dramatically suppress HIV infection in an organism," says corresponding author Premlata Shankar, who conducted the work while she was a junior investigator at the Harvard Medical School-affiliated Immune Disease Institute and an assistant professor at Harvard Medical School. Shankar is now a professor at Texas Tech University Health Sciences Center in El Paso.

Although labs must verify the findings in other animal models before attempting clinical trials, this method—published online Aug. 7 in Cell — may eventually supplement or replace the harsh drug cocktails currently prescribed to patients with HIV, reducing the side effects of treatment.

When the Nobel Prize in Physiology or Medicine was awarded in 2006 for the discovery of RNAi, the judges speculated that it might "lead to novel therapies in the future." Researchers hoped to flood specific cells in patients with short interfering RNAs (siRNAs), molecules that silence genes by disrupting the protein templates they produce. But scientists weren't sure how to deliver the siRNAs exclusively into relevant cell types within an organism.

In collaboration with Sang-Kyung Lee of Hanyang University, Shankar's lab overcame this obstacle, delivering siRNAs directly into T cells, which are targeted by HIV. The team used an apparatus analogous to a truck equipped with GPS and a trailer hitch to haul the siRNAs to their destination. The truck—in this case, a single-chain antibody developed by Georg Fey of the University of Erlangen in Germany—homed to a protein found exclusively on the surface of T cells. The trailer hitch—an oligo-9-arginine—pulled siRNAs along for the ride.

This new antibody delivery vehicle lends itself to mass production in a dish. The team built thousands of these carriers for use in experiments, loading them with siRNAs targeting three key genes. One encodes a human protein called CCR5, which dots the surface of T cells and allows HIV to gain

entry. The others encode proteins produced by the virus within cells upon infection.

Harvard Medical School postdoctoral researcher and first author Priti Kumar mixed the siRNAs with the antibody carriers and injected them into the veins of mice that harbor human T cells rather than their own. These mice serve as an animal model of HIV. After being infected with the virus, the mice mirror progression of the disease in humans.

Developed by study co-authors Leonard Shultz of the Jackson Laboratory and Dale Greiner of the University of Massachusetts, these mice lack their own immune systems, so they tolerate tissue from other species. The team injected the mice with human blood stem cells, which divided time and again, building a human immune system in their hosts. When infected with HIV, the synthetic immune system seemed to respond as it would in humans, since T cell levels followed the same pattern in both species.

Kumar's siRNAs halted T cell destruction in the mice, essentially stopping the virus in its tracks.

"Both prophylactic and therapeutic regimens proved successful," said Kumar. "Apparently, the siRNAs kept HIV from entering most T cells and kept it from replicating when it managed to slip inside."

Kumar and Shankar caution that labs need to confirm the findings in other animals, tweak the dosage, and tinker with the siRNA delivery vehicle before attempting clinical trials. In addition, the molecules degrade with time, so periodic shots may be necessary to maintain cellular immunity, precluding large-scale vaccination.

"I'm not saying we've developed tomorrow's therapy, but this is a major step forward," says Shankar. "We've used a small animal model for HIV and proven that RNAi works in that model."

John Rossi, a pioneer in RNA-based therapeutics who was not part of the study, hopes labs will use the new animal model to compare the side effects of potential and existing therapeutic regimens.

"The number one problem with the current antiretroviral drug regimens is toxicity," says Rossi, a professor at the Beckman Research Institute of the City of Hope. He wonders if siRNAs will eventually enable doctors to lower the doses of existing drugs in patients. Perhaps siRNAs will one day supplement or replace harsh antiretrovirals.

"Overall, I see this work as an exciting proof of principle," says Rossi. "This is a strategy that can be developed for clinical applications in humans."

This research is supported by the National Institutes of Health, the Korea Ministry of Education and Science Technology, and the Center for AIDS Research at Harvard.

Journal reference:

1. Kumar et al. **T Cell-Specific siRNA Delivery Suppresses HIV-1 Infection in Humanized Mice**. *Cell*, Online Aug. 7, 2008 DOI: 10.1016/j.cell.2008.06.034

Adapted from materials provided by Harvard Medical School.

http://www.sciencedaily.com:80/releases/2008/08/080807130828.htm

Periodontal Disease Independently Predicts New Onset Diabetes

ScienceDaily (Aug. 8, 2008) — Periodontal disease may be an independent predictor of incident Type 2 diabetes, according to a study by researchers at Columbia University Mailman School of Public Health. While diabetes has long been believed to be a risk factor for periodontal infections, this is the first study exploring whether the reverse might also be true, that is, if periodontal infections can contribute to the development of diabetes.

The Mailman School of Public Health researchers studied over 9,000 participants without diabetes from a nationally representative sample of the U.S. population, 817 of whom went on to develop diabetes. They then compared the risk of developing diabetes over the next 20 years between people with varying degrees of periodontal disease and found that individuals with elevated levels of periodontal disease were nearly twice as likely to become diabetic in that 20 year timeframe. These findings remained after extensive multivariable adjustment for potential confounders including, but not limited to, age, smoking, obesity, hypertension, and dietary patterns.

"These data add a new twist to the association and suggest that periodontal disease may be there before diabetes," said Ryan T. Demmer, PhD, MPH, associate research scientist in the Department of Epidemiology at the Mailman School of Public Health and lead author. "We found that over two decades of follow-up, individuals who had periodontal disease were more likely to develop Type 2 diabetes later in life when compared to individuals without periodontal disease."

Also of interest, the researchers found that those study participants who had lost all of their teeth were at intermediate risk for incident diabetes. "This could be suggestive that the people who lost all of their teeth had a history of infection at some point, but subsequently lost their teeth and removed the source of infection," noted Dr. Demmer. "This is particularly interesting as it supports previous research originating from The Oral Infections and Vascular Disease Epidemiology Study (INVEST) which has shown that individuals lacking teeth are at intermediate risk for cardiovascular disease" said Moïse Desvarieux, MD, PhD, director of INVEST, associate professor and Inserm Chair of Excellence in the Department of Epidemiology at the Mailman School and senior author of the paper.

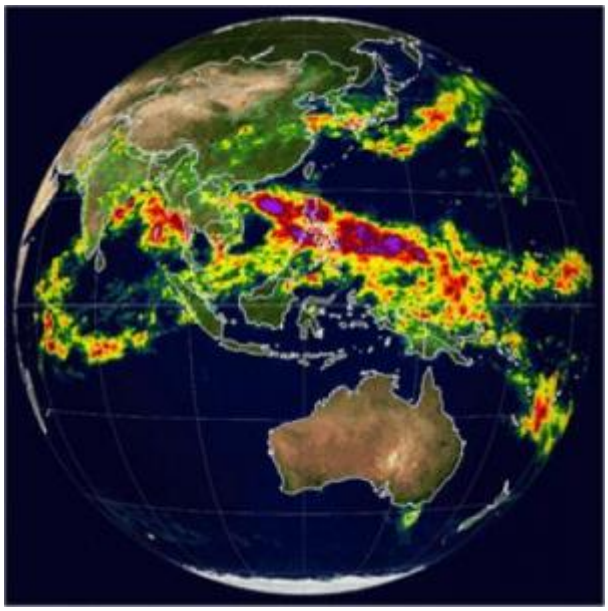
The contributory role of periodontal disease in the development of Type 2 diabetes is potentially of public health importance because of the prevalence of treatable periodontal diseases in the population and the pervasiveness of diabetes-associated morbidity and mortality. However, observes Dr. Demmer, more studies are needed both to determine whether gum disease directly contributes to type 2 diabetes and, from there, that treating the dental problem can prevent diabetes. In addition to Dr. Desvarieux, David R. Jacobs Jr., PhD, professor in the Department of Epidemiology and Community Health at the University of Minnesota, also contributed to the research.

The full study findings are published in the July 2008 issue of Diabetes Care.

Adapted from materials provided by Columbia University's Mailman School of Public Health.

http://www.sciencedaily.com/releases/2008/08/080806184905.htm

Climate Change: When It Rains It Really Pours



A new study conducted at the University of Miami and the University of Reading (UK) provides the first observational evidence to confirm the link between a warmer climate and more powerful or "extreme" rainstorms. (Credit: NASA)

ScienceDaily (Aug. 8, 2008) — Climate models have long predicted that global warming will increase the intensity of extreme precipitation events. A new study conducted at the University of Miami and the University of Reading (U.K.) provides the first observational evidence to confirm the link between a warmer climate and more powerful rainstorms.

One of the most serious challenges humanity will face in response to global warming is adapting to changes in extreme weather events. Of utmost concern is that heavy rainstorms will become more common and more intense in a warmer climate due to the increased moisture available for condensation. More intense rain events increase the risk of flooding and can have substantial societal and economic impacts.

To understand how precipitation responds to a warmer climate, researchers in this study used naturally-driven changes associated with El Niño as a laboratory for testing their hypotheses. Based on 20 years of satellite observations, they found a distinct link between tropical rainfall extremes and temperature, with heavy rain events increasing during warm periods and decreasing during cold periods.

"A warmer atmosphere contains larger amounts of moisture which boosts the intensity of heavy downpours," said Dr. Brian J. Soden, associate professor at the University of Miami Rosenstiel School of Marine & Atmospheric Science.

The report, "Atmospheric Warming and the Amplification of Precipitation Extremes," previewed in Science Express this Thursday, August 7, and published in an upcoming issue of Science, found that both observations and models indicated an increase in heavy rainstorms in response to a warmer climate. However, the observed amplification of rainfall extremes was found to be substantially larger in the observations than what is predicted by current models.

"Comparing observations with results from computer models improves understanding of how rainfall responds to a warming world" said Dr. Richard P. Allan, NERC advance fellow at the University of Reading's Environmental Systems Science Centre. "Differences can relate to deficiencies in the measurements, or the models used to predict future climatic change"

Adapted from materials provided by University of Miami Rosenstiel School of Marine & Atmospheric Science, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2008/08/080807144240.htm

Is There Life On Jupiter's Moon Europa? Finding Signs Of Current Geological Activity On A Frozen World

Scientists were amazed to see ice and water jets exploding from cracks in the icy surface of Saturn's moon Enceladus, highlighted here in a false. The satellite is one of only four bodies in the solar system known to have current geologic activity. The other three are Earth, Neptune's Moon Triton, and Saturn's moon Io. (Credit: NASA/JPL/Space Science Institute)

ScienceDaily (Aug. 7, 2008) — With average temperatures of minus 260 degrees Fahrenheit, an almost nonexistent atmosphere and a complex web of cracks in a layer of ice encompassing the entire surface, the environment on Jupiter's moon Europa is about as alien as they come.

So are the enormous forces behind the surface display, namely an ocean beneath the ice nine times deeper than Earth's deepest ocean trench and gravitational affects from a planet 318 times the mass of Earth.

For nearly a decade, it has been Simon Kattenhorn's passion to understand the amazing surface features on Europa and how they are formed. And supported by new grants from NASA, his research may provide clues to one of Mankind's biggest questions—is there life outside of Earth?

Kattenhorn—an associate professor of geology at the University of Idaho—delights in dissecting the beautiful and complex web of cracks, faults and ridges on the surface of Jupiter's fourth largest moon. The first of his two recent grants totaling $358,000 will allow him to study the most recent geological features on the highest resolution photos NASA has to offer of Europa. These subtle cracks will reveal if there is any current geological activity on the distant moon, which would also be the best place to look for signs of life.

"In order to really get at the issue, 'Is there life out there?', we have to know the best place to look," said Kattenhorn, who is also currently authoring a chapter for a book on the moon. "And in the case of Europa, the best place to look is where cracks on its icy surface are active today."

But finding signs for current geological activity is no easy task. Kattenhorn can tell a lot about fractures because they form very specific patterns that allow him to unravel their relative ages. His goal in this project is to find the youngest fractures and compare them to the tidal forces that Europa would be experiencing today to see if the features and recent forces match up.

Although there is some debate over how thick Europa's outer shell of ice is—some say over 20 miles and some claim only a few—it is generally agreed that it covers an ocean more than 60 miles deep. This means that although Europa is only about the size of our moon, it has more water than Earth.

As the moon orbits Jupiter, it gets closer and further from the giant planet, changing the amount of

gravitational pull it experiences. The result is that the moon is constantly being squeezed and released like a balloon full of water, which causes cracks and fissures, raising the question of the possibility of geysers, like the ones recently spotted on Saturn's moon Enceladus.

Recent photos from the Cassini spacecraft passing by Enceladus revealed stunning plumes of water-ice jetting out into space. The discovery sent a flurry of excitement and activity through the academic community, including Kattenhorn, whose second recent NASA grant will allow him to apply what he's learned from Europa to studies on Enceladus.

The discovery also led to a renewed vigor to study and explore Europa in order to find out if similar, active processes might be occurring today.

"This research feeds that need that I have as a geologist and as a person to be the explorer, to be the adventurer, to see things that no one else has seen before and figure out things that no one else has figured out before," said Kattenhorn of his research into the two moons. "And out in the solar system is a great place to do that, because there are some things—like the plumes on Enceladus—that we really are seeing for the very first time."

Only a few decades ago, nobody would have believed any form of life could exist on or in an icy moon like Europa. But recent discoveries of amazingly adaptive bacteria in some of Earth's harshest environments have led to the speculation that it is possible.

"Europa has the potential for something very similar to hydrothermal systems we have here in our oceans," said Susan Childers, head of the geomicrobiology research team at the University of Idaho, who studies life in extreme environments. "Very ancient organisms that thrive on oxidized metals could potentially be centered on one of these oases formed by heat and metals seeping from cracks in the ocean floor."

The search for extraterrestrial life has long guided NASA's choices in mission planning. Currently, NASA is in the process of choosing its next flagship mission; the most ambitious, long-term programs that often provide the most data. The choices include sending a satellite to explore Saturn's moon Titan, Europa or the entire Jupiter system, meaning there is a two in three chance the next major mission will include Europa. This makes research detailing where to look—or maybe even land with a probe — that much more important.

But even if further exploration of Europa wasn't a possibility, Kattenhorn would still be eager to study the fascinating moon.

"We don't walk around on Earth with our eyes closed. We want to know what's going on; why things happen," said Kattenhorn. "It's like Galileo looking through his telescope all those centuries ago and going, 'Gosh! What's out there?' It's that same spirit of exploration and I just get a real kick out of that."

Adapted from materials provided by University of Idaho.

http://www.sciencedaily.com/releases/2008/08/080806210116.htm

Whom Do We Fear Or Trust?

An untrustworthy face. Scientists concluded the least trustworthy face (score, -8) had eyebrows pointing down and lips curled at the edges. (Credit: Oosterhof & Todorov)

ScienceDaily (Aug. 7, 2008) — A pair of Princeton psychology researchers has developed a computer program that allows scientists to analyze better than ever before what it is about certain human faces that makes them look either trustworthy or fearsome.

In doing so, they have also found that the program allows them to construct computer-generated faces that display the most trustworthy or dominant faces possible.

Such work could have implications for those who care what effect their faces may have upon a beholder, from salespeople to criminal defendants, the researchers said.

In a paper appearing in the online edition this week of the Proceedings of the National Academy of Sciences, Alexander Todorov, an assistant professor of psychology and public affairs at Princeton, and Nikolaas Oosterhof, a research specialist, continue an inquiry into the myriad messages conveyed by the human face. In 2005, Todorov's lab garnered international headlines with a study published in Science demonstrating that quick facial judgments can accurately predict real-world election results.

Taking what they have learned over time -- namely that, rightly or wrongly, people make instant judgments about faces that guide them in how they feel about that person -- the scientists decided to search for a way to quantify and define exactly what it is about each person's face that conveys a sense they can be trusted or feared. They chose those precise traits because they found they corresponded with a whole host of other vital characteristics, such as happiness and maturity.

"Humans seem to be wired to look to faces to understand the person's intentions," said Todorov, who has

spent years studying the subtleties of the simple plane containing the eyes, nose and mouth. "People are always asking themselves, 'Does this person have good or bad intentions?'"

To conduct the study, the scientists showed unfamiliar faces to test subjects and asked them to describe traits they could gauge from the faces. The scientists boiled down the list of traits to about a dozen of the most commonly cited characteristics, including aggressiveness, unkemptness and various emotional states. The researchers showed the faces to another group and asked them to rate each face for the degree to which it possessed one of the dozen listed traits.

Based on this data, the scientists found that humans make split-second judgments on faces on two major measures -- whether the person should be approached or avoided and whether the person is weak or strong.

From there, using a commercial software program that generates composites of human faces (based on laser scans of real subjects), the scientists asked another group of test subjects to look at 300 faces and rate them for trustworthiness, dominance and threat. Common features of both trustworthiness and dominance emerged. A trustworthy face, at its most extreme, has a U-shaped mouth and eyes that form an almost surprised look.

An untrustworthy face, at its most extreme, is an angry one with the edges of the mouth curled down and eyebrows pointing down at the center. The least dominant face possible is one resembling a baby's with a larger distance between the eyes and the eyebrows than other faces. A threatening face can be obtained by averaging an untrustworthy and a dominant face.

Using the program and the ratings from subjects, the scientists could actually construct models of how faces vary on these social dimensions. Once those models were established, the scientists could exaggerate faces along these dimensions, show them to other test subjects to confirm that they were eliciting the predicted emotional response, and find out what facial features are critical for different social judgments.

"If you can think of an emotion being communicated by the face as a kind of signal, you can understand that we can amplify that signal into what was almost a caricature to see if we get the proper effect," Todorov said. "And we do."

The research raises questions about whether the brain is equipped with a special mechanism for "reading" or evaluating faces, he said. Some studies of infants have shown that, when offered a choice between looking at a random pattern and one resembling a human face, infants prefer the face. And there is evidence that face-seeking is deeply rooted in both the psyche and evolution as the amygdala, a primitive region of the brain, is stimulated when someone spies a scary face.

While it may be true that people have little control over their facial features, the study also indicates that expressions may be important as well, which could have implications for people in jobs that require extensive interactions with the public.

The research was supported by the National Science Foundation and a Huygens Scholarship from the Netherlands Organization for International Cooperation in Higher Education.

Adapted from materials provided by Princeton University.

http://www.sciencedaily.com/releases/2008/08/080805150808.htm

How Chemo Kills Tumors: Research To Reduce Side Effects

ScienceDaily (Aug. 7, 2008) — University of Manchester researchers are investigating exactly how chemotherapy drugs kill cancerous tumours in a bid to reduce side effects and test the effectiveness of safer new agents.

Dr Stephen Taylor and Karen Gascoigne at the University's Faculty of Life Sciences have taken a new systematic approach to studying anti-mitotic drugs, which are used extensively for breast or ovarian cancer in the UK.

This class of drugs, which includes the agent taxol, has been used clinically for many years because they are highly effective. However, as in all chemotherapy, there are side effects. In the case of taxol these include peripheral neuropathies which can lead to permanent nerve damage and loss of sensation in fingers.

In addition little is known about how anti-mitotic drugs work, despite a lot of research on them, because many studies were population-based approaches that were indirect and led to vague and confusing interpretations.

Dr Taylor said: "To bypass the neurotoxicity, new anti-mitotics are being generated. Early clinical studies show that these drugs do not result in significant neurotoxicity. The big question now is whether they will have anti-tumour effects.

"To help determine this, we need to know which types of tumours are likely to be sensitive to these new agents, and which ones are likely to be resistant. This would allow clinicians to better design the clinical trials, i.e. you only recruit patients who are likely to respond. In addition, if the drugs show promise, then it would pave the way for patient stratification in the future, again allowing oncologists to identify which patients are likely to benefit from these drugs in advance of treatment.

"To predict which types of tumours are likely to respond, we first need to know how anti-mitotic drugs work, both the classical drugs and these new agents."

He and Ms Gascoigne, whose findings are published in the journal Cancer Cell (August 2008), have shown how different tumours respond to the anti-mitotic drugs – which target the mitotic spindle (the structure that separates the chromosomes during cell division) – and revealed that the variation in cell behaviour was far greater than previously recognized.

They used a high throughput automated time-lapse light microscopy approach to systematically analyze over 10,000 single cells from 15 cell lines in response to three different classes of anti-mitotic drug. This revealed the large variation in cell behavior with cells within any given line exhibiting multiple fates.

Dr Taylor explained: "We know that anti-mitotic drugs block the final stage of the cell division process, mitosis. How the cells then die is a mystery.

"We embarked on a fresh, more direct approach that is actually quite simple. Basically, we just watched the cells using time-lapse microscopy; this allowed us to track the behaviour of individual cells and determine their fate when exposed to different anti-mitotic drugs.

"The first thing we realised was that the picture was much more complicated that we originally thought; the range of different behaviours was profound. Not only did cells from different cell lines behave

differently, but cells within the same line also behaved differently.

"The level of complexity was at first overwhelming. However, as we slowly made our way through the data, patterns began to emerge. This allowed us to formulate a new hypothesis. We were then able to design more experiments to test this hypothesis.

"In essence, it turns out that when cells are exposed to these drugs they arrest in mitosis. Then a race starts between two competing cellular signalling networks. One network is trying to kill the cell, the other is trying to cause the cell to exit mitosis and thus allow the cell to survive. The winner of the race decides the fate of the cell; death or survival.

"The factors influencing the race not only vary from cell line to cell line, but also within cells from the same line, explaining why there is so much complexity.

"What we want to do now is figure out how we can help the cell death pathway win the race more often; this would hopefully mean that the anti-mitotic drugs would be better at killing cancer cells. First we want to test this idea in the lab but hopefully in the longer run this will mean that these drugs can be used more effectively in the clinic."

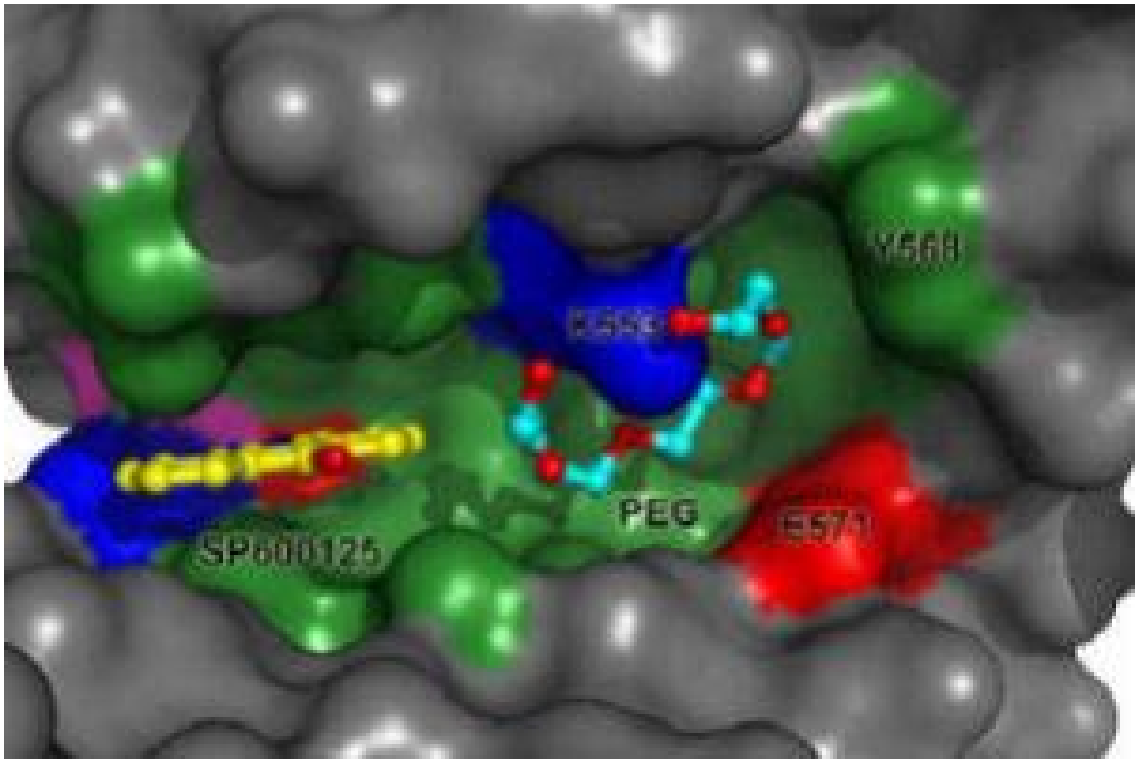
He added: "Karen, a talented graduate student, worked very hard on this study and the work was only possible because the Faculty recently bought a fully automated microscope that allowed us to analyse such large numbers of cells. We acquired this state-of-the-art microscope thanks to the University's Strategic Research Fund, which demonstrates the University's commitment to cancer research.

"Our systematic, single-cell-based approach to describe how different tumour cells respond to these drugs has given a data set that provides an invaluable resource and an intellectual framework for dissecting how anti-mitotic agents kill tumour cells."

Adapted from materials provided by University of Manchester.

http://www.sciencedaily.com/releases/2008/08/080806113149.htm

Researchers Unveil Vital Key To Cancer



Crystalline structure of Mps1. (Credit: Image courtesy of University of Manchester)

ScienceDaily (Aug. 7, 2008) — University of Manchester scientists have uncovered the 3D structure of Mps1 – a protein that regulates the number of chromosomes during cell division and thus has an essential role in the prevention of cancer – which will lead to the design of safer and more effective therapies.

Mps1 belongs to the family of proteins called kinases. When subsets of these enzymes become deregulated, cancer can be one of the outcomes – making them a critical target for research by oncologists. Over 100 of the 500 or so kinases have been shown to be associated with cancer, but so far scientists only know the 3D structure of a handful. Knowing the structure is critical for the design of new kinase inhibitors as therapeutic agents, an area of enormous importance to the pharmaceutical industry. Over 100 kinase inhibitors are currently in clinical trials, and the revolutionary kinase inhibitor Glivec was approved for treating Leukaemia in the UK in 2001.

Mps1 is particularly important as it controls a 'checkpoint' that cells use to encourage accurate chromosome sorting during mitosis. Mps1 therefore prevents aneuploidy, the change in the number of chromosomes that is closely associated with cancer.

Dr Patrick Eyers and his team, including Hong Kong-born PhD student Matthew Chu, used the Diamond Light synchrotron, a "super-microscope" that works by speeding electrons around a huge doughnut-shaped chamber the size of five football pitches until they are travelling so fast they emit high energy particles. The X-rays were "fired" at a pure sample of the protein, allowing the researchers to "see" the protein's atomic structure for the first time.

Their structure revealed the pocket where Mps1 binds to ATP, the natural substrate from which Mps1 transfers a phosphate group to its cellular target proteins. Further work showed the protein in complex

with the ATP-competitive inhibitor SP600125, a well-known but non-specific inhibitor of many kinases, which revealed a secondary pocket not utilised by this compound. If a next-generation drug can be designed to specifically block this secondary pocket, it is hoped that Mps1 will be specifically disabled, killing rapidly dividing cells such as those found in tumours.

The team hopes its work will allow chemists to design an anti-cancer drug with fewer side effects, allowing scientists to assess the relative importance of Mps1 inhibition in different disease indications, including those that are currently hard to treat such as lung and pancreatic cancers.

Dr Eyers, whose findings are published in the Journal of Biological Chemistry (August 2008), said: "The crystallalographic structures of only a few key "mitotic" kinases are currently known so we are very early in the game. The scientific community has high hopes for developing novel "anti-mitotic" cancer therapies using this method of structure-based drug design.

