Infoteca's E-Journal

An Electronic Compilation of Scientific and C
Sistema de Infotecas Centrales, Universidad

CONTENTS

Invitation to know UNESCO cathedra magazines
In Fruit Flies, Homosexuality Is Biological But Not Hard-wired
Are Humans Evolving Faster?
Nanotube-producing Bacteria Show Manufacturing Promise
Cord Blood Viable Option For Kids With Life-threatening Metabolic Disorders
Mars Rover Investigates Signs Of Steamy Martian Past
Top 11 Warmest Years On Record Have All Been In Last 13 Years
For The Fruit Fly, Everything Changes After Sex
Voyager 2 Proves Solar System Is Squashed
Distorted Self-image In Body Image Disorder Due To Visual Brain Glitch 24
Hazy Red Sunset On Extrasolar Planet 26
Building Blocks Of Life Formed On Mars, Scientists Conclude 28
Massive Dinosaur Discovered In Antarctica Sheds Light On Life 30
Scientists Overcome Major Obstacles To Stem Cell Heart Repair 32
More 'Functional' DNA In Genome Than Previously Thought 34
Neurotransmitters In Biopolymers Stimulate Nerve Regeneration 35
Female Lower Back Has Evolved To Accommodate The Weight Of Pregnancy 37
Rising Carbon Dioxide Signals Wetter Storms For Northern Hemisphere 39
Different Areas Of The Brain Respond To Belief, Disbelief And Uncertainty 40
Cholesterol-lowering Drugs And The Risk Of Hemorrhagic Stroke 42
Women Persist In Plastic Surgery Treatments That Are Not Working, Research Says 43
Discovery Of Primary Deposit Of Rubies Leads To Improved Prospecting Strategies 44
Ancient Maya Marketplace Located, Challenges Views On Goods Distribution 46
Ancient Blood Found On Sculptures From Kingdom Of Mali 48
Saturn's rings 'may live forever' 49
Body clock 'control switch' found 51
Extinction threat to wild salmon 53
Foot-and-mouth 'wasn't contained' 56
Andean Highlands In Chile Yield Ancient South American Armored Mammal Fossil 58
Captain Kidd's Shipwreck Of 1699 Discovered 60
Call for rethink in obesity fight 62
Doctors urge folic acid progress 64
Talk more in class, experts say 66
Jupiter's Moon Europa: What Could Be Under The Ice? 68
'Magma P.I.' Unearths Clues To How Earth's Crust Was Sculpted 70
Present-day Species Of Piranha Resulted From Marine Incursion Into Amazon Basin 72
Natural Climate Changes Can Intensify Hurricanes Than Global Warming 74

Semen Ingredient 'Drastically' Enhances HIV Infection	76
Mom's Personality Means Survival For Her Squirrel Pups	78
Blind Humans Retain Normal Responses To Non-visual Effects Of Light	80
Drug Study For Brain Cancer Shows Promising Results	82
E113xperts Urge Complete Access To Iodized Salt; Prevents IQ Loss And Brain Damage	83
Why Time Seems to Slow Down in Emergencies	85
The Polarization of Extremes	86
Cooler, Faster, Cheaper: Researchers Advance Process To Manufacture Silicon Chips	89
3-D Real-time Heart 'Mapping' Technology Improves Precision And Patient Safety	91
Laser Beam 'Fire Hose' Used To Sort Cells; New Kinds Of Biological Research	92
Hidden Cosmic Giant: New Cluster Of Galaxies Discovered	94
Sodium issue clouds Enceladus	96
Google debuts knowledge project	99
Hi-tech tools divide social sites	100
Sperm clue to 'disease immunity'	102
The beauty of maths	104
Ladies of the French Resistance	108
Largest Digital Survey Of The Milky Way Released	111
Explosives At The Microscopic Scale Produce Shocking Results	113
Key to cancer drug use pinpointed	115
New target for anti-malaria drugs	117
Stronger drinks put many at risk	119
Deep Impact Spacecraft Heads For Comet Hartley 2	121
Stem Cells Show Power To Predict Disease, Drug Toxicity	124
New Oil-repelling Material Created	126
Losses Of Long-established Genes Contribute To Human Evolution	128
Two New Mammal Species Discovered In Indonesia's Wilderness	130
The Skyline as Architectural History	132
Science Cafés Tap Nation's Fascination With Research and Discoveries	134
World is not flat, academic says	136
Building Respect at Yale	138

Dear UAdeC community:

The Digital Library portal will soon have a link to the UNESCO cathedra, so you may add it to your favorites.

These are 38 publications specialized in education and TICs

http://www.uned.es/catedraunesco-ead/relectronicas_espanol.htm

Greetings, and happy holidays

Haidy Arreola
harreola@mail.uadec.mx
(844) 411-8210
Centro de información Especilizada
Infoteca Central Saltillo

In Fruit Flies, Homosexuality Is Biological But Not Hard-wired, Study Shows

David Featherstone and his team have discovered that sexual orientation in fruit flies is controlled by a previously unknown regulator of synapse strength. Armed with this knowledge, the researchers found they were able to use either genetic manipulation or drugs to turn the flies' homosexual behavior on and off within hours. (Credit: Roberta Dupuis-Devlin/UIC Photo Services Copyright 2007 University of Illinois)

ScienceDaily (Dec. 10, 2007) — While the biological basis for homosexuality remains a mystery, a team of neurobiologists reports they may have closed in on an answer -- by a nose.

The team led by University of Illinois at Chicago researcher David Featherstone has discovered that sexual orientation in fruit flies is controlled by a previously unknown regulator of synapse strength. Armed with this knowledge, the researchers found they were able to use either genetic manipulation or drugs to turn the flies' homosexual behavior on and off within hours.

Featherstone, associate professor of biological sciences at UIC, and his coworkers discovered a gene in fruit flies they called "genderblind," or GB. A mutation in GB turns flies bisexual.

Featherstone found the gene interesting initially because it has the unusual ability to transport the neurotransmitter glutamate out of glial cells -- cells that support and nourish nerve cells but do not fire like neurons do. Previous work from his laboratory showed that changing the amount of glutamate outside cells can change the strength of nerve cell junctions, or synapses, which play a key role in human and animal behavior.

But the GB gene became even more interesting when post-doctoral researcher Yael Grosjean noticed that all the GB mutant male flies were courting other males.

"It was very dramatic," said Featherstone. "The GB mutant males treated other males exactly the same way normal male flies would treat a female. They even attempted copulation."

Other genes that alter sexual orientation have been described, but most just control whether the brain develops as genetically male or female. It's still unknown why a male brain chooses to do male things

and a female brain does female things. The discovery of GB provided an opportunity to understand why males choose to mate with females.

"Based on our previous work, we reasoned that GB mutants might show homosexual behavior because their glutamatergic synapses were altered in some way," said Featherstone. Specifically, the GB mutant synapses might be stronger.

"Homosexual courtship might be sort of an 'overreaction' to sexual stimuli," he explained.

To test this, he and his colleagues genetically altered synapse strength independent of GB, and also fed the flies drugs that can alter synapse strength. As predicted, they were able to turn fly homosexuality on and off -- and within hours.

"It was amazing. I never thought we'd be able to do that sort of thing, because sexual orientation is supposed to be hard-wired," he said. "This fundamentally changes how we think about this behavior."

Featherstone and his colleagues reasoned that adult fly brains have dual-track sensory circuits, one that triggers heterosexual behavior, the other homosexual. When GB suppresses glutamatergic synapses, the homosexual circuit is blocked.

Further work showed precisely how this happens -- without GB to suppress synapse strength, the flies no longer interpreted smells the same way.

"Pheromones are powerful sexual stimuli," Featherstone said. "As it turns out, the GB mutant flies were perceiving pheromones differently. Specifically, the GB mutant males were no longer recognizing male pheromones as a repulsive stimulus."

Featherstone says it may someday be possible to domesticate insects such as fruit flies and manipulate their sense of smell to turn them into useful pollinators rather than costly pests.

The research appeared on line December 10 in Nature Neuroscience, and is scheduled for print in the January issue.

Grosjean, now with the Center of Integrative Genomics in Lausanne, Switzerland, is the paper's first author. Along with Featherstone, authors include Hrvoje Augustin of UIC and Micheline Grillet and Jean-Francois Ferveur of the Université de Bourgogne in Dijon, France.

Adapted from materials provided by University of Illinois at Chicago.

http://www.sciencedaily.com/releases/2007/12/071210094541.htm

Are Humans Evolving Faster? Findings Suggest We Are Becoming More Different, Not Alike

"We aren't the same as people even 1,000 or 2,000 years ago," says University of Utah anthropologist Henry Harpending. That might explain, for example, part of the difference between Viking invaders and their peaceful Swedish descendants. (Credit: iStockphoto/Manuel Velasco)

ScienceDaily (Dec. 11, 2007) — Researchers have discovered genetic evidence that human evolution is speeding up -- and has not halted or proceeded at a constant rate, as had been thought -- indicating that humans on different continents are becoming increasingly different.

"We used a new genomic technology to show that humans are evolving rapidly, and that the pace of change has accelerated a lot in the last 40,000 years, especially since the end of the Ice Age roughly 10,000 years ago," says research team leader Henry Harpending, a distinguished professor of anthropology at the University of Utah.

Harpending says there are provocative implications from the study, published online Monday, Dec. 10 in the journal Proceedings of the National Academy of Sciences:

-- "We aren't the same as people even 1,000 or 2,000 years ago," he says, which may explain, for example, part of the difference between Viking invaders and their peaceful Swedish descendants. "The dogma has been these are cultural fluctuations, but almost any temperament trait you look at is under strong genetic influence."

-- "Human races are evolving away from each other," Harpending says. "Genes are evolving fast in Europe, Asia and Africa, but almost all of these are unique to their continent of origin. We are getting less alike, not merging into a single, mixed humanity." He says that is happening because humans dispersed from Africa to other regions 40,000 years ago, "and there has not been much flow of genes between the regions since then."

"Our study denies the widely held assumption or belief that modern humans [those who widely adopted advanced tools and art] appeared 40,000 years ago, have not changed since and that we are all

pretty much the same. We show that humans are changing relatively rapidly on a scale of centuries to millennia, and that these changes are different in different continental groups."

The increase in human population from millions to billions in the last 10,000 years accelerated the rate of evolution because "we were in new environments to which we needed to adapt," Harpending adds. "And with a larger population, more mutations occurred."

Study co-author Gregory M. Cochran says: "History looks more and more like a science fiction novel in which mutants repeatedly arose and displaced normal humans -- sometimes quietly, by surviving starvation and disease better, sometimes as a conquering horde. And we are those mutants."

Harpending conducted the study with Cochran, a New Mexico physicist, self-taught evolutionary biologist and adjunct professor of anthropology at the University of Utah; anthropologist John Hawks, a former Utah postdoctoral researcher now at the University of Wisconsin, Madison; geneticist Eric Wang of Affymetrix, Inc. in Santa Clara, Calif.; and biochemist Robert Moyzis of the University of California, Irvine.

No Justification for Discrimination

The new study comes from two of the same University of Utah scientists -- Harpending and Cochran -- who created a stir in 2005 when they published a study arguing that above-average intelligence in Ashkenazi Jews -- those of northern European heritage -- resulted from natural selection in medieval Europe, where they were pressured into jobs as financiers, traders, managers and tax collectors. Those who were smarter succeeded, grew wealthy and had bigger families to pass on their genes. Yet that intelligence also is linked to genetic diseases such as Tay-Sachs and Gaucher in Jews.

That study and others dealing with genetic differences among humans -- whose DNA is more than 99 percent identical -- generated fears such research will undermine the principle of human equality and justify racism and discrimination. Other critics question the quality of the science and argue culture plays a bigger role than genetics.

Harpending says genetic differences among different human populations "cannot be used to justify discrimination. Rights in the Constitution aren't predicated on utter equality. People have rights and should have opportunities whatever their group."

Analyzing SNPs of Evolutionary Acceleration

The study looked for genetic evidence of natural selection -- the evolution of favorable gene mutations -- during the past 80,000 years by analyzing DNA from 270 individuals in the International HapMap Project, an effort to identify variations in human genes that cause disease and can serve as targets for new medicines.

The new study looked specifically at genetic variations called "single nucleotide polymorphisms," or SNPs (pronounced "snips") which are single-point mutations in chromosomes that are spreading through a significant proportion of the population.

Imagine walking along two chromosomes -- the same chromosome from two different people. Chromosomes are made of DNA, a twisting, ladder-like structure in which each rung is made of a "base pair" of amino acids, either G-C or A-T. Harpending says that about every 1,000 base pairs, there will be a difference between the two chromosomes. That is known as a SNP.

Data examined in the study included 3.9 million SNPs from the 270 people in four populations: Han Chinese, Japanese, Africa's Yoruba tribe and northern Europeans, represented largely by data from Utah Mormons, says Harpending.

Over time, chromosomes randomly break and recombine to create new versions or variants of the chromosome. "If a favorable mutation appears, then the number of copies of that chromosome will increase rapidly" in the population because people with the mutation are more likely to survive and reproduce, Harpending says.

"And if it increases rapidly, it becomes common in the population in a short time," he adds.

The researchers took advantage of that to determine if genes on chromosomes had evolved recently. Humans have 23 pairs of chromosomes, with each parent providing one copy of each of the 23. If the same chromosome from numerous people has a segment with an identical pattern of SNPs, that indicates that segment of the chromosome has not broken up and recombined recently.

That means a gene on that segment of chromosome must have evolved recently and fast; if it had evolved long ago, the chromosome would have broken and recombined.

Harpending and colleagues used a computer to scan the data for chromosome segments that had identical SNP patterns and thus had not broken and recombined, meaning they evolved recently. They also calculated how recently the genes evolved.

A key finding: 7 percent of human genes are undergoing rapid, recent evolution.

The researchers built a case that human evolution has accelerated by comparing genetic data with what the data should look like if human evolution had been constant:

- The study found much more genetic diversity in the SNPs than would be expected if human evolution had remained constant.
- If the rate at which new genes evolve in Africans was extrapolated back to 6 million years ago when humans and chimpanzees diverged, the genetic difference between modern chimps and humans would be 160 times greater than it really is. So the evolution rate of Africans represents a recent speedup in evolution.
- If evolution had been fast and constant for a long time, there should be many recently evolved genes that have spread to everyone. Yet, the study revealed many genes still becoming more frequent in the population, indicating a recent evolutionary speedup.