"Mps1 is a rational target because of its critical role in preventing aneuploidy. We wanted to see what this protein looked like at the molecular level and, by revealing the active site "lock", help design a new inhibitory "key" to physically block the ATP-binding site.

His colleague Dr Lydia Tabernero added: "This work presents the first crystallographic structure of human Mps1, an important regulator of chromosomal stability and a potential target in cancer therapy. Our research has revealed several important structural features and additional binding sites that could be exploited for the development of specific Mps1 inhibitors."

Adapted from materials provided by University of Manchester.

http://www.sciencedaily.com/releases/2008/08/080806113151.htm

Next-generation Computer Antivirus System Developed

ScienceDaily (Aug. 7, 2008) — Antivirus software on your personal computer could become a thing of the past thanks to a new "cloud computing" approach to malicious software detection developed at the University of Michigan.Cloud computing refers to applications and services provided seamlessly on the Internet.

Traditional antivirus software is installed on millions of individual computers around the world but according to researchers, antivirus software from popular vendors is increasingly ineffective. The researchers observed malware --malicious software--detection rates as low as 35 percent against the most recent threats and an average window of vulnerability exceeding 48 days. That means new threats went undetected for an average of seven weeks. The computer scientists also found severe vulnerabilities in the antivirus engines themselves.The researchers' new approach, called CloudAV, moves antivirus functionality into the "network cloud" and off personal computers. CloudAV analyzes suspicious files using multiple antivirus and behavioral detection programs simultaneously.

"CloudAV virtualizes and parallelizes detection functionality with multiple antivirus engines, significantly increasing overall protection," said Farnam Jahanian, professor of computer science and engineering in the Department of Electrical Engineering and Computer Science.Jahanian, along with doctoral candidate Jon Oberheide and postdoctoral fellow Evan Cooke, both in the Department of Electrical Engineering and Computer Science, recently presented a paper on the new approach at the USENIX Security Symposium.

To develop this novel approach, the researchers evaluated 12 traditional antivirus software programs against 7,220 malware samples, including viruses, collected over a year. The vendors tested were: Avast, AVG, BitDefender, ClamAV, CWSandbox, F-Prot, F-Secure, Kaspersky, McAfee, Norman Sandbox, Symantec and Trend Micro.Traditional antivirus software that resides on a personal computer checks documents and programs as they are accessed. Because of performance constraints and program incompatibilities, only one antivirus detector is typically used at a time.

CloudAV, however, can support a large number of malicious software detectors that act in parallel to analyze a single incoming file. Each detector operates in its own virtual machine, so the technical incompatibilities and security issues are resolved, Oberheide said.CloudAV is accessible to any computer or mobile device on the network that runs a simple software agent. Each time a computer or device receives a new document or program, that item is automatically detected and sent to the antivirus cloud for analysis. The CloudAV system the researchers built uses 12 different detectors that act together to tell the inquiring computer whether the item is safe to open.

CloudAV also caches analysis results, speeding up the process compared with traditional antivirus software. This could be useful for workplaces, for example, where multiple employees might access the same document. The new approach also includes what the developers call "retrospective detection," which scans its file access history when a new threat is identified. This allows it to catch previously-missed infections earlier.The researchers see promising opportunities in applying CloudAV to cell phones and other mobile devices that aren't robust enough to carry powerful antivirus software.Reference: CloudAV: N-Version Antivirus in the Network Cloud by Jon Oberheide, Evan Cooke, and Farnam Jahanian presented at the Proc. of the 17th USENIX Security Symposium, July 2008.

Adapted from materials provided by University of Michigan.

http://www.sciencedaily.com/releases/2008/08/080806152434.htm

Child Development: Lack Of Time On Tummy Shown To Hinder Achievement

ScienceDaily (Aug. 7, 2008) — The American Physical Therapy Association (APTA) is urging parents and caregivers to ensure that babies get enough "tummy time" throughout the day while they are awake and supervised, in light of a recent survey of therapists who say they've noticed an increase in motor delays in infants who spend too much time on their backs while awake.

In the national survey of 400 pediatric physical and occupational therapists, conducted on behalf of Pathways Awareness, a non-profit group dedicated to early detection of motor delays in children, two-thirds of those surveyed say they've seen an increase in early motor delays in infants over the past six years. The survey was conducted with the assistance of APTA's Section on Pediatrics and the Neuro-Development Treatment Association (NDTA).

Those physical therapists who saw an increase in motor delays said that the lack of "tummy time," or the amount of time infants spend lying on their stomachs while awake, is the number one contributor to the escalation in cases.

APTA spokesperson Judy Towne Jennings, PT, MA, a physical therapist and researcher from Fairfield, Ohio, said, "We have seen first-hand what the lack of tummy time can mean for a baby: developmental, cognitive, and organizational skills delays, eye-tracking problems, and behavioral issues, to name just some complications." She added, "New parents are told of the importance of babies sleeping on their backs to avoid SIDS, but they are not always informed about the importance of tummy time."

Jennings explains that because new parents now use car seats that also serve as infant carriers – many of which fasten directly into strollers and swings without having to remove the baby from the seat -- this generation of babies spends prolonged periods of time in one position. She recommends that awake babies be placed in a variety of positions, including on their tummies, as soon as they return home from the hospital. "Ideally, babies should be placed on their tummies after every nap, diaper change and feeding, starting with 1-2 minutes," she said. Jennings is co-author of the research, "Conveying the Message about Optimal Infant Positions," Physical and Occupational Therapy in Pediatrics, Volume 25, Number 3, 2005.

In 1992, the American Academy of Pediatrics launched its successful "Back to Sleep" campaign, which helped reduce the number of sudden infant death syndrome (SIDS) cases by educating parents on the importance of putting infants to sleep on their backs, rather than on their stomachs. While putting infants to sleep on their backs is still vitally important in reducing infant deaths, according to APTA, many physical therapists believe that there should be more education to parents on the importance of "tummy time" while babies are awake and supervised.

APTA spokesperson Colleen Coulter-O'Berry, PT, MS, PCS, a physical therapist at Children's Healthcare of Atlanta, said flattening of the baby's skull is another side effect of too much time spent on the back. "Since the early 1990s, we have seen a significant decrease in SIDS cases, while simultaneously witnessing an alarming increase in skull deformation," she said. Coulter-O'Berry cites a recent study published in Cleft Palate-Craniofacial Journal 45(2): 208-16, in which it was reported that several risk factors for misshapen heads were more common among babies born after the "Back to Sleep" initiative. The study, which took place at Children's Hospital and Regional Medical Center in Seattle, Washington, found that prior to 1992, the prevalence of misshapen heads among infants was reportedly 5 percent. In recent years, craniofacial centers and primary care providers reported a dramatic increase of up to 600 percent in referrals for misshapen heads.

She also points out that the combination of babies sleeping on their backs, as well as spending an inordinate amount of time in infant carriers that double as car seats, puts pressure on the head which can

create a flattening of the skull. In extreme cases, babies are fitted with a custom-molded band that gently guides the baby's head into a more normal shape.

According to Coulter-O'Berry, parents can increase tummy time by incorporating exercises into routine activities such as carrying, diapering, feeding, and playing with baby. "Increasing the amount of time your baby lies on his or her tummy promotes muscle development in the neck and shoulders; helps prevent tight neck muscles and the development of flat areas on the back of the baby's head; and helps build the muscles baby needs to roll, sit and crawl," she said. Coulter-O'Berry is co-author of Tummy Time Tools, an informative brochure that provides caregivers ideas and activities to ensure that babies get enough tummy time throughout the day. The brochure is now offered on the APTA Web site, http://www.apta.org/consumers.

Karen Karmel-Ross, PT, PCS, LMT, pediatric clinical specialist at University Hospitals Case Medical Center, Rainbow Babies and Children's Hospital in Cleveland, Ohio and national lecturer on muscular torticollis (neck muscle imbalance), says that one way to engage in tummy time is to spend time during each diaper change encouraging the infant to find, focus and follow the caregiver's face or a toy with their eyes looking up, down, left and right. "It's important to get our infants out of devices that constrain mobility and onto their tummies so they can focus on neck muscle balance as they interact with their caregivers," she said.

Adapted from materials provided by American Physical Therapy Association.

http://www.sciencedaily.com/releases/2008/08/080806122422.htm

Humans' Response To Risk Can Be Unnecessarily Dangerous

ScienceDaily (Aug. 7, 2008) — The traffic light ahead of you is turning yellow. Do you gun the engine and speed through the intersection, trusting that others will wait for their green, or do you slow down and wait your turn?

That depends more on experience than personality, according to new research from Tel Aviv University. Arnon Lotem, a behavioral ecologist from the Department of Zoology at Tel Aviv University, reports in the journal Nature that people adopt risk-taking behaviors similar to those of animals like rats and bees. And this behavior, Prof. Lotem and his colleagues say, might not prepare humankind for the modern dangers we face every day -- like crossing the street, accepting a high-risk mortgage, or driving on the freeway.

Lotem believes that our risk-taking behavior had its advantages when we were living as cave-dwellers, but that it poses new and potentially dangerous challenges in our modern technology-driven world.

Feeling Risky

"People want to know how people make decisions, whether it's how you drive your car, or whether to invest in a mortgage. It's important to understand when and how we make those decisions, to understand the type of errors people are prone to make," says Prof. Lotem.

"What we have found is that people make decisions based on what option 'appears' to be better most of the time. Under conditions in the natural world this would be the best strategy, but in modern life it has nothing do with the real inherent risks," he adds, citing our individual responses to that yellow light.

People are aware of the actual risks when driving through a light at an intersection, but unless they've already had a brush-with-death or a brush-with-a-traffic-cop, the perceived risk remains low, says Prof. Lotem. This is because in most cases nothing happens to the risk-taker. "You save one minute, but you can lose everything. People don't do the math," he says.

Lotem's study found that, presented with simple decision-making stimuli, people are not analyzing the complete situation based on logical rationales or statistics. Instead, they appear to be making decisions based on simple strategies for coping in nature, based mainly on personal experience.

Evolved to Fear Cobras, not Traffic Lights

During many years of evolution and under natural conditions, he says, people made decisions like other animals. This tactic worked fine for survival, but did not however evolve to survive the modern world. "We've evolved to be afraid of snakes, but not traffic lights," he says.

The results of Lotem's research may also be used by economists, politicians and psychologists, who need to know when people will take risks, says Prof. Lotem. A wider understanding of this phenomenon can affect business decisions, the economy -- and, hopefully, the number of road accidents in America each year.

In the business world, Lotem says, "If you give feedback and rewards to employees in a clear way, they might be more willing to take risks on your behalf." He adds that this approach might help governments to cultivate the entrepreneurial activities of their citizens.

Don't Gamble On It

But the more complex the risk, the more difficult to predict how people will react. Lotem cautions that in complicated decision-making scenarios such as gambling, addiction and excitement are new variables that come into play. It is also difficult to assess whether children exhibit similar risk-taking strategies as adults, because children tend to imitate what adults around them are doing.

The study's participants also included a team of scientists from the Technion Israel Institute of Technology and The Faculty of Agriculture of the Hebrew University of Jerusalem.

Adapted from materials provided by Tel Aviv University.

http://www.sciencedaily.com/releases/2008/08/080806140126.htm

Use Of Cleaning Products During Pregnancy Increases Risk Of Asthma In Young Children

ScienceDaily (Aug. 7, 2008) — Women who use a lot of household cleaning products when they are pregnant, or shortly after giving birth, are increasing their child's risk of developing asthma. That's according to the Avon Longitudinal Study of Parents of Children (ALSPAC, also known as Children of the Nineties), that recruited over 13,000 children from before birth and has followed them to post 16.

The findings indicated that early life exposure to the chemicals contained in household cleaning products was linked to a 41% increase in a child's chances of developing asthma by the age of 7 years. During the study, a large number of other factors known to affect the onset of asthma, such as family history, were accounted for.

The results thus present a possible mechanism for the 'hygiene hypothesis', which suggests that children brought up with low exposure to bacteria and dust in the home in their early years are less likely to build an immunity to asthma later in life.

Dr. Alexandra Farrow, Reader at Brunel University's School of Health Sciences and Social Care and a member of the ALSPAC research team, explains: "Previous research has shown that a child's risk of developing asthma is lower if he or she is exposed to bacteria or bacterial products (endotoxins) in early life ('hygiene hypothesis'), probably because it assists in the development of a child's immune system.

However, our research suggests that one possible mechanism for this hypothesis may involve the chemicals found in domestic cleaning products. These chemicals have been linked to increased risk of asthma with additional evidence from studies of workers who have exposure to cleaning chemicals".

Adapted from materials provided by Brunel University, via AlphaGalileo.

http://www.sciencedaily.com/releases/2008/08/080806154716.htm

Quantum Computers Are One Step Closer

ScienceDaily (Aug. 7, 2008) — Complex computer encryption codes could be solved and new drug design developed significantly faster thanks to new research carried out by the University of Surrey.

The results bring the reality of a workable quantum computer one step closer, proving for the first time that it is possible to make these computers in silicon rather than a vacuum, which has been the focus of previous research.

Quantum computing has the potential to fix problems that would normally take millions of years to solve, much faster than ordinary computers. For these quantum computers to work, atoms need to be kept fixed in space, allowing them to move in an undisturbed oscillating wave motion. This atomic quantum wave holds much more information than a normal computer bit, meaning the computer logic and programmes needed to crack a code are more powerful, and therefore much faster.

Previous research has only succeeded in creating some building blocks for a quantum computer by using atoms suspended in a vacuum. However it has not been possible to make enough for a whole computer as scientists can only hold a limited number of atoms in place for a short period of time. Using atoms trapped in a silicon crystal, the research team, which also involved scientists from University College London and Heriot-Watt University, showed that the quantum waves oscillate long enough for a computer operation, and now hope to produce a higher number of computer bits.

"These results are a significant step forward in the development of quantum computing," commented research leader Professor Ben Murdin from the University of Surrey. "We hope that this work will open up a new field of physics, where quantum coherence can be explored in solid crystals, but at the same time we have brought a scalable silicon quantum computer a step nearer."

The researchers used the 'free electron laser' FELIX in the Netherlands to carry out the work which has been published in Proceedings of the National Academy of Sciences of the USA.

Adapted from materials provided by University of Surrey.

http://www.sciencedaily.com/releases/2008/08/080806154712.htm

Invisibility cloak 'step closer'

Scientists in the US say they are a step closer to developing materials that could render people invisible.

Researchers at the University of California in Berkeley have developed a material that can bend light around 3D objects making them "disappear".

The materials do not occur naturally but have been created on a nano scale, measured in billionths of a metre.

The team says the principles could one day be scaled up to make invisibility cloaks large enough to hide people.

Stealth operations

The findings, by scientists led by Xiang Zhang, were published in the journals Nature and Science.

The light-bending effect relies on reversing refraction, the effect that makes a straw placed in water appear bent.

Previous efforts have shown this negative refraction effect using microwaves—a wavelength far longer than humans can see.

In order to have the 'Harry Potter' effect, you just need to find the right materials for the visible wavelengths
Ortwin Hess

The new materials instead work at wavelengths around those used in the telecommunications industry—much nearer to the visible part of the spectrum.

Two different teams led by Zhang made objects made of so-called metamaterials—artificial structures with features smaller than the wavelength of light that give the materials their unusual properties.

One approach used nanometre-scale stacks of silver and magnesium fluoride in a "fishnet" structure, while another made use of nanowires made of silver.

Light is neither absorbed nor reflected by the objects, passing "like water flowing around a rock," according to the researchers. As a result, only the light from behind the objects can be seen.

Cloak and shadow

"This is a huge step forward, a tremendous achievement," says Professor Ortwin Hess of the Advanced Technology Institute at the University of Surrey.

"It's a careful choice of the right materials and the right structuring to get this effect for the first time at these wavelengths."

There could be more immediate applications for the devices in telecommunications, Prof Hess says.

What's more, they could be used to make better microscopes, allowing images of far smaller objects than conventional microscopes can see.

And a genuine cloaking effect isn't far around the corner.

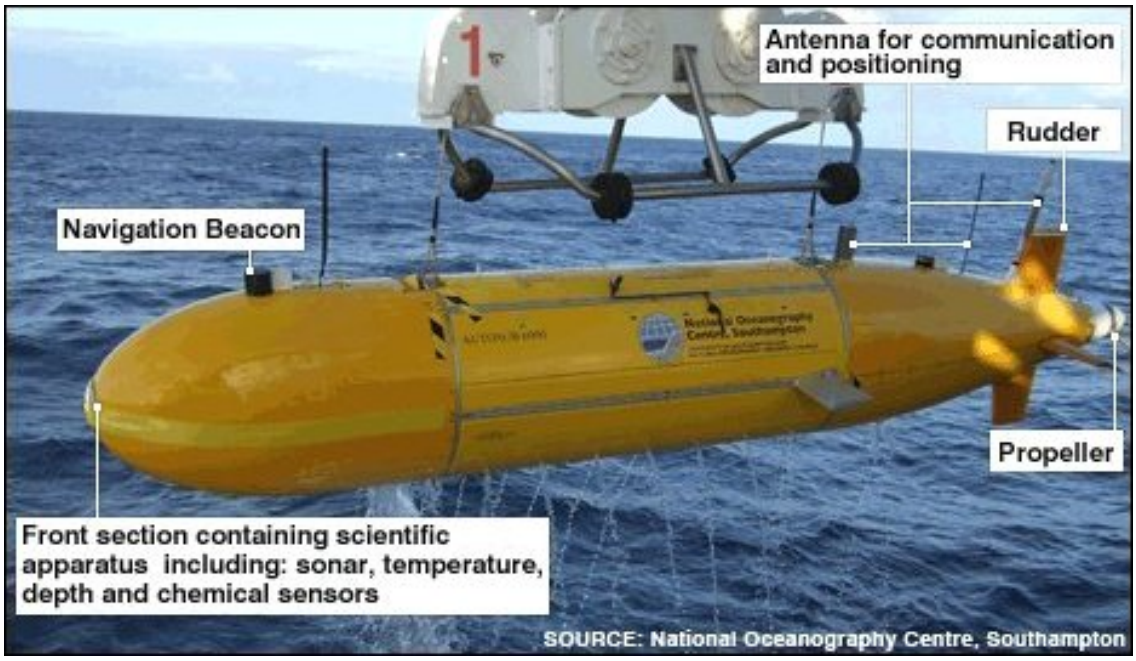
"In order to have the 'Harry Potter' effect, you just need to find the right materials for the visible wavelengths," says Prof Hess, "and it's absolutely thrilling to see we're on the right track."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/7553061.stm

Published: 2008/08/11 00:53:07 GMT

Sub to make deep Caribbean dive

By Jennifer Carpenter
Science reporter, BBC News



AUTOSUB6000 - UK'S NEW DEEP-DIVING AUV
Autosub6000 is a 5.5m-long, 2,800kg Autonomous Underwater Vehicle

Scientists are set to explore the world's deepest undersea volcanoes, which lie 6km down in the Caribbean.

Delving into uncharted waters to hunt for volcanic vents will be Autosub6000, Britain's new autonomously controlled, robot submarine.

Once found, the life, gas and sediment around the vents - the world's hottest - will be sampled and catalogued.

The research will be carried out by a British team aboard the UK's latest research ship, the James Cook.

"We are heading out on two expeditions, each close to a month long, to map the full length of the Cayman Trough," said team leader, Dr Jon Copley of the National Oceanography Centre in Southampton (NOCS).

Dr Copley explained that the Cayman Trough, which lies between Jamaica and the Cayman Islands, is a product of the Caribbean tectonic plate pulling away from the American plate.

"It is the world's deepest volcanic ridge and totally unexplored," the Southampton-based researcher told BBC News.

Along with Autosub6000, the researchers will also rely on Isis, the UK's deepest-diving, remotely operated vehicle to scan the deep.

Double Sub

First overboard will be Autosub6000, an unmanned undersea vehicle that can go down to 6,000m and carry out a dive without being controlled from the surface.

It will be tasked with finding the volcanic vents on the ocean floor.

The second submarine to take the plunge will be the Isis.

Isis will sample fluids and sediments from around the lip of the vents to test their geochemistry, and also collect animal specimens.

"We are hoping to find several different types of vents along the ridge," said Dr Copley.

"Some of the vents will be very similar in depth to the vents we already know about, and because the conditions will be alike, we might expect very similar animals," he explained.

The researchers will look to compare the animals around the Cayman vents with those in the Atlantic and Pacific, in the hope of better understanding the processes that affect how deep-sea creatures "get about".

If the organisms in the Cayman Trough look like those from other deep volcanic trenches, it will suggest that ocean currents must play a role in shaping the patterns of deep-sea life by transporting the animals' larvae around.

However, if the Cayman Trough animals are very different from those existing in other parts of the Earth's oceans then isolation will be considered more important.

"The deep ocean is our planet's largest ecosystem. If we are going to use its resources responsibly then we need understand what determines its patterns of life," the Southampton-based researcher said.

New vents

Dr Copley told BBC News that there was also another kind of venting that was driven by a very different geological process in which the Earth's mantle is directly exposed to the water.

This type of volcanism has only ever been seen once before, in the mid-Atlantic.

The temperatures around these hydrothermal vents were so hot because they were so deep, Dr Copley said.

"They could be hotter than 500C (930F), and if they are that hot, they will probably have quite different chemistry and life forms - we expect to find new species."

The researchers expect that, at depths greater than 3,000m, one in every two animals they come across will be a species new to science.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/7547695.stm

Published: 2008/08/09 13:52:28 GMT

Eat kangaroo to 'save the planet'

Switching from beef to kangaroo burgers could significantly help to reduce greenhouse gas emissions, says an Australian scientist.

The methane gas produced by sheep and cows through belching and flatulence is more potent than carbon dioxide in the damage it can cause to the environment.

But kangaroos produce virtually no methane because their digestive systems are different.

Dr George Wilson, of the Australian Wildlife Services, urges farming them.

He says they have a different set of micro-organisms in their guts to cows and sheep.

Sheep and cattle account for 11% of Australia's carbon footprint and over the years, there have been various proposals to deal with the problem.

Now Dr Wilson believes kangaroos might hold the answer.

He said: "It tastes excellent, not unlike venison - only a different flavour."

The country already produces 30 million kangaroos farmed by landholders in the outback.

But Dr Wilson is keen to see that population dramatically increased to produce the same amount of kangaroo meat as that currently produced by conventional livestock.

Methane is about 25 times more potent as a greenhouse gas than carbon dioxide molecule for molecule.

But the much greater volume of CO2 generated by human activities such as industry and transport means that it is the largest contributor to modern-day global warming.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/uk_news/7551125.stm

Published: 2008/08/09 14:03:18 GMT

Cell change 'keeps organs young'

Researchers may have found a way to halt the biological clock which slows down our bodies over the decades.

A US team thinks it may have found the genetic levers to help boost a system vital to cleaning up faulty proteins within our cells.

The journal Nature Medicine reported that the livers of genetically-altered older mice worked as well as those in younger animals.

They suggested it might one day help people with progressive brain diseases.

> **These results show it's possible to correct this protein 'logjam' that occurs in our cells as we get older, thereby perhaps helping us to enjoy healthier lives well into old age**
> Dr Ana Maria Cuervo
> Yeshiva University

The researchers, from Yeshiva University in New York, are focusing on a process which is central to the proper working of cells.

The fundamental chemicals of cells - proteins - often have very short working lives, and need to be cleared away and recycled as soon as possible.

The body has a system for doing just that, but it becomes progressively less efficient as we get older.

This leads to progressive falls in the function of major organs - the heart, liver and brain, some of which

contribute to the diseases of old age.

Dr Ana Maria Cuervo, from Yeshiva, created a mouse with two genetic alterations.

The first, when activated, boosted the number of specific cell receptors linked to this protein recycling function, while the second allowed the first to be turned on whenever Dr Cuervo wished simply by modifying the animal's diet.

Switched on

She waited until the mice were six months old - the point at which age-related decline in the protein-recycling system begins - then turned on the receptor gene.

When examined at two years old, the liver cells of these mice were far more effective at recycling protein compared with normal mice.

When the overall liver function of the very old genetically-modified mice was tested, they performed at a comparable level to much younger mice.

Dr Cuervo said: "These results show it's possible to correct this protein 'logjam' that occurs in our cells as we get older, thereby perhaps helping us to enjoy healthier lives well into old age."

She now plans to test animal models of Alzheimer's and Parkinson's diseases, believing that the abnormal protein deposits in Alzheimer's in particular might be dealt with more effectively this way.

Thomas von Zglinicki, Professor of Cellular Gerontology at Newcastle University, said that the results were "very exciting".

"It's not often you see studies where they have managed to improve function in this way.

"What they seem to have managed is to maintain the mice at this young stage, and both restore and maintain normal activity."

He said that it should, in theory, be possible to achieve the same effect across the whole body.

A spokesman for the Alzheimer's Society said: "As we age we have an increase in protein misfolding and general faults in protein processing, so the ability to maintain an effective system to clear these would be beneficial.

"However, a direct line to the clearance of defective proteins in the brain is not so clear from this research."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/7548874.stm

Published: 2008/08/10 17:05:40 GMT

Scientists ask to plant GM trees

Scientists have applied to plant a group of genetically modified trees on land owned by the Forestry Commission.

University of Southampton researchers want to establish a settlement of GM poplar trees for biofuel research.

The Forestry Commission confirmed the application, but said no decision had been taken yet.

The plantation would be the first attempt to cultivate GM trees in the UK since 1999, when activists destroyed 115 plants in Berkshire.

Campaigners warned that allowing the move to go ahead would be "an unknown and worrying risk" for Britain's ecosystems.

Clare Oxborrow, a GM campaigner for Friends of the Earth, said: "Our concerns with GM trees are even more serious than crops because trees are very long lived.

"They are inherently geared up for spreading seeds and pollen because of they way the reproduce. There's a huge potential for cross-pollination."

University officials were unavailable for comment.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/uk_news/7551988.stm

Published: 2008/08/09 22:10:07 GMT

Gene hooks smokers at first puff

Puffing on a first cigarette is a rite of passage for many teenagers, but whether it is enjoyable may be partly down to genetics, researchers suggest.

University of Michigan scientists have identified a gene variant found more often in people who said their first cigarette produced a "buzz".

These people were much more likely to go on to become regular smokers, the journal Addiction reports.

The researchers say the finding may help development of anti-smoking drugs.

> **It appears that for people who have a certain genetic make-up, the initial physical reaction to smoking can play a significant role in determining what happens next**
> Professor Ovide Pomerleau
> University of Michigan

A person's decision to smoke for the first time, or carry on smoking, is not thought to be governed solely by his or her genes, but a mixture of genes, environmental factors and social pressures.

However, scientists are hoping that by cracking the genetic secrets of nicotine addiction, they could make it easier for people to wean themselves off cigarettes, or even stop them taking up the habit in the first place.

The gene in question, CHRNA5, has already been highlighted by other studies into nicotine addiction, and it has been suggested that it could increase a smoker's chance of developing lung cancer.

The Michigan research, however, suggests that it could be at work from the very first instance of exposure to nicotine.

Genetic data was obtained from 435 volunteers, some of whom were regular smokers, and some who had

tried cigarettes but were not currently smokers.

They were quizzed about how they felt about their first smoking experience.

Practical uses

Regular smokers were far more likely to have the variant version of the gene and more likely to report that their first smoking experience was pleasurable.

Professor Ovide Pomerleau, who led the research, said: "It appears that for people who have a certain genetic make-up, the initial physical reaction to smoking can play a significant role in determining what happens next.

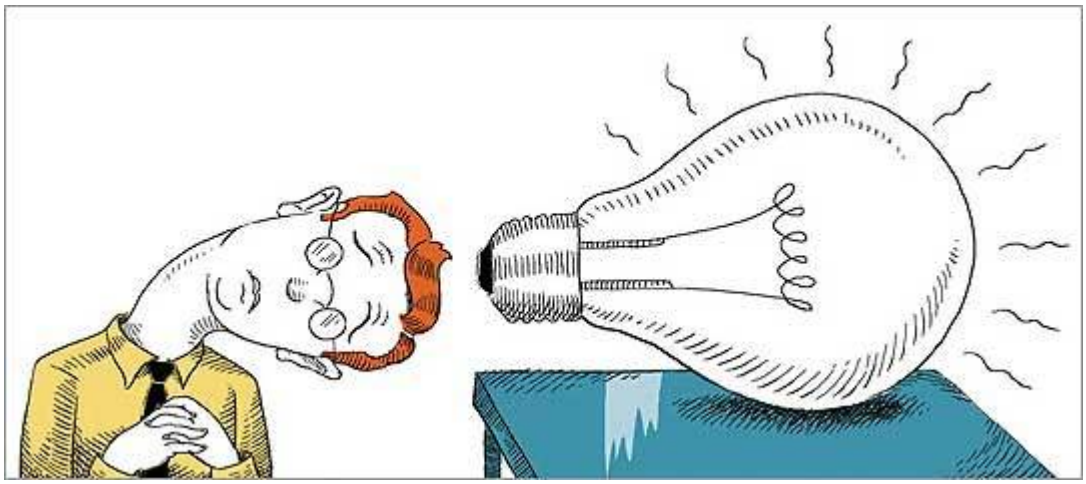
"If cigarette smoking is sustained, nicotine addiction can occur in a few days to a few months - the finding of a genetic association with pleasurable early smoking experiences may help explain how people get addicted."

Dr Marcus Munafo, from Bristol University, said that while the study was interesting, any treatments or tests based on the gene variant would be some way off.

He said: "It's interesting to see research which helps us join the dots on the whole mechanism of nicotine addiction, but in practical terms, we have, for now, to carry on doing what we are currently doing to help smokers."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/7548878.stm

Published: 2008/08/08 23:06:49 GMT



(Wesley Bedrosian for the Boston Globe)

Uncommon Knowledge

Surprising insights from the social sciences

By Kevin Lewis | August 10, 2008

Why innovation is getting harder

OUR NATION DEPENDS on innovation. It's so important that the Constitution specifically encourages Congress "to promote the progress of science and useful arts." According to one economist, however, there may be a crisis looming: The frontier of knowledge is becoming very hard to reach, making innovation more difficult and costly, and narrowing the window of opportunity in a prospective innovator's (limited) life span. His analysis finds that the average age for a first invention, the degree of specialization, and the teamwork required for innovation have all been climbing rapidly.

Jones, B., "The Burden of Knowledge and the 'Death of the Renaissance Man': Is Innovation Getting Harder?" Review of Economic Studies (forthcoming).

It's expensive to be poor

BEING POOR IS bad enough. Now a study reports that even basic groceries are more expensive in poor neighborhoods. The study thoroughly cataloged prices - and surveyed customers - at stores selling grocery items in various neighborhoods around Buffalo. Prices for the same items were about 10 to 15 percent higher in poor neighborhoods relative to affluent neighborhoods. The cause? Competition. In wealthier neighborhoods, there are more chain stores, and customers are more likely to have cars, making it easier to price shop. This drives down prices. Moving the nearest chain store closer by 1 mile to a particular neighborhood store brings the neighborhood store's prices down by 1-3 percent, the author found.

Talukdar, D., "Cost of Being Poor: Retail Price and Consumer Price Search Differences across Inner-City and Suburban Neighborhoods," Journal of Consumer Research (forthcoming).

When a meritocracy isn't

IN A MERITOCRACY, performance is supposed to determine success. To achieve this goal, many organizations have instituted formal processes to review employee performance. But a process is only as

good as the people who run it, and some people may not be entirely objective. A sociologist at MIT was given access to internal records on 8,898 support staff at a large high-tech service-sector company (management didn't allow access to their own records). He found that, while women and minorities could expect the same starting salaries and performance ratings for doing the same job, they could not expect to get the same raises. The effect was quite small, but real: For a given performance rating, raises were 0.4 percent smaller for women, 0.5 percent smaller for African-Americans, 0.5 percent smaller for Hispanics, and 0.6 percent smaller for foreign-born employees. Moreover, for African-Americans, performance ratings were less predictive of a raise. The source of the bias appeared to be the fact that the managers who gave the performance rating were not the managers who determined the size of the raise. The latter were subject to less accountability and transparency, such that no one at the company seemed to be aware of the bias.

Castilla, E., "Gender, Race, and Meritocracy in Organizational Careers," American Journal of Sociology (May 2008).

The personalities of nations

COUNTRIES DON'T JUST differ in their traditions and values. One of the more intriguing patterns in psychology is that different cultures are characterized by different personality types. A team of psychologists has proposed a new explanation: the legacy of disease. They matched the personality scores of people to historical data on the prevalence of major diseases in each country. They found that a history of disease in a country corresponded to a personality characterized by a less promiscuous orientation - especially for women - and by less extraversion and openness to experience. The idea is that more inhibited personalities evolved to prevent the spread of disease by minimizing risky social contact.

Schaller, M. and Murray, D., "Pathogens, Personality, and Culture: Disease Prevalence Predicts Worldwide Variability in Sociosexuality, Extraversion, and Openness to Experience," Journal of Personality and Social Psychology (July 2008).

Fewer clothes = more coverage

AS YOU WATCH the Olympics this week, try to put yourself inside the minds of the network executives who get to decide what to broadcast. Given that you've spent billions on licensing and production costs - meaning that you need the most people from the best advertising demographics to watch - which events and athletes do you highlight? A study out of Clemson University analyzed videotapes of all prime-time Summer and Winter Olympic programming since 1996. Although the Summer Olympics covered men's and women's events about the same, the Winter Olympics was significantly biased toward men's events. The author notes that prominent coverage of women in gymnastics, swimming, diving and, lately, beach volleyball is consistent with the notion "that the Summer Games (offering many events that involve women athletes in swimsuits and leotards) will yield higher clock-time totals than the Winter Games (offering many events that involve women athletes in parkas and other less sexually charged apparel)."

Billings, A., "Clocking Gender Differences: Televised Olympic Clock-Time in the 1996-2006 Summer and Winter Olympics," Television & New Media (September 2008).

Kevin Lewis is an Ideas columnist. He can be reached at kevin.lewis.ideas@gmail.com. ■

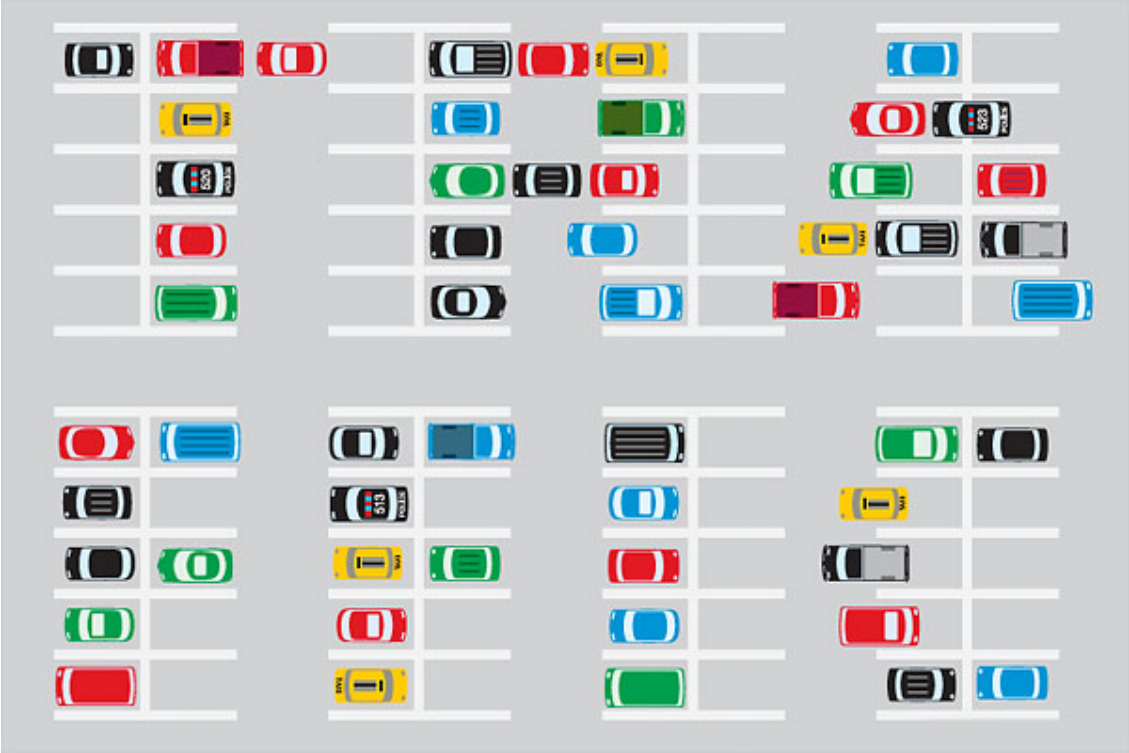
http://www.boston.com/bostonglobe/ideas/articles/2008/08/10/uncommon_knowledge?mode=PF

Slow-Moving Vehicle

By MARY ROACH

TRAFFIC

Why We Drive the Way We Do (And What It Says About Us).



By Tom Vanderbilt.

402 pp. Alfred A. Knopf. $24.95.

Traffic jams are not, by and large, caused by flaws in road design but by flaws in human nature. While this is bad news for drivers — there's not much to be done about human nature — it is good news for readers of Tom Vanderbilt's new book. "Traffic" is not a dry examination of highway engineering; it's a surprising, enlightening look at the psychology of human beings behind the steering wheels.

An alternate title for the book might be "Idiots." Vanderbilt, who writes regularly about design and technology, cites a finding that 12.7 percent of the traffic slowdown after a crash has nothing to do with wreckage blocking lanes; it's caused by gawkers. Rubberneckers attend to the spectacle so avidly that they themselves then get into accidents, slamming into the car in front of them when it brakes to get a better look or dig out a cellphone

to take a picture. (This happens often enough for traffic types to have coined a word for it: "digi-necking.") Exasperated highway professionals have actually tried erecting anti-rubbernecking screens around the scenes of accidents, but the vehicle toting the screen typically gets caught in the traffic jam it's meant to prevent.

Moreover, Vanderbilt adds, “there is the interest in the screen itself.” Drivers will slow down to look at anything: “Something as simple as a couch dumped in a roadside ditch can send minor shudders of curiosity through the traffic flow.” “Traffic” is jammed with these delicious you’ve-got-to-be-kidding moments.

Even without home furnishings to distract us, we rarely seem to get anywhere fast at any time of day. One reason, Vanderbilt reports, is that people are driving to do things they once did at home or down the block. “It is not just that American households have more cars,” he writes, “it is that they are finding new places to take them.” They’re going someplace to eat. They’re driving to Whole Foods because they don’t like the produce at their neighborhood supermarket. They’re going out to get coffee. (So much of Starbucks’s revenue now comes from drive-through lanes that the company will put stores across the street from each other, sparing drivers “the agony of having to make a left turn during rush hour.”)

And they’re parking. Or trying to. In a study of one 15-block area near U.C.L.A., cars were logging, on an average day, 3,600 miles in pursuit of a place to park. It’s not only the number of parkers on the roads that slows things down. It’s the way they drive, crawling along, sitting and waiting and engaging in other irritating examples of what one expert calls “parking foreplay.” The answer? Sorry: more expensive street parking to encourage the circling hordes to use pay lots.

Traffic does not yield to simple, appealing solutions. Adding lanes or roads is a short-lived fix. Widen one highway, and drivers from another will defect. Soon that road is worse than it was before. The most effective, least popular solution — aside from the currently effective, unpopular solution of $5-a-gallon gasoline — is congestion pricing: charging extra to use roads during rush hours. For unknown reasons, Americans will accept a surcharge for peak-travel-time hotel rooms and airfares but not for roads.

If it’s any consolation, traffic has always been bad. Vanderbilt begins with a short (I longed for more!) section on the history of traffic congestion. By studying chariot “rutways” and “wear patterns on curbstones,” archaeologists have determined that the citizens of Pompeii had to contend with construction detours and one-way streets. Meanwhile, in ancient Rome, “the chariot traffic grew so intense that Caesar ... declared a daytime ban on carts and chariots, ‘except to transport construction materials for the temples of the gods or for other great public works or to take away demolition materials.’”

I was less surprised by all that than by the existence of so many traffic professionals. Given the seeming anarchy of traffic, there are a surprising variety of experts employed to manage it. Vanderbilt has interviewed them all, from traffic “vision specialists” (who have, of late, taken to making road signs in “incident pink”) to “one of the world’s leading authorities on queues.” (One of!) The author is an impressively energetic researcher, even, at one point, tracking down the person who programs the Hebrew calendar into about 75 signal lights in Los Angeles. This is done to enable Sabbath-observant Jews to cross the street without pushing a button and violating the ban on operating machinery. (In New York it isn’t necessary, as most crossing buttons long ago stopped working.)

Vanderbilt spends much time deconstructing crashes — a problem even before there were cars. “In the New York of 1867,” he writes, “horses were killing an average of four pedestrians a week (a bit higher than today’s rate of traffic fatalities).” Nowadays, the cause of collisions, or one of them, is people believing they’re better drivers than they are. We base our judgment on the number of crashes we’ve been in, rather than on the number of accidents we narrowly avoid, which, if we’re being honest (or we’re being me), happen just about every time we drive. Compounding this vehicular hubris is the fact that most of the driving we do appears to be safer than it is. Driving rarely commands 100 percent of our attention, and so we feel comfortable multitasking: talking on the phone, unfolding a map, taking in the Barca-Lounger on the road’s shoulder. Vanderbilt cites a statistic that nearly 80 percent of crashes involve drivers not paying attention for up to three seconds. Thus the places that seem the most dangerous — narrow roads, hairpin turns — are rarely where people mess up. “Most crashes,” Vanderbilt writes, “happen on dry roads, on clear, sunny days, to sober drivers.” For this reason, roads that could be straight

are often constructed with curves — simply to keep drivers on the ball.

This basic truth — feeling safe kills — lies beneath many of the book's insights. Americans think roundabouts are more dangerous than intersections with traffic lights. Roundabouts require you to adjust your speed, to merge, in short, to pay attention. At an intersection, we simply watch the light. And so we may not notice the red-light runner coming at us or the pedestrian stepping off the curb. A study that followed 24 intersections that had been converted from signals or stop signs to roundabouts showed an almost 90 percent drop in fatal crashes after the change.

For similar reasons, S.U.V.'s are more dangerous than cars. Not just because they're slower to stop and harder to maneuver, but because — by conferring a sense of safety — they invite careless behavior. "The safer cars get," Vanderbilt says, "the more risks drivers choose to take." (S.U.V. drivers are more likely to not bother with their seat belts, to talk on cellphones, and to not wear seat belts while talking on cellphones.) So it goes for much of the driving universe. More people are killed while crossing in crosswalks than while jaywalking. Drivers pass bicyclists more closely on a road with bike lanes than on one without.

My solution to the nation's vehicular woes would be to make this good book required reading for anyone applying for a driver's license. Though you could then be sure that some percentage of car crashes in America would be caused by people trying to skim "Traffic" while stuck in a bottleneck on their way to the D.M.V.

Mary Roach's most recent book is "Bonk: The Curious Coupling of Science and Sex."

http://www.nytimes.com/2008/08/10/books/review/Roach-t.html?_r=1&8bu&emc=bua1&oref=slogin

They May Not Mean to, but They Do

By CARYN JAMES

ALFRED AND EMILY

By Doris Lessing.

Illustrated. 274 pp. Harper/HarperCollins Publishers. $25.95.

As an adolescent, Doris Lessing looked at her parents sitting on the veranda of their hardscrabble African farm — the British soldier who had lost a leg in World War I, the nurse who had cared for him in a London hospital, now linked in a marriage of extreme disappointment in colonial Rhodesia — and saw lives blighted by the war meant to end war itself. As she wrote in "Under My Skin," the piercing first volume of her autobiography, "For years I kept bright in my mind, like scenes from a film, what they would have been without that war," and imagined her mother efficiently running a hospital instead of pathetically clinging to her children, her father strong and vigorous instead of a near-invalid diabetic.

Like so many adolescents, Lessing swore never to be like "these sick and half crazy people, my parents." Unlike most, she became a brilliant Nobel Prize-winning writer, and in "Alfred and Emily" offers them the greatest gift she can: the lives they might have had. The book's first half is a novella about an Alfred and Emily who flourished — not together, we soon learn — in a peaceful, prosperous Britain. The second half offers the nonfiction version, exploring these unhappy characters as their daughter actually knew them. Because that daughter is Doris Lessing, she recreates them with all the anger and unsentimental clarity of her best work, yet adds qualities not often associated with her: generosity and grace.

Nobel or not, some people still think of Lessing as either a one-book wonder, famous for her 1962 feminist classic, "The Golden Notebook," or a literary version of a crazy bag lady, writing books about her cats and novels set on other planets. But "The Golden Notebook" also holds up for its trenchant social and psychological observations, and Lessing has always been a first-rate realist, never more so than when drawing on her life in Africa. (Her first five years were spent in Persia, where her father worked for a bank; she left Rhodesia for England when she was 30.) "Alfred and Emily" may be partly wish fulfillment, but it relies on Lessing's strengths as a shrewd realist.

Lessing has been circling around the subject for decades: her essay "My Father" appeared in 1963 and "Under My Skin" in 1994. From those and many other works, we know that although she was born after World War I, she experienced it through her parents as a dark cloud hovering over her childhood. Her passionate conviction that the war destroyed them may account for her lifelong social activism, at least as much as her youth in segregated Africa.The entire project of "Alfred and Emily" is more revealing than either part of the book alone. The novella can be flat-footed; the biographical material is more thorough in "Under My Skin." But it's amazing to witness Lessing, at 88, still ferociously grappling with the meaning of her parents' shattered lives. Of course, in explaining them she is also explaining herself. And this book continues her obsession with alternate realities. (Closest to home, the heroine of her 1974 novel, "The Memoirs of a Survivor," finds a parallel world behind her living room wall.)

The alternate story Lessing creates here begins when Alfred Tayler and Emily McVeagh meet at a country cricket match when they are not yet 20. The meeting is pure fiction, yet believable; at its best, the novella has a rich, Hardyesque appreciation of rural life, which suits Alfred perfectly. Weaving in details of their actual histories, Lessing allows her father to resist his own mother's pressure to join a bank; he becomes a farmer instead. Lessing instinctively "got" her father, and he is the simpler character, granted a long, happy life.

Her relationship with her controlling mother was always fraught. “I hated my mother,” she recalls. It’s not a surprising line in the Lessing canon, and even now she doesn’t entirely break free of her old resentment. She grew up hearing that her mother had been heartbroken when a doctor she deeply loved was drowned. She lets the fictional Emily become his wife, but it’s a cold marriage. Character, Lessing seems to be saying — specifically her chilly mother’s — doesn’t change. Yet she extends compassion to her mother by sounding one of her truest, most enduring themes: Emily, the efficient nurse, feels she has lost any sense of herself in this traditional marriage. So Lessing kindly kills off the husband. As a widow, the other Emily comes into her own, helps impoverished children and establishes a chain of Montessori schools.

The novella sketchily fills in history without the Great War. Britain does just fine, but there are conflicts around the world, and in one of Lessing’s less inspired touches, women’s hairdos express support for rival sides in a Turkish-Serbian war. (Ringlets for Turks, spit curls for Serbs.) But Lessing doesn’t intend anyone to stay in this alternate world for long. At times she even drops in a line about the actual story to come. “In life, my father’s appendix burst just before the Battle of the Somme, saving him from being killed with the rest of his company.” In the book’s eloquent second half, she explores how war permanently damages even its survivors. Lessing’s father was visited in dreams by his dead comrades and endlessly told stories about “the Trenches, tanks, star-shells” as a way, his daughter believes, “of ridding himself of the horrors.” Her mother, so capable in London and a social butterfly in Persia, arrived in Africa and took to her bed for a time, calling her small children to her side and whimpering, “Poor Mummy.” Lessing writes that “nothing fits” in her mother’s sad transformation, and she makes it fit by blaming the war. Emily had nursed so many wounded soldiers. “They died, you see, and often we could do nothing,” she tried to tell her daughter, who refused to hear. Looking back, Lessing concludes, “My mother’s wartime ordeals were ravaging her from within just as my father’s Trenches were eating away at him.”

That may be partly true, but much too neat. For one thing, it diminishes elements of Emily’s life that Lessing herself has described. Some of her most poignant scenes, here and in “Under My Skin,” are of the once beautiful dinner dresses, the “silvery stockings, brocaded shoes” Emily had so wrong-headedly packed for her glittering new life in Africa. It’s touching to see Lessing trying so hard to understand her hated mother’s unhappiness. And it’s part of the brutal honesty we have come to expect from her that she can’t quite get past her anger.

“Alfred and Emily” may be, above all, a way for Lessing to give artistic shape to her own indignation. “To this day I can feel the outrage I felt then,” she says of her volatile reaction to her mother’s self-pity. Of her father’s war stories she says, “We were complicit in a rage of understanding,” and believes that his “rage at the Trenches took me over” and “never left.” In “Memoirs of a Survivor,” which Lessing has called “an attempt at autobiography,” the heroine takes in a girl named Emily, and it is Emily’s childhood she sees in the dreamlike world behind her wall. That childhood hints at Emily McVeagh’s but is even closer to Doris Lessing’s: a stern, unloving mother figure and a hapless soldier father.

In its generosity of spirit, its shaped and contained fury, “Alfred and Emily” is also an extraordinary, unconventional addition to Lessing’s autobiography. She’s said she has written her last book (well, she has said a lot of silly things), but there isn’t the slightest tone of valediction or summing up here. That’s why she remains so vital: even in old age, she sounds as fierce and passionate as a girl.

Caryn James, the author of the novels “What Caroline Knew” and “Glorie,” is at work on two nonfiction books.

http://www.nytimes.com/2008/08/10/books/review/James-t.html?8bu&emc=bua2

'Punk Half Panther'

By STEPHEN BURT

187 REASONS MEXICANOS CAN'T CROSS THE BORDER

Undocuments 1971-2007.

By Juan Felipe Herrera.

352 pp. City Lights. Paper, $16.95.

HALF OF THE WORLD IN LIGHT

New and Selected Poems.

By Juan Felipe Herrera.

310 pp. The University of Arizona Press. Paper, $24.95.

Most of Juan Felipe Herrera's many books evoke at once the hardships that Mexican-Americans have undergone and the exhilarating space for self-reinvention that a New World art offers. The child of migrant workers and now a professor at the University of California, Riverside, Herrera began to publish and perform verse in the late 1960s and early '70s, amid the Chicano cultural ferment of Los Angeles and San Diego; he has been, and should be, admired for his portrayals of Chicano life. Yet he is no mere recorder of social conditions. Herrera is, instead, a sometimes hermetic, wildly inventive, always unpredictable poet, whose work commands attention for its style alone.

If there is one earlier writer Herrera resembles, that writer is Allen Ginsberg, whose volatile temperament he shares. In a poem dedicated to Ginsberg (and to "Oloberto & Magritta") Herrera calls himself a "Punk Half Panther": his slangy enthusiasms make him at home among "Toyota gangsta' / monsters, surf of new world colony definitions / & quasars & culture prostars going blam." Like the young Ginsberg, Herrera is at once an idiosyncratic visionary and antiestablishment advocate; like Ginsberg, Herrera manifests glee in extremes, in paeans and in jeremiads. "Blood on the Wheel" — part blues, part doggerel, part litany — denounces a pathologically American nexus of sex, commerce and violence by drawing on the border and on the biblical Ezekiel: "Blood of the painted donkey forced into prostitute zebra, / Blood of the Tijuana tourist finally awake & forced into pimp sleep again."

Like Ginsberg, Herrera presents not stories but simultaneities, in which everything takes place at once. Such crowded worlds find adequate praise, or damnation, only in rapid-fire lists: "the dawn-eyed village alley, / the intrepid nets of hushed camps, you / with your embarcation, gypsy-Indian hair, and me / without a hat, did you love me." He delves insistently

> Into the tilted factories, the smeared taxis,
> the stunted universities, into the parlor of bank notes,
> in the cramped cookhouse where the dark-skinned
> humans still stoop and pitch the daily lettuce bags.

Such an art of accelerated inclusion uses its fast pace and its adjectival surprises to propel into view scenes we may otherwise avoid.

Herrera had energy from the beginning: he needed to find forms that would let him use it. Like Ginsberg — like Pablo Neruda, like Walt Whitman — Herrera found such forms in long lists, long lines, long poems made out of short parts, and in the literary device called anaphora, where many lines begin with the same words. No poet alive, perhaps, uses anaphora better; none relies on it more. The title poem in "187 Reasons Mexicanos Can't Cross the Border" is also the first in the book. Each of its 187 lines begins "Because": "Because multiplication is our favorite sport," "Because someone made our IDs out of corn," "Because we're still running from La Migra / Because we're still kissing the Pope's hand."

Herrera's anaphora, in that poem, pivots between ironies directed at Mexican-Americans and anger over California's Proposition 187, designed to keep illegal immigrants out. "Performance & text-in-the-community work," Herrera claims, "is at the core of all Chican@ poetry." (Herrera likes the @ suffix for words that could end with -a or -o, as in "Latin@.") It certainly lies at the core of his own. Arranged with the most recent (and best) poems first, "187 Reasons" gathers, from throughout Herrera's career, verse and prose especially fit for oral performance. Herrera calls these works "undocuments" because they solicit the voice rather than lying flat (like "documents") on the page, and because they often concern undocumented immigrants. They are "undocuments," too, because they are works of imagination rather than pieces of evidence. The title "Autobiography of a Chicano Teen Poet" (1987) may promise the literal record of a life, but delivers, instead, such lines as these: "My brother died in the ring, / stabbed 14 times by the King of Desire. / All the electric guitars moaned in the pawnshops / and my mother grew smaller with memory."

Herrera's vaulting confidence and his concessions to the demands of an audience (where subtlety may be no asset) can raise poems above the page or sink them. "Señorita X: Song for the Yellow-Robed Girl From Juárez" sometimes soars: "This is the song of mumbling fathers with harmonicas conjuring the winds / This is the song of tiny lost brothers and sisters hiding under mercado glass." Yet other parts of the same elegy sound clumsy or naïve: "The mothers push the blood ocean & cradle close the blood crib cry / ... They are the black center where you dwell." Elsewhere vigor and naïveté prove inseparable, as in these lines about children dying of thirst: "hey moony moon they said / give me a flask of your water white fresh / hey moonmoonymoon." That poem ("One by One"), like others throughout his books, appears in English and in Spanish (where the corresponding lines read "oye lunitalunera dijeron / dame un vaso de tu agua blanca fresca / oye luna lunita lunera"). Herrera does not say which is "original," which translation.