Next, the researchers examined the history of human population size on each continent. They found that mutation patterns seen in the genome data were consistent with the hypothesis that evolution is faster in larger populations.

Evolutionary Change and Human History: Got Milk?

"Rapid population growth has been coupled with vast changes in cultures and ecology, creating new opportunities for adaptation," the study says. "The past 10,000 years have seen rapid skeletal and dental evolution in human populations, as well as the appearance of many new genetic responses to diet and disease."

The researchers note that human migrations into new Eurasian environments created selective pressures favoring less skin pigmentation (so more sunlight could be absorbed by skin to make vitamin D), adaptation to cold weather and dietary changes.

Because human population grew from several million at the end of the Ice Age to 6 billion now, more favored new genes have emerged and evolution has speeded up, both globally and among continental groups of people, Harpending says.

"We have to understand genetic change in order to understand history," he adds.

For example, in China and most of Africa, few people can digest fresh milk into adulthood. Yet in Sweden and Denmark, the gene that makes the milk-digesting enzyme lactase remains active, so "almost everyone can drink fresh milk," explaining why dairying is more common in Europe than in the Mediterranean and Africa, Harpending says.

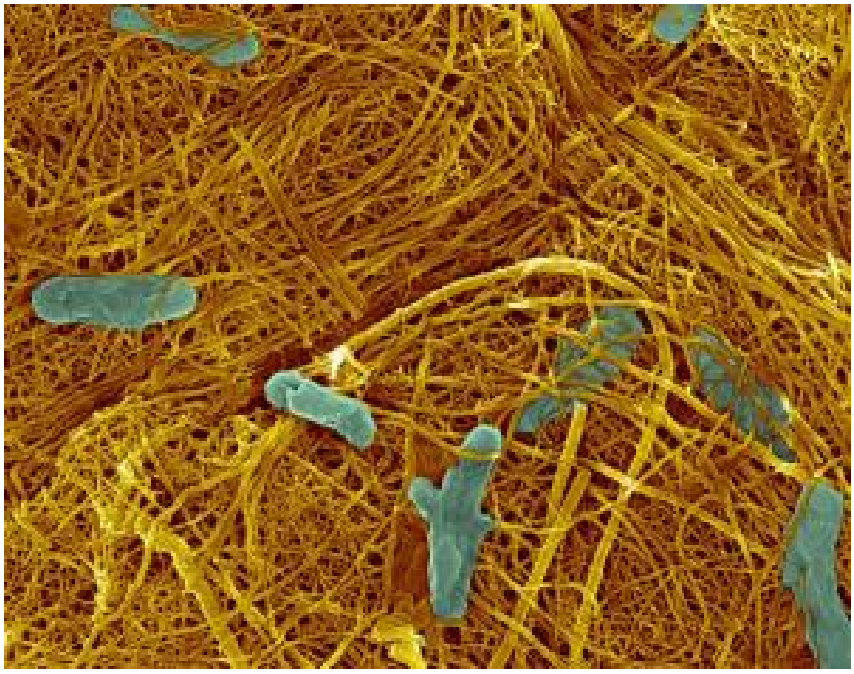
He now is studying if the mutation that allowed lactose tolerance spurred some of history's great population expansions, including when speakers of Indo-European languages settled all the way from northwest India and central Asia through Persia and across Europe 4,000 to 5,000 years ago. He suspects milk drinking gave lactose-tolerant Indo-European speakers more energy, allowing them to conquer a large area.

But Harpending believes the speedup in human evolution "is a temporary state of affairs because of our new environments since the dispersal of modern humans 40,000 years ago and especially since the invention of agriculture 12,000 years ago. That changed our diet and changed our social systems. If you suddenly take hunter-gatherers and give them a diet of corn, they frequently get diabetes. We're still adapting to that. Several new genes we see spreading through the population are involved with helping us prosper with high-carbohydrate diet."

Adapted from materials provided by University of Utah.

http://www.sciencedaily.com/releases/2007/12/071210212227.htm

Nanotube-producing Bacteria Show Manufacturing Promise



Shewanella bacteria (shown in blue) forming nanotubes. (Credit: Hor-Gil Hur, GIST)

ScienceDaily (Dec. 10, 2007) — Two engineers at the University of California, Riverside are part of a binational team that has found semiconducting nanotubes produced by living bacteria -- a discovery that could help in the creation of a new generation of nanoelectronic devices.

The research team believes this is the first time nanotubes have been shown to be produced by biological rather than chemical means. It opens the door to the possibility of cheaper and more environmentally friendly manufacture of electronic materials.

The team, including Nosang V. Myung, associate professor of chemical and environmental engineering in the Bourns College of Engineering, and his postdoctoral researcher Bongyoung Yoo, found the bacterium Shewanella facilitates the formation of arsenic-sulfide nanotubes that have unique physical and chemical properties not produced by chemical agents.

"We have shown that a jar with a bug in it can create potentially useful nanostructures," Myung said. "Nanotubes are of particular interest in materials science because the useful properties of a substance can be finely tuned according to the diameter and the thickness of the tubes."

The whole realm of electronic devices which power our world, from computers to solar cells, today depend on chemical manufacturing processes which use tremendous energy, and leave behind toxic metals and chemicals. Myung said a growing movement in science and engineering is looking for ways to produce semiconductors in more ecologically friendly ways.

Two members of the research team, Hor Gil Hur and Ji-Hoon Lee from Gwangju Institute of Science and Technology (GIST), Korea, first discovered something unexpected happening when they attempted to remediate arsenic contamination using the metal-reducing bacterium Shewanella. Myung, who specializes in electro-chemical material synthesis and device fabrication, was able to characterize the resulting nano-material.

The photoactive arsenic-sulfide nanotubes produced by the bacteria behave as metals with electrical and photoconductive properties. The researchers report that these properties may also provide novel functionality for the next generation of semiconductors in nano- and opto-electronic devices.

In a process that is not yet fully understood, the Shewanella bacterium secretes polysacarides that seem to produce the template for the arsenic sulfide nanotubes, Myung explained. The practical significance of this technique would be much greater if a bacterial species were identified that could produce nanotubes of cadmium sulfide or other superior semiconductor materials, he added.

"This is just a first step that points the way to future investigation," he said. "Each species of Shewanella might have individual implications for manufacturing properties."

Study results appear in the December 7 issue of the early edition of the Proceedings of the National Academy of Sciences.

Myung, Yoo, Hur and Lee were joined in the research by Min-Gyu Kim, Pohang Accelerator Laboratory, Pohang, Korea; Jongsun Maeng and Takhee Lee, GIST; Alice C. Dohnalkova and James K. Fredrickson, Pacific Northwest National Laboratory, Richland, Wash.; and Michael J. Sadowsky, University of Minnesota.

The Center for Nanoscale Innovation for Defense provided funding for Myung's contribution to the study.

Adapted from materials provided by University of California - Riverside.

http://www.sciencedaily.com/releases/2007/12/071207150717.htm

Cord Blood Viable Option For Kids With Life-threatening Metabolic Disorders

ScienceDaily (Dec. 11, 2007) — Children born with inherited metabolic disorders that cause organ failure and early death can be treated successfully with umbilical cord blood transplants from unrelated donors and, in some cases go on to live for many years, according to a study led by Duke University Medical Center researchers.

Umbilical cord blood transplant may confer advantages over bone marrow transplant, which has been the traditional method for treating these disorders, the researchers said.

"During the past 25 years, children with these disorders, which include Hurler disease and Krabbe leukodystrophy, have been treated successfully with bone marrow transplants but only if a matched donor was available," said Vinod Prasad, M.D., a pediatric hematologist/oncologist at Duke and lead investigator on the study. "Umbilical cord blood transplant can be done successfully from a mismatched donor, so it opens the possibility of treatment to many patients who otherwise would succumb to their disorders."

The researchers presented their findings on Dec. 10 at the American Society of Hematology meeting in Atlanta. The study was funded by the National Institutes of Health and Hunter's Hope Foundation, an organization founded in memory of former NFL quarterback Jim Kelly's son Hunter, who died from Krabbe disease, an inherited metabolic disorder that affects the nervous system.

"These disorders are rare when taken individually -- some of them occur in only one in a million births -- but if you put them together they have a sizeable incidence, maybe 1 in 10,000 births," Prasad said. "What these patients have in common is that they have some type of gene defect that causes them to lack a critical enzyme, required for the development of a vital organ, such as the heart or the brain or the nerves."

Without successful intervention, many of these children die before their first birthday, he said. Bone marrow and umbilical cord blood transplant work in these patients in much the same way -- by replacing missing enzymes and allowing the affected organs to develop more normally.

For this study, researchers looked at 159 children with inherited metabolic disorders who received unrelated cord blood transplants at Duke between 1995 and 2007.

"We saw that there were advantages to the unrelated cord blood transplant," Prasad said. "For instance, cord blood is more readily available than bone marrow and there was a decreased risk of complications, including a lower incidence of serious and potentially fatal graft-versus-host disease, which occurs when donor cells perceive a recipient's tissues and organs as foreign."

The study also suggests that when patients are transplanted while they are still relatively healthy, they have better outcomes than their counterparts who received bone marrow transplants.

"Over 88 percent of this subset of patients were alive one year after their cord blood transplants, and close to 80 percent were alive five years afterwards," Prasad said. "One reason for this could be the cord blood cells are immunologically more naïve than the blood-forming stem cells derived from bone marrow and therefore they may be more adaptable and less reactive once they get into the patient's body."

In a previous study looking at bone marrow transplant as a treatment for Hurler disease, which causes damage to the heart, liver and brain, only 35 percent of patients were alive five years after treatment, whereas 58 percent of all patients examined as part of the current study -- those with both high and lower functional status -- were alive after five years, Prasad said.

"Patients with inherited metabolic disorders who could benefit from transplantation should be referred early and diagnosis should be made early by enzyme testing, whenever possible," he said. "If we see them early enough they can have excellent short-term and hopefully long-term outcomes."

Duke has the largest cord blood transplant program in the country, and the first unrelated cord blood transplant was performed by Duke doctor Joanne Kurtzberg in 1993 on a patient with leukemia.

Other researchers involved in this study were Suhag Parikh, Paul Szabolcs, Timothy Driscoll, Kristin Page, Sonali Lakshminarayanan, June Allison, Susan Wood, Deborah Semmel, Paul Martin and Joanne Kurtzberg of Duke; Adam Mendizabal of the EMMES Corporation; and Maria Escolar of the University of North Carolina at Chapel Hill.

Adapted from materials provided by Duke University Medical Center.

http://www.sciencedaily.com/releases/2007/12/071210163317.htm

Mars Rover Investigates Signs Of Steamy Martian Past

In March 2007, NASA's Spirit rover found a patch of bright-toned soil so rich in silica that scientists proposed water must have been involved in concentrating it. (Credit: NASA/JPL/Cornell)

ScienceDaily (Dec. 13, 2007) — Researchers using NASA's twin Mars rovers are sorting out two possible origins for one of Spirit's most important discoveries, while also getting Spirit to a favorable spot for surviving the next Martian winter.

The puzzle is what produced a patch of nearly pure silica -- the main ingredient of window glass -- that Spirit found last May. It could have come from either a hot-spring environment or an environment called a fumarole, in which acidic steam rises through cracks. On Earth, both of these types of settings teem with microbial life.

"Whichever of those conditions produced it, this concentration of silica is probably the most significant discovery by Spirit for revealing a habitable niche that existed on Mars in the past," said Steve Squyres of Cornell University, Ithaca, N.Y., principal investigator for the rovers' science payload. "The evidence is pointing most strongly toward fumarolic conditions, like you might see in Hawaii and in Iceland. Compared with deposits formed at hot springs, we know less about how well fumarolic deposits can preserve microbial fossils. That's something needing more study here on Earth."

Halfway around Mars from Spirit, Opportunity continues adding information about types of wet environments on ancient Mars other than hot springs or fumaroles. It is examining layers exposed inside a crater, but still near the top of a stack of sulfate-rich layers hundreds of meters (yards) thick. Scientists read a history of conditions that evolved from wetter to drier, based on findings by Opportunity and observations of the region by Mars orbiters.

The solar-powered rovers have been active on Mars since January 2004, more than 15 times longer than originally planned. Their third Martian winter will not reach minimum sunshine until June, but Spirit already needs two days of power output to drive for an hour.

"Spirit is going into the winter with much more dust on its solar panels than in previous years," said John Callas of NASA's Jet Propulsion Laboratory, Pasadena, Calif., project manager for the rovers. "The last Martian winter, we didn't move Spirit for about seven months. This time, the rover is likely to be stationary longer and with significantly lower available energy each Martian day."

Dust storms that darkened Martian skies this past June dropped dust onto both rovers. However, gusts cleaned Opportunity's panels, and Opportunity is closer to the equator than Spirit is, so concerns for winter survival focus on Spirit. The team has selected a sun-facing slope of about 25 degrees on the northern edge of a low plateau, "Home Plate," as a safe winter haven for Spirit.

Both rovers resumed productive field work after the June dust storms. Spirit explored the top of Home Plate, in the vicinity of silica-rich soil it discovered before the dust storms hit.

"This stuff is more than 90 percent silica," Squyres said. "There aren't many ways to explain a concentration so high." One way is to selectively remove silica from the native volcanic rocks and concentrate it in the deposits Spirit found. Hot springs can do that, dissolving silica at high heat and then dropping it out of solution as the water cools. Another way is to selectively remove almost everything else and leave the silica behind. Acidic steam at fumaroles can do that. Scientists are still assessing both possible origins. One reason Squyres favors the fumarole story is that the silica-rich soil on Mars has an enhanced level of titanium. On Earth, titanium levels are relatively high in some fumarolic deposits.

Mineral mapping and high-resolution imagery from Mars orbiters are helping scientists put the findings of Spirit and Opportunity into broader geological context. Opportunity's exploration of the Meridiani region has taken advantage of the natural excavations at impact craters to inspect layers extending several meters below the surface of the regional plain. These sulfate-rich layers bear extensive evidence for a wet, acidic past environment. They are a small upper fraction of the sulfate-rich layering exposed elsewhere in Meridiani and examined from orbit.

"We see evidence from orbit for clay minerals under the layered sulfate materials," said Ray Arvidson of Washington University in St. Louis, deputy principal investigator for the rovers' science payload. "They indicate less acidic conditions. The big picture appears to be a change from a more open hydrological system, with rainfall, to more arid conditions with groundwater rising to the surface and evaporating, leaving sulfate salts behind."