One of Herrera's best books is called "Border-Crosser With a Lamborghini Dream." Each border or barrier in Herrera's work seems meant to be denied, crossed, overcome: oral and written, Spanish and English, oneiric and public, lyric and oratorical. He also unites two kinds of Mexicanness, which might (without him) seem forever at odds: one urban, youthful, tough, fast-paced and secular (as in "Punk Half Panther"), the other older, bound up with folk religion and agricultural life. This second version comes out in the chants and spells that punctuate many poems, but takes center stage in the sequence "Thunderweavers," spoken by ethnic Mayans in Chiapas:

> This womb is another willow, little moon leaf
> branch of green winds and raw combat. It is of drum,
> flute cane and day-break corn.

Trying to break down old borders and orders, Herrera risks making his poetry, simply, a mess. A suite about Frida Kahlo declares, "There are no frames, really / It goes against the nation of love." "Style, Genre & Craft" seem to him in one mood maleficent "interests of Master-power." No artist could believe such a claim all the time, and Herrera does not: he may say, in a 1999 prose poem, "I hate sonnets. Sestinas are for pigs," but the same year saw him publish fine unrhymed sonnets, one of which ("La Victima") warns, "Don't believe anything I've said."

Herrera's best work seems not formless but endlessly fertile, open-ended, full of beginnings: "Stop resisting the rupture. / Stop grasping the form," he advises, "recognize the rubble. My mother's rubble

sky."

"Half of the World in Light" draws on all Herrera's 14 books of verse for adults (though not on his writings for children): it contains all the kinds of poems he writes — verse orations and evocative monologues, but also imitations of imaginary paintings, travel poems about the Middle East and visual-typographic verse in the manner of e. e. cummings. Herrera's talent invites such amplitude, though "Half of the World" may overdo it; it seems too various, too generous and simply too long to make an ideal introduction.

Along with "187 Reasons," however, it is the introduction we have. Herrera's worst poems seem disorganized, excessive, frantic; his best seem disheveled, excited, uncommonly free. "A poem," he promises, brings "a way to attain a life without boundaries." All life, all art, involves boundaries, if only those of birth and death. Some poets keep us conscious of those boundaries; others, like Herrera, discover their powers by defying them. Many poets since the 1960s have dreamed of a new hybrid art, part oral, part written, part English, part something else: an art grounded in ethnic identity, fueled by collective pride, yet irreducibly individual too. Many poets have tried to create such an art: Herrera is one of the first to succeed.

Stephen Burt's new book of literary criticism is "The Forms of Youth"; a collection of essays and reviews, "Close Calls With Nonsense," will appear in 2009. He teaches at Harvard.

http://www.nytimes.com/2008/08/10/books/review/Burt2-t.html?8bu&emc=bua2

Marathon Man

By GEOFF DYER

WHAT I TALK ABOUT WHEN I TALK ABOUT RUNNING

By Haruki Murakami.

Translated by Philip Gabriel.

180 pp. Alfred A. Knopf. $21.

I seem to have developed a fondness for approaching great writers via the road less traveled. I read John Cheever's "Journals" before his stories and novels. I got around to Joseph Brodsky's poems, in "A Part of Speech," only after reading "Watermark," his short book on Venice. Martin Amis? I started off with the bits of journalism in "The Moronic Inferno" and then moved on to "Money." And now I commence my reading of Haruki Murakami, not with "The Wind-Up Bird Chronicle" or "Norwegian Wood" but with this little book about running. I'm guessing that the potential readership for "What I Talk About When I Talk About Running" is 70 percent Murakami nuts, 10 percent running enthusiasts and an overlapping 20 percent who will be on the brink of orgasm before they've even sprinted to the cash register. And then there's me, the zero-percenter: a non-running Murakami virgin. Oh well. The supreme test of nonfiction is that it be interesting irrespective of the reader's indifference to the subject under discussion, and a great writer's work is obviously beflecked with greatness whatever the occasion. So the terms of the test are clear.

Murakami began running seriously when he was 33, in 1982. In recent years he has covered an average of six miles a day, six days a week and has competed in more than 20 marathons. In 1996 he completed an ultramarathon of 62 miles. Lately he's developed a fondness for triathlons, and although he's fighting a losing battle these days against his own previous (that is, younger) race times, he has no intention of quitting. To give up running would be like giving up writing, which would be like giving up living. When he crosses the ultimate finish line his gravestone will, he hopes, read:

> Haruki Murakami
> 1949-20**
> Writer (and Runner)
> At Least He Never Walked

The book is part training diary, part reruns of escapades undertaken at the behest of magazines (including an excellent account of a solo assault on the original route from Athens to Marathon in the full scorch of summer) and part memoir. Narrative incentive is provided by the looming prospect of the 2005 New York City Marathon. Some of the nicest touches derive from stuff he notices out of the corner of his eye, on the hoof, as it were. As a quick chill descended on Boston in the fall, "even the faces of the squirrels looked different as they scurried around collecting food." Or there are moments when he views himself and his fellow triathletes as they might appear to an outsider, as "a bunch of pitiful dolphins washed up on the shore, waiting for the tide to come in."

"What I Talk About" is the latest installment in a pleasant mini-tradition of writers bunking off from their day jobs to take their sporting hobbyhorses out for a trot: Robert Hughes on fishing, John Updike on golf, Joyce Carol Oates on boxing. Sometimes this interest is entirely that of a spectator (Oates), sometimes it is that of a keen if limited practitioner (Updike); always it engenders quasi-philosophical musings. Murakami exaggerates when he describes his own thoughts on "the fleeting nature of existence" as "very philosophical," but running certainly has closer kinship with the labor of writing than any other sport. For

Murakami, long-haul running is not just a metaphor for the loneliness of the long-distance novelist; it's pretty well synonymous with it. In the style of Albert Camus — who claimed that much of what he knew about morality and duty he learned from soccer — Murakami believes that "most of what I know about writing I've learned through running every day." Specifically, he believes that writing requires, in order of priority, talent, focus and endurance — all of which find their complements in the habit of running. Writing, he thinks, is "an unhealthy type of work" because it brings the author face to face with the "toxin that lies deep down in all humanity" and without which "no creative activity in the real sense can take place." Even if you don't buy into this — and I don't see how you can, unless you throw in the dully dampening qualifier that it depends on the kind of creativity involved — the more modest claim, that running is a useful antidote to sitting on your bum and writing, is easy to accept. The discipline needed to keep running when you don't feel like it, the constant instruction to your body to cover the requisite number of miles, offer immediate parallels with the grind of meeting your target of however many words a day. Murakami is not dogmatic. He knows that for writers, as a Tobias Wolff character put it, "there is no such thing as an exemplary life," but an unyielding regime of running and early nights is what's enabled him to keep churning out critically acclaimed best sellers.

Murakami may be addicted to running, but hey, it seems a lot healthier than Mishima's bodybuilding trip — and nothing about the book under review suggests that Murakami will disembowel himself and get a friend to cut off his head. Even so, aspects of his training involve such extremes of self-torture that even the most tolerant reader will find them questionable, for the unpalatable truth is that Murakami listens to Eric Clapton while running.

Is there any connection between the music Murakami listens to and his own prose? In races he is conscious of his fellow competitors' running styles in the same way "two writers perceive each other's diction and style." Jogging alongside him we get ample opportunity to check out his literary style, at least as given to us in this translation from the Japanese by Philip Gabriel.

To characterize it as briefly as possible: easy on ear and mind alike, it's the type of prose I would call sort of pretty poor. Running is "sort of a vague theme" (i.e., not just vague but vaguely vague), and the book is "a kind of memoir." Murakami sort of likes this kind of thing, not just as an indistinct modifier but as a form of category-definition. He's the "type of person," "kind of person" — I lost track of the number of times this came up — who likes "sort of laid-back" music and is "sort of a brazen person" who sometimes has "a sort of arrogant attitude."

I have not made a comparative study, but I suspect that the most tedious four-word combo in any language is "As I said earlier." Murakami wastes no time demonstrating his mastery of all the variants of this heart-sinking turn of phrase. It first pops up on Page 12 — difficult to see how it could have come any earlier — and its cousin "As I mentioned before" appears five pages later.

On Page 25 he tells us that the "kind of" jazz club he used to run was "pretty rare" and served "pretty decent food" and that he was "pretty naïve." Moving on, we learn that he was "pretty surprised" when his first novel was "fairly well received," that his Cambridge apartment was "pretty noisy," that his new running shoes have been "pretty well" broken in, that he is "pretty easygoing" and had "a pretty good feeling for the pace" he would need to maintain in the New York marathon.

In an afterword Murakami explains that part of the motive for writing the book was "to sort out what kind of life I've led." If he'd written "sort of sort out" I would have forgiven him everything, but instead, he goes in for further self-incrimination. Apparently, it took quite some time to "carefully polish and rework" the book, and he "needed to revisit the manuscript many times over a period of time." So it's a straight choice: either he's the kind of writer who's a pretty poor editor of his own stuff or this kind of lazy repetition is deliberate. But if it is deliberate, what conceivable purpose is being served? Thomas Bernhard uses incessant repetition to screw his prose into an excruciating ball of angst, and occasionally, Murakami's short-order tics bunch up so close that they almost run away with themselves: "As I've said, I'm not a very competitive type of person." The sloppiness reaches an anticlimax of sorts when, in the

midst of a “pretty disorderly” swimming race, he becomes “kind of confused.” The rest of the time this accumulating cloud of imprecision, this lack of linguistic focus (one of his trinity of crucial qualities, remember), seems “kind of lethargic” and succeeds in making us identify closely with “the type of person who, once he gets sleepy, can fall sound asleep anywhere.”

Now, I don’t know how representative this book is of Murakami’s novelistic style, but I wonder: Is this low-maintenance, attention-deficit prose part of Murakami’s attraction, especially among the young? Do people enjoy reading him for the same reason they persist in listening to music as blandly familiar as Clapton’s? If Martin Amis is engaged in a “war against cliché” — a phrase in danger of becoming a cliché itself — then Murakami, on the evidence of this book, is a serial appeaser. How much does his thigh hurt? “Like crazy.” How do we know the weather is nice? Because — as he tells us (twice) — there’s “not a cloud in the sky.”

It’s not all bad, of course. There are flashes of quality, as when his muscles feel “as hard as week-old cafeteria bread,” but most of the time his prose, unlike those muscles, is so laid back that it can barely stand up (to even moderate scrutiny). As he imagines an editor saying about a memory evoked by another musical favorite, the Lovin’ Spoonful: “It’s not bad, but it’s sort of ordinary and doesn’t amount to much.”

Geoff Dyer’s new novel, “Jeff in Venice, Death in Varanasi,” will be published next spring.

http://www.nytimes.com/2008/08/10/books/review/Dyer-t.html?8bu&emc=bua2

Cern lab set for beam milestone

By Paul Rincon
Science reporter, BBC News

A vast physics experiment - the Large Hadron Collider (LHC) - reaches a key milestone this weekend ahead of an official start-up on 10 September.

Engineers had previously brought a beam of protons - tiny, sub-atomic particles - to the "doorstep" of the LHC.

On 9 August, protons will be piped through LHC magnets for the first time.

The most powerful physics experiment ever built, the LHC will re-create the conditions present in the Universe just after the Big Bang.

> **It's been a long-haul, and we're all eager to get the LHC research programme underway**
> Lyn Evans, LHC project leader

There are over 5,000 magnets arranged end-to-end in a ring that runs for 27km through a giant tunnel under the French Swiss border.

Once the LHC is fully operational, two proton beams will be fired down pipes running through these magnets. These beams will then be steered in opposite directions around the main ring at close to the

speed of light.

At allotted points along the tunnel, the beams will cross paths, smashing into one another with cataclysmic force. Scientists hope to see new particles in the debris of these collisions, revealing fundamental new insights into the nature of the cosmos and how it came into being.

Precision timing

For the two-day "synchronisation test", engineers will thread a low intensity beam through the injection system and one of the LHC's eight sectors.

These two sectors have now reached a sufficient level of readiness to handle the energetic stream of particles, and this opened up the opportunity to run the test.

The purpose of the test is to help ensure that the LHC is working in step with its "injector", known as the Super Proton Synchrotron (SPS) accelerator.

Before a beam can be fired into the main ring, the proton beams have to be boosted to high energies in a chain of particle accelerators, or injectors.

The SPS is the last link in this chain; it is from here that protons are fed directly into the LHC ring via two "injection lines" - one for each beam.

"The aim is to get the timings right between the two machines and in order to do that we will take some beam into sector 2-3," said Roberto Saban, the LHC's head of hardware commissioning.

Cern, the organisation that operates the collider, said it will attempt to circulate two proton beams all the way around the ring on 10 September. This is considered the giant lab's official "switch-on".

Beam collision

"It's been a long haul, and we're all eager to get the LHC research programme underway," said Lyn Evans, the project leader.

This full beam injection will take place at an energy of about 450 gigaelectronvolts (GeV). Over subsequent weeks, engineers will gradually boost the energy and fine tune the machine.

Roberto Saban said that in order to obtain high magnetic fields with a modest power consumption, the LHC's magnets are required to be "superconducting".

This is the property, exhibited by some materials at very low temperatures, to channel electrical current with zero resistance and very little power loss.

This requires cooling the magnets to a temperature of 1.9 Kelvin (-271C; -456F). Six out of eight sectors are currently at their operating temperatures; cooling of the remaining two should be completed in the next few weeks.

Over August, scientists will continue electrical testing of the LHC hardware prior to circulating beams in early September.

This phase will continue through the month to ensure that the entire machine is capable of accelerating

and colliding beams at an energy of five teraelectronvolts (TeV).

Once stable, circulating beams have been established, they will be smashed together - in preparation for the LHC's science phase.

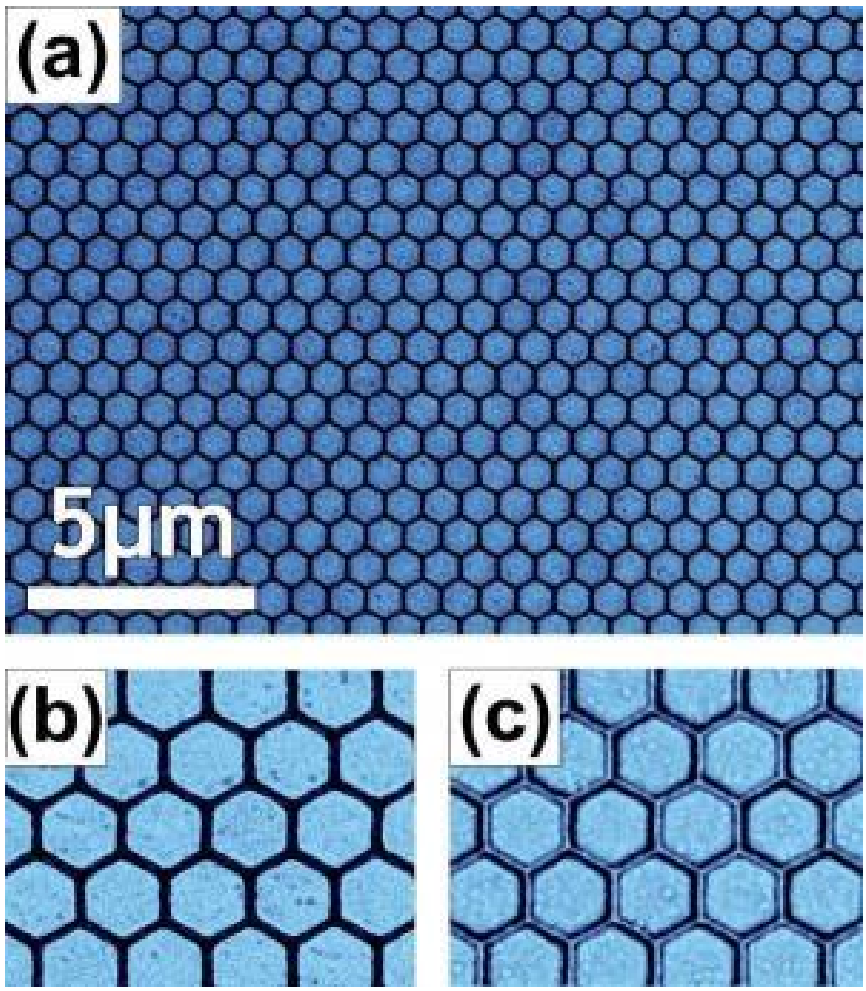
BBC Radio 4 will broadcast live from Cern on 10 September. The Big Bang Day starts in the LHC control room at 0830 BST for the official start-up, and then continues through the day with related programmes, from indepth discussions about particle physics to a special one-off radio version of the popular TV drama Torchwood.

Paul.Rincon-INTERNET@bbc.co.uk

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/7547118.stm

Published: 2008/08/07 17:23:47 GMT

Meta-materials Mimic Ice And Illuminate Why Water-ice Doesn't Fully Conform To Third Law Of Thermodynamics



(a) A TEM image of the artificial spin ice created by the Cumings group. (b) a close-up image of a small region of the artificial spin ice. Each link is only 500 nm in length. (c) A Lorentz TEM image of the same region as (b). Here the magnetic direction can be determined by the bright and dark lines in each link. Despite showing disordered configurations, each vertex obeys the ice rule. (Credit: Cumings research group, U-MD)

ScienceDaily (Aug. 8, 2008) — "Ye canna change the laws of physics!" Scotty warned Captain Kirk on "Star Trek." But engineers and physicists at the University of Maryland may rewrite one of them.

The Third Law of Thermodynamics is on the minds of John Cumings, assistant professor of materials science and engineering at the University of Maryland's A. James Clark School of Engineering, and his research group as they examine the crystal lattice structure of ice and seek to define exactly what happens when it freezes.

"Developing an accurate model of ice would help architects, civil engineers, and environmental engineers understand what happens to structures and systems exposed to freezing conditions," Cumings said. "It could also help us understand and better predict the movement of glaciers."

Understanding the freezing process is not as straightforward as it may seem. The team had to develop a

type of pseudo-ice, rather than using real ice, in order to do it.

Despite being one of the most abundant materials on Earth, water, particularly how it freezes, is not completely understood. Most people learn that as temperatures fall, water molecules move more slowly, and that at temperatures below 32º F/0º C, they lock into position, creating a solid—ice. What's going on at a molecular level, says Cumings, is far more complicated and problematic. For one thing, it seems to be in conflict with a fundamental law of physics.

The Third Law of Thermodynamics states that as the temperature of a pure substance moves toward absolute zero (the mathematically lowest temperature possible) its entropy, or the disorderly behavior of its molecules, also approaches zero. The molecules should line up in an orderly fashion.

Ice seems to be the exception to that rule. While the oxygen atoms in ice freeze into an ordered crystalline structure, its hydrogen atoms do not.

"The hydrogen atoms stop moving," Cumings explains, "but they just stop where they happen to lie, in different configurations throughout the crystal with no correlation between them, and no single one lowers the energy enough to take over and reduce the entropy to zero."

So is the Third Law truly a law, or more of a guideline?

"It's a big fundamental question," says Cumings. "If there's an exception, it's a rule of thumb."

Materials that violated the Third Law as originally written were found in the 1930s, mainly non-crystalline substances such as glasses and polymers. The Third Law was rewritten to say that all pure crystalline materials' entropy moves toward zero as their temperatures move toward absolute zero. Ice is crystalline—but it seems only its oxygen atoms obey the Law. Over extremely long periods of time and at extremely low temperatures, however, ice may fully order itself, but this is something scientists have yet to prove.

Creating an accurate model of ice to study has been difficult. The study of ice's crystal lattice requires precise maintenance of temperatures below that of liquid nitrogen (-321 °F/-196 °C), and also a lot of time: no one knows how long it takes for ice to ultimately reach an ordered state—or if it does at all. Experiments have shown that if potassium hydroxide is added to water, it will crystallize in an ordered way—but researchers don't know why, and the addition shouldn't be necessary due to the Third Law's assertion that pure substances should be ordered as they freeze.

To overcome these problems, scientists have designed meta-materials, which attempt to mimic the behavior of ice, but are created out of completely different substances. A previous material, spin ice, was designed from rare earth elements and had a molecular structure resembling ice, with magnetic atoms (spins) representing the position of hydrogen atoms. However, it did not always behave like ice.

The Cumings group is refining a successor to spin ice called artificial spin ice, which was originally pioneered by researchers at Penn State. The newer meta-material takes the idea a step further.

"The original spin ice research went from one part of the periodic table to a more flexible one," said Cumings. "But artificial spin ice goes off the periodic table altogether."

Artificial spin ice is a collection of "pseudo-atoms" made of a nickel-iron alloy. Each pseudo-atom is a large-scale model made out of millions of atoms whose collective behavior mimics that of a single one.

As with the original spin ice, magnetic fields are stand-ins for hydrogen atoms. Working at this "large" scale—each pseudo-atom is 100x30 nanometers in size (100 nanometers is 1000

times smaller than the width of a human hair)—gives the researchers control over the material and freedom to explore how real atoms behave.

"It mimics the behavior of real ice but is completely designable with specific properties," Cumings said. "We can change the strength of the spin or reformulate the alloy to change the magnetic properties, which creates new bulk properties that we either couldn't get from normal materials, or couldn't control at the atomic level."

The team is also able to image the behavior of the pseudo hydrogen atoms using an electron microscope—such direct observation is not possible with the original spin ice or real ice.

"This is the first time the rules of ice behavior have ever been rigorously confirmed by directly counting pseudo hydrogen atoms," explained group member and postdoctoral research associate Todd Brintlinger. "We can track the position and movement of each pseudo atom in our model, see where defects occur in the lattice, and simulate what happens over much longer periods of time."

The ultimate impact of the research may go beyond civil engineering and the environment. "Although we're mimicking the behavior of ice," Cumings explained, "our meta-material is very similar to patterned hard-disk media. Magnetic 'bits' used in hard drives are usually placed at random, but memory density could be increased if they were in a tight, regular pattern instead.

"We've found that both hydrogen in ice and the pseudo-hydrogen in our artificial spin ice also behave as bits, can carry information, and interact with each other. Perhaps in the future, engineers will be inspired by this in their hard drive designs. The formal patterning and bit interactions may actually help to stabilize information, ultimately leading to drives with much higher capacities."

Adapted from materials provided by University of Maryland.

http://www.sciencedaily.com/releases/2008/08/080807144311.htm

Back To The Future: Psychologists Examine Children's Mental Time Traveling Abilities

'When will we be there?' Researchers have found that children find it difficult to imagine their future selves in a particular situation when preoccupied with their current state. (Credit: iStockphoto/Maya Kruchancova)

ScienceDaily (Aug. 8, 2008) — Planning and anticipating occur so frequently in our everyday lives that it is hard to imagine a time when we didn't have this capability. But just as many other capacities develop, so does this mental time traveling ability. Researchers have recently explored how children comprehend the future and ways that this understanding can be affected by, for example, their current physiological state.

In one particular study, psychologists Cristina Atance from the University of Ottawa and colleague Andrew Meltzoff from the Univeristy of Washington tested children ages three, four and five to determine the precise age that they develop the ability to plan for the future. Atance presented preschoolers with a pretend situation in the future, such as going to the mountains, and then asked them to choose from three items to take along. In the mountain scenario, the three items included a lunch, which would prepare for the possibility of hunger, and two unrelated items, such as a comb and a bowl. Results showed that four- and five-year-olds were more likely to select the correct response for future planning, such as the lunch, than the three-year-olds.

Other findings, which appear in the August 2008 issue of Current Directions in Psychological Science, a publication of the Association for Psychological Science, indicated that children found it difficult to imagine their future selves in a particular situation if they were preoccupied with their current state.

To show this, Atance and Meltzoff presented one group of preschoolers with

pretzels, which would cause them to become thirsty, and did not present a second group with anything; both groups later were offered either pretzels or water. The first group of children, who already had eaten pretzels, tended to choose water while the other group selected pretzels. More importantly, two other groups of children--one who had eaten pretzels and one who had not--were asked to choose whether they would prefer pretzels or water for "tomorrow." The psychologists found that the children who ate pretzels to the point of thirst tended to think of the pretzels as undesirable for the next day, whereas the other group did not.

These findings and others can shed light on the childhood development of this mental time-traveling ability and encourage understanding of it in various settings. As Atance said, "This research can benefit parents, teachers and other individuals working with children as it can allow them to set realistic expectations for, and better interpret, children's everyday behavior."

Journal reference:

1. Cristina M. Atance. **Future Thinking in Young Children**. *Current Directions in Psychological Science*, Published Online: Jul 28 2008 DOI: 10.1111/j.1467-8721.2008.00593.x

Adapted from materials provided by Association for Psychological Science.

http://www.sciencedaily.com/releases/2008/08/080805124011.htm

Twenty Disease-specific Stem Cell Lines Created

ScienceDaily (Aug. 8, 2008) — A set of new stem cell lines will make it possible for researchers to explore ten different genetic disorders—including muscular dystrophy, juvenile diabetes, and Parkinson's disease—in a variety of cell and tissue types as they develop in laboratory cultures.

Harvard Stem Cell Institute researcher George Q. Daley, MD, PhD, also associate director of the Stem Cell Program at Children's Hospital Boston, and HSCI colleagues Konrad Hochedlinger and Chad Cowan have produced a robust new collection of disease-specific stem cell lines, all of which were developed using the new induced pluripotent stem cell (iPS) technique.

The paper is being published in the August 6 on-line edition of the journal Cell.

The new iPS lines, developed from the cells of patients ranging in age from one month to 57-years-old and suffering from a range of conditions from Down Syndrome to Parkinson's disease, will be deposited in a new HSCI "core" facility being established at Massachusetts General Hospital (MGH), HSCI co-director Doug Melton announced yesterday. The operations of the iPS Core will be overseen by a faculty committee, which Daley will chair.

The cell lines the researchers produced carry the genes or genetic components for 10 different diseases, including Parkinson's Disease, Type I diabetes, Huntington's Disease, Down Syndrome, a form of combined immunodeficiency ("Bubble Boy's Disease"), Lesch-Nyhan syndrome, Gaucher's Disease, and two forms of Muscular Dystrophy, among others.

"We wanted to produce a large number of disease models for ourselves, our collaborators, and the stem cell research community to accelerate research," Daley said. "The original embryonic stem cell lines are generic, and allow you to ask only basic questions. But these new lines are valuable tools for attacking the root causes of disease. Our work is just the beginning for studying thousands of diseases in a petri dish," he said.

Melton said that the HSCI iPS Core will serve as a repository for iPS cells produced by HSCI scientists. "The Core will also function as a technical laboratory to produce these disease- specific lines for use by scientists around the world," Melton said. He went on to say that "the suite of iPS cell lines reported by the Daley group marks an important achievement and a very significant advance for patients suffering from degenerative diseases. These disease-specific iPS cells are invaluable tools that will allow researchers to watch the development diseases in petri dishes, outside of the patients. And we have good reason to believe that this will make it possible to find new treatments, and eventually drugs, to slow or even stop the course of a number of diseases. In years ahead," Melton said, "this report will be seen as opening the door to a new approach to develop therapies."

"One of our goals in creating the NIH Director's Pioneer Award programs was to enable exceptionally creative scientists to move quickly in promising new directions, thereby speeding the intellectual and technical breakthroughs needed to address major challenges in biomedical or behavioral research," said National Institutes of Health Director Elias A. Zerhouni, M.D. "This is certainly the case for Drs. Daley and Hochedlinger, who deployed their Director's award resources to advance our ability to use induced pluripotent stem cells for disease-specific studies and drug development."