Adapted from materials provided by NASA/Jet Propulsion Laboratory.

http://www.sciencedaily.com/releases/2007/12/071212000742.htm

Top 11 Warmest Years On Record Have All Been In Last 13 Years

In September 2007, the Northwest Passage in the Arctic was ice-free for the first time since satellite records began. (Credit: NASA)

ScienceDaily (Dec. 13, 2007) — The decade of 1998-2007 is the warmest on record, according to data sources obtained by the World Meteorological Organization (WMO). The global mean surface temperature for 2007 is currently estimated at 0.41°C/0.74°F above the 1961-1990 annual average of 14.00°C/57.20°F.

The University of East Anglia and the Met Office's Hadley Centre have released preliminary global temperature figures for 2007, which show the top 11 warmest years all occurring in the last 13 years. The provisional global figure for 2007 using data from January to November, currently places the year as the seventh warmest on records dating back to 1850.

Other remarkable global climatic events recorded so far in 2007 include record-low Arctic sea ice extent, which led to first recorded opening of the Canadian Northwest Passage; the relatively small Antarctic Ozone Hole; development of La Niña in the central and eastern Equatorial Pacific; and devastating floods, drought and storms in many places around the world.

The preliminary information for 2007 is based on climate data up to the end of November from networks of land-based weather stations, ships and buoys, as well as satellites. The data are continually collected and disseminated by the National Meteorological and Hydrological Services (NMHS) of WMO's 188 Members and several collaborating research institutions. Final updates and figures for 2007 will be published in March 2008 in the annual WMO brochure for the Statement on the Status of the Global Climate.

WMO's global temperature analyses are based on two different sources. One is the combined dataset maintained by both the Hadley Centre of the UK Meteorological Office, and the Climatic Research Unit, University of East Anglia, UK, which at this stage ranked 2007 as the seventh warmest on record. The other dataset is maintained by the US Department of Commerce's National Oceanic and

Atmospheric Administration (NOAA), which indicated that 2007 is likely to be the fifth warmest on record.

Since the start of the 20th century, the global average surface temperature has risen by 0.74°C. But this rise has not been continuous. The linear warming trend over the last 50 years (0.13°C per decade) is nearly twice that for the last 100 years.

According to the Intergovernmental Panel on Climate Change's 4th Assessment (Synthesis) Report, 2007, "warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level."

2007 global temperatures have been averaged separately for both hemispheres. Surface temperatures for the northern hemisphere are likely to be the second warmest on record, at 0.63°C above the 30-year mean (1961-90) of 14.6°C/58.3°F. The southern hemisphere temperature is 0.20°C higher than the 30-year average of 13.4°C/56.1°F, making it the ninth warmest in the instrumental record since 1850.

January 2007 was the warmest January in the global average temperature record at 12.7°C/54.9°F, compared to the 1961-1990 January long-term average of 12.1°C/53.8°F.

Regional temperature anomalies

2007 started with record breaking temperature anomalies throughout the world. In parts of Europe, winter and spring ranked amongst the warmest ever recorded, with anomalies of more than 4°C above the long-term monthly averages for January and April.

Extreme high temperatures occurred in much of Western Australia from early January to early March, with February temperatures more than 5°C above average.

Two extreme heat waves affected south-eastern Europe in June and July, breaking previous records with daily maximum temperatures exceeding 40°C/104°F in some locations, including up to 45°C/113°F in Bulgaria. Dozens of people died and fire-fighters battled blazes devastating thousands of hectares of land. A severe heat wave occurred across the southern United States of America during much of August with more than 50 deaths attributed to excessive heat. August to September 2007 was extremely warm in parts of Japan, setting a new national record of absolute maximum temperature of 40.9°/105.6°F on 16 August.

In contrast, Australia recorded its coldest ever June with the mean temperature dropping to 1.5°C below normal. South America experienced an unusually cold winter (June-August), bringing winds, blizzards and rare snowfall to various provinces with temperatures falling to -22°C/-7.6°F in Argentina and -18°C/-0.4°F in Chile in early July.

Prolonged drought

Across North America, severe to extreme drought was present across large parts of the western U.S. and Upper Midwest, including southern Ontario/Canada, for much of 2007. More than three-quarters of the Southeast U.S. was in drought from mid-summer into December, but heavy rainfall led to an end of drought in the southern Plains.

In Australia, while conditions were not as severely dry as in 2006, long term drought meant water resources remained extremely low in many areas. Below average rainfall over the densely populated and agricultural regions resulted in significant crop and stock losses, as well as water restrictions in most major cities.

China experienced its worst drought in a decade, affecting nearly 40 million hectares of farmland. Tens of millions of people suffered from water restrictions.

Flooding and intense storms

Flooding affected many African countries in 2007. In February, Mozambique experienced its worst flooding in six years, killing dozens, destroying thousands of homes and flooding 80,000 hectares of crops in the Zambezi valley.

In Sudan, torrential rains caused flash floods in many areas in June/July, affecting over 410,000 people, including 200,000 left homeless. The strong southwesterly monsoon resulted in one of the heaviest July-September rainfall periods, triggering widespread flash floods affecting several countries in West Africa, Central Africa and parts of the Greater Horn of Africa. Some 1.5 million people were affected and hundreds of thousands homes destroyed.

In Bolivia, flooding in January-February affected nearly 200,000 people and 70,000 hectares of cropland. Strong storms brought heavy rain that caused extreme flooding in the littoral region of Argentina in late March/early April. In early May, Uruguay was hit by its worst flooding since 1959, with heavy rain producing floods that affected more than 110,000 people and severely damaged crops and buildings. Triggered by storms, massive flooding in Mexico in early November destroyed the homes of half a million people and seriously affected the country's oil industry.

In Indonesia, massive flooding on Java in early February killed dozens and covered half of the city of Jakarta by up to 3.7 metres of water. Heavy rains in June ravaged areas across southern China, with flooding and landslides affecting over 13.5 million people and killing more than 120. Monsoon-related extreme rainfall events caused the worst flooding in years in parts of South Asia. About 25 million people were affected in the region, especially in India, Pakistan, Bangladesh and Nepal. Thousands lost their lives. However, rainfall during the Indian summer monsoon season (June-September) for India was, generally, near normal (105% of the long-term average), but with marked differences in the distribution of rainfall in space and time.

A powerful storm system, Kyrill, affected much of northern Europe during 17-18 January 2007 with torrential rains and winds gusting up to 170km/h. There were at least 47 deaths across the region, with disruptions in electric supply affecting tens of thousands during the storm.

England and Wales recorded its wettest May-July period since records began in 1766, receiving 406 mm of rain compared to the previous record of 349 mm in 1789. Extensive flooding in the region killed nine and caused more than US$6 billion in damages.

Development of La Niña

The brief El Niño event of late 2006 quickly dissipated in January 2007, and La Niña conditions became well established across the central and eastern Equatorial Pacific in the latter half of 2007.

In addition to La Niña, unusual sea surface temperature patterns with cooler than normal values across the north of Australia to the Indian Ocean, and warmer than normal values in the Western Indian Ocean, were recorded. These are believed to have modified the usual La Niña impacts in certain regions around the world.

The current La Niña is expected to continue into the first quarter of 2008 at least.

Devastating tropical cyclones

Twenty-four named tropical storms developed in the North-West Pacific during 2007, below the annual average of 27. Fourteen storms were classified as typhoons, equalling the annual average.

Tropical cyclones affected millions in south-east Asia, with typhoons Pabuk, Krosa, Lekima and tropical storms like Peipah among the severest.

During the 2007 Atlantic Hurricane season, 14 named storms occurred, compared to the annual average of 12, with 6 being classified as hurricanes, equalling the average. For the first time since 1886, two category 5 hurricanes (Dean and Felix) made landfall in the same season.

In February, due to tropical cyclone Gamède, a new worldwide rainfall record was set in French La Reunion with 3,929 mm measured within three days.

In June, cyclone Gonu made landfall in Oman, affecting more than 20,000 people and killing 50, before reaching the Islamic Republic of Iran. There is no record of a tropical cyclone hitting Iran since 1945.

On 15 November, tropical cyclone Sidr made landfall in Bangladesh, generating winds of up to 240 km/h and torrential rains. More than 8.5 million people were affected and over 3,000 died. Nearly 1.5 million houses were damaged or destroyed. Often hit by cyclones, Bangladesh has developed a network of cyclone shelters and a storm early-warning system, which significantly reduced casualties.

Australia's 2006/2007 tropical season was unusually quiet, with only five tropical cyclones recorded, equalling the lowest number observed since at least 1943-44.

Relatively small Antarctic ozone hole

The 2007 Antarctic ozone hole was relatively small due to mild stratosphere winter temperatures. Since 1998, only the 2002 and 2004 ozone holes were smaller. In 2007, the ozone hole reached a maximum of 25 million square kms in mid-September, compared to 29 million square kms in the record years of 2000 and 2006. The ozone mass deficit reached 28 megatonnes on 23 September, compared to more than 40 megatonnes in the record year of 2006.

Record-low Arctic sea ice extent opened the Northwest Passage

Following the Arctic sea ice melt season, which ends annually in September at the end of the northern summer, the average "sea ice extent" was 4.28 million square kms, the lowest on record. The "sea ice extent" at September 2007 was 39% below the long-term 1979-2000 average, and 23% below the previous record set just two years ago in September 2005.For the first time in recorded history, the disappearance of ice across parts of the Arctic opened the Canadian Northwest Passage for about five weeks starting 11 August. Nearly 100 voyages in normally ice-blocked waters sailed without the threat of ice. The September rate of sea ice decline since 1979 is now approximately 10% per decade, or 72,000 square kms per year.

Sea level rise continues

The sea level continued to rise at rates substantially above the average for the 20th century of about 1.7 mm per year. Measurements show that the 2007 global averaged sea level is about 20 cm higher than the 1870 estimate. Modern satellite measurements show that since 1993 global averaged sea level has been rising at about 3 mm per year.

Global 10 Warmest Years Mean Global temperature (°C) (anomaly with respect to 1961-1990)

1. 1998 0.52
2. 2005 0.48
3. 2003 0.46
4. 2002 0.46
5. 2004 0.43

6. 2006 0.42
7. 2007(Jan-Nov) 0.41
8. 2001 0.40
9. 1997 0.36
10. 1995 0.28

UK 10 Warmest Years Mean UK Temperature (°C) (anomaly with respect to 1971-2000)

1. 2006 +1.15
2. 2007 (Jan to 10th Dec) + 1.10
3. 2003 + 0.92
4. 2004 + 0.89
5. 2002 + 0.89
6. 2005 + 0.87
7. 1990 + 0.83
8. 1997 + 0.82
9. 1949 + 0.80
10. 1999 + 0.78

Adapted from materials provided by World Meteorological Organization.

http://www.sciencedaily.com/releases/2007/12/071213101419.htm

For The Fruit Fly, Everything Changes After Sex

Female Drosophila melanogaster flies start laying eggs shortly after mating. (Credit: IMP-IMBA Graphics Department)

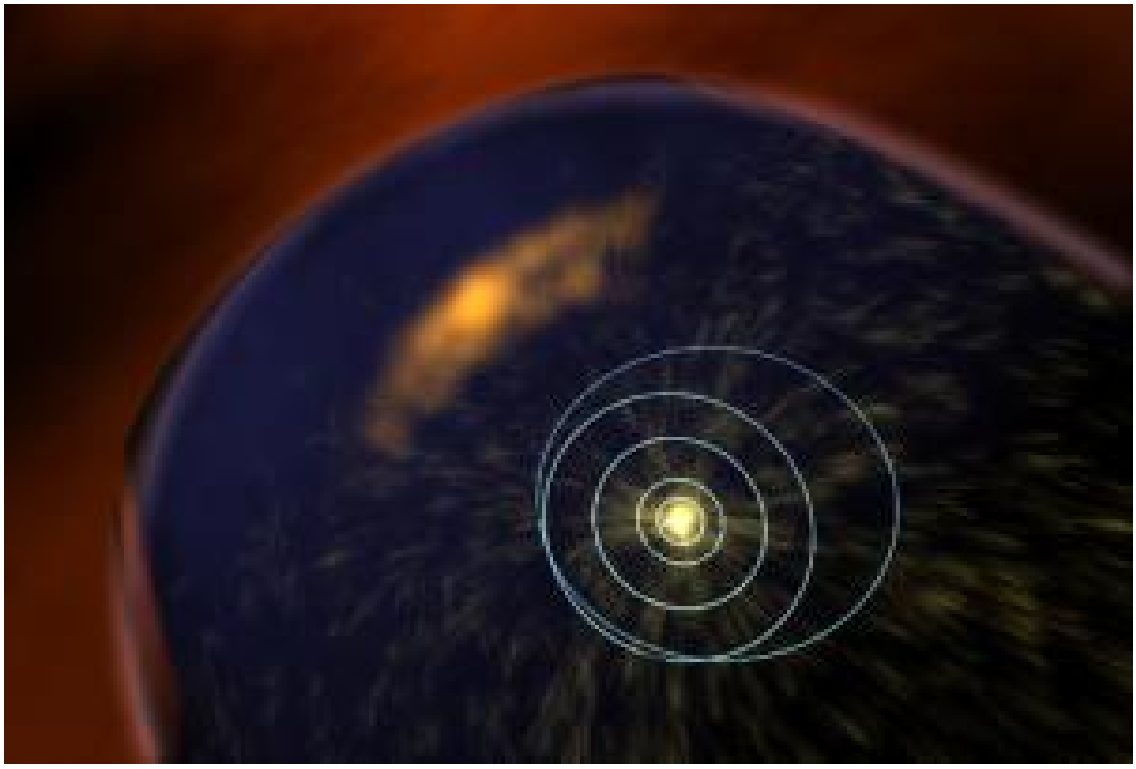
ScienceDaily (Dec. 13, 2007) — Barry Dickson, director of the Research Institute of Molecular Pathology (IMP) in Austria, and his group are interested in the genetic basis of innate behaviour. They focus on the reproductive behaviour of the fruit fly Drosophila melanogaster. Two years ago, the team was able to identify the fruitless gene as a key regulator of mating behaviour. For 20 years, scientists have been trying to identify another molecular switch which changes the behaviour of female insects after mating. It makes them lose interest in further sexual contact and start laying eggs. Mosquitoes, once fertilized, look out for a meal of blood and may transmit the malaria parasite along the way.