Daley and his colleagues, led by first-author and Children's researcher In Hyun Park, PhD, intentionally produced some stem cell lines for highly heritable, single-gene diseases, such as Gaucher's; complex genetic syndromes, such as Down; and then complex diseases, such as Parkinson's, that involve genetic, cellular, and perhaps environmental components.

"The cell lines available from the iPS Core will allow stem cell researchers around the world to explore possible gene therapies for some conditions, and will aid in the development of drugs for others," Daley said.

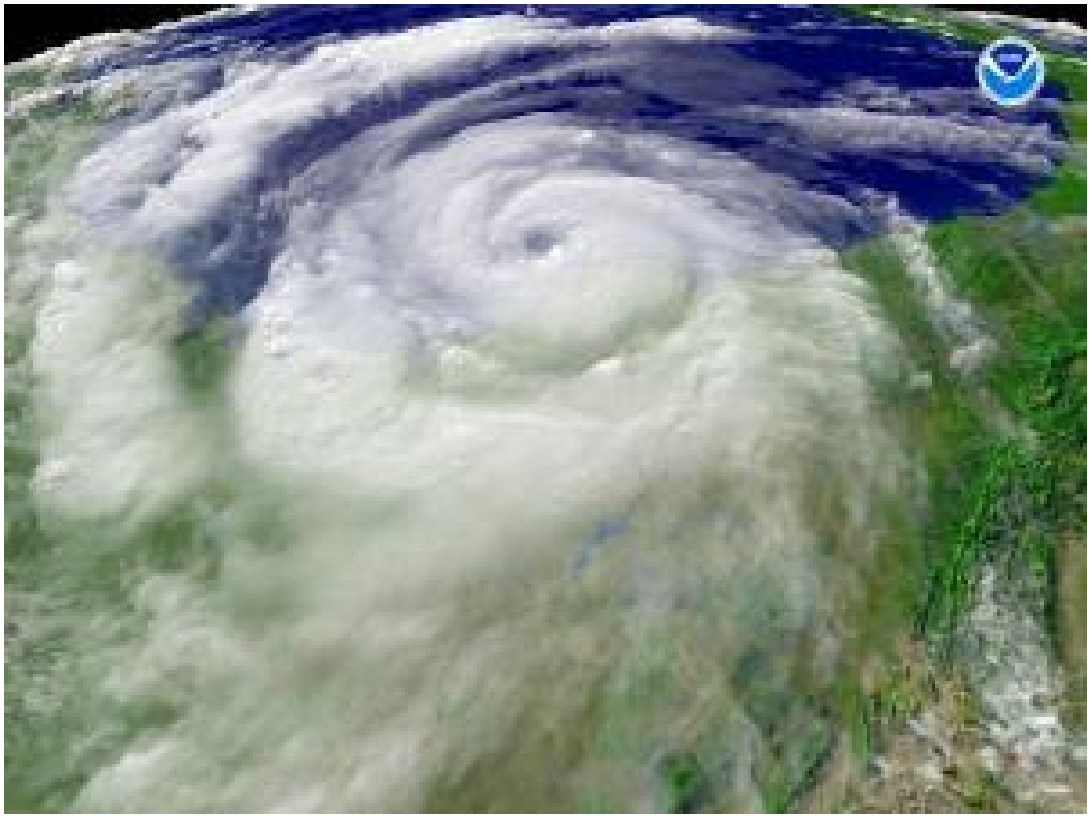
While Daley, President of the International Society for Stem Cell Research, is enthusiastic about the promise of reprogramming studies, he is far from ready to abandon experiments with embryonic stem cells. Daley believes that reprogramming and ESC research must advance in tandem to bring cell therapy to the clinic as quickly as possible.

The study was supported by grants from the National Institutes of Health (NIH), an NIH Director's Pioneer Award of the NIH Roadmap for Medical Research, an NIH Innovator's Award, the Burroughs Wellcome Fund, the Leukemia and Lymhoma Society, the Harvard Stem Cell Institute, Children's Hospital Boston Stem Cell Program, the Stowers Medical Institute, and the Howard Hughes Medical Institute.

Adapted from materials provided by Children's Hospital Boston, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2008/08/080807130834.htm

NOAA Forecasts Even Stronger Atlantic Hurricane Season For 2008 Than Earlier Prediction



Hurricane Dolly on July 23, 2008. (Credit: NOAA)

ScienceDaily (Aug. 8, 2008) — In the August update to the Atlantic hurricane season outlook, NOAA's Climate Prediction Center has increased the likelihood of an above-normal hurricane season and has raised the total number of named storms and hurricanes that may form. Forecasters attribute this adjustment to atmospheric and oceanic conditions across the Atlantic Basin that favor storm development - combined with the strong early season activity.

NOAA now projects an 85 percent probability of an above-normal season – up from 65 percent in May. The updated outlook includes a 67 percent chance of 14 to 18 named storms, of which seven to 10 are expected to become hurricanes, including three to six major hurricanes of Category 3 strength or higher on the Saffir-Simpson Scale. These ranges encompass the entire season, which ends November 30, and include the five storms that have formed thus far.

In May, the outlook called for 12 to 16 named storms, including six to nine hurricanes and two to five major hurricanes. An average Atlantic hurricane season has 11 named storms, including six hurricanes and two major hurricanes.

"Leading indicators for an above-normal season during 2008 include the continuing multi-decadal signal – atmospheric and oceanic conditions that have spawned increased hurricane activity since 1995 – and the lingering effects of La Niña," said Gerry Bell, Ph.D., lead seasonal hurricane forecaster at NOAA's Climate Prediction Center. "Some of these conditions include reduced wind shear, weaker trade winds, an active West African monsoon system, the winds coming off of Africa and warmer-than-average water in

the Atlantic Ocean."

Another indicator favoring an above-normal hurricane season is a very active July, the third most active since 1886. Even so, there is still a 10 percent chance of a near normal season and a five percent chance of a below normal season.

NOAA's hurricane outlook is a general guide to the expected level of hurricane activity for the entire season. NOAA does not make seasonal landfall predictions since hurricane landfalls are largely determined by the weather patterns in place as a hurricane approaches.

Five named storms have formed already this season. Tropical Storm Arthur affected the Yucatan Peninsula in late May and early June. Bertha was a major hurricane and the longest-lived July storm (July 3-20) on record. Tropical Storm Cristobal skirted the North Carolina coastline. Dolly made landfall as a Category 2 hurricane at South Padre Island, Texas on July 25. And on August 5, Tropical Storm Edouard struck the upper Texas coast.

"It is critical that everyone know the risk for your area, and have a plan to protect yourself, your family and your property, or to evacuate if requested by local emergency managers. Be prepared throughout the remainder of the hurricane season," Bell said. "Even people who live inland should be prepared for severe weather and flooding from a tropical storm or a hurricane."

The Atlantic hurricane season includes activity over the Atlantic Ocean, Caribbean Sea and Gulf of Mexico. The peak months of the season are August through October.

NOAA understands and predicts changes in the Earth's environment, from the depths of the ocean to the surface of the sun, and conserves and manages our coastal and marine resources.

Adapted from materials provided by National Oceanic And Atmospheric Administration.
http://www.sciencedaily.com/releases/2008/08/080808114131.htm

Museum of History Unveils Its Future

By ROBIN POGREBIN

In 2003, one could be forgiven for questioning what the future held for the Museum of the City of New York. It had lost its promised new home in the Tweed Courthouse downtown, had given up on a proposed merger with the New-York Historical Society and was adjusting to a new director, Susan Henshaw Jones.

Now, five years later, the museum is cutting the ribbon on Wednesday on the first completed phase of a building project intended to give the institution, on Fifth Avenue between 103rd and 104th Streets, more space and greater visibility. It is also a symbol of its renewal.

"The transformation of the museum has been both physical and mission-driven," Ms. Jones said in an interview. "The structural renovation supports our goals."

Those goals include becoming a more attention-getting destination, on a par with city museums around the world. This is no small challenge.

"We've always been the poor sister to the city museums in London, Rome, Paris and Tokyo," said James S. Polshek, the lead architect of the project. Under the Giuliani administration, Mr. Polshek said, the museum was particularly neglected and came to be pigeonholed as a place "where little kids go to look at fire engines."

To counter that image and reinvigorate the museum's presence at its 76-year-old home, Mr. Polshek's firm, Polshek Partnership, has designed a 3,000-square-foot glass-clad pavilion gallery in a former vacant lot behind the museum. The new two-level gallery has translucent surfaces that diffuse sunlight to protect

the artifacts on display. The entrance vestibule and rotunda of the museum have been updated with a connection to the new gallery that leads through the two-story, semicircular wall and cradles the existing grand stairway.

"We used architecture to create a public announcement of the state of the institution," Mr. Polshek said in an interview. "We wanted to give a signal that this was an alive and modern museum, capable of catering to the next generation of visitors in New York City."

Even as the architects introduced the contemporary addition, they also restored Joseph H. Freedlander's original 1932 Georgian Revival building, which was designated a city landmark in 1967. The front facade has been restored; its 4,700-square-foot front terrace facing Fifth Avenue has been redesigned and relandscaped. In the back of the building, the existing terrace on the south side of the pavilion has been expanded and a new terrace added on its north side. "This marries a mid-20th-century building in a historic style to a contemporary piece of architecture that represents the 21st century," Mr. Polshek said.

His firm's three-level addition includes one story below ground, the museum's new curatorial center. This new space features cold rooms for the preservation of some 500,000 photographic images of New York City, as well as for glass and acetate negatives and prints.

"We did not have proper storage at all for our collections," said James G. Dinan, the museum's chairman.

The museum's theater collections will now be housed in movable storage cabinets; a specialized conservation area is reserved for the care of the costume collection. Other additions include a research room for visiting scholars, a vault for the museum's silver collection and a room for the handling of artifacts, a common requirement for temporary exhibitions.

The museum will now also have full disability access for the first time.

The new pavilion gallery will be used for temporary exhibitions. The first, scheduled to open on Oct. 3, is "Paris/New York Design, Fashion, Culture 1925-1940." The gallery will be named the James G. Dinan and Elizabeth R. Miller Gallery, in recognition of those donors' gift of more than $5 million. (They declined to give the exact amount.)

"The goal, really, is to create a wow factor, a must-see factor, so the museum becomes one of the mandatory stops," said Mr. Dinan, the founder and chief executive of York Capital Management.

About $20 million of the $28 million construction cost for the first phase of the refurbishment plan was covered by the city, which owns the building. The additional $8 million was raised from private sources.

The second phase, scheduled to start in the fall, will provide new office space on the fourth and fifth floors, as well as climate control and an upgraded electrical system for the south wing of the building. This $24 million portion of the project will also include the renovation of existing galleries, the Children's Center and the museum shop. The final phase calls for the renovation of the museum's north wing and an endowment campaign.

The project was divided into three phases so the museum could remain open throughout construction. The full renovation is to be finished by 2010 or 2011.

The museum said it planned to raise an additional $33 million over the next three years from both public and private sources.

"It's on time, it's on budget, and it dovetails perfectly with the exponential growth of this institution,"

said Kate D. Levin, the city's cultural affairs commissioner.

Even as it has been renewing its physical plant, the museum has been trying to develop programming that encourages public discourse. A new series, for example, has featured panel discussions on design in the city, New York infrastructure and preservation and development.

"We really want to be an urban forum for New York," Ms. Jones said.

Exhibitions currently on view include "Campaigning for President: New York and the American Election," "Catholics in New York 1808-1946" and "New York Fast Forward: Neil Denari Builds on the High Line," about that Los Angeles architect's design for a tower along the former elevated railway.

"We don't think about blockbusters — we're not the Met," Mr. Dinan said. "The idea is to create our own programming, so that what you're getting is something that's very original."

This strategy seem to have borne fruit. Attendance has more than doubled, to 211,000 visitors in fiscal year 2007, up from 98,700 in fiscal year 2003. Over the last five years the museum's earned and contributed income increased to $17.6 million from $5.7 million.

The museum's recent exhibition on the city's master builder Robert Moses drew a strong critical reception and brought in crowds. At the same time, Ms. Jones said, "there are more people out there we want to reach." In 2004 she had said that she hoped to increase annual attendance to 500,000 by 2009. There is still, clearly, a way to go.

But Mr. Polshek said he expected the renovation would bring the museum closer to that goal and would help cement its status as a hometown institution.

"The City of New York finally has one of the great city museums in the world," he said, "and one could not say that before."

http://www.nytimes.com/2008/08/12/arts/design/12muse.html?_r=1&th&emc=th&oref=slogin

New Report Details Historic Mass Extinction Of Amphibians; Humans Worsen Spread Of Deadly Emerging Infectious Disease

Dead southern mountain yellow-legged frogs (Rana muscosa) killed by the chytrid fungus. Sixty Lake Basin, Kings Canyon National Park, California USA. (Credit: Photo by V. Vredenburg (August 2006), San Francisco State University)

ScienceDaily (Aug. 12, 2008) — Amphibians, reigning survivors of past mass extinctions, are sending a clear, unequivocal signal that something is wrong, as their extinction rates rise to unprecedented levels, according to a paper published by the Proceedings of the National Academy of Sciences (PNAS). Humans are exacerbating two key natural threats – climate change and a deadly disease that is jumping from one species to another.

The authors confront the question of whether Earth is experiencing its sixth mass extinction and suggest that amphibians, as a case study for terrestrial life, provide a clear answer. "A general message from amphibians is that we may have little time to stave off a potential mass extinction," write co-authors Vance T. Vredenburg, assistant professor of biology at San Francisco State University, and David B. Wake, curator of herpetology in the Museum of Vertebrate Zoology at University of California, Berkeley, in the August 12 issue of PNAS.

Amphibians are among the oldest organisms on earth, having survived the last four mass extinctions. The current extinction rate of amphibians is cause for alarm, according to biologists.

"An ancient organism, which has survived past extinctions, is telling us that something is wrong right now" Vredenburg said. "We -- humans -- may be doing fine right now, but they are doing poorly. The

question, really, is whether we'll listen before it's too late."

While many factors have been cited for the profound change in global amphibian populations, a new emerging infectious disease, chytridiomycosis, is thought to be directly responsible for wiping out more than 200 species. It poses the greatest threat to biodiversity of any known disease. An aquatic fungus of unknown origin, it's the first of its kind to infect vertebrates, and only amphibians.

Understanding the ecology of chytridiomycosis may not only help amphibians, but human health. Scientists seek to map how the pathogen is transmitted from one species to another to develop ways to prevent or control outbreaks.

The Sierra Nevada Yellow-legged Frog is an example of a species under threat of extinction. In 2001, chytridiomycosis was detected in the mountains of the Sierra Nevada, and subsequently the authors have documented mass die-offs and the collapse of populations because of outbreaks. The fungus is surprisingly virulent, according to authors, and how it causes death is not yet known.

"It's important for people to understand what's infecting and killing these frogs," Vredenburg said. "This disease is a remarkable example of a pathogen jumping boundaries and causing havoc. If we can understand how it is able to do so, we may be able to help the frogs as well as ourselves."

David B. Wake served as the director of the Museum of Vertebrate Zoology (MVZ) for 27 years and is now curator of herpetology and professor of the Graduate School at the University of California, Berkeley. MVZ is a center for research and education in the biology of amphibians, reptiles, birds and mammals. Founded in 1908, the Museum's mission is to document and increase understanding of the diversity of terrestrial vertebrates, with particular emphasis on western North America.

Vance T. Vredenburg is an assistant professor at San Francisco State University. His research focuses broadly on the ecology, evolution and conservation of amphibians and incorporates elements of population, community and behavioral ecology to investigate the impacts of emerging infectious disease, introduced predators, and habitat loss on threatened amphibians. He is the co-founder of AmphibiaWeb.org (http://amphibiaweb.org) an online bioinformatics project promoting science and conservation of the world's amphibians.

Adapted from materials provided by San Francisco State University.

http://www.sciencedaily.com:80/releases/2008/08/080811195627.htm

Running Slows The Aging Clock, Researchers Find

Regular running slows the effects of aging, according to a new study. (Credit: iStockphoto/Josh Webb)

ScienceDaily (Aug. 11, 2008) — Regular running slows the effects of aging, according to a new study from Stanford University School of Medicine that has tracked 500 older runners for more than 20 years. Elderly runners have fewer disabilities, a longer span of active life and are half as likely as aging nonrunners to die early deaths, the research found.

"The study has a very pro-exercise message," said James Fries, MD, an emeritus professor of medicine at the medical school and the study's senior author. "If you had to pick one thing to make people healthier as they age, it would be aerobic exercise." The new findings will appear in the Aug. 11 issue of the journal Archives of Internal Medicine.

When Fries and his team began this research in 1984, many scientists thought vigorous exercise would do older folks more harm than good. Some feared the long-term effect of the then-new jogging craze would be floods of orthopedic injuries, with older runners permanently hobbled by their exercise habit. Fries had a different hypothesis: he thought regular exercise would extend high-quality, disability-free life. Keeping the body moving, he speculated, wouldn't necessarily extend longevity, but it would compress the period at the end of life when people couldn't carry out daily tasks on their own. That idea came to be known as "the compression of morbidity theory."

Fries' team began tracking 538 runners over age 50, comparing them to a similar group of nonrunners. The subjects, now in their 70s and 80s, have answered yearly questionnaires about their ability to perform everyday activities such as walking, dressing and grooming, getting out of a chair and gripping objects. The researchers have used national death records to learn which participants died, and why. Nineteen years into the study, 34 percent of the nonrunners had died, compared to only 15 percent of the runners.

At the beginning of the study, the runners ran an average of about four hours a week. After 21 years, their running time declined to an average of 76 minutes per week, but they were still seeing health benefits from running.

On average both groups in the study became more disabled after 21 years of aging, but for runners the onset of disability started later.

"Runners' initial disability was 16 years later than nonrunners,'" Fries said. "By and large, the runners have stayed healthy."

Not only did running delay disability, but the gap between runners' and nonrunners' abilities got bigger with time.

"We did not expect this," Fries said, noting that the increasing gap between the groups has been apparent for several years now. "The health benefits of exercise are greater than we thought."

Fries was surprised the gap between runners and nonrunners continues to widen even as his subjects entered their ninth decade of life. The effect was probably due to runners' greater lean body mass and healthier habits in general, he said. "We don't think this effect can go on forever," Fries added. "We know that deaths come one to a customer. Eventually we will have a 100 percent mortality rate in both groups."

But so far, the effect of running on delaying death has also been more dramatic than the scientists expected. Not surprisingly, running has slowed cardiovascular deaths. However, it has also been associated with fewer early deaths from cancer, neurological disease, infections and other causes.

And the dire injury predictions other scientists made for runners have fallen completely flat. Fries and his colleagues published a companion paper in the August issue of the American Journal of Preventive Medicine showing running was not associated with greater rates of osteoarthritis in their elderly runners. Runners also do not require more total knee replacements than nonrunners, Fries said.

"Running straight ahead without pain is not harmful," he said, adding that running seems safer for the joints than high-impact sports such as football, or unnatural motions like standing en pointe in ballet.

"When we first began, there was skepticism about our ideas," Fries said. "Now, many other findings go in the same direction."

Fries, 69, takes his own advice on aging: he's an accomplished runner, mountaineer and outdoor adventurer.

Hanging on his office wall is a photo he jokingly describes as "me, running around the world in two minutes." In the dazzling image of blue sky and white ice, Fries makes a tiny lap around the North Pole.

Fries collaborated with Stanford colleagues Eliza Chakravarty, MD, MS, an assistant professor of medicine; Helen Hubert, PhD, a researcher now retired from Stanford, and Vijaya Lingala, PhD, a research software developer.

The research was supported by grants from the National Institute of Arthritis and Musculoskeletal and Skin Diseases and by the National Institute on Aging.

Journal reference:

1. Eliza F. Chakravarty, MD, MS; Helen B. Hubert, PhD; Vijaya B. Lingala, PhD; James F. Fries, MD. **Reduced Disability and Mortality Among Aging Runners: A 21-Year Longitudinal Study**. *Archives of Internal Medicine*, 2008; 168 (15): 1638 DOI: 10.1001/archinte.168.15.1638

Adapted from materials provided by Stanford University Medical Center.

http://www.sciencedaily.com/releases/2008/08/080811195633.htm

Designer RNA Fights High Cholesterol, Researchers Find

ScienceDaily (Aug. 11, 2008) — Small, specially designed bits of ribonucleic acid (RNA) can interfere with cholesterol metabolism, reducing harmful cholesterol by two-thirds in pre-clinical tests, according to a new study by researchers at UT Southwestern Medical Center in collaboration with Alnylam Pharmaceuticals and the Massachusetts Institute of Technology.

In a study that appears online today and in an upcoming issue of the Proceedings of the National Academy of Sciences, researchers found that a single dose of a small interfering RNA (siRNA), a chemical cousin of DNA, lowered cholesterol levels up to 60 percent in rodents, with the effects lasting for weeks. This result indicated that the RNA interference, or RNAi, mechanism could provide a new tactic for treating high cholesterol. Similar treatments in four nonhuman primates, conducted off-site by a certified contract research organization, produced an average 56 percent drop in low-density lipoprotein cholesterol levels in the animals' blood.

The siRNA works by jamming the production of PCSK9 (proprotein convertase subtilisin/kexin type 9), a protein that normally raises the level of LDL cholesterol, the "bad" cholesterol that tends to create fatty deposits inside blood vessels.

Studies by other UT Southwestern researchers have found that people with mutations in the PCSK9 gene, which prevented them from making normal levels of the PCSK9 protein, had LDL cholesterol levels 28 percent lower than individuals without the mutation and were protected from developing coronary heart disease.

"It's very clear that eliminating this protein has cardiovascular benefits," said Dr. Jay Horton, professor of internal medicine and molecular genetics at UT Southwestern and the study's co-senior author.

The RNAi method also performed as well as cholesterol-lowering drugs currently on the market or in clinical trials, Dr. Horton said. Those medicines can provide about 20 percent to 50 percent drops in LDL cholesterol, but patients usually have to take maximum doses over prolonged periods.

"RNA-based drugs might provide a course of treatment for people whose cholesterol levels are resistant to current drugs, or they might be combined with current drugs," said Dr. Horton.

Working with scientists at MIT and at Alnylam, an RNAi therapeutics company in Cambridge, Mass., Dr. Horton and his colleagues designed siRNAs to block the process by which DNA creates the PCSK9 protein. Normally, to make a protein, DNA's genetic code is translated to form a correspondingly coded RNA, which carries out instructions that tell the cell to make the protein.

But in the study, the lab-designed siRNA latched onto the cell's much larger RNA, preventing it from completing the PCSK9 protein-creation process.

The scientists made versions of siRNA that blocked the forms of PCSK9 found in mice, rats, nonhuman primates and humans. Those siRNAs were then injected into normal rodents and non-human primates, as well as into mice that had been genetically engineered to produce human PCSK9.

The siRNAs caused the levels of PCSK9 to drop up to 70 percent in mice livers and 60 percent in rat livers, where the protein is primarily produced. The non-human primates also showed a significant drop in blood levels of PCSK9.

In conjunction with the drop in PCSK9, the levels of cholesterol in the blood dropped by about one-third

in mice and nearly two-thirds in rats.

The nonhuman primates' LDL cholesterol dropped an average of 56 percent, with one animal showing a nearly 70 percent reduction.

Other UT Southwestern researchers involved in the study were Dr. Aldo Grefhorst, postdoctoral fellow in molecular genetics, and Norma Anderson, senior research associate of molecular genetics. Researchers from Alnylam Pharmaceuticals included lead author Dr. Maria Frank-Kamenetsky and co-senior author Dr. Kevin Fitzgerald. Researchers from Roche Kulmbach GmbH in Germany also participated.

The work was supported by the Perot Foundation, the National Institutes of Health, the Royal Netherlands Academy of Arts and Sciences, and Alnylam Pharmaceuticals.

Adapted from materials provided by UT Southwestern Medical Center.

http://www.sciencedaily.com/releases/2008/08/080811195631.htm

Growing Wheat In Acidic Soil

Researchers have found markers for aluminum-resistance genes in wheat that breeders could use to improve the resistance of regional varieties. Aluminum can hurt production for wheat growers in the southern Great Plains. (Credit: Photo by Scott Bauer)

ScienceDaily (Aug. 11, 2008) — Many wheat farmers in the southern Great Plains states face a significant challenge: High levels of aluminum released in the acidic soils can stunt crop growth. So Agricultural Research Service (ARS) plant geneticist Guihua Bai leads a team that is improving the odds for cultivating wheat in these acidic soils.

Bai works at the ARS Plant Science and Entomology Research Unit, part of the agency's Grain Marketing and Production Research Center in Manhattan, Kan. His research includes finding aluminum-resistance genes in wheat that breeders could use to improve the resistance of regional varieties to aluminum toxicity.

Bai and Kansas State University colleagues Dadong Zhang and Shibin Cai created a wheat population by crossing "FSW," a Chinese wheat landrace known for its resistance to aluminum, with "ND35," a wheat line sensitive to elevated levels of aluminum in soils. They exposed the population to high aluminum levels to assess their resistance to aluminum toxicity.

The team assessed the effects of aluminum exposure on roots by measuring root growth and evaluating how effectively hematoxylin stained the root tissue. Hematoxylin is a natural dye that only stains root tissue after reacting to aluminum that has been drawn out of the soil and into the roots.

The researchers then compared patterns of 1,028 simple-sequence-repeat (SSR) markers between the two wheat parents and their offspring to identify relationships between markers and aluminum resistance among the offspring. SSR markers are short repeating segments of deoxyribonucleic acid (DNA) that are found in all chromosomes. Some SSRs are near the genes that confer beneficial traits in plants and can be

used to locate these genes in experimental populations.

The scientists used the SSR map to locate two genes in FSW that together accounted for about 58 percent of its aluminum resistance. They also identified several SSR markers that are in close proximity to these genes. These SSRs could potentially be used to tag aluminum resistance genes for breeding aluminum-resistant wheat varieties.

Adapted from materials provided by USDA - Agricultural Research Service.

http://www.sciencedaily.com/releases/2008/08/080807081632.htm

'Lost Tribe' Of Clinician-scientists: Medical Doctors Who Do Research Could Be A Dying Breed

ScienceDaily (Aug. 11, 2008) — The road from disease research to disease cure isn't usually a smooth one. One role which bridges the laboratory and the clinic is that of the "clinician-scientist" – a doctor who understands disease both in the patient and in the Petri dish. Yet an editorial published in Disease Models & Mechanisms (DMM), contends that clinician-scientists in the UK and elsewhere are not prospering, but rather are "under threat in a hostile environment."

The editorial author, Dr Nick Lemoine, Director of the Cancer Research UK Clinical Centre and a clinician-scientist himself, believes that a lack of career support is partially to blame. Contrasting UK training programs to similar programs in the United States, he discusses how Britain's prospective doctors have fewer research training opportunities than their American counterparts. US dual-degree programs for a combined MD/PhD are comparatively well-funded. Additionally, follow-up studies show that graduates from US Medical Scientist Training Programs are successful in developing well-funded research careers. Clinician-scientists in the UK, however, lack a clear career structure, and are at a disadvantage compared to doctors who opt for traditional specialist training and seek out National Health Service posts.

Lemoine also calls attention to the major financial disadvantage of medical scientists in both countries. Pursuing an untraditional academic route adds a risk which is exacerbated by significant medical school debts. "Setting out on an academic path at qualification with a cloud of debt overhead is a brave move," Lemoine wrote, "and one that a diminishing proportion of graduates have been prepared to make."