The trigger for the behavioral switch is a factor present in the seminal fluid of male insects. This sex peptide (SP), as it is called in Drosophila, has been known to scientists for quite a while. Nilay Yapici, a PhD student in Barry Dickson's team, has now identified the receptor (SPR) responsible for the effect of SP and thus revealed the underlying molecular mechanism. She also showed that the gene for SPR is active in the reproductive organs as well as the brain of the flies. To get this far, it took two years of painstaking work and a scientific tool which was developed over the past few years by the Dickson group. This "Drosophila RNAi Library" is a collection of 22,000 fly strains and has recently been made available to researchers worldwide. Due to this collection, it is now possible to switch off any chosen gene in the fly. By doing so, neurobiologists are able to identify genes that influence behaviour.

Nilay Yapici studied 22,000 female flies and observed how they behaved after mating. In 130 cases, she found flies which continued to mate and laid very few or no eggs. Further evaluation of these genes and subsequent experiments with cell cultures led to the identification of the long-sought receptor, SPR. By activating or disrupting SPR in specific neurons, the receptor could be localized in the central nervous system of the fly. Apart from the benefit to basic research, the discovery might offer new approaches for controlling the reproductive or host-seeking behaviours of various agricultural pests and human disease carriers. The molecular mechanism has remained remarkably stable in the course of evolution and SPR-like receptors can be found in many insect species. Ms. Yapici thinks that "It might be possible to develop a substance that blocks the receptor SPR. This inhibitor would work as a kind of 'birth control pill': female insects would continue to mate but would not lay eggs." *Adapted from materials provided by Research Institute of Molecular Pathology.*

http://www.sciencedaily.com/releases/2007/12/071210163142.htm

Voyager 2 Proves Solar System Is Squashed



This image shows coronal mass ejections (CME). CMEs can propagate from the Sun to the boundary with interstellar space. IBEX will study the interaction between the solar wind and the material beyond our solar system called the interstellar medium. (Credit: Walt Feimer, Goddard Space Flight Center)

ScienceDaily (Dec. 13, 2007) — NASA's Voyager 2 spacecraft has followed its twin Voyager 1 into the solar system's final frontier, a vast region at the edge of our solar system where the solar wind runs up against the thin gas between the stars.

However, Voyager 2 took a different path, entering this region, called the heliosheath, on August 30, 2007. Because Voyager 2 crossed the heliosheath boundary, called the solar wind termination shock, about 10 billion miles away from Voyager 1 and almost a billion miles closer to the sun, it confirmed that our solar system is “squashed” or “dented”– that the bubble carved into interstellar space by the solar wind is not perfectly round. Where Voyager 2 made its crossing, the bubble is pushed in closer to the sun by the local interstellar magnetic field.

“Voyager 2 continues its journey of discovery, crossing the termination shock multiple times as it entered the outermost layer of the giant heliospheric bubble surrounding the Sun and joined Voyager 1 in the last leg of the race to interstellar space.” said Voyager Project Scientist Dr. Edward Stone of the California Institute of Technology, Pasadena, Calif.

The solar wind is a thin gas of electrically charged particles (plasma) blown into space by the sun. The solar wind blows in all directions, carving a bubble into interstellar space that extends past the orbit of Pluto. This bubble is called the heliosphere, and Voyager 1 was the first spacecraft to explore its outer layer, when it crossed into the heliosheath in December 2004. As Voyager 1 made this historic passage, it encountered the shock wave that surrounds our solar system called the solar wind termination shock, where the solar wind is abruptly slowed by pressure from the gas and magnetic field in interstellar space.

Even though Voyager 2 is the second spacecraft to cross the shock, it is scientifically exciting for a couple of reasons. The Voyager 2 spacecraft has a working Plasma Science instrument that can directly

measure the velocity, density and temperature of the solar wind. This instrument is no longer working on Voyager 1 and estimates of the solar wind speed had to be made indirectly. Secondly, Voyager 1 may have had only a single shock crossing and it happened during a data gap. But Voyager 2 had at least five shock crossings over a couple of days (the shock “sloshes” back and forth like surf on a beach, allowing multiple crossings) and three of them are clearly in the data. They show us an unusual shock.

In a normal shock wave, fast-moving material slows down and forms a denser, hotter region as it encounters an obstacle. However, Voyager 2 found a much lower temperature beyond the shock than was predicted. This probably indicates that the energy is being transferred to cosmic ray particles that were accelerated to high speeds at the shock.

"The important new data describing the termination shock are still being pondered, but it is clear that Voyager has once again surprised us," said Dr. Eric Christian, Voyager Program Scientist at NASA Headquarters, Washington.

The two Voyager spacecraft will be the only source of local observations of this distant but highly interesting region for years to come. But in the summer of 2008, NASA will be launching a mission specifically designed to globally image the termination shock and heliosheath remotely from Earth orbit. The Interstellar Boundary Explorer (IBEX), led by Dr. David McComas of the Southwest Research Institute in San Antonio, Texas, will use energetic neutral atoms (ENAs) to create all-sky maps at various energies of the interaction of the heliosphere with interstellar space.

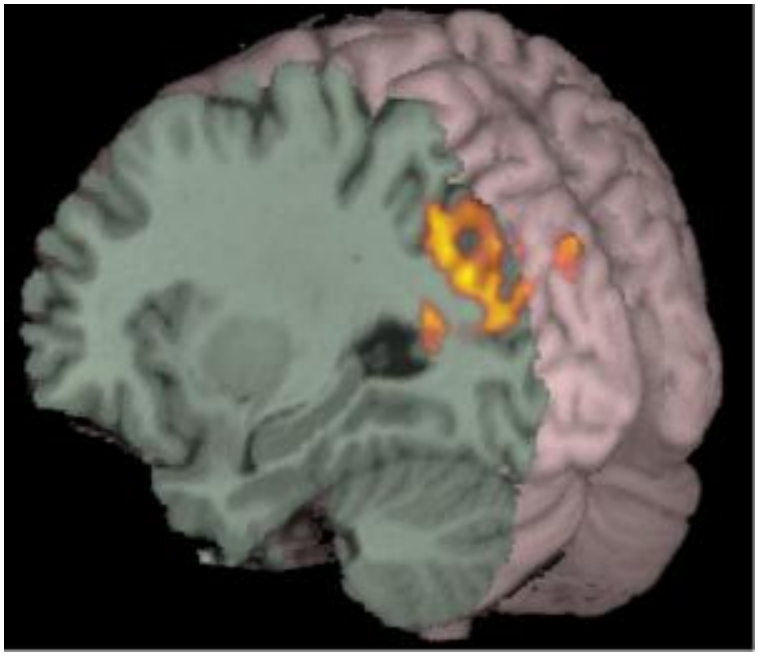
ENAs are formed when energetic electrically-charged particles “steal” an electron from another particle. Once neutral, they travel straight, unaffected by the solar magnetic field. IBEX will detect some of the particles that happen to be headed towards the Earth, and the number and energy of the particles coming from all different directions will tell us much more about the overall structure of the interaction between the heliosphere and interstellar space.

Results on the Voyager 2 shock crossing from the entire Voyager science team are being presented at the Fall 2007 meeting of the American Geophysical Union in San Francisco. The Voyagers were built by NASA’s Jet Propulsion Laboratory (JPL) in Pasadena, Calif., which continues to operate both spacecraft.

Adapted from materials provided by NASA/Goddard Space Flight Center.

http://www.sciencedaily.com/releases/2007/12/071210111958.htm

Distorted Self-image In Body Image Disorder Due To Visual Brain Glitch, Study Suggests



MRI scans of the brains of BDD patients show predominant activity on the left side of the brain. (Credit: Image courtesy of University of California - Los Angeles)

ScienceDaily (Dec. 12, 2007) — Although they look normal, people suffering from body dysmorphic disorder (BDD) perceive themselves as ugly and disfigured. New imaging research reveals that the brains of people with BDD look normal, but function abnormally when processing visual details. The UCLA findings are the first to demonstrate a biological reason for patients' distorted body image.

"Our discovery suggests that the BDD brain's hardware is fine, but there's a glitch in the operating software that prevents patients from seeing themselves as others do," explained Dr. Jamie Feusner, principal investigator and assistant professor of psychiatry at UCLA's Semel Institute. "Now that we've identified a possible physical cause, down the road we may be able to pinpoint ways that patients' brains can be retrained to perceive faces more accurately."

Individuals with BDD fixate on an imagined flaw in appearance or a slight physical abnormality. To fix their "problem," they tend to pursue plastic surgery -- sometimes repeatedly. They often feel ashamed, depressed and anxious, increasing their risk of suicide.

Affecting an estimated two percent of the population, BDD tends to run in families and is especially common in persons with obsessive-compulsive disorder (OCD). Thirty percent of people with BDD suffer from eating disorders, which are also linked to a distorted self-image.

Feusner was curious whether BDD patients' brains interfered with the interpretation of visual input, and if so, whether this glitch occurred when looking at faces other than their own.

"We hoped that asking patients to focus on others' faces would allow them to be less emotionally engaged during the experiment," he said.

For the first time, functional magnetic resonance imaging (fMRI) was used to reveal how the patients' brains processed visual input. The UCLA team outfitted 12 BDD patients with special goggles that enabled them to view digital photos of various faces as they underwent a brain scan.

Each volunteer viewed three types of images. The first type was an untouched photo. The second type was a photo altered to eliminate facial details that appear frequently, such as freckles, wrinkles and scars. This "low frequency" technique blurred the final image.

The third type of image essentially subtracted the blurred second image from the untouched photo. This "high frequency" technique resulted in a finely detailed line drawing.

Feusner's team compared the BDD patients' responses to 12 control subjects matched by age, gender, education and handedness. What the scientists observed surprised them.

"We saw a clear difference in how the right and left sides of the brain worked in people with BDD versus those without the disorder," noted Feusner.

BDD patients more often used their brain's left side -- the analytic side attuned to complex detail -- even when processing the less intricate, low-frequency images. In contrast, the left sides of the control subjects' brains activated only to interpret the more detailed high-frequency information. Their brains processed the untouched and low-frequency images on the right side, which is geared toward seeing things in their entirety.

"We don't know why BDD patients analyze all faces as if they are high frequency," said Feusner. "The findings suggest that BDD brains are programmed to extract details -- or fill them in where they don't exist. It's possible they are thinking of their own face even when they are looking at others."

Feusner also recently discovered that the more severe the BDD patient's symptoms, the more strongly the brain's left side activates during visual processing. He is currently studying how BDD patients process their own faces in order to explore how emotional arousal may influence visual processing.

"All of these findings indicate that BDD has a biological link and can no longer be attributed solely to our society's focus on appearance," he concluded.

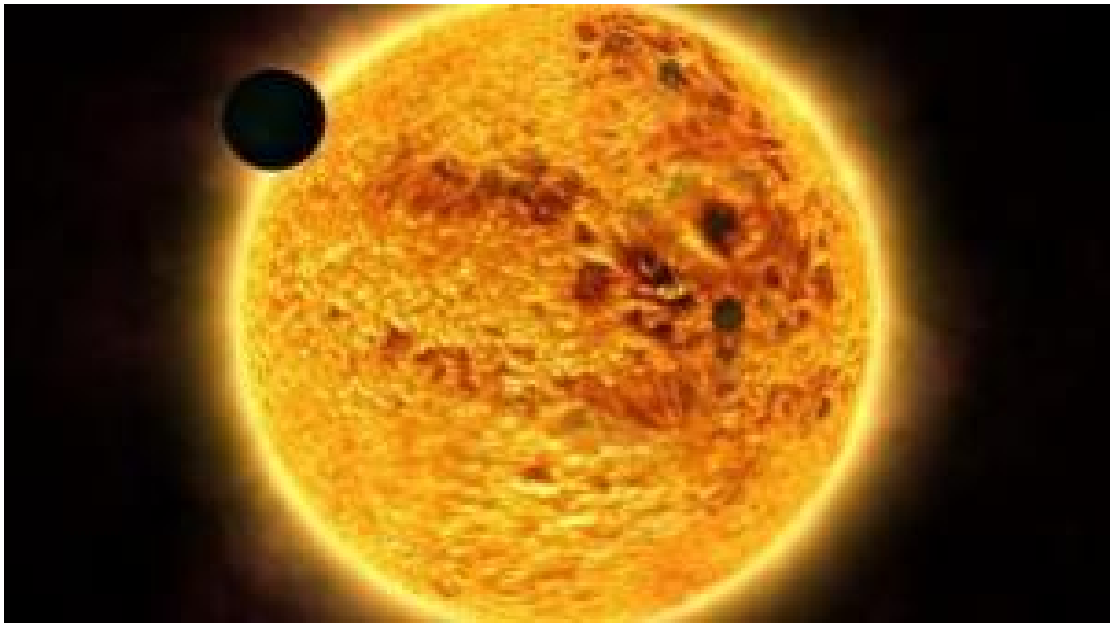
This research was reported in the December edition of the Archives of General Psychiatry.

The study was supported by the Saban Family Foundation, the Neysa Jane BDD Fund and National Institute of Mental Health. Feusner's coauthors included Dr. Susan Bookheimer, Dr. Alexander Bystritsky and Jennifer Townsend, all of UCLA's Semel Institute.

Adapted from materials provided by University of California - Los Angeles.

http://www.sciencedaily.com/releases/2007/12/071203103409.htm

Hazy Red Sunset On Extrasolar Planet



An artist's impression of the extrasolar planet HD 189733b seen here with its parent star looming behind. The planet is slightly larger than our own Solar System's Jupiter. Its atmosphere is a scorching eight hundred degrees Celsius. Astronomers have found that the sunset on HD 189733b would look similar to a hazy red sunset on Earth. (Credit: ESA, NASA and Frederic Pont (Geneva University Observatory))

ScienceDaily (Dec. 12, 2007) — A team of astronomers have used the NASA/ESA Hubble Space Telescope to detect, for the first time, strong evidence of hazes in the atmosphere of a planet orbiting a distant star. The discovery comes after extensive observations made recently with Hubble's Advanced Camera for Surveys (ACS).

The team, led by Frédéric Pont from the Geneva University Observatory in Switzerland, used Hubble's ACS to make the first detection of hazes in the atmosphere of the giant planet. "One of the long-term goals of studying extrasolar planets is to measure the atmosphere of an Earth-like planet, this present result is a step in this direction" says Pont. "HD 189733b is the first extrasolar planet for which we are piecing together a complete idea of what it really looks like."

The new observations were made as the extrasolar planet, dubbed HD 189733b, passed in front of its parent star in a transit. As the light from the star passes through the atmosphere around the limb of the giant extrasolar planet, the gases in the atmosphere stamp their unique signature on the starlight from HD 189733.