However, the clinician-scientist environment might be changing in the UK, Lemoine observes. New funding is being allocated from both public organizations and private charities, and these sponsors are also developing mentorship programs to track participants in clinician-scientist training and monitor quality of their research.

Lemoine's editorial was published in the inaugural July/August issue of a new research journal, Disease Models & Mechanisms (DMM), published by The Company of Biologists, a non-profit based in Cambridge, UK. The DMM website is located at http://dmm.biologists.org.

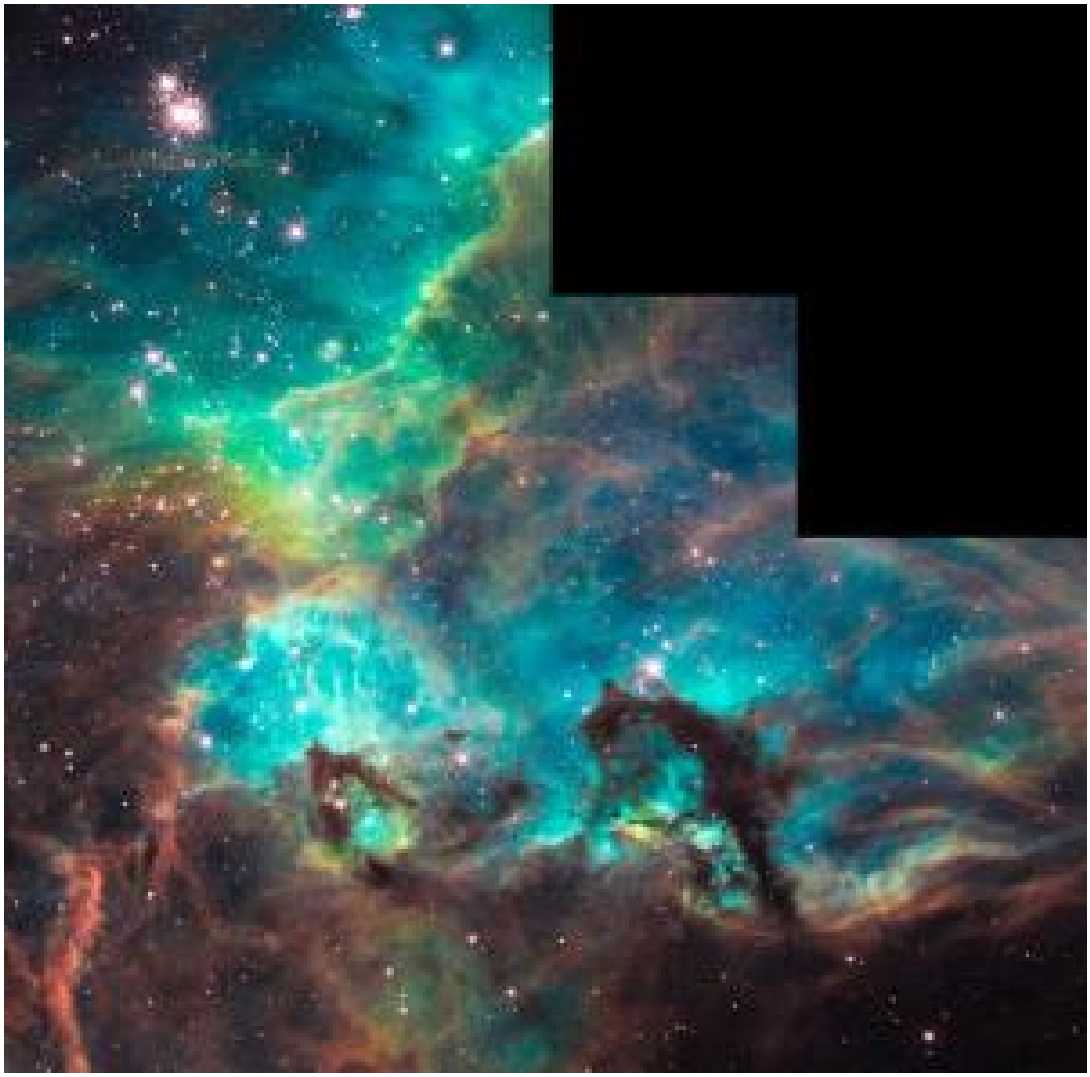
Journal reference:

1. Nick R. Lemoine. **The clinician-scientist: a rare breed under threat in a hostile environment**. *Disease Models and Mechanisms*, 2008; 1 (1): 12 DOI: 10.1242/dmm.000752

Adapted from materials provided by The Company of Biologists, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2008/08/080807130925.htm

Colorful Star Birth Region Near Tarantula Nebula Unveiled On Hubble's 100,000th Orbit Milestone



In commemoration of the NASA/ESA Hubble Space Telescope completing its 100 000th orbit around the Earth in its 18th year of exploration and discovery, scientists have aimed Hubble to take a snapshot of a dazzling region of celestial birth and renewal. Hubble peered into a small portion of the nebula near the star cluster NGC 2074 (upper, left). The region is a firestorm of raw stellar creation, perhaps triggered by a nearby supernova explosion. It lies about 170 000 light-years away near the Tarantula nebula, one of the most active star-forming regions in our Local Group of galaxies. This representative colour image was taken on 10 August, 2008, with Hubble's Wide Field Planetary Camera 2. Red shows emission from sulphur atoms, green from glowing hydrogen, and blue from glowing oxygen. (Credit: NASA, ESA and M. Livio (STScI))

ScienceDaily (Aug. 11, 2008) — During Hubble's 100,000th orbit around the Earth it peered into a small portion of the nebula near the star cluster NGC 2074.

The region is a firestorm of raw stellar creation, perhaps triggered by a nearby supernova explosion. It lies about 170 000 light-years away near the Tarantula nebula, one of the most active star-forming regions in

our Local Group of galaxies.

The three-dimensional-looking image reveals dramatic ridges and valleys of dust, serpent-head "pillars of creation", and gaseous filaments glowing fiercely under torrential ultraviolet radiation. The region is on the edge of a dark molecular cloud that is an incubator for the birth of new stars.

The high-energy radiation blazing out from clusters of hot young stars already born in NGC 2074 is sculpting the wall of the nebula by slowly eroding it away. Another young cluster may be hidden beneath a circle of brilliant blue gas at centre, bottom.

In this approximately 100-light-year-wide fantasy-like landscape, dark towers of dust rise above a glowing wall of gases on the surface of the molecular cloud. The seahorse-shaped pillar at lower, right is approximately 20 light-years long, roughly four times the distance between our Sun and the nearest star, Alpha Centauri.

The region is in the Large Magellanic Cloud (LMC), a satellite of our Milky Way galaxy. It is a fascinating laboratory for observing star-formation regions and their evolution. Dwarf galaxies like the LMC are considered to be the primitive building blocks of larger galaxies.

This representative colour image was taken on 10 August, 2008, with Hubble's Wide Field Planetary Camera 2. Red shows emission from sulphur atoms, green from glowing hydrogen, and blue from glowing oxygen.

Adapted from materials provided by European Space Agency.

http://www.sciencedaily.com/releases/2008/08/080811072457.htm

Better Bandage: Microscopic Scaffolding Offers 'Simple' Solution To Treating Skin Injuries

ScienceDaily (Aug. 11, 2008) — A revolutionary dissolvable scaffold for growing new areas of skin could provide a safer, more effective way of treating burns, diabetic ulcers and similar injuries.

This ultra-fine, 3-dimensional scaffold, which is made from specially developed polymers, looks similar to tissue paper but has fibres 100 times finer. Before it is placed over a wound, the patient's skin cells (obtained via a biopsy) are introduced and attach themselves to the scaffold, multiplying until they eventually grow over it. When placed over the wound, the scaffold dissolves harmlessly over 6 to 8 weeks, leaving the patient's skin cells behind.

This new approach to skin reconstruction has been developed by a team of chemists, materials scientists and tissue engineers at the University of Sheffield, with funding from the Engineering and Physical Sciences Research Council. It is designed primarily for cases involving extensive burns where surgeons are unable to take enough skin grafts from elsewhere on the body to cover the damaged areas. Currently, bovine collagen or skin from human donors is used in these cases, but these approaches have potential health and rejection risks.

"Simplicity is the key," says Professor Tony Ryan, who is leading the team. "Previous attempts to find better ways of encouraging skin cell growth have used chemical additives and other elaborate techniques to produce scaffolds, but their success has been limited. We've found that skin cells are actually very 'smart' – it's in their DNA to sort themselves into the right arrangement. They just need a comparatively uncomplicated scaffold (and each other) to help them grow in a safe, natural way."

The polymers used in the scaffold are biodegradable materials already approved for medical applications. Because the team has recognised that skin cells are 'smart' and the scaffold can therefore be 'dumb' (i.e. not overly sophisticated), simple polymers can be used.

The process for making the scaffolds is based on the well-known technique of electrospinning. However, the team has made a key advance by developing a new method of making, from the same biodegradable polymers, aligned-fibre 'mats' of potential use in promoting nerve or tendon growth. This method is currently being patented.

The next step in the research is to develop the skin reconstruction technology for clinical use, hopefully in the next few years. The technology also offers possibilities for testing the toxicity of cosmetic and similar products, using materials grown in the laboratory that closely resemble natural skin.

"Ultimately, we can envisage treatment of burns victims and the undertaking of reconstructive surgery using the scaffold and the patient's own skin to produce bespoke skin for that patient," says Professor Ryan. "As an accident-prone mountain biker, I find that prospect very attractive!"

Adapted from materials provided by Engineering and Physical Sciences Research Council (EPSRC), via AlphaGalileo.

http://www.sciencedaily.com/releases/2008/08/080801074738.htm

Roman Temple Uncovered In Ancient Jewish Capital Of Galilee

View of the monumental building on the north side of the decumanus with a pile of collapsed columns in the courtyard -- probably the result of an earthquake. (Credit: Gaby Laron)

ScienceDaily (Aug. 11, 2008) — Ruins of a Roman temple from the second century CE have recently been unearthed in the Zippori National Park. Above the temple are foundations of a church from the Byzantine period.

The excavations, which were undertaken by the Noam Shudofsky Zippori Expedition led by of Prof. Zeev Weiss of the Institute of Archaeology at the Hebrew University of Jerusalem, shed light on the multi-cultural society of ancient Zippori (also known as Sepphoris).

The discovery indicated that Zippori, the Jewish capital of the Galilee during the Roman period, had a significant pagan population which built a temple in the heart of the city center. The central location of the temple which is positioned within a walled courtyard and its architectural relation to the surrounding buildings enhance our knowledge regarding the planning of Zippori in the Roman era.

The building of the church on the foundation of the temple testifies to the preservation of the sacred section of the city over time. This new finding demonstrates not only the religious life, culture and society in Roman and Byzantine Zippori, but also that this was a city in which Jews, pagans and later Christians lived together and developed their hometown with various buildings.

The newly discovered temple is located south of the decumanus - colonnaded street - which ran from east to west and was the main thoroughfare in the city during the Roman through Byzantine period. The temple, measuring approximately 24 by 12 meters, was built with a decorated façade facing the street. The temple's walls were plundered in ancient times and only its foundations remain.

No evidence has been found that reveals the nature of the temple's rituals, but some coins dating from the time of Antoninus Pius, minted in Diocaesarea (Zippori), depict a temple to the Roman gods Zeus and Tyche. The temple ceased to function at an unknown date, and a large church, the remains of which were uncovered by the Hebrew University excavation team in previous seasons, was built over it in the Byzantine period.

North of the decumanus, opposite the temple, a monumental building was partially excavated this summer. Its role is still unclear, although its nature and size indicate that it was an important building. A courtyard with a well-preserved stone pavement of smooth rectangular slabs executed in high quality was uncovered in the center of the building, upon which were found a pile of collapsed columns and capitals - probably as a result of an earthquake. The decoration on these architectural elements was executed in stucco. Beyond a row of columns, an adjacent aisle and additional rooms were discovered. Two of them were decorated with colorful, geometrical mosaics.

Adapted from materials provided by Hebrew University of Jerusalem, via AlphaGalileo.

http://www.sciencedaily.com/releases/2008/08/080811072503.htm

Pacific Shellfish Ready To Invade Atlantic

ScienceDaily (Aug. 11, 2008) — As the Arctic Ocean warms this century, shellfish, snails and other animals from the Pacific Ocean will resume an invasion of the northern Atlantic that was interrupted by cooling conditions three million years ago, predict Geerat Vermeij, professor of geology at the University of California, Davis, and Peter Roopnarine at the California Academy of Sciences.

Climate models predict a nearly ice-free Arctic Ocean by 2050. That will restore conditions that last existed during the mid-Pliocene era around three to 3.5 million years ago. Several north Pacific species have relatives in the north Atlantic, and the fossil record shows a lot of invasion from the Pacific to the Atlantic at that time, Vermeij said.

When cold conditions returned, the Arctic route was cut off, mostly by a lack of food. As the ice melts, productivity in the Arctic will rise and the northward march of the mollusks will resume where it left off three million years ago.

Vermeij and Roopnarine reviewed literature on mollusks found in the Bering and Chuckchi seas between Alaska and eastern Siberia. At least 77 molluscan lineages, about a third of the species of shallow-water shellfish in the Bering Sea, have the potential to spread to the Atlantic, they concluded.

Three factors drove the one-way traffic across the North Pole during the Pliocene, Vermeij said. The Bering and Chukchi seas are very productive, with abundant food; there is a net northward flow of water from the Pacific through the Bering Strait; and strong competition in the Bering Sea means bigger, tougher animals.

But the invaders will not wipe out native species, Vermeij said. The fossil record shows that invasions rarely lead to species extinction in marine environments, he said. Instead, the invasion will add new species and hybrids and increase competition in the North Atlantic.

"The composition and dynamics of north Atlantic communities will change," Roopnarine said. "But whether that will help or harm local fisheries is an open question. Humans may have to adapt as well."

In the paper, Vermeij and Roopnarine note that in the past, species expanded their ranges within and between oceans during warm periods.

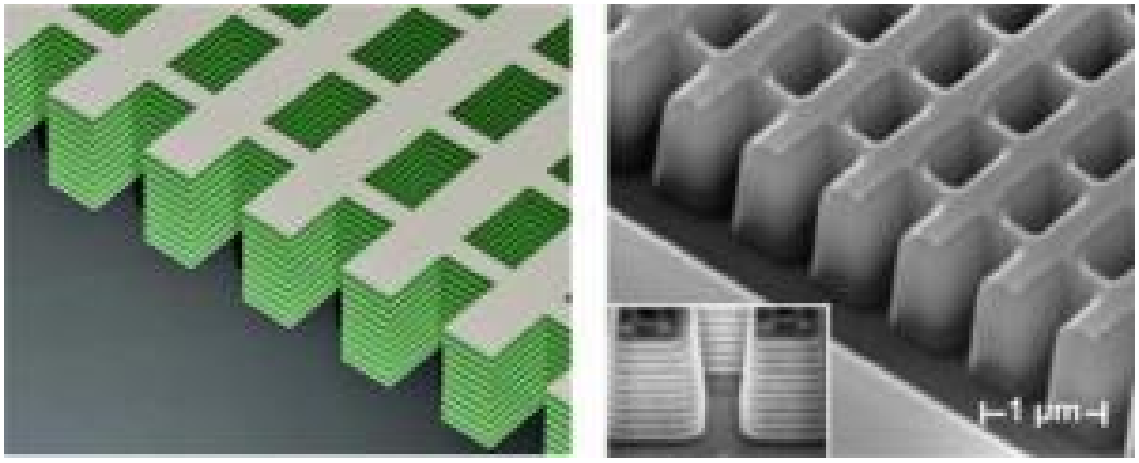
"The interesting thing to me is that the fossil record has something to say about the consequences of global warming," Vermeij said.

The article is published in the Aug. 8 issue of the journal Science.

Adapted from materials provided by University of California - Davis.

http://www.sciencedaily.com/releases/2008/08/080807144238.htm

Invisibility Cloak One Step Closer: New Metamaterials Bend Light Backwards



On the left is a schematic of the first 3-D "fishnet" metamaterial that can achieve a negative index of refraction at optical frequencies. On the right is a scanning electron microscope image of the fabricated structure, developed by UC Berkeley researchers. The alternating layers form small circuits that can bend light backwards. (Credit: Image by Jason Valentine, UC Berkeley)

ScienceDaily (Aug. 11, 2008) — Scientists at the University of California, Berkeley, have for the first time engineered 3-D materials that can reverse the natural direction of visible and near-infrared light, a development that could help form the basis for higher resolution optical imaging, nanocircuits for high-powered computers, and, to the delight of science-fiction and fantasy buffs, cloaking devices that could render objects invisible to the human eye.

Two breakthroughs in the development of metamaterials - composite materials with extraordinary capabilities to bend electromagnetic waves - are reported separately this week in the Aug. 13 advanced online issue of Nature, and in the Aug. 15 issue of Science.

Applications for a metamaterial entail altering how light normally behaves. In the case of invisibility cloaks or shields, the material would need to curve light waves completely around the object like a river flowing around a rock. For optical microscopes to discern individual, living viruses or DNA molecules, the resolution of the microscope must be smaller than the wavelength of light.

The common thread in such metamaterials is negative refraction. In contrast, all materials found in nature have a positive refractive index, a measure of how much electromagnetic waves are bent when moving from one medium to another.

In a classic illustration of how refraction works, the submerged part of a pole inserted into water will appear as if it is bent up towards the water's surface. If water exhibited negative refraction, the submerged portion of the pole would instead appear to jut out from the water's surface. Or, to give another example, a fish swimming underwater would instead appear to be moving in the air above the water's surface.

Other research teams have previously developed metamaterials that function at optical frequencies, but those 2-D materials have been limited to a single monolayer of artificial atoms whose light-bending properties cannot be defined. Thicker, 3-D metamaterials with negative refraction have only been reported at longer microwave wavelengths.

"What we have done is take two very different approaches to the challenge of creating bulk metamaterials that can exhibit negative refraction in optical frequencies," said Xiang Zhang, professor at UC Berkeley's

Nanoscale Science and Engineering Center, funded by the National Science Foundation (NSF), and head of the research teams that developed the two new metamaterials. "Both bring us a major step closer to the development of practical applications for metamaterials."

Zhang is also a faculty scientist in the Material Sciences Division at the Lawrence Berkeley National Laboratory.

Humans view the world through the narrow band of electromagnetic radiation known as visible light, with wavelengths ranging from 400 nanometers (violet and purple light), to 700 nanometers (deep red light). Infrared light wavelengths are longer, measuring from about 750 nanometers to 1 millimeter. (A human hair is about 100,000 nanometers in diameter.)

For a metamaterial to achieve negative refraction, its structural array must be smaller than the electromagnetic wavelength being used. Not surprisingly, there has been more success in manipulating wavelengths in the longer microwave band, which can measure 1 millimeter up to 30 centimeters long.

In the Nature paper, the UC Berkeley researchers stacked together alternating layers of silver and non-conducting magnesium fluoride, and cut nanoscale-sized fishnet patterns into the layers to create a bulk optical metamaterial. At wavelengths as short as 1500 nanometers, the near-infrared light range, researchers measured a negative index of refraction.

Jason Valentine, UC Berkeley graduate student and co-lead author of the Nature paper, explained that each pair of conducting and non-conducting layers forms a circuit, or current loop. Stacking the alternating layers together creates a series of circuits that respond together in opposition to that of the magnetic field from the incoming light.

Valentine also noted that both materials achieve negative refraction while minimizing the amount of energy that is absorbed or "lost" as light passes through them. In the case of the "fishnet" material described in Nature, the strongly interacting nanocircuits allow the light to pass through the material and expend less energy moving through the metal layers.

"Natural materials do not respond to the magnetic field of light, but the metamaterial we created here does," said Valentine. "It is the first bulk material that can be described as having optical magnetism, so both the electrical and magnetic fields in a light wave move backward in the material."

The metamaterial described in the Science paper takes another approach to the goal of bending light backwards. It is composed of silver nanowires grown inside porous aluminum oxide. Although the structure is about 10 times thinner than a piece of paper - a wayward sneeze could blow it away - it is considered a bulk metamaterial because it is more than 10 times the size of a wavelength of light.

The authors of the Science paper observed negative refraction from red light wavelengths as short as 660 nanometers. It is the first demonstration of bulk media bending visible light backwards.

"The geometry of the vertical nanowires, which were equidistant and parallel to each other, were designed to only respond to the electrical field in light waves," said Jie Yao, a student in UC Berkeley's Graduate Program in Applied Science and Technology and co-lead author of the study in Science. "The magnetic field, which oscillates at a perpendicular angle to the electrical field in a light wave, is essentially blind to the upright nanowires, a feature which significantly reduces energy loss."

The innovation of this nanowire material, researchers said, is that it finds a new way to bend light backwards without technically achieving a negative index of refraction. For there to be a negative index of refraction in a metamaterial, its values for permittivity - the ability to transmit an electric field - and

permeability - how it responds to a magnetic field - must both be negative.

The benefits of having a true negative index of refraction, such as the one achieved by the fishnet metamaterial in the Nature paper, is that it can dramatically improve the performance of antennas by reducing interference. Negative index materials are also able to reverse the Doppler effect - the phenomenon used in police radar guns to monitor the speed of passing vehicles - so that the frequency of waves decreases instead of increases upon approach.

But for most of the applications touted for metamaterials, such as nanoscale optical imaging or cloaking devices, both the nanowire and fishnet metamaterials can potentially play a key role, the researchers said.

"What makes both these materials stand out is that they are able to function in a broad spectrum of optical wavelengths with lower energy loss," said Zhang. "We've also opened up a new approach to developing metamaterials by moving away from previous designs that were based upon the physics of resonance. Previous metamaterials in the optical range would need to vibrate at certain frequencies to achieve negative refraction, leading to strong energy absorption. Resonance is not a factor in both the nanowire and fishnet metamaterials."

While the researchers welcome these new developments in metamaterials at optical wavelengths, they also caution that they are still far off from invisibility cloaks and other applications that may capture the imagination. For instance, unlike the cloak made famous in the Harry Potter novels, the metamaterials described here are made of metal and are fragile. Developing a way to manufacture these materials on a large scale will also be a challenge, they said.

Nevertheless, the researchers said achieving negative refraction in an optical wavelength with bulk metamaterials is an important milestone in the quest for such devices.

Co-lead authors of the Science paper are Zhaowei Liu, postdoctoral researcher; and Yongmin Liu, Ph.D. student, both members of Zhang's Lab at UC Berkeley.

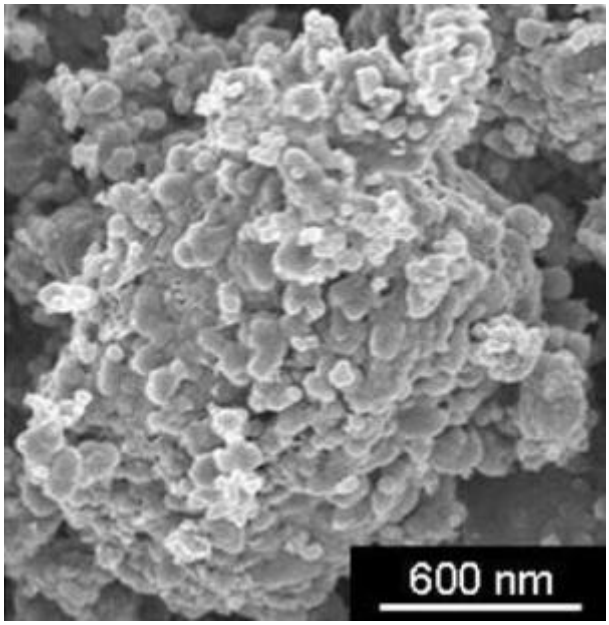
The Nature paper's co-lead authors are Shuang Zhang and Thomas Zentgraf, postdoctoral researchers, who are also members of Zhang's Lab at UC Berkeley.

The NSF helped support research into both metamaterials. Additionally, the U.S. Army Research Office helped support the work reported in Nature, and the U.S. Air Force Office of Scientific Research helped fund the project described in Science.

Adapted from materials provided by University of California - Berkeley, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2008/08/080811092450.htm

Promising Lithium Batteries For Electric Cars



The lithium iron phosphate nanoparticles (100 nm) making up the agglomerate are individually transformed though the "domino cascade process" as the battery is charged. (Credit: Copyright ICMCB)

ScienceDaily (Aug. 11, 2008) — Why does lithium iron phosphate, a candidate for use in future lithium batteries, conduct electricity despite being an insulating material? Chemists at CNRS [(1)], working in collaboration with a team from CEA-Liten [(2)], have shed light on this paradox.

Their experimentally verified "domino-cascade model" shows that local stresses within the material allow electrical and ionic conduction to spread from one area to the next, making the battery function. These results open new horizons in the search for improved battery electrode materials and help explain how tomorrow's electric car batteries work.

Lithium-ion batteries, which store three to four times more energy per unit mass than traditional batteries, are now used extensively in portable electronic devices (computers, cell phones, MP3 players, etc.). The positive electrode materials in these batteries are highly effective but too expensive to be used in the large batteries needed for electric vehicles and second generation hybrid vehicles.

In the future, these applications may rely on lithium iron phosphate: it is environmentally friendly and has exceptional properties combined with low cost and good thermal stability (important for safety reasons). All these qualities make it the best candidate to be used in lithium batteries for future electric cars. However, this material does not have the ionic and electrical conduction properties needed to make the electrode work.

CNRS chemists from the Institut de chimie de la matière condensée de Bordeaux (ICMCB) and their partners from CEA-Liten became the first to explain this paradox. By studying lithium iron phosphate, they showed that the battery's charge-discharge cycles are made possible by a "domino cascade process." This phenomenon occurs as soon as stresses are present at the interface between the discharging material and the material in the discharged state. Electrical and ionic conduction is then extremely rapid in the interfacial zone, propagating from one spot to the next like dominos as the interface moves. The model has been verified by microscopic measurements.

This novel reaction process, resembling a wave sweeping through the crystal, explains how two insulating materials (one in the charged state and the other in the discharged state) can nonetheless make lithium-ion batteries function. These results are an important step forward in the quest for new low cost and safer electrode materials for future lithium batteries. The research has also made it possible to understand the processes taking place at the nanometer scale in lithium iron phosphate-based batteries, which may be used in tomorrow's hybrid and electric cars.

Notes:

(1) Institut de chimie de la matière condensée de Bordeaux, ICMCB, (CNRS / Université de Bordeaux / ENSCPB).

(2) CEA-Liten : Laboratoire d'innovation pour les technologies des énergies nouvelles et les nanomatériaux.