The planet itself, orbiting close to its parent star, is a 'hot-Jupiter' type of gas giant slightly larger than Jupiter. The proximity to its star results in an atmospheric temperature of roughly seven hundred degrees Celsius. Measurements of the way light varies as the planet passes in front of its parent star indicates that HD 189733b has neither Earth-sized moons nor any discernable Saturn-like ring system.

Hubble's ACS camera, coupled with a grism (a kind of cross between a prism and a diffraction grating) allowed the astronomers to make extremely accurate measurements of the spectrum of HD 189733b, allowing conclusions to be drawn about the composition of the planet's atmosphere. The exquisite level of precision needed to make this observation can only, at the moment, be achieved from space. The combination of a large planet and relatively small parent star -- only 76% of the diameter of our Sun -- contributes to the success of this delicate experiment.

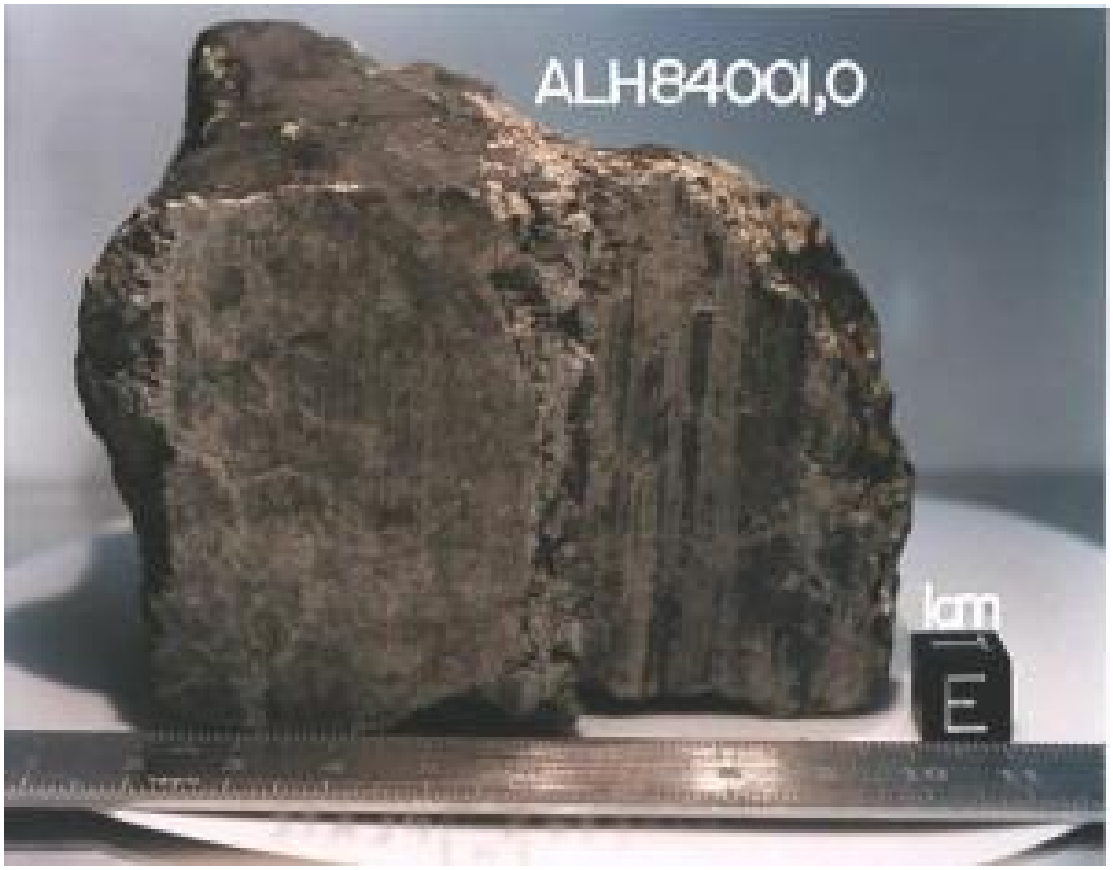
Where the scientists had expected to see the fingerprints of sodium, potassium and water there were none. This finding, combined with the distinct shape of the planet's spectrum, infers that high level hazes (with an altitude range of roughly 1000 km) are present. So the atmosphere on HD 189733b would look very similar to a gorgeous red sunset over Athens! Venus and Saturn's moon Titan, in our own Solar System, are also covered with haze. According to the scientists the haze probably consists of tiny particles (less than 1/1000 mm in size) of condensates of iron, silicates and aluminium oxide dust (the compound on Earth which the mineral sapphire is made of).

As part of the observations of HD 189733, the teams of astronomers also needed to accurately account for the variations in the star's brightness during the set of observations. 'Starspots' like those seen on our own Sun may cover several percent of the star and are thought to be about 1000 degrees Celsius cooler than the rest of HD 189733's surface. It was found that there is a starspot on the star's surface which is over 80,000 km across.

Adapted from materials provided by ESA/Hubble Information Centre.

http://www.sciencedaily.com/releases/2007/12/071211094914.htm

Building Blocks Of Life Formed On Mars, Scientists Conclude



The famous Martian meteorite pictured above houses microscopic structures interpreted by many as fossils of ancient Martian life. (Credit: JSC, NASA)

ScienceDaily (Dec. 12, 2007) — Organic compounds contain carbon and hydrogen and form the building blocks of all life on Earth. By analyzing organic material and minerals in the Martian meteorite Allan Hills 84001, scientists at the Carnegie Institution's Geophysical Laboratory have shown for the first time that building blocks of life formed on Mars early in its history. Previously, scientists have thought that organic material in ALH 84001 was brought to Mars by meteorite impacts or more speculatively originated from ancient Martian microbes.

The Carnegie-led team made a comprehensive study of the ALH 84001 meteorite and compared the results with data from related rocks found on Svalbard, Norway. The Svalbard samples occur in volcanoes that erupted in a freezing Arctic climate about 1 million years ago—possibly mimicking conditions on early Mars.

“Organic material occurs within tiny spheres of carbonate minerals in both the Martian and Earth rocks,” explained Andrew Steele, lead author of the study. “We found that the organic material is closely associated with the iron oxide mineral magnetite, which is the key to understanding how these compounds formed.”

The organic material in the rocks from Svalbard formed when volcanoes erupted under freezing conditions. During cooling, magnetite acted as a catalyst to form organic compounds from fluids rich in carbon dioxide (CO2) and water (H2O). This event occurred under conditions where no forms of life are likely to exist. The similar association of carbonate, magnetite and organic material in the Martian meteorite ALH 84001 is very compelling and shows that the organic material did not originate from Martian life forms but formed directly from chemical reactions within the rock. This is the first study to show that Mars is capable of forming organic compounds at all.

The organic material in the Allan Hills meteorite may have formed during two different events. The first, similar to the Svalbard samples, was during rapid cooling of fluids on Mars. A second event produced organic material from carbonate minerals during impact ejection of ALH 84001 from Mars.

"The results of this study show that volcanic activity in a freezing climate can produce organic compounds," remarked co-author Hans E.F. Amundsen from Earth and Planetary Exploration Services. "This implies that building blocks of life can form on cold rocky planets throughout the Universe."

"Our finding sets the stage for the Mars Science Laboratory (MSL) mission in 2009," remarked Steele, who is a member of the Sample Analysis on Mars (SAM) instrument team onboard MSL. "We now know that Mars can produce organic compounds. Part of the mission's goal is to identify organic compounds, their sources, and to detect molecules relevant to life. We know that they are there. We just have to find them."

The research is published in Meteoritics & Planetary Science http://meteoritics.org/index.htm

For more information on the MSL mission and the SAM instrument see http://mars.jpl.nasa.gov/msl/ and http://ael.gsfc.nasa.gov/marsSAM.shtml

This research was funded by NASA SRLIDA, ASTEP, NAI and ASTID programs; the Marshall Scholarship program; and the University of Oxford, Earth Sciences Department and was carried out in collaboration with the Arctic Mars Analog Svalbard Expedition (AMASE) project.

Adapted from materials provided by Carnegie Institution for Science.

http://www.sciencedaily.com/releases/2007/12/071211095141.htm

Massive Dinosaur Discovered In Antarctica Sheds Light On Life, Distribution Of Sauropodomorphs

Artist's reconstruction of Glacialisaurus hammeri and Antarctica during the Early Jurassic, with several pterosaurs in the background and a small mammal-like reptile in the foreground. The new dinosaur genus and species was described by Nathan Smith, a graduate student at The Field Museum, and Diego Pol, a paleontologist at the Museo Paleontológico in Chubut, Argentina. (Credit: Copyright 2007 William Stout)

ScienceDaily (Dec. 12, 2007) — A new genus and species of dinosaur from the Early Jurassic has been discovered in Antarctica. The massive plant-eating primitive sauropodomorph is called Glacialisaurus hammeri and lived about 190 million years ago.

The recently published description of the new dinosaur is based on partial foot, leg and ankle bones found on Mt. Kirkpatrick near the Beardmore Glacier in Antarctica at an elevation of more than 13,000 feet.

"The fossils were painstakingly removed from the ice and rock using jackhammers, rock saws and chisels under extremely difficult conditions over the course of two field seasons," said Nathan Smith, a graduate student at The Field Museum. "They are important because they help to establish that primitive sauropodomorph dinosaurs were more broadly distributed than previously thought, and that they coexisted with their cousins, the true sauropods."

The findings were published online Dec. 5 in the Acta Palaeontologica Poloncica. Diego Pol, a paleontologist at the Museo Paleontológico Egidio Feruglio in Chubut, Argentina, is the other co-author of the research.

Sauropodomorph dinosaurs were the largest animals to ever walk the earth. They were long-necked herbivores and include Diplodocus and Apatosaurus. Their sister group is the theropods, which include Tyrannosaurus, Velociraptor, and modern birds.

Glacialisaurus hammeri was about 20-25 feet long and weighed about 4-6 tons . It was named after Dr. William Hammer, a professor at Augustana College who led the two field trips to Antarctica that uncovered the fossils. Glacialisaurus belongs to the sauropodomorph family Massopsondylidae, which may represent a secondary radiation of basal sauropodomorphs during the Early Jurassic.

Currently, the development and evolutionary relationships of the sauropodomorph dinosaurs are hotly debated by paleontologists. This discovery, however, helps to resolve some of this debate by establishing two things. First, it shows that sauropodomorphs were widely distributed in the Early Jurassic--not only in China, South Africa, South America and North America, but also in Antarctica.

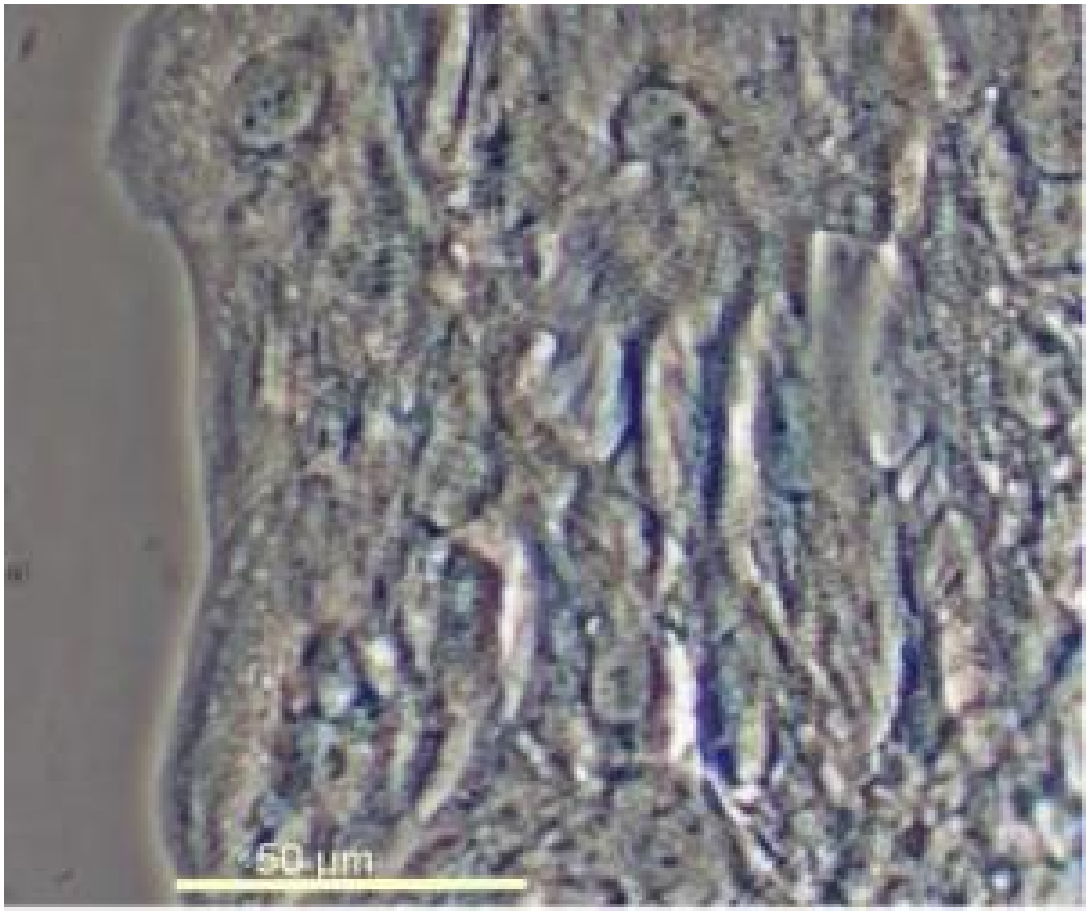
"This was probably due to the fact that major connections between the continents still existed at that time, and because climates were more equitable across latitudes than they are today," Smith said.

Second, the discovery of Glacialisaurus hammeri shows that primitive sauropodomorphs probably coexisted with true sauropods for an extended period of time. The recent discovery of a possible sauropod at roughly the same location in Antarctica lends additional evidence to the theory that the earliest sauropods coexisted with their basal sauropodomorph cousins, including Glacialisaurus hammeri, during the Late Triassic and Early Jurassic, Smith and Pol conclude in their research findings.

Adapted from materials provided by Field Museum.

http://www.sciencedaily.com/releases/2007/12/071210214308.htm

Scientists Overcome Major Obstacles To Stem Cell Heart Repair



Human embryonic stem-cell derived cardiomyocytes maturing at 150 days. (Credit: Harding, Imperial College London)

ScienceDaily (Dec. 13, 2007) — Scientists at Imperial College London have overcome two significant obstacles on the road to harnessing stem cells to build patches for damaged hearts. Presenting the research at a UK Stem Cell Initiative conference December 13 in Coventry, research leader Professor Sian Harding has explained how her group have made significant progress in maturing beating heart cells (cardiomyocytes) derived from embryonic stem cells and in developing the physical scaffolding that would be needed to hold the patch in place in the heart in any future clinical application.