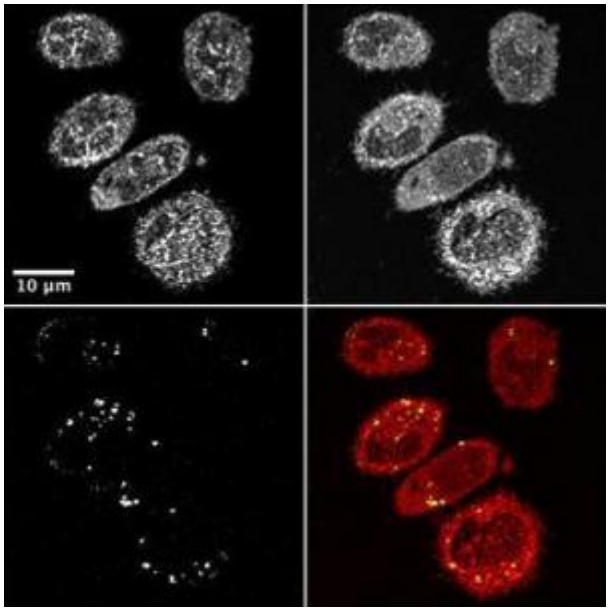
Journal reference:

1. Delmas et al. **Lithium deintercalation in LiFePO4 nanoparticles via a domino-cascade model**. *Nature Materials*, 2008; 7 (8): 665 DOI: 10.1038/nmat2230

Adapted from materials provided by CNRS.

http://www.sciencedaily.com/releases/2008/08/080807073753.htm

Heavy Atoms Can Help Destroy Tumor Cells



The images above show where different types of atoms are found in the cell. The top right panel indicates the location of sulfur, and the bottom left shows where platinum is found. The bottom right panel superimposes these two previous panels. (Credit: Copyright Claude Le Sech/CNRS 2008)

ScienceDaily (Aug. 11, 2008) — A new discovery has been made in cancer research. Researchers from the Laboratoire des collisions atomiques et moléculaires (CNRS/Université Paris 11) and the Laboratoire Génotoxicologie et cycle cellulaire (CNRS/Institut Curie) were the first to show that it is possible to improve hadrontherapy's[(1)] targeting and destruction of tumor cells by loading the cells with heavy atoms like platinum. This new method enables both the treatment's effectiveness and the ions' ballistic effect to be improved without damaging healthy tissue.

One of the fundamental challenges in radiation therapy is to destroy tumors with irradiation while preserving healthy tissue. With hadrontherapy, the use of fast ions as ionizing particles offers a major advantage because they deposit most of their energy in the tissue at the end of their range. This method enables tumors to be destroyed in a targeted manner by adjusting the initial energy of the particles. Also, the ions used in this technique are more effective in destroying cancerous tissue than conventional treatments (X-rays, for example).

In this work, the researchers combined, for the first time, ionic radiation with platinum-enriched cells, using agents such as cis-platinum[(2)], similar to molecules used in medicine. The impact of the incident ions (protons, carbon) and the electrons ejected along the way causes the platinum atoms to become highly ionized. The process of electron capture and emission that ensues significantly increases damage to surrounding molecules and considerably enhances cell death rate. In the presence of platinum, the effectiveness of ions at their end point is increased by at least 50 percent, thus improving how well the tumor can be targeted.

These results suggest that the combination of hadrontherapy and the addition of heavy atoms like platinum can improve both tumor targeting and the effectiveness of cancer treatments while preserving healthy tissue (the onset of toxicity results from the irradiation, and the molecules used are not themselves toxic for the cell). This work paves the way for research on new, non-toxic radiosensitizing agents –

molecules, nanoparticles, and lysosomes(3) –containing large numbers of atoms(4).

In practice, there are very few medical centers in the world specializing in hadrontherapy because this new technique is still very expensive. Researchers and clinicians at the Heavy Ion Medical Accelerator (HIMAC) in Chiba, Japan, were the first to demonstrate the effectiveness of carbon ions in therapeutic treatments. In France, proton therapy at the Centre de protonthérapie at the Institut Curie (Orsay) already makes it possible to treat certain cases of cancer that cannot be cured by conventional methods. Another technology is currently being developed that uses carbon ions, and although more expensive, this technique is also more effective in certain cases. In 2012, a treatment center using carbon therapy will be opened in Lyon ("Projet étoile"), which will improve cancer treatment.

Notes:

(1) Hadrontherapy uses atomic ions (such as protons or carbon ions, which are very effective in inducing therapeutic cell death) to treat cancerous tumors.

(2) Cis-platinum is a platinum-containing molecule that is frequently used in chemotherapy.

(3) Lysosomes are cellular components found in the cytoplasm. They contain proteins that break molecules and can destroy cells.

(4) In other words, high-Z atoms (atoms with a high atomic number, i.e., that have a large number of protons and electrons). (Z=78 for platinum.)

References:

N. Usami, Y. Furusawa, K. Kobayashi, S. Lacombe, A Reynaud-Angelin, E. Sage, Ting-Di Wu, A. Croisy, J-L. Guerquin-Kern and C. Le Sech. Mammalian cells loaded with Platinum-containing molecules are sensitised to fast atomic ions. International Journal of Radiation Biology, 84, July 2008.

Adapted from materials provided by CNRS.

http://www.sciencedaily.com/releases/2008/08/080807071852.htm

Mixed fortunes for world's whales

By Mark Kinver
Science and nature reporter, BBC News

The latest global assessment of cetaceans shows that the marine mammals throughout the world's oceans have experienced mixed fortunes.

The IUCN Red List of Threatened Species reveals that some large species, like humpbacks, have seen numbers increase.

However, it warns that smaller species, including river dolphins, have declined as a result of human actions.

The IUCN added that it was unable to assess more than half of the world's cetaceans because of a lack of data.

"It shows that if you protect these animals then they can recover," said Randall Reeves, chairman of Cetacean Specialist Group for the IUCN, the global conservation body.

"I'm encouraged by the fact that several of the large whale species that had been in trouble for a long time have shown steady increases over recent decades."

RED LIST DEFINITIONS
The Tonkin snub-nosed monkey is listed as Critically Endangered
Extinct - Surveys suggest last known individual has died
Critically Endangered - Extreme high risk of extinction - this means some Critically Endangered species are also tagged Possibly Extinct
Endangered - Species at very high risk of extinction
Vulnerable - Species at high risk of extinction
Near Threatened - May soon move into above categories
Least Concern - Species is widespread and abundant
Data Deficient - not enough data to assess

The latest assessment has down-listed the humpback whale (*Megaptera novaeangliae*) from Vulnerable to Least Concern.

The southern right whale (*Eubalaena australis*) was another species that was deemed no longer at risk of extinction.

Both animals had recorded increased numbers across much of their range, primarily because they had been protected from commercial whaling, Dr Reeves explained.

"Humpbacks have really shown an ability to recover strongly from extremely intensive hunting," he added.

However, he warned that recoveries needed to be measured over a timescale of decades.

"It takes a while for conservationists to build up the confidence that it is a real signal of recovery and not a short-term variation."

Hunting for answers

The findings are likely to impact on the current stand-off between pro- and anti-whaling nations over the merits of a global moratorium on commercial whaling.

Pro-hunting nations could use the assessment to argue that the humpback whales' recovery means that the mammals could now be caught sustainably.

Whereas anti-whaling countries will argue that the recovery is the result of the global ban, and that any form of hunting will again lead to a dangerous decline in numbers.

"It is a political question, and it will be answered in a political form," Dr Reeves observed.

"I think it is really important to stress that the Red List is not about whether a given species can be exploited.

"It's simply about looking at the status of these animals and giving people some idea where they are now in relation to where they used to be."

Despite the improvement in the status of the two large species, the Red List showed that nearly a quarter of the 86 species assessed were considered to be at risk of extinction, nine of which were listed as Endangered or Critically Endangered.

Dr Reeves said the vaquita, a porpoise in the Gulf of California, Mexico, was identified as the one that was mostly likely to become extinct in the coming years.

Only about 150 individuals are believed to remain in the wild, yet an estimated 15% of the dwindling population is believed to drown in fishing nets each year.

Elsewhere, the banjii (*Lipotes vexillifer*) has been listed as Critically Endangered, Possibly Extinct, after an extensive survey of the creatures' entire range in China's Yangtze River last year failed to detect a single surviving specimen.

Its demise was blamed on an unsustainable number being caught in fishermen's nets as by-catch.

"The trouble is that the nets that cause the most trouble, the entangling nets that are unselective in what they catch, are still being used," Dr Reeves told BBC News.

Dangerous waters

Although fishing nets remain the main threat to coastal and river species, Dr Reeves said that other threats were emerging.

"I think we are just seeing the start of the effects of climate change in the oceans. Another big problem is noise [from sonar], which we don't fully understand yet."

Studies have shown that the distribution of many whales is changing as the oceans warm.

Conservationists fear that the change in behaviour could result in the mammals being exposed to new diseases, and inter-species competition for food.

Military sonar is also deemed as a particular threat for deep-diving beaked whales and melon-headed whales.

Despite a growing awareness of the range of threats facing the marine mammals, increased shipping and fishing were still claiming a growing number of victims.

"If you take the North Atlantic right whale," Dr Reeves said, "preventing deliberate harm of that species has been ongoing for nearly a century and has been pretty effective.

"But the numbers that are killed in ship strikes and become entangled in lines from lobster and crab traps are preventing the population, which is not very big in the first place, recovering.

"How you stop or reduce that is a real challenge."

While species such as the humpback whale have been studied in considerable detail over the years, many other species were still a relative mystery.

Conservationists warned that the outlook for the world's cetaceans could be worse than thought because more than half of the species on the Red List were classified as Data Deficient.

"The Data Deficient category is pretty large for cetaceans, probably surprisingly large to many people," Dr Reeves said.

"It is the species that live far offshore, that are found in less developed parts of the world that, in many cases, we don't have a clue about how many there are.

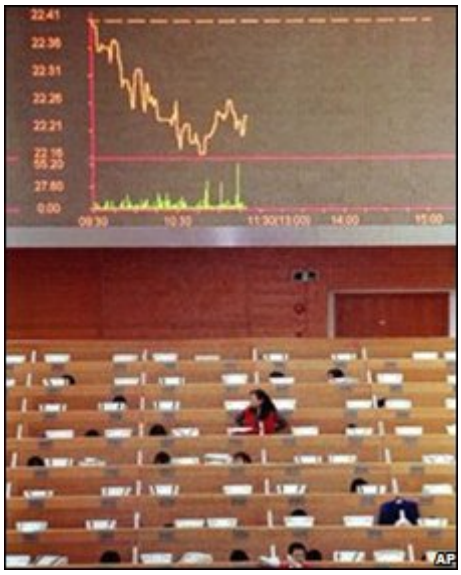
"In many ways, the Red List has a value in showing where there are holes in our knowledge that need to be filled quickly."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/7553805.stm

Published: 2008/08/12 00:36:45 GMT

'Pump and Dump' conmen targeted

By Maggie Shiels
Technology reporter, BBC News, Silicon Valley



Scammers using the net to hype stocks are being targeted with software that can spot fraudulent trading patterns.

Many hi-tech conmen use junk mail to hype stocks so they can sell shares they own in the companies at a profit.

It has been estimated that 15% of all spam or junk e-mail is made up of messages that "pump" stocks that are later "dumped".

Developed by web giant VeriSign the anti-fraud software works by keeping an eye on real-time trading activity.

"This gives brokers a jump on the attackers and raises the bar," said Perry Tancredi, senior manager of anti-fraud services at Verisign.

Cashing in

Pump and dump schemes involve stocks that have had their price artificially inflated. This can be done by manipulating the market but often it is done by sending out a spam run tricking small investors to cash in on a stock.

The fraudsters then quickly sell the overhyped shares collecting profits for themselves and causing investors and brokerages to lose money.

A study of such scams in 2006 concluded that spammers can regularly make a return of up to 6% via such schemes.

This is basic lying, cheating and stealing and the message to anyone engaging in these shenanigans is they are going to get caught."
John Stark, SEC

They are regarded by the U.S. Securities and Exchange Commission (SEC) as one of the most common internet frauds costing billions of dollars a year. Typically scammers target so-called penny stocks for these scams.

"Investors need to be extra careful when they are investing in this kind of company because they can lose all of their money and these stocks are particularly vulnerable to manipulation more than ever because of the internet," said John Stark, head of internet enforcement at the SEC.

Red flag

Mr Tancredi said Verisign's fraud detection kit would help "decrease the time between the attack being launched and the brokerage being able to respond".

Before now, he said, brokerages relied on counter measures such as restrictive stock trading or analysis packages that only spotted a problem when money had gone.

Verisign's software is a module that brokers can add to their in-house trading system that alerts anti-fraud teams to look more closely at trades that exhibit certain behaviour patterns.

"What this self-learning behavioural engine does is look at the different attributes of the event, not necessarily about the computer or where you are logging on from but about the actual transaction, the trade, the amount of the trade," said Mr Tancredi.

"For example have you liquidated all of your assets in stock that you own in order to buy one penny stock?" he said. "Another example is when a customer who normally trades tech stock on Nasdaq all of a sudden trades a penny stock that has to do with health care and is placing a trade four times more than normal."

Because the software looks at the behaviour of a penny stock it can cope with cases where those buying shares are doing so for the first time or have been victims of identity theft.

"The fraudster may buy that one stock in multiple small chunks to stay under the radar, but we can pick that up and send an alert on that," Mr Tancredi said.

"More subtly it will detect and question if say five people at the same brokerage are trading this one penny stock in a short period of time and that stock has shown a spike in volatility," he said, "that will also raise a red flag."

'Investor confidence'

No exact figures are available for how much scammers using "pump and dump" schemes are getting away with.

Geoff Turner, a senior analyst with Forrester Research, said it was easy to understand why figures were vague.

"People are somewhat shy on reporting losses because it erodes investor confidence," he said.

One pump and dump scheme revolving GTX Global involved tens of millions of dollars, said Mr Turner.

He said software than could effectively stop this kind of fraud in its tracks was something the business world would welcome.

"Pump and dump increases the cost of doing business in terms of the loss in the marketplace," he said.

"VeriSign has taken a proven concept in counter fraud control activity from what they have been successful in doing in the online banking environment and that is to gauge the risk of a specific account activity on the fly and score the risk when they see something that departs from the norm."

Mr Stark from the SEC told the BBC that it could not comment on a commercial product, but said the Commission worked closely with many agencies to pursue fraudsters.

He said: "This is basic lying, cheating and stealing and the message to anyone engaging in these shenanigans is they are going to get caught."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/7552009.stm

Published: 2008/08/11 15:36:49 GMT

Sky-high system to aid soldiers

Hardware used to spot gamma ray bursts could soon be helping direct troops on a battlefield.

Defence firm Qinetiq has brought the technology down to Earth to make a monitoring system that may be able to track thousands of targets.

The futuristic system manages the feat without using lenses to gather light from the scene it is watching.

Instead it employs a sensor array, a special "mask" and image processing software to picture a scene.

High guard

Astronomers had been attracted to such devices because they coped much better with harsh conditions when a spacecraft is launched and in space, said Dr Chris Slinger, Qinetiq's principal investigator on the system.

"It's hard using lenses and mirrors up there," he said.

Instead of lenses the imaging system uses an array of microscopic sensors in front of which is a specially made "mask" randomly punctured with holes in a particular pattern.

Light from the scene over which the detector is passing hits the mask and casts a distinctive shadow on the array behind it.

"If you design your coding pattern well it's possible to take this mishmash pattern and use digital signal processing to decode the pattern to pull out an image of the scene," said Dr Slinger.

Nasa used such an approach, called coded aperture imaging, for the Swift satellite that was sent aloft to spot gamma ray sources.

By doing away with lenses and mirrors to focus light it is possible to produce an imaging system that is very sensitive but also light and durable.

Because the image the device is picking up is spread across many thousands of sensors, damage to one in the array does not significantly degrade the entire image.

Shifting the systems focus of interest was much easier than with bulky lens-based equipment because it was so light, said Dr Slinger.

The system should also have a "super resolution" mode that can dial into a scene to produce very detailed pictures of one location in its field of view.

Qinetiq is developing the imaging system for the US Defense Advanced Research Projects Agency (Darpa) as part of a project known as Lacoste - Large Area Coverage Optical Search While Track and Engage.

The Lacoste project aims to produce an imaging system that will fly on a drone or airship to keep an eye on a battlefield or a huge swathe of a city.

Dr Slinger said Darpa wanted the system to be able to keep track of thousands of vehicles for months at a time.

Hardware with these abilities would be helpful for peace-keeping forces who want to wind images back from an incident, such as a car bomb exploding, to gather useful intelligence about where the vehicle began its journey.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/7553622.stm

Published: 2008/08/12 09:04:27 GMT

Pain 'linked with low vitamin D'

Low levels of the sunshine vitamin, vitamin D, may contribute to chronic pain among women, scientists believe.

The link does not apply to men, suggesting hormones may be involved, according to a study published in the Annals of Rheumatic Diseases said.

The team from the Institute of Child Health in London said studies were now needed to see if vitamin D supplements can guard against chronic pain.

About one in 10 people are affected by chronic pain at any one time in the UK.

The causes are not well understood and much of the focus to date has been on emotional factors.

Dr Elina Hyppönen and colleagues believe, at least in women, vitamin D levels could play a role in some cases of chronic pain.

Sunshine vitamin

The nutrient, essential for healthy bones, is produced in the body when exposed to sunlight and is also found in oily fish, egg yolks and margarine.

Among the 7,000 men and women aged 45 from across England, Scotland and Wales that they studied, those who were smokers, non-drinkers, the overweight and the underweight all reported higher rates of chronic pain.

Among the women, vitamin D levels also appeared to be important.

This finding was not explained by gender differences in lifestyle or social factors, such as levels of physical activity and time spent outdoors, say the authors.

Women with vitamin D levels between 75 and 99 mmol/litre - a level deemed necessary for bone health -

had the lowest rates of this type of pain, at just over 8%.

Women with levels of less than 25 mmol/litre had the highest rates, at 14.4%.

Severe lack of vitamin D in adults can lead to the painful bone disease osteomalacia.

But the researchers said osteomalacia did not account for their findings.

Dr Hyppönen said work was needed to evaluate whether vitamin D supplements could help prevent chronic pain.

In the meantime, she advised: "If I had chronic pain I would certainly check I was getting enough vitamin D."

Kate MacIver of the Pain Research Institute at Liverpool University cautioned: "Taking too high a dose of Vitamin D supplements as a means of preventing or treating chronic pain could result in Vitamin D toxicity and high blood calcium levels."

Most people should be able to get all the vitamin D they need from their diet and by getting a little sun.

However, if you are pregnant or breastfeeding you should take 10 micrograms (0.01 mg) of vitamin D each day, the Food Standards Agency recommends.

Older people should also consider taking 10 micrograms (0.01 mg) of vitamin D each day.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/7553833.stm

Published: 2008/08/11 23:34:16 GMT

Couple's 'fast-freeze' IVF baby

Ian and Rebecca Bloomer have had baby Evie following groundbreaking IVF treatment.

A couple have become the first in Wales to have a baby using a pioneering IVF technique which fast-freezes embryos, doctors in Cardiff say.

Evie, who was conceived through "vitrification", was born to Ian and Rebecca Bloomer on 23 July.

The method uses liquid nitrogen to freeze embryos quickly, reducing the risk of damage when they are thawed.

The couple, of Cwmbran, had tried for a baby for seven years and say their success should offer hope to others.

The couple had been trying for a baby since they married in 2001 but tests revealed Mrs Bloomer, 28, had endometriosis, a condition which was making it difficult for her to conceive.

They attended the IVF clinic at the University Hospital of Wales, in Cardiff, and after a failed attempt, the hospital offered the Bloomers a new way of freezing their unused embryos.

The technique - vitrification - gives embryos a better chance of surviving until couples are ready to try IVF again because the fast-freeze method prevents the formation of crystals that can damage embryos when they are thawed.

Mrs Bloomer became pregnant almost immediately using one of the fast-frozen embryos and gave birth to Evie at the Royal Gwent Hospital, in Newport, on 23 July.

"We were willing to try anything really, we'd both always wanted children. It's overwhelming. I'm still staring at her now thinking 'wow, she's ours - it's actually happened for us'," said Mrs Bloomer.

"I hope that if anybody going through treatment sees us and sees Evie it gives them one last little bit of

hope to go for it.

"It's been a real emotional rollercoaster. There's been ups and downs, but you get through it and to have Evie now, you forget what you went through. It makes it all worthwhile."

Chemotherapy hope

The Cardiff hospital was the first in Wales to begin offering embryo vitrification, in August 2007.

Lyndon Miles, head of embryology and andrology for IVF Wales, said 17 out of the 39 women offered the treatment so far had fallen pregnant and four of those were expecting twins.

He said the process would also be helpful to women diagnosed with cancer who wanted to freeze a number of eggs in case chemotherapy left them infertile.

Mr Miles said early results and publications in Japan and the USA had been "extremely encouraging".

He said a study on babies born from vitrification showed "no adverse effects of the technique and there are no implications to Evie's health as a result of the vitrification process".

He added: "I'm delighted we have been able to help Ian and Rebecca."

Vitrification involves rapidly cooling and storing embryos at very low temperatures for future use.

"An IVF cycle produces a number of embryos. Those that aren't immediately transferred back to the patient and that are of good enough quality are cooled slowly to the temperature of liquid nitrogen (-196C) and stored until needed.

"Conventional, slow freezing creates ice crystals which can damage the embryo as it is thawed," Mr Miles said.

"Vitrification differs from traditional cooling and storing techniques in that it allows instantaneous 'glass-like' solidification of eggs and embryos without the formation of ice crystals.

"Since no ice crystals form, a much greater percentage of embryos survive thawing following vitrification."

He said with conventional freezing methods, post-thaw survival rates varied from 50% to 80% whereas with vitrification they had achieved 98%.

"In addition, since the introduction of the technique, our pregnancy rate has more than doubled compared to conventional freezing methods," Mr Miles added.

Dr Simon Fishel, managing director of Care Fertility Group, dismissed claims made by the trust earlier that this was the first in UK as being "17 years out of date".

He said: "I introduced this technology in 1991 and the first baby, Laura, was born in October 1992 and was reported in the media at that time - called the 'sugar drop' baby.

"At the time of the birth the HFEA placed a moratorium on this technology as 'too new', but gradually it

has been introduced in recent years.

"Care Fertility has had many babies from vitrified embryos, indeed our recent new chromosome technology announced in the media several months ago resulted in babies born that were originally frozen as vitrified embryos.

"The truly latest technology, which we have been the first to introduce, is vitrifying eggs - this has created a paradigm shift in IVF technology."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/uk_news/wales/7555141.stm

Published: 2008/08/12 12:30:38 GMT

Bosses say education has worsened

Nearly half of senior managers believe education in the UK has declined over the last 10 years, despite improvements in exam results, a study suggests.

The majority of managers polled in an Institute of Directors study also said young people's skills, particularly in writing and mathematics, had weakened.

But the survey of 500 institute members also suggests that young people have better information technology skills.

The government said results had risen and quality was sharply scrutinised.

In its report, Education Briefing Book, the IoD suggests more than half (55%) of its members feel the government's performance on education and skills has been unfavourable to business.

> **There is a substantial 'credibility gap' between what official statistics show and what employers feel on the front line**
> Miles Templeman
> IoD

This compares to one in eight IoD members who felt it was favourable.

Another survey for the IoD of 100 university admissions tutors, carried out as part of the report, suggested some of these concerns were shared by academics.

The snapshot survey found 72% of admissions tutors believed the quality of undergraduates beginning a course in their department had remained the same or got worse. Just 28% thought the quality of students had risen.

These findings go against the official figures on educational attainment, which show huge improvements over the past decade.

In higher education, the proportion of students awarded first class or upper second class degrees in the

UK increased from one third to 57% between 1982 and 2007.

At GCSE, the proportion of people achieving five good GCSEs in England has increased from 45.1% to 62% between 1997 and 2007.

At A-level, the pass rate rose for the 16th year in succession to reach 97.4% last year. And the percentage of A-levels graded A to C has doubled since the mid-1980s to 72.6%.

The paper also contains a review of current academic research into educational standards which suggests that although there is evidence of a rise in attainment at some levels, the actual increase is lower than the official figures suggest.

'**Higher expectations**'

Director general of the IoD, Miles Templeman, said there was a substantial "credibility gap" between what official statistics showed and what employers felt "on the front line".

"It is probably impossible to determine definitively the extent to which education services have improved or otherwise over the last decade.

"However, the analysis conducted for the Briefing Book suggests that we approach official statistics with caution. This matters."

England's Schools Minister Jim Knight said there was no doubt that English and maths standards had risen over the last decade.

"Business concerns about school leavers reflect the reality of the changing economy - with historic low unemployment and the virtual elimination of low-skill jobs.

"The reality is that employers rightly have far higher expectations of workers' skills than ever before."

He said employers' concerns were being tackled in England with tougher A-levels and GCSEs, improved skills training and the work alongside employers to introduce the new Diploma next year.

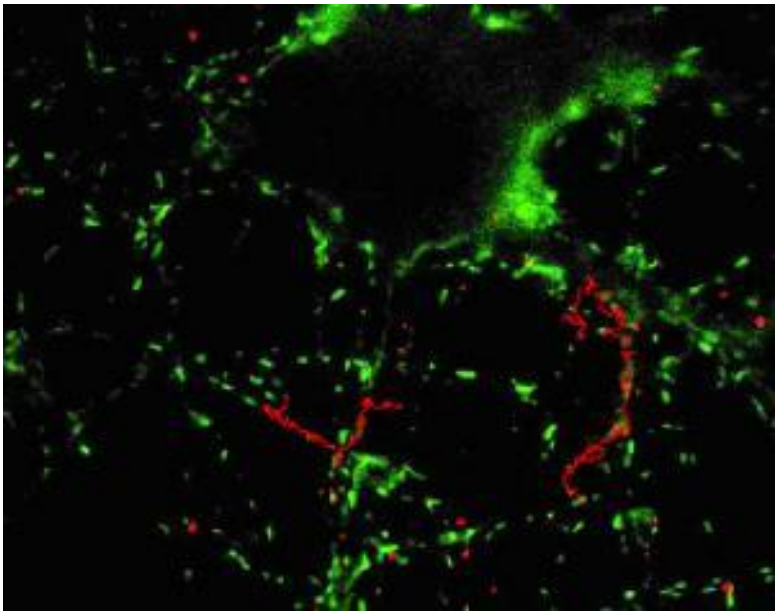
The report says much of the data it includes relates to England but that its authors have tried to include information from Wales, Northern Ireland and Scotland as well.

The Scottish Government would not comment on the report as it said it focused on GCSE and A-lelvel results - exams which are not taken in Scotland.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/uk_news/education/7554132.stm

Published: 2008/08/11 16:15:03 GMT

Stress Hormone Found To Regulate Brain Neurotransmission



The trajectory of receptors (in red) is shown here after corticosterone was applied to hippocampal neurons. The receptors, detected with nanoparticles (Quantum Dot), diffuse in and out of synapses (in green). (Credit: Copyright Laboratoire Physiologie Cellulaire de la Synapse)

ScienceDaily (Aug. 11, 2008) — CNRS and Inserm[1] researchers, working at the future NeuroCampus in Bordeaux, have just shown how one of the stress hormones regulates brain neurotransmission on the short and long term and enables neuronal connections to adapt.

This work, directed by Laurent Groc and Francis Chaouloff, may lead to the identification of new therapeutic targets for psychiatric illnesses such as post-traumatic stress disorder and depression.

When we are subjected to a stress, our adrenal glands secrete hormones that affect our entire body. One of these hormones, cortisol, enables us to adapt physically and mentally to the stimulus. Following a major or repeated stress that the individual has no control over, however, cortisol is secreted in great quantities over a long period of time. This hypersecretion has damaging effects on the individual, to the point of accelerating aging and facilitating the onset of illnesses such as depression.

The researchers have shown that in one part of the brain, the hippocampus, corticosterone (the equivalent of human cortisol in laboratory rats) modifies the intensity of transmissions made by excitatory synapses[2]. To the researchers' great surprise, this hormone increases the mobility of receptors found on the surface of neurons, thus allowing synaptic connections to adapt more effectively to the demands of brain activity. The stress hormone can be thought of as an alarm that mobilizes the receptors.