From the outset the Imperial College researchers have been aiming to solve two problems in the development of a stem cell heart patch. The first is undesirable side effects, such as arrhythmia, that can result from immature and undeveloped cardiomyocytes being introduced to the heart. The second is the need for a scaffold that is biocompatible with the heart and able to hold the new cardiomyocytes in place while they integrate into the existing heart tissue. Matching the material to human heart muscle is also hoped to prevent deterioration of heart function before the cells take over.

The stem cell team, led by Dr Nadire Ali, co-investigator on the grant*, have managed to follow beating embryonic stem cell-derived cardiomyocytes for up to seven months in the laboratory and demonstrate that these cells do mature. In this period the cells have coordinated beating activity, and they adopt the mature controls found in the adult heart by approximately four months after their generation from embryonic stem cells. These developed cardiomyocytes will then be more compatible with adult heart and less likely to cause arrhythmias.

The team have also overcome hurdles in the development of a biocompatible scaffold. Working closely with a group of biomaterial engineers, led by Dr Aldo Boccaccini and Dr Qizhi Chen, co-investigators on the grant, in the Department of Materials, Imperial College London, they have developed a new biomaterial with high level of biocompatibility with human tissue, tailored elasticity and programmable degradation. The latter quality is important as any application in the heart needs to be able to hold cells in place long enough for them to integrate with the organ but then degrade safely away. The researchers have found that their material, which shares the elastic characteristics of heart tissue, can be programmed to degrade in anything from two weeks upwards depending on the temperatures used during synthesis.

Professor Harding said: "Although we are still some way from having a treatment in the clinic we have made excellent progress on solving some of the basic problems with stem cell heart therapies. The work we have done represents a step forward in both understanding how stem cell-derived developing heart cells can be matured in the laboratory and how materials could be synthesised to form a patch to deliver them to damaged areas of the heart.

"A significant amount of hard work and research remains to be done before we will see this being used in patients but the heart is an area where stem cell therapies offer promise. We know that the stem cell-derived cardiomyocytes will grow on these materials, and the next step is to see how the material and cell combination behave in the long term."

Professor Nigel Brown, BBSRC Director of Science and Technology, commented: "This research shows that although embryonic stem cell therapies are still some way away from the clinic, progress is being made on the basic biological developments. As with all new biomedical applications, an understanding of the underpinning fundamental science is essential to successfully moving forward."

*This research was funded by the Biotechnology and Biological Sciences Research Council.

Adapted from materials provided by Biotechnology and Biological Sciences Research Council.

http://www.sciencedaily.com/releases/2007/12/071212201501.htm

More 'Functional' DNA In Genome Than Previously Thought

ScienceDaily (Dec. 13, 2007) — Surrounding the small islands of genes within the human genome is a vast sea of mysterious DNA. While most of this non-coding DNA is junk, some of it is used to help genes turn on and off. As reported online this week in Genome Research, Hopkins researchers have now found that this latter portion, which is known as regulatory DNA and contributes to inherited diseases like Parkinson's or mental disorders, may be more abundant than we realize.

By conducting an exhaustive analysis of the DNA sequence around a gene required for neuronal development, Andrew McCallion, Ph.D., an assistant professor in the McKusick-Nathans Institute of Genetic Medicine, and his team found that current computer programs that scan the genome looking for regulatory DNA can miss more than 60 percent of these important DNA regions.

The current methods find regulatory sequences by comparing DNA from distantly related species, under the theory that functionally important regions will appear more similar in sequence than non-functional regions. "The problem with this approach, we have discovered," says McCallion, "is that it's often throwing the baby out with the bath water. So while we believe sequence conservation is a good method to begin finding regulatory elements, to fully understand our genome we need other approaches to find the missing regulatory elements."

McCallion had suspected that using sequence conservation would overlook some regulatory DNA, but to see how much, he set up a small pilot project looking at the phox2b gene; he chose this gene both because of its small size and his interest in nerve development (phox2b is involved in forming part of the brain associated with stress response as well as nerves that control the digestive system).

The researchers created what they call a "tiled path," cutting up the DNA sequence around the phox2b gene into small pieces, then inserted each piece into zebrafish embryos along with a gene for a fluorescent protein. If a phox2b fragment was a regulatory element, then it would cause the protein to glow. By watching the growing fish embryos - which have the advantage of being transparent - the researchers could see which pieces were regulators.

They uncovered a total of 17 discrete DNA segments that had the ability to make fish glow in the right cells. The team then analyzed the entire region around the phox2b gene using the five commonly used computer programs that compute sequence conservation; these established methods picked up only 29 percent to 61 percent of the phox2b regulators McCallion identified in the zebrafish experiments.

"Our data supports the recent NIH encyclopedia of DNA elements project, which suggests that many DNA sequences that bind to regulatory proteins are in fact not conserved," says McCallion. "I hope this pilot shows that these types of analyses can be worthwhile, especially now that they can be done quickly and easily in zebrafish."

McCallion is now planning a larger study of other neuronal genes. "I think we are only starting to realize the importance and abundance of regulatory elements; by regulating the gene activity in each cell they help create the diverse range of cell types in our body."

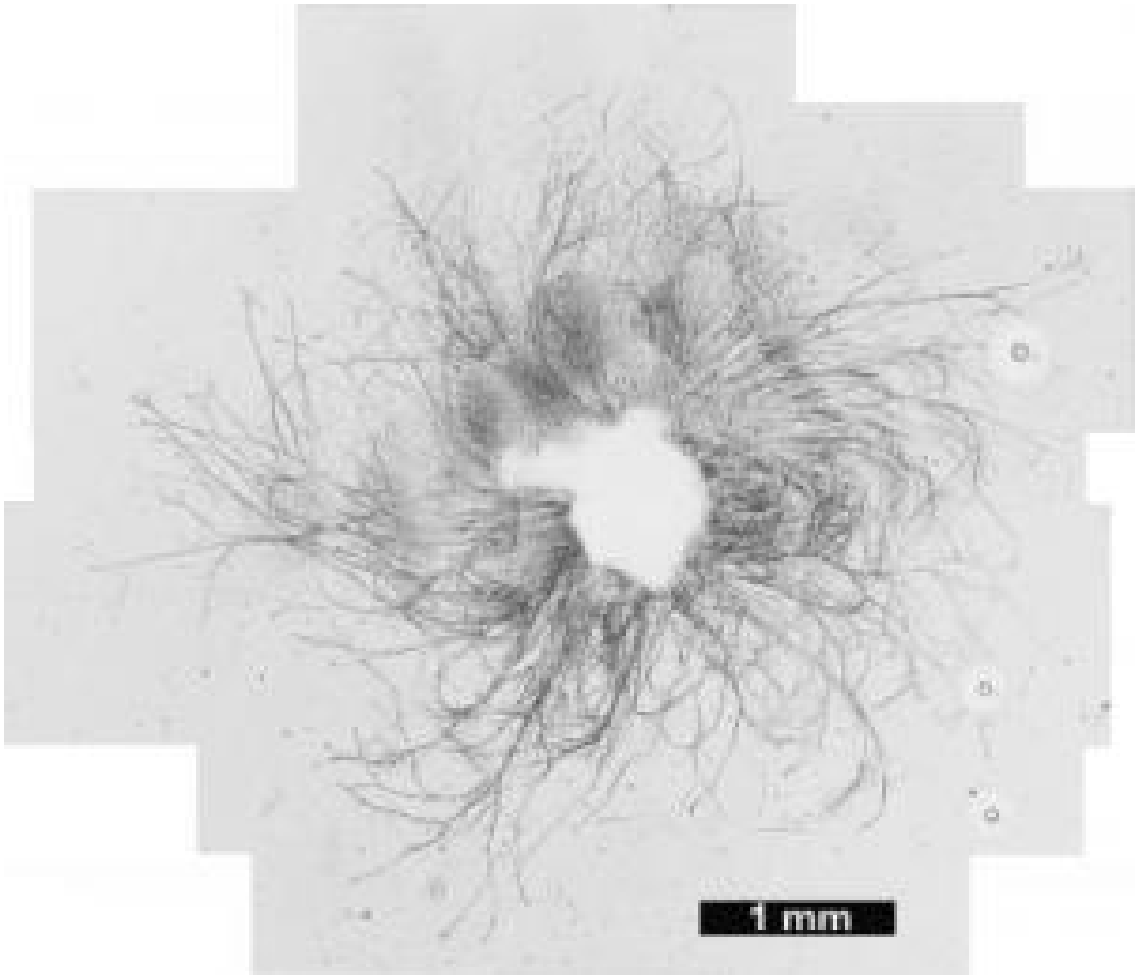
The research was funded by the National Institutes of Health and the March of Dimes.

Authors on the paper are David McGaughey, Ryan Vinton, Jimmy Huynh, Amr Al-Saif, Michael Beer and McCallion of Johns Hopkins.

Adapted from materials provided by Johns Hopkins Medical Institutions.

http://www.sciencedaily.com/releases/2007/12/071211232720.htm

Neurotransmitters In Biopolymers Stimulate Nerve Regeneration



hase-contrast micrograph of a ganglion on a 70 percent acetylcholine polymer that shows neurite growth. The figure is merged from a series of 100x magnification images. (Credit: Image courtesy of Christiane Gumera)

ScienceDaily (Dec. 13, 2007) — Research reported December 11 in the journal Advanced Materials describes a potentially promising strategy for encouraging the regeneration of damaged central nervous system cells known as neurons.

The technique would use a biodegradable polymer containing a chemical group that mimics the neurotransmitter acetylcholine to spur the growth of neurites, which are projections that form the connections among neurons and between neurons and other cells. The biomimetic polymers would then guide the growth of the regenerating nerve.

There is currently no treatment for recovering human nerve function after injury to the brain or spinal cord because central nervous system neurons have a very limited capability of self-repair and regeneration.

"Regeneration in the central nervous system requires neural activity, not just neuronal growth factors alone, so we thought a neurotransmitter might send the necessary signals," said Yadong Wang, assistant professor in the Coulter Department of Biomedical Engineering at Georgia Tech and Emory University, and principal investigator of the study. The research was supported by Georgia Tech, the National Science Foundation and the National Institute of Biomedical Imaging and Bioengineering (NIBIB).

Chemical neurotransmitters relay, amplify and modulate signals between a neuron and another cell. This new study shows that integrating neurotransmitters into biodegradable polymers results in a biomaterial that successfully promotes neurite growth, which is necessary for victims of central nervous system injury, stroke or certain neurodegenerative diseases to recover sensory, motor, cognitive or autonomic functions.

Wang and graduate student Christiane Gumera developed novel biodegradable polymers with a flexible backbone that allowed neurotransmitters to be easily added as a side chain. In its current form, the polymer would be implanted via surgery to repair damaged central nerves.

"One of our ultimate goals is to create a conduit for nerve regeneration that guides the neurons to regenerate, but gradually degrades as the neurons regenerate so that it won't constrict the nerves permanently," explained Wang.

For the experiments, the researchers tested polymers with different concentrations of the acetylcholine-mimicking groups. Acetylcholine was chosen because it is known to induce neurite outgrowth and promote the formation and strengthening of synapses, or connections between neurons. They isolated ganglia nervous tissue samples, placed them on the polymers and observed new neurites extend from the ganglia.

Since these neuron extensions must traverse a growth inhibiting material in the body, Wang and Gumera tested the ability of the biomaterial to enhance the extension of sprouted neurites. More specifically, they assessed whether the ganglia sprouted at least 20 neurites and then measured neurite length and neurite length distribution with an inverted phase contrast microscope.

"We found that adding 70 percent acetylcholine to the polymer induced regenerative responses similar to laminin, a benchmark material for nerve culture," said Wang. Seventy percent acetylcholine also led to a neurite growth rate of up to 0.7 millimeters per day, or approximately half the thickness of a compact disc.

Laminin is a natural protein present in the nervous tissues, but it dissolves in water, making it difficult to incorporate into a conduit that needs to support nerves for months. A synthetic polymer with acetylcholine functional groups, on the other hand, can be designed to be insoluble in water, according to Wang.

Since functional restoration after nerve injury requires synapse formation, the researchers also searched for the presence of synaptic vesicle proteins on the newly formed neurites. With fluorescence imaging, they found that neurons cultured on these acetylcholine polymers expressed an established neuronal marker called synaptophysin.

To provide insights to new approaches in functional nerve regeneration, the researchers are currently investigating the mechanisms by which the neurons interact with these polymers. Since neurons that remain intact after severe injury have only a limited capacity to penetrate the scar tissue, these new findings in nerve regeneration could help compensate for the lost connections.

"This polymer and approach aren't limited to nerve regeneration though, they can probably be used for other neurodegenerative disorders as well," added Wang.

This work was funded by grant number R21EB008565 from the NIBIB of the National Institutes of Health (NIH). The content is solely the responsibility of the authors and does not necessarily represent the official view of the NIBIB or the NIH.

Adapted from materials provided by Georgia Institute of Technology.

http://www.sciencedaily.com/releases/2007/12/071211233410.htm

Female Lower Back Has Evolved To Accommodate The Weight Of Pregnancy

ScienceDaily (Dec. 13, 2007) — When a pregnant woman leans back, and shifts her weight to stand more comfortably, she is performing a motion that for millions of years has helped to compensate for the strain and weight of childbearing on the body. According to a new study from researchers at Harvard University and the University of Texas at Austin, women's lower spines evolved to be more flexible and supportive than men's to increase comfort and mobility during pregnancy, and to accommodate the special biology of carrying a baby for nine months while standing on two feet.

The study, published in the Dec. 13 Nature, was led by Katherine Whitcome, a postdoctoral researcher in the Department of Anthropology in Harvard's Faculty of Arts and Sciences, with Daniel Lieberman, professor of anthropology at Harvard, and Liza Shapiro, associate professor of anthropology of the University of Texas at Austin.

"Pregnancy presents an enormous challenge for the female body," says Whitcome. "The body must change in dramatic ways to accommodate the baby, and these changes affect a woman's stability and posture. It turns out that enhanced curvature and reinforcement of the lower spine are key to maintaining normal activities during pregnancy."