In addition, briefly exposing neurons to corticosterone increases synaptic plasticity[3], due to increased receptor mobility. Although this first effect is beneficial, in the case of prolonged stress (corticosterone stimulation over several hours), synaptic plasticity is reduced. This inverse effect can be explained by the fact that after a certain amount of time, the stress hormone not only increases receptor mobility, but also increases the number of receptors mobilized at the synapse level, leading to a decrease in plasticity.

The characterization of these newly discovered mechanisms opens up numerous possibilities for future research that could enhance both fundamental knowledge and clinical benefits. We can now imagine that in certain individuals subjected to major stress, lack of receptor mobility contributes to a lack of

adaptation. Under stressful conditions, synaptic plasticity would then depend on the dynamic interactions between cortisol and the neuronal receptors that modulate brain activity. In the end, better mobility means better adaptation.

Notes:

(1) Laboratoire Physiologie Cellulaire de la Synapse UMR5091 CNRS and Neurocentre U862 Inserm, Université de Bordeaux.

(2) Excitatory synapses represent more than 80% of synapses. The neurons communicate between each other at the synapse level. Broadly, this junction contains a pre-synaptic element, which sends the information, and a post-synaptic element that receives the information. When the pre-synaptic compartment is stimulated by an electrical signal, it releases chemical messengers called neurotransmitters. Then, several milliseconds later, these neurotransmitters bind to special receptors.

(3) A synapse's ability to modify the information that it transmits.

Journal reference:

1. Groc L., Choquet D., Chaouloff F. **The stress hormone corticosterone conditions AMPA receptor surface trafficking and synaptic potentiation**. *Nature Neuroscience*, Online July 11, 2008 DOI: 10.1038/nn.2150

Adapted from materials provided by CNRS.

http://www.sciencedaily.com:80/releases/2008/08/080807072125.htm

Eat Oily Fish At Least Once A Week To Protect Your Eyesight In Old Age

ScienceDaily (Aug. 11, 2008) — Eating oily fish once a week may reduce age-related macular degeneration (AMD) which is the major cause of blindness and poor vision in adults in western countries and the third cause of global blindness, according to a study published in the American Journal of Clinical Nutrition August 8, 2008.

There are two types of AMD, wet and dry. Of the two, wet AMD is the main cause of vision loss. A team of researchers across seven European countries and co-ordinated by the London School of Hygiene & Tropical Medicine sought to investigate the association between fish intake and omega 3 fatty acids with wet AMD, comparing people with wet AMD with controls. Participants were interviewed about their dietary habits including how much fish they ate and what type. Information on the main omega 3 fatty acids (docosahexaenoicacid (DHA) and eicosapentaenoic acid (EPA) was obtained by linking dietary data with food composition tables.

The findings show that people who habitually consume oily fish at least once a week compared with less than once a week are 50% less likely to have wet AMD. There was no benefit from consumption of non oily white fish. There was a strong inverse association between levels of DHA and EPA and wet AMD. People in the top 25% of DHA and EPA levels (300 mg per day and above) were 70% less likely to have wet AMD.

Astrid Fletcher, Professor of Epidemiology at the London School of Hygiene & Tropical Medicine, who led the study, commented: "This is the first study in Europeans to show a beneficial association on wet AMD from the consumption of oily fish and is consistent with results from studies in the USA and Australia. Two 3oz servings a week of oily fish, such as salmon, tuna or mackerel, provides about 500 mg of DHA and EPA per day".

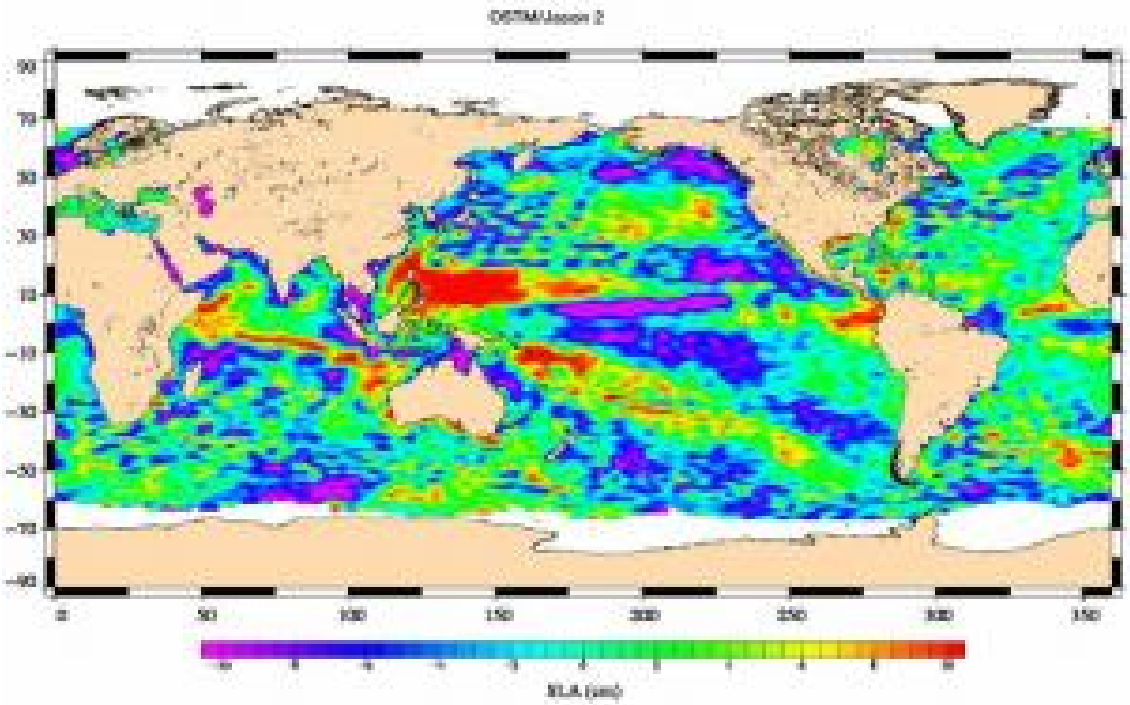
The research team is not, however, recommending omega 3 supplements as the study did not investigate whether supplements would have the same benefit as dietary sources.

The EUREYE study was funded by the European Commission with additional support from the Macular Disease Society UK and the Thomas Pocklington Trust.

Adapted from materials provided by London School of Hygiene & Tropical Medicine, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2008/08/080808104925.htm

Ocean Surface Topography Mission/Jason 2 Begins Mapping Oceans



OSTM/Jason 2 map of sea-level anomalies from July 4 to July 14, 2008. (Credit: Image courtesy of NASA/Jet Propulsion Laboratory)

ScienceDaily (Aug. 11, 2008) — Less than a month after launch, the NASA-French space agency Ocean Surface Topography Mission (OSTM)/Jason 2 oceanography satellite has produced its first complete maps of global ocean surface topography, surface wave height and wind speed.

The new data will help scientists monitor changes in global sea level and the distribution of heat in the ocean. This information is used to monitor climate change and ocean circulation, and to enable more accurate weather, ocean and climate forecasts. The data reveal patterns of sea level anomalies, which are used by scientists to calculate the speed and direction of ocean surface currents.

The new mission extends a 16-year continuous record of global sea level measurements begun in 1992 by the NASA/Centre National d'Etudes Spatiales (CNES) Topex/Poseidon mission and continued by the two agencies on Jason 1, launched in 2001. Data from Topex/Poseidon and Jason 1 show that mean sea level has been rising by about three millimeters (.12 inches) a year since 1993.

The new maps were generated from the first 10 days of data collected once the new satellite, OSTM/Jason 2, reached its operational orbit of 1,336 kilometers (830 miles) on July 4. The new satellite and its predecessor, Jason 1, are now flying in formation in the same orbit approximately 55 seconds apart, making nearly simultaneous measurements that are allowing scientists to precisely calibrate the new satellite's instruments. Comparisons of data from the two satellites on sea-level anomalies, significant wave height and ocean wind speed all show very close correlation of all measured parameters.

"These initial observations from OSTM/Jason 2 compare very closely to those of Jason 1," said Lee-Lueng Fu, OSTM/Jason 2 project scientist at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "To be able to collect such high-quality science data within a month of launch breaks previous records. It is also a direct reflection of how mature the field of satellite altimetry has become and of the seamless

cooperation of our international team."

The satellite's first radar altimeter data were acquired just 48 hours after its launch on June 20 from Vandenberg Air Force Base, Calif., on a Delta II rocket. The French space agency processed the first test results, followed by more advanced data results a week after launch. The more advanced results came after calculating the precise location of the satellite's preliminary orbits. The satellite, its instruments and ground segment are all functioning properly. Once it has been fully calibrated and validated, the satellite will begin providing oceanographic products to users around the world.

OSTM/Jason 2 is an international endeavor, with responsibilities for satellite development and launch shared between NASA and CNES. CNES provided the OSTM/Jason 2 spacecraft, NASA provided the launch, and NASA and CNES jointly provided the primary payload instruments. CNES and the U.S. National Oceanic and Atmospheric Administration (NOAA) are responsible for satellite operations, while JPL is managing the mission for NASA. Data processing is being carried out by CNES, the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and NOAA, depending on the type of product.

Once on-orbit commissioning of OSTM/Jason 2 is completed, CNES will hand over mission operations and control to NOAA, which will then join with EUMETSAT to generate, archive and distribute data products to users worldwide.

For more information about OSTM/Jason 2, visit: http://www.nasa.gov/ostm .

Adapted from materials provided by NASA/Jet Propulsion Laboratory.

http://www.sciencedaily.com/releases/2008/08/080807074916.htm

Fuel From Cellulose, Cheaper And With Better Yields Than Ever Before

ScienceDaily (Aug. 11, 2008) — Independence from fossil fuel exporting nations, a reduction in the release of greenhouse gases, conservation of dwindling resources: there are any number of reasons to stop the use of fossil fuels. Hydrogen technology and solar energy will very probably provide the solution to our global energy problem—in the long term.

For an initial quick remedy we may look to bioenergy. Biomass can be used to generate alternative carbon-based liquid fuels, allowing the continued use of current automotive combustion engine technology and existing infrastructure. At the same time, the chemical industry would continue to be supplied with the carbon compounds it requires as raw materials for plastics, textiles, etc. Mark Mascal and Edward B. Nikitin at the University of California, Davis (USA) have now developed an interesting new method for the direct conversion of cellulose into furan-based biofuels. Their simple, inexpensive process delivers furanic compounds in yields never achieved before.

Atmospheric carbon dioxide is viewed as the ultimate carbon source of the future. It is most efficiently "harvested" by plants via photosynthesis. Currently, biofuel producers primarily use starch, which is broken down to form sugars that are then fermented to give ethanol. Cellulose is however the most common form of photosynthetically fixed carbon. The problem is that the degradation of cellulose into its individual sugar components, which could then be fermented, is a slow and expensive process. "Another problem is that the carbon economy of glucose fermentation is poor," explains Mascal, "for every 10 g of ethanol produced, you also release 9.6 g CO_2."

Could we avoid the breakdown of cellulose and fermentation? Mascal and Nikitin demonstrate that we can indeed. They have developed a simple process for the conversion of cellulose directly into "furanics", which are furan-based organic liquids. Furans are molecules whose basic unit is an aromatic ring made of one oxygen and four carbon atoms. The main product the researchers obtain under the conditions they have been developing is 5-chloromethylfurfural (CMF).

CMF and ethanol can be combined to give ethoxymethylfufural (EMF), and CMF reacts with hydrogen to give 5-methylfurfural. Both of these compounds are suitable as fuels. EMF has previously been investigated and found to be of interest in mixtures with diesel by Avantium Technologies, a spin-off of Shell.

"Our method appears to be the most efficient conversion of cellulose into simple, hydrophobic, organic compounds described to date," says Mascal. "It also surpasses the carbon yields of glucose and sucrose fermentation. Furanics could be established as both the automotive energy source and chemical starting material of the future."

Journal reference:

1. Mark Mascal et al. **Direct, High-Yield Conversion of Cellulose into Biofuel**. *Angewandte Chemie International Edition*, Online 1 Aug 2008 DOI: 10.1002/anie.200801594

Adapted from materials provided by Wiley-Blackwell.

http://www.sciencedaily.com/releases/2008/08/080808114928.htm

Psychiatrists Shift Away From Providing Psychotherapy

ScienceDaily (Aug. 11, 2008) — A declining number of office-based psychiatrists appear to be providing psychotherapy to their patients, according to a new report.

Psychotherapy has been part of the practice of psychiatry for generations, the authors write as background information in the article. Various forms of psychotherapy, either alone or in combination with medications, are recommended for the treatment of major depression, post-traumatic stress disorder, bipolar disorder and other psychiatric illnesses."Yet, despite the traditional prominence of psychotherapy in psychiatric practice and training, there are indications of a recent decline in the provision of psychotherapy by U.S. psychiatrists—a trend attributed to reimbursement policies favoring brief medication management visits rather than psychotherapy and the introduction of newer psychotropic medications with fewer adverse effects," the authors write.

Ramin Mojtabai, M.D., Ph.D., M.P.H., then of Beth Israel Medical Center and now of the Johns Hopkins Bloomberg School of Public Health, Baltimore, and Mark Olfson, M.D., M.P.H., of the Columbia University Medical Center and New York State Psychiatric Institute, New York, analyzed trends in psychotherapy provision using data from national surveys of office-based psychiatrist visits from 1996 through 2005.Over the 10-year period, psychotherapy was provided in 5,597 (34 percent) of 14,108 visits lasting longer than 30 minutes. The percentage of visits involving psychotherapy declined from 44.4 percent in 1996-1997 to 28.9 percent in 2004-2005. "This decline coincided with changes in reimbursement, increases in managed care and growth in the prescription of medications," the authors write.

The number of psychiatrists who provided psychotherapy to all of their patients also declined over the same time period, from 19.1 percent to 10.8 percent. "Psychiatrists who provided psychotherapy to all of their patients relied more extensively on self-pay patients, had fewer managed-care visits and prescribed medications in fewer of their visits compared with psychiatrists who provided psychotherapy less often," the authors write."These trends highlight a gradual but important change in the content of outpatient psychiatric care in the United States and a continued shift toward medicalization of psychiatric practice," they conclude. "A key challenge facing the future generation of psychiatrists will likely involve maintaining their professional role as integrators of the biological and psychosocial perspectives while working within the constraints of the strong market forces of third-party payers and managed care to implement advances in the diagnosis and treatment of mental disorders."

This study was supported in part by a grant from the Agency for Healthcare Research and Quality. Dr. Mojtabai has received research funding from Bristol-Myers Squibb and AstraZeneca pharmaceutical companies and consultant fees from Bristol-Myers Squibb. Dr. Olfson has received research funding from Eli Lilly, Bristol-Myers Squibb and Jansen pharmaceutical companies and has worked as a paid consultant to Pfizer and McNeil Pharmaceuticals.

Journal reference:

1. Ramin Mojtabai; Mark Olfson. **National Trends in Psychotherapy by Office-Based Psychiatrists**. *Arch Gen Psychiatry*, 2008;65(8):962-970 [link]

Adapted from materials provided by JAMA and Archives Journals.

http://www.sciencedaily.com/releases/2008/08/080804165316.htm

Mutation Found In Dachshund Gene May Help Develop Therapies For Humans With Blindness

Scientists test specially designed sunglasses to aid the vision of a dachshund suffering from dayblindness caused by inherited cone-rod dystrophy. (Credit: Photo courtesy of Frode Lingaas, Norwegian School of Veterinary Science)

ScienceDaily (Aug. 10, 2008) — Cone-rod dystrophies (CRDs) are a group of eye diseases caused by progressive loss of the photoreceptor cells in the retina. Researchers have identified a novel mutation in a gene associated with CRD in dogs, raising hopes that potential therapies can be developed for people suffering from these eye disorders.

CRD represents a heterogeneous set of disorders characterized by progressive loss of retinal cone function. As these photoreceptor cells allow us to see in bright light, loss of cones results in what is commonly known as dayblindness, and can advance to blindness altogether. Thus far, investigations into the genetic basis for autosomal recessively inherited cases of human CRD have turned up only a few genes associated with the disorder, therefore it is likely there are other genes associated with CRD not yet identified.

Eye disorders are one of the most frequently inherited disorders in dogs, however canine CRD is limited to only a few breeds. A gene mutation had previously been associated with CRD in the miniature long-haired dachshund, while a genetic basis for CRD in the standard wire-haired dachshund and the pit bull terrier remained unknown.

In this study, scientists led by Dr. Frode Lingaas of the Norwegian School of Veterinary Science and Dr. Kerstin Lindblad-Toh of the Broad Institute of MIT and Harvard have identified a mutation in a novel gene for early-onset CRD in standard wire-haired dachshund by genome-wide association mapping of a dachshund family.

The genome-wide strategy utilized by Lingaas' group isolated a region on chromosome 5 associated with CRD in dachshund. A search for mutations of this area revealed that a portion of the nephronophthisis 4 (NPHP4) gene has been deleted and is likely responsible for recessively inherited CRD in the standard wire-haired dachshund. The finding is particularly interesting, as the human form of NPHP4 has been previously implicated in disease. "This gene has been associated with a combination of kidney and eye disease in human patients," explained Lingaas. "Here, we found a mutation that affects only the eyes,

suggesting that this gene might be a candidate for human patients with eye disease only."

The researchers suggest that the protein coded for by the mutant form of NPHP4 may lack a domain that would normally interact with other proteins involved in eye function, yet still retain the region involved in kidney function. "The new information that the NPHP4 gene can be involved in eye diseases only can shed light on the etiology of some low-frequency eye diseases in people where similar mutations may be involved," Lindblad-Toh said.

Lingaas noted that identification of causal mutations for diseases has practical implications for dogs, as genetic tests could be implemented to avoid new cases of the disorder and reduce the frequency of the mutation in the population. Furthermore, this investigation of the genetic basis for CRD in dogs could facilitate the development of treatments for humans.

Scientists from the Norwegian School of Veterinary Science (Oslo, Norway), the Broad Institute of MIT and Harvard (Cambridge, MA), Massachusetts General Hospital (Boston, MA), and Uppsala University (Uppsala, Sweden) contributed to this study.

This work was supported by the Norwegian School of Veterinary Science.

Journal reference:

1. Wiik, A.C., Wade, C., Biagi, T., Ropstad, E.-O., Bjerkås, E., Lindblad-Toh, K., and Lingaas, F. **A deletion in nephronophthisis 4 (NPHP4) is associated with recessive cone-rod dystrophy in standard wire-haired dachshund**. *Genome Research*, Online August 8, 2008 DOI: 10.1101/gr.074302.107

Adapted from materials provided by Cold Spring Harbor Laboratory, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2008/08/080807175434.htm

Compressor-free Refrigerator May Loom In The Future

ScienceDaily (Aug. 10, 2008) — Refrigerators and other cooling devices may one day lose their compressors and coils of piping and become solid state, according to Penn State researchers who are investigating electrically induced heat effects of some ferroelectric polymers.

"This is the first step in the development of an electric field refrigeration unit," says Qiming Zhang, distinguished professor of electrical engineering. "For the future, we can envision a flat panel refrigerator. No more coils, no more compressors, just solid polymer with appropriate heat exchangers."

Other researchers have explored magnetic field refrigeration, but electricity is more convenient.

Zhang, working with Bret Neese, graduate student, materials science and engineering; postdoctoral fellows Baojin Chu and Sheng-Guo Lu; Yong Wang, graduate student, and Eugene Furman, research associate, looked at ferroelectric polymers that exhibit temperature changes at room temperature under an electrical field. These polarpolymers include poly(vinylidene fluoride-trifluoroethylene) and poly(vinylidene fluoride-trifluoroethylene)-chlorofluoroethylene, however there are other polarpolymers that exhibit the same effect.

Conventional cooling systems, -- refrigerators or air conditioners -- rely on the properties of gases to cool and most systems use the change in density of gases at changing pressures to cool. The coolants commonly used are either harmful to people or the environment. Freon, one of the fluorochlorocarbons banned because of the damage it did to the ozone layer, was the most commonly used refrigerant. Now, a variety of coolants is available. Nevertheless, all have problems and require energy-eating compressors and lots of heating coils.

Zhang's approach uses the change form disorganized to organized that occurs in some polarpolymers when placed in an electric field. The natural state of these materials is disorganized with the various molecules randomly positioned. When electricity is applied, the molecules become highly ordered and the material gives off heat and becomes colder. When the electricity is turned off, the material reverts to its disordered state and absorbs heat.

The researchers report a change in temperature for the material of about 22.6 degrees Fahrenheit, in today's (Aug. 8) issue of Science. Repeated randomizing and ordering of the material combined with an appropriate heat exchanger could provide a wide range of heating and cooling temperatures.

"These polymers are flexible and can be used for heating and cooling, so there may be many different possible applications," said Zhang, also a faculty member of Penn State's Materials Research Institute.

Besides air conditioning and refrigeration units, applications could include heating or cooling of a variety of clothing including cooling of protective gear for fire fighters, heating of mittens and socks or shoes for athletes, sportsmen and law enforcement officer and even cooling of mascot and cartoon character costumes. Another application would be in electronics, where small amounts of the polymers could effectively cool over heating circuit boards and allow closer packing, and therefore smaller devices.

The U.S. Department of Energy supported this work.

Adapted from materials provided by Penn State.

http://www.sciencedaily.com/releases/2008/08/080807144234.htm

Quantum Chaos Unveiled?

University of Utah physicist Brian Saam examines tubes of invisible xenon gas that he used to explore the relationship between chaos theory and modern quantum physics. (Credit: Image courtesy of University of Utah)

ScienceDaily (Aug. 9, 2008) — A University of Utah study is shedding light on an important, unsolved physics problem: the relationship between chaos theory – which is based on 300-year-old Newtonian physics – and the modern theory of quantum mechanics.

The study demonstrated a fundamental new property – what appears to be chaotic behavior in a quantum system – in the magnetic "spins" within the nuclei or centers of atoms of frozen xenon, which normally is a gas and has been tested for making medical images of lungs.

The new study – published in the Aug. 8 issue of the journal Physical Review Letters – was led by Brian Saam, an associate professor of physics and associate dean of the University of Utah's College of Science.

Quantum mechanics – which describes the behavior of molecules, atoms electrons and other subatomic particles – "plays a key role in understanding how electronics work, how all sorts of interesting materials behave, how light behaves during communication by optical fibers," Saam says.

"When you look at all the technology governed by quantum physics, it's not unreasonable to assume that if one can apply chaos theory in a meaningful way to quantum systems, that will provide new insights, new technology, new solutions to problems not yet known."

A Chaotic Dance of Nuclear Spins

Just as atomic nuclei and their orbiting electrons can have electrical charges, they also have another property known as "spin." The spin within an atomic nucleus or electron is like a spinning bar magnet that points either up or down.

Saam and graduate student Steven Morgan zapped xenon atoms with a strong magnetic field, laser beam

and radio-wave pulse so the nuclear spins were aligned in four different configurations in four samples of frozen xenon, each containing about 100 billion billion atoms [billion twice is correct].

Despite differing initial configurations, the "dances" of the xenon spins evolved so they eventually were in sync with each other, as measured by nuclear magnetic resonance, or NMR. That took a few thousandths of a second – something physicists seriously call "long-time behavior."

"This type of common behavior has been a signature of classically chaotic (Newtonian) systems, mostly studied using a computer, but it never had been observed in an experimental system that only can be described by quantum mechanics," Saam says.

As an analogy, imagine billions of people in a huge, unfamiliar city. They start walking around in different places and directions, with little conversation among them. Yet, eventually, they all end up walking in the same direction.

Such behavior in nuclear spins had been predicted in 2005 by the study's third author, physicist Boris Fine of the University of Heidelberg in Germany. Fine had made the prediction by adapting chaos theory to quantum theory.

Order from Chaos

The evolution of disorder into order by the xenon atoms' nuclear spins is a signature of chaos theory, which, contrary to the popular notion, does not imply complete disorder. Instead, chaos theory describes how weather, certain chemical reactions, planetary orbits, subatomic particles and other dynamic systems change over time, with the changes often highly sensitive to starting conditions.

"When you have a [chaotic] system that is characterized by extreme randomness, it paradoxically can produce ordered behavior after a certain amount of time," says Saam. "There is strong evidence that is happening here in our experiment."

The sensitivity to starting conditions is known popularly as "the butterfly effect," based on the fanciful example that a butterfly flapping its wings in South America might set off subtle atmospheric changes that eventually build into a tornado in Texas.

Saam says chaos theory can make predictions about extremely complex motions of many particles that are interacting with each other. The mathematical notion of chaos first was described in the 1890s. Chaos theory was developed in the 1960s, based on classical physics developed in the late 1600s by Sir Isaac Newton. Classical physics says the motion, speed and location of any particle at any time can be determined precisely.

In contrast, quantum mechanics holds that "when things get atom small, our notions of being able to put a specific particle in a specific place with a specific speed at a specific time become blurry," Saam says. So a particle's speed and location is a matter of probability, and "the probability is the reality."

Details of the Study: 'These Guys are Dancing Together'

Technically, spin is the intrinsic angular momentum of a particle – a concept so difficult to explain in lay terms that physicists usually use the bar magnet analogy.

A nonmagnetic material normally has random spins in the nuclei of its atoms – half the spins are up and half are down, so the net spin is zero. But magnetic fields can be applied so that the spins are aligned –

with more up than down, or vice versa.

Physicists can measure the alignment or "polarization" of the spins using NMR's strong magnetic field. Nuclear spins also are used medically: When a patient lies within a magnetic resonance imaging (MRI) device's large magnet, the spins within atoms in the body generate electrical signals that are used to make images of body tissues. Doctors are testing xenon as a way to enhance MRI images of the lungs.

Saam and colleagues used xenon because its spins can be aligned relatively easily.

In each experiment, Saam and Morgan used a magnetic field and a laser to align or "hyperpolarize" the spins in a sample of about 100 billion billion xenon gas atoms so a majority of the spins either were aligned "up" or "down." Then, they froze the gas into a solid at a temperature of 321 degrees below zero Fahrenheit.Then they applied a radio wave pulse, which "flips" the spins so they all are perpendicular to the magnetic field instead of parallel to it. That makes them start circling around the magnetic field axis like spinning tops.

In this manner, the physicists created four frozen xenon samples. Within each sample, the spins were aligned, but different radio pulses were used to make the initial alignment or configuration of the spins different from one sample to the next.

The scientists then used NMR to watch the spins decay or fade over thousandths of a second.

"Although they are held in place in the crystal structure, the spins can interact with each other and change the direction in which they're pointed in much the same way that magnets interact with each other when brought close together," Saam says.

The initial configuration of spins in each xenon sample evolved in extremely complicated ways due to the presence of billions of interacting spins, and each sample rapidly "lost its memory" of where it started. Such behavior has been known for 60 years.

The surprise was that while each sample's initial NMR signal was radically different from the other, they displayed "identical long-time behavior," says Saam.

"Somehow despite the fact these spins have very complicated interactions with each other and started out in completely different orientations, they end up all moving in the same way after several milliseconds," he says. "That's never been seen before in a quantum mechanical system. These guys are dancing together."

Saam says the technical achievement was that the huge amount of polarization made it possible for NMR to measure an extremely weak spin signal – only one-thousandth as strong as the original signal by the time the samples appeared to behave chaotically.

Adapted from materials provided by University of Utah.

http://www.sciencedaily.com/releases/2008/08/080806140211.htm