It has long been appreciated that giving birth to large-brained infants has influenced human pelvic shape, but there has been little attention paid to the major challenge that pregnant bipedal mothers endure when holding up an enormous fetus and placenta well in front of the hip joints. The study is the first of its kind to examine the evolutionary mechanisms that allow women to carry a baby to term, and the way that women's bodies compensate for increased weight in the abdomen during pregnancy.

Walking on two feet, which happened early in human evolution, presents a unique challenge during pregnancy because the center of gravity shifts far in front of the hips, destabilizing the upper body and impairing locomotion. This is not the case for animals that walk predominantly on four legs such as chimpanzees, or even other bipeds.

To accommodate this shifted center of gravity, women's spines have evolved to help offset the additional weight in the abdomen during pregnancy, so that the back muscles are not taxed in counter-balancing the destabilizing effects of the baby's weight.

In both women and men the curvature of the spine in the lower back, called the lordosis, stabilizes the upper body above the lower body. The researchers studied 19 pregnant women between the ages of 20 and 40, and found that when naturally standing, the women lean back, increasing their lordosis by as much as 60 percent by the end of their term. In doing so, pregnant women maintain a stable center of gravity above the hips.

The research also demonstrates, for the first time, that human lumbar vertebrae differ between males and females in ways that decrease the shearing forces that the lumbar extension of pregnancy places on the lower back in pregnant mothers.

"In females, the lordosis is subtly different than that of males, because the curvature extends across three vertebrae, while the male lordosis curves across only two vertebrae," says Whitcome. "Loading across three vertebrae allows an expectant mother to increase her lordosis, realigning her center of gravity above her hips and offsetting the destabilizing weight of the baby."

In addition to the difference in the number of vertebrae across which the lordosis spans, the female joints are relatively larger and flare out further down the spine than those of males improving the spine's strength. All of this contributes to an increased ability to extend the spine, so that the woman can lean back, realign the body's center of gravity, and safely maintain a more stable position. These differences in the lower back may even reinforce her capability to support and carry her baby in her arms after the baby has been born.

When human ancestors first became bipedal, they set the human lineage off on a different evolutionary path from other apes, but in so doing created special challenges for pregnant mothers. One exciting discovery is that the ability of human females to better carry a baby to term while standing on two feet appears to have evolved at least two million years ago. The researchers studied two hominin fossils that were approximately two million years old, one of which - presumably a female - displayed three lordosis vertebrae and one of which - presumably a male - displayed fewer.

"Early human women lived very strenuous, active lives, and pregnant females were forced to cope with the discomfort of childbearing while foraging for food and escaping from predators," Lieberman says. "This evolution of the lower back helped early woman to remain more mobile during pregnancy, which would have been essential to survival, and appears to have been favored by natural selection."

The research was funded by the National Science Foundation, the L.S.B. Leakey Foundation, and the American School of Prehistoric Research.

Adapted from materials provided by Harvard University.

http://www.sciencedaily.com/releases/2007/12/071212201946.htm

Rising Carbon Dioxide Signals Wetter Storms For Northern Hemisphere, Study Says

ScienceDaily (Dec. 13, 2007) — While two new studies by researchers at the University of Colorado at Boulder's Cooperative Institute for Research in Environmental Sciences predict wetter storms for the Arctic and for the Northern Hemisphere because of global warming, whether or not this means more net precipitation depends on the latitude.

"Global climate model predictions for the 21st century indicate an increase in the frequency of storms in the Arctic with no clear trend in the mid-latitudes but an increase in the amount of precipitation associated with individual storms in both regions," said Assistant Professor John Cassano of the CU-Boulder atmospheric and oceanic sciences department and lead author of one of the studies.

Both studies will be published on Dec. 28 in a special edition of the Journal of Geophysical Research-Biogeosciences titled "Changes in the Arctic Freshwater System: Identification, Attribution and Impacts at Local and Global Scales." Cassano also will give a poster presentation on the work Dec. 13 during the fall meeting of the American Geophysical Union in San Francisco.

According to Cassano, higher precipitation at high latitudes over the next century could influence important climate factors, such as seasonal snow cover, ice sheet growth and freshwater dilution of the Arctic Ocean. Enhancing freshwater sources to the ocean could, if substantial, affect the Atlantic's thermohaline circulation -- the ocean conveyor belt that helps maintain Western Europe's warm temperatures and plays a dominant role in global climate, he said.

"Already scientists have observed higher river runoff into the Arctic Ocean, but the source of this additional runoff was unclear," Cassano said. "These studies provide one piece of the puzzle to understand this observed change." In contrast, mid-latitudes, like the continental United States, will see wetter storms but also a drop in storm frequency, effectively canceling out any change in net precipitation, he said.

Joel Finnis, a CU-Boulder doctoral student and lead author of the second study, analyzed the effects of rising CO_2 levels on both the frequency and moisture content of storms over the entire Northern Hemisphere. He found that in mid-latitudes, higher storm moisture content will be offset, and in some cases exceeded, by decreases in storm frequency.

"We're likely to see fewer storms carrying more water," said Finnis. "This could mean an increased chance that individual events will produce severe weather, but a decrease in overall water resources." Finnis also believes that these changes in storm frequency and moisture content will be most pronounced during the fall.

As for why storms will be wetter as CO_2 rises, more than 75 percent of the predicted increase in storm moisture content will be the result of the warming and moistening of the atmosphere as the global climate warms, the researchers said.

"The wetter storms and higher precipitation over the Arctic are best explained by the heating of the atmosphere as greenhouse gases increase," said Cassano. "As the atmosphere warms it can hold more water and this change is largely responsible for the increase in Artic precipitation that is predicted over the next 100 years."

Both Cassano and Finnis used data sets from the Intergovernmental Panel on Climate Change's Fourth Assessment Report and analyzed projected storm tracks and precipitation changes under a doubling of present-day CO_2 levels during the 21st century.

Adapted from materials provided by University of Colorado at Boulder.

http://www.sciencedaily.com/releases/2007/12/071211232947.htm

Different Areas Of The Brain Respond To Belief, Disbelief And Uncertainty

ScienceDaily (Dec. 13, 2007) — The human mind is a prolific generator of beliefs about the world. The capacity of our minds to believe or disbelieve linguistic propositions is a powerful force for controlling both behavior and emotion, but the basis of this process in the brain is not yet understood.

Sam Harris, a UCLA graduate student in the lab of Mark Cohen, a professor of psychiatry at the UCLA Center for Cognitive Neuroscience and a study co-author, and Sameer Sheth of Massachusetts General Hospital, report that functional magnetic resonance imaging (fMRI) reveals clear differences in the areas of the brain involved in belief, disbelief and uncertainty.

Their results suggest that the differences among these cognitive states may one day be distinguished reliably, in real time, by techniques of neuroimaging. This finding has implications for the detection of deception, for the control of the placebo effect during drug design and for the study of any higher cognitive phenomenon in which the differences among belief, disbelief and uncertainty might be relevant.

Fourteen adult volunteers were scanned in an MRI device at UCLA's Brain Imaging Center. While inside the scanner, subjects were presented with written statements covering a broad range of topics, including mathematics, geography, factual knowledge, word definitions, religion, ethics and biographical facts about themselves. Subjects were asked to rate these statements as true, false or undecidable. The authors then compared the brain images recorded when their subjects believed, disbelieved or could not judge the truth-value of these written propositions.

The scientists predicted that the difference between belief and disbelief would be largely mediated by activity in the frontal lobes -- the part of the brain most enlarged and differentiated in humans. Indeed, when belief and disbelief were compared, the investigators saw differences principally in a region known as the ventromedial prefrontal cortex (VMPFC), near the front of the brain, along its midline.

"The involvement of the VMPFC in belief processing suggests an anatomical link between the purely cognitive aspects of belief and human emotion and reward," the authors said. "The fact that ethical belief showed a similar pattern of activation to mathematical belief suggests that the physiological difference between belief and disbelief may be independent of content or emotional associations."

The areas especially engaged in disbelief included the limbic system's cingulate areas and the anterior insula, a brain region known to report visceral sensations such as pain and disgust and to be involved largely in negative appraisals of sensations like taste and smell.

"Our results appear to make sense of the emotional tone of disbelief, placing it on a continuum with other modes of stimulus appraisal and rejection," the authors said. "False propositions might actually disgust us."

When the subjects experienced uncertainty, yet another pattern emerged. A different portion of the cingulate cortex, located closer to the front of the brain, showed a much stronger signal. This so-called "anterior cingulate" cortex frequently shows up in studies of conflict monitoring, error detection and cognitive interference. When compared to both belief and disbelief, the state of uncertainty also showed a decreased signal in the caudate, a region of the basal ganglia, which plays a role in motor action.

Noting that uncertainty differs from both belief and disbelief by not allowing us to settle upon "a specific, actionable interpretation of the world," the authors suggest that the basal ganglia may play a role in mediating the cognitive and behavioral differences between decision and indecision.

Taken together, these data offer insight into the way in which our brains work to form beliefs about the world.

"What I find most interesting about our results is the suggestion that our view of the world must pass through a bottleneck in regions of the brain generally understood to govern emotion, reward and primal feelings like pain and disgust," Harris said. "While evaluating mathematical, ethical or factual statements requires very different kinds of processing, accepting or rejecting these statements seems to rely upon a more primitive process that may be content-neutral. I think that it has long been assumed that believing that two plus two equals four and believing that George Bush is President of the United States have almost nothing in common as cognitive operations. But what they clearly have in common is that both representations of the world satisfy some process of truth-testing that we continually perform. I think this is yet another result, in a long line of results, that calls the popular opposition between reason and emotion into question."

Article: "Functional Neuroimaging of Belief, Disbelief, and Uncertainty," Sam Harris, Sameer Sheth, Mark S. Cohen, Annals of Neurology, December 2007.

Research in Cohen's lab is funded by grants from the National Institutes of Health.

Adapted from materials provided by University of California - Los Angeles.

http://www.sciencedaily.com/releases/2007/12/071212202008.htm

Cholesterol-lowering Drugs And The Risk Of Hemorrhagic Stroke

ScienceDaily (Dec. 13, 2007) — People taking cholesterol-lowering drugs such as atorvastatin after a stroke may be at an increased risk of hemorrhagic stroke, or bleeding in the brain, a risk not found in patients taking statins who have never had a stroke. But researchers caution the risk must be balanced against the much larger overall benefit of the statin in reducing the total risk of a second stroke and other cardiovascular events when making treatment decisions.

For the study, researchers conducted a secondary analysis of the results of the Stroke Prevention with Aggressive Reduction in Cholesterol Levels (SPARCL) clinical trial. The trial enrolled 4,731 people who were within one to six months of having had a stroke or transient ischemic attack, or mini-stroke, and with no history of heart disease. Half of the participants received atorvastatin and half received a placebo. The participants were then followed for an average of four and a half years.

Overall, treatment was associated with a 16-percent reduction in total stroke, the study's primary endpoint, as well as significant reductions in coronary heart events. However, secondary analysis found that the overall reduction in stroke included an increase in the risk of brain hemorrhage. Of those people randomized to atorvastatin, the study found 2.3 percent experienced a hemorrhagic stroke during the study compared to 1.4 percent of those taking placebo. The study also found there was a 21-percent reduction in ischemic stroke, a more common type of stroke involving a block in the blood supply to the brain, among people taking atorvastatin.

Other factors were also found to increase the risk of brain hemorrhage. For example, those who had experienced a hemorrhagic stroke prior to the study were more than five times as likely to suffer a second stroke of this kind. Men were also nearly twice as likely as women to suffer a hemorrhagic stroke. People with severe high blood pressure at their last doctor's visit prior to the hemorrhagic stroke had over six times the risk of those with normal blood pressure.

"Although treatment of patients with a stroke or transient ischemic attack was clearly associated with an overall reduction in a second stroke, hemorrhagic stroke was more frequent in people treated with atorvastatin, in those with a prior hemorrhagic stroke, in men and in those with uncontrolled hypertension," according to study author Larry B. Goldstein, MD, with Duke University Medical Center in Durham, North Carolina, and Fellow of the American Academy of Neurology. "This risk of hemorrhagic stroke also increased with age."

"Treatment with atorvastatin did not disproportionately increase the frequency of brain hemorrhage associated with these other factors. The risk of hemorrhage in patients who have had a transient ischemic attack or stroke must be balanced against the benefits of cholesterol-lowering drugs in reducing the overall risk of a second stroke, as well as other cardiovascular events," said Goldstein.

The research is published in the December 12, 2007, online issue of Neurology®, the medical journal of the American Academy of Neurology.

The SPARCL trial was funded by Pfizer, the maker of atorvastatin.

.

Adapted from materials provided by American Academy of Neurology.

http://www.sciencedaily.com/releases/2007/12/071212202001.htm

Women Persist In Plastic Surgery Treatments That Are Not Working, Research Says

ScienceDaily (Dec. 13, 2007) — Women are more likely to persist with using creams, supplements and plastic surgery to look younger if they feel these are not yet working, new research says.

A study of 297 women aged from 27 to 65 years found that they were more motivated to persist with special diets, vitamins, creams, Botox or plastic surgery if they believed these had so far failed to make them look significantly younger.

The researchers, Professor Brett Martin and Dr Rana Sobh, found that women who used these means to look younger were trying to avoid a 'feared self' -- an image of themselves they had of appearing wrinkled and old. They have found that when women want to avoid this feared self, they kept trying if they perceive themselves to be failing, but as soon as they began to succeed their anxiety lessened and they stopped trying.

Professor Martin, of the University of Bath, UK, and Dr Sobh, of Qatar University, found that of those women who felt that the treatments they were taking were not working, 73 per cent wanted to continue using them. Among those women who felt the treatments were working, only 45 per cent wanted to continue.

"This study is more evidence for the belief that when someone is thinking negatively about themselves, and they try and fail to improve their situation, they will be motivated to try again," said Dr Sobh, of Qatar University's College of Business.

"How women imagine themselves in the future has a strong effect on how motivated they are to keep using a product or service such as creams or other treatments for ageing.

"When people dwell on a negative future, they are motivated by fear, yet as they move away from this feared state -- say a wrinkled skin -- they become less motivated to carry on using a product or service."

Professor Martin, who has carried out a study on men and women using gyms, said: "This doesn't just apply to women -- men have a similar psychology about using a gym to get fit and look good."

Professor Martin said that as people became happier with their bodies, so they entered a more positive frame of mind. In this state, they became more strongly motivated by success and not by failure, as before, something the researchers believe marketers should bear in mind when selling their products.

Of the 297 women in the study, in the previous year:

- 37 % had used a special diet
- 61 % had used vitamins
- 48 % had taken a sauna
- 96 % had used moisturising cream
- 75 % had used anti-ageing skin care products such as lotions or gels
- 70 % had used a mini-facial such as an exfoliant or peeling cream
- 48 % had used in-salon treatments such as facials or light therapy
- 3 % had used treatments by doctors such as lasers, Botox, chemical peeling
- 0.25 % (1 person) had had a face-lift.

Adapted from materials provided by University of Bath.

http://www.sciencedaily.com/releases/2007/12/071212201504.htm

Discovery Of Primary Deposit Of Rubies Leads To Improved Prospecting Strategies

Rubies and sapphires from Madagascar. (Credit: IRD, Giuliani Gaston)

ScienceDaily (Dec. 13, 2007) — Ruby and sapphire formation occurs deep in the lithosphere in a regime of extremely high pressures and temperatures. Although it is known that most of these gem stones, classified as corundums, were torn from the Earth's crust by a magma generated in the mantle before being transported towards the surface, their exact origin is still uncertain. Thanks to a pooling of results from several international research teams (1), a databank for compiling the oxygen isotope concentration ratios, 18O/16O, for the corundums of all basaltic-type placers (2) is now available.

This parameter contributes many indicators of the provenance of sapphires and rubies, but researchers still needed access to a primary deposit in order to identify the origin of these precious stones with absolute certainty. This last piece of the puzzle was recently put together by a joint research team from the IRD, the CNRS and the University of Antananarivo who discovered such a deposit of rubies in Madagascar.

Combination of this new field data with the oxygen isotope composition gave the geologists the possibility to determine exactly the origin of all the rubies and sapphires found in alkaline basalts. This information could enable geologists locally to trace the origin back up to the parent-rock and thus increase the possibilities of exploitation of these gem stone deposits.

Rubies and sapphires belong to the corundum mineralogical family. Corundums exist in a wide range of colours. They consist of aluminium oxide crystals containing impurities which dote them with their various tints: titanium and iron for the blue of the sapphire, chromium and vanadium for the red of rubies. Humans have been captivated by the beauty of these precious stones for many centuries, yet the original environment of formation of some of them is still a matter for debate. This is especially the case for sapphires found in alkaline basalts, volcanic rocks from which most of the world's commercialized blue sapphires are extracted.

It is the extremely high pressures and temperatures prevailing several tens of kilometres deep in the Earth's crust which generated corundums. Rising magma then brought them up to the surface where the crystals accumulated following the erosion of the surrounding protective rock. Prospectors then find these stones in placers which correspond to sedimentary deposits. That explains why it is extremely difficult to determine the origin of these stones from secondary deposits.

Geologists have nevertheless been attempting for several years to go back up to the primary genesis of corundums, basing their search particularly on the isotope composition of the oxygen (18O/16O)

trapped inside these crystals. Compilation of the results of several international teams enabled them to establish a databank of isotopic values for oxygen for the whole of the world's deposits of sapphires and rubies found in alkaline basalts.

Yet although this parameter enables scientists to make progress towards revealing the genesis of these stones, geological study of a primary deposit is crucial for identifying unambiguously their provenance. In Madagascar, researchers at the University of Antananarivo, from the IRD and the CNRS recently gained access to a well preserved part of ruby bearing rock brought up by magma of mantle origin.

This discovery represents the link that geologists needed in order to confirm the nature of the host-rocks of rubies, and also of sapphires, found in the alkaline basalts. The study of samples taken from the site were successful in indicating the conditions in which these rubies were formed: extremely high pressure of 20 kbar and a temperature of around 1100°C, pointing to a depth of 60 km, were necessary for these precious stones to generate. By combining this new field data with oxygen isotope compositions determined for 150 sapphires from basaltic placers originating from 13 different countries, the geologists succeeded in identifying the precise source of all rubies and sapphires found in alkaline basalts. In the great majority of cases, the cross-referencing and combining of all these results led to confirmation of the magmatic origin for the sapphires found in these rocks. This result corroborates those from previous studies focusing on the chemical composition of various glasses trapped by these sapphires and which are typical of magmatic environments. Moreover, the existence of sapphires bearing syenite xenoliths (3) confirmed that these corundums were crystallized from a magma whose source was the mantle.

An unequivocal metamorphic origin was also determined for 20 % of the sapphires and for all the rubies of basaltic origin, 62 different samples coming from deposits in Asia, Australia and Madagascar. In this second scenario, the parent-rock no longer originated from the mantle but from the deep continental crust in the transition zone between the crust and the mantle. This type of primary deposit is encountered in high pressure and temperature environments which form sizeable outcrops in the ancient basements as in Madagascar.

Understanding the genesis of the rubies and sapphires found in sedimentary deposits could therefore help in the determination of their geological origin and thus increase the possibilities for mining these gemstones. Downstream of the extraction stage, the process could also be envisaged as a method for controlling the trading circuits. However, unlike emeralds, for which this type of study comparing field analyses and isotopic measurements provides the elements for identifying both the geological origin and the geographic location of the primary deposit, sapphires can reveal only their geological origin. A peculiarity which will probably leave part of the mystery cloaking these fascinating stones still intact for many years to come.

Notes

(1) This research was conducted by the 'Laboratoire des Mécanismes de Transfert en Géologie (LMTG)' of Toulouse and the 'Centre de Recherches Pétrographiques et Géochimiques (CRPG)' in Nancy jointly with the Scottish Universities Environmental Research Centre of Glasgow (Scotland), the Institut Gubelin in Switzerland, the Pakistan Geological Service and the universities of Hanoi (Viet-Nam) and of Antananarivo (Madagascar)

(2) Secondary deposits of precious stones formed by the accumulation of fluvial or marine alluvium.

(3) Syenite is a rock composed of more than 60% of potassium feldspars

Adapted from materials provided by Institut de Recherche Pour le Développement.

http://www.sciencedaily.com/releases/2007/12/071203135739.htm

Ancient Maya Marketplace Located, Challenges Views On Goods Distribution

BYU environmental scientist Richard Terry samples soil at an ancient Maya site similar to one in present-day Mexico that his team proved was once a marketplace. (Credit: Image courtesy of Brigham Young University)

ScienceDaily (Dec. 10, 2007) — Coaxing answers from 1500-year-old clues hidden in soil clumps, a team of archaeologists and environmental scientists identified a marketplace in an ancient Maya city, calling into question archaeologists' widely held belief that people of the era relied on rulers to tax and re-distribute goods, rather than trading them with one another.

Brigham Young University professor of environmental science Richard Terry and his student team helped confirm the location of a suspected marketplace on the Yucatan peninsula, giving Maya studies powerful new evidence for understanding the advanced civilization's economy.

Terry's specialty is analyzing soil from archaeological sites to find chemical traces that indicate what took place there. Such creative detective work is particularly useful in tropical areas, where 90 percent of inhabitants' possessions were made from organic material that has since decomposed.

"Looking at soil residues promises to open up the investigation of ancient Maya economic systems for the first time," said Bruce Dahlin, lead author on the new study and archaeologist with Shepherd University. "It's the first way of confirming that an area that looks like a marketplace, is a marketplace."

In trying to determine if the Maya of the Classic era (about A.D. 300 to 900) had a market economy, scientists had found large, open areas within settlements of the period, but no indications of the areas'

purposes. Terry's soil analysis revealed outlines of use clearly consistent with a modern-day open-air market in the region.

"These methods reveal intricate patterns of human behavior in what would ordinarily be invisible - the chemical residues left by trading, marketing, farming, and habitation," said Stephen Houston, a Maya scholar at Brown University not associated with the study. "[Terry] is at the forefront of developing and applying these methods in the New World."

Dahlin explained that he and other Maya archaeologists had recognized that many Maya cities appeared to have held more people than the regions' agricultural capacities could have supported. For years, researchers sought evidence of sophisticated farming or irrigation techniques to explain this. The idea of a market economy that facilitated the importing of food and other goods wasn't taken seriously, in part because it would be difficult to distinguish from most archaeologists' belief that the Maya elite had a tax and tribute system and effectively paid their underlings for loyalty by passing goods down the social ladder. But proof of the existence of a market would certainly prove a market economy.

After hearing a proposal from Terry's then-graduate student Chris Jensen, a coauthor on the new paper, Dahlin invited the BYU team to his dig in Chunchucmil on the western Yucatan. They sampled surface soil from a large, open area bordered by ancient thoroughfares, hunting for phosphorus.

"All food materials contain phosphorus, and a common denominator of all humans is that they bring food to places where they live," Terry said. "Over time, the organic matter is ground into the soil and rots, but the phosphorus holds to the soil particles even in a tropical rain forest that gets a meter or two of rain every year."

The soil chemists mixed two-gram samples of soil with chemicals and filtered the resulting solution. A handheld device shined light through the solution to determine the concentration of phosphorus.

"Our innovation was to develop a field laboratory so that we could report soil phosphorus results quickly to the archaeologists without having to wait for results from the Provo lab," Terry said.

The results from the plaza at Chunchucmil showed concentrations of phosphorus up to 40 times higher than in ancient patios and streets. The pattern of phosphorus residue indicated that a footpath ran through the marketplace parallel to the bordering street, and that food was vended on either side.

This layout proved to be consistent with the last remaining modern market in the region that runs atop soil (all the others have been paved). Another of Terry's students and coauthors, David Wright, sampled soil from that one, in Antigua, Guatemala, that yielded the similar pattern.

The researchers believe further geochemical studies at other sites, such as the large settlements of Tikal and Chichen Itza, will reveal how far the market economy may have spread. Terry and his students are also analyzing other chemicals left in soil to pinpoint ancient workshops and religious sites and are studying carbon isotopes in the soil to locate the ancient corn fields.

This research was reported in the December issue of Latin American Antiquity. Timothy Beach of Georgetown University is also a coauthor on the paper. The research was funded by the National Science Foundation, the National Geographic Society, Howard University and BYU. The Instituto Nacional de Antropologia y Historia de Mexico allowed the work at Chunchucmil.

Adapted from materials provided by Brigham Young University.

Ancient Blood Found On Sculptures From Kingdom Of Mali

A new, highly-sensitive analytical test was used to confirm the presence of blood in the coating of this animal-like artifact used in ancient Mali rituals. (Credit: Pascale Richardin, Center for Research and Restoration for the Museums of France)

ScienceDaily (Dec. 8, 2007) — Scientists in France are reporting for the first time that sculptors from the fantastically wealthy ancient Empire of Mali -- once the source of almost half the world's gold -- used blood to form the beautiful patina, or coating, on their works of art. Pascale Richardin and colleagues describe development of a new, noninvasive test that accurately identifies traces of blood apparently left on ancient African artifacts used in ceremonies involving animal sacrifices.

Archaeologists often had reported or suspected the presence of blood on many African artifacts, the study points out. However, accurately identifying the presence of blood was difficult because of the tiny amounts of blood remaining over the ages.

The researchers describe use of three highly sensitive tests -- time-of-flight secondary ion mass spectrometry, infrared microscopy, and X-ray microfluoresence -- to identify iron-bound (the chemical fingerprint of blood) on the patina from seven Dogon and Bamana sculptures from Mali. The technique, which caused virtually no damage to priceless artworks, also is suitable for identification of blood on other ancient artifacts, the study states.

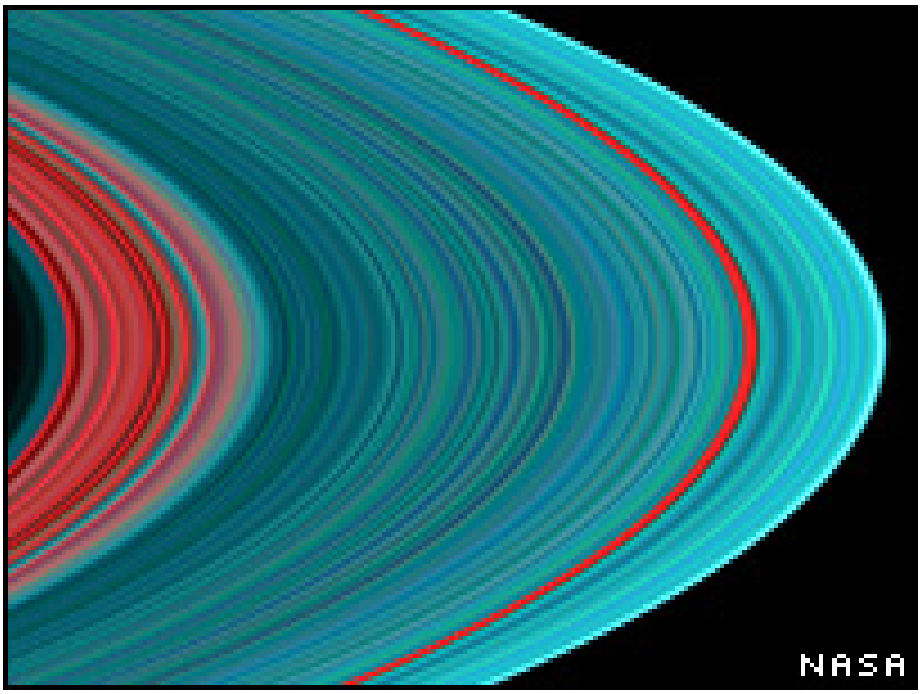
The article "Identification of Ritual Blood in African Artifacts using TOF-SIMS and Synchrotron Radiation Microspectroscopies" is scheduled for the Dec. 15 issue of ACS' Analytical Chemistry.

Adapted from materials provided by American Chemical Society.

http://www.sciencedaily.com/releases/2007/12/071203091232.htm

Saturn's rings 'may live forever'

By Jonathan Amos
Science reporter, BBC News, San Francisco



Saturn's iconic rings may be much older than we thought, scientists say.

New data from the Cassini probe shows these thin bands of orbiting particles were probably there billions years ago, and are likely to be very long-lived.

It means we are not in some special time - the giant planet has most likely always provided a stunning view.

Previous data had led researchers to believe the rings were created just 100 million years ago, when a huge moon or comet shattered in Saturn's vicinity.

Professor Larry Esposito told the American Geophysical Union Fall Meeting that Cassini had completely changed that view.

"Despite what was thought after the [1970s] Voyager investigations of Saturn - that Saturn's rings might be very youthful, perhaps only as ancient as the dinosaurs - we have results that show the rings could have lasted as long as the Solar System and maybe will be around for billions of years," he said.

Mini-moons

Cassini has been studying the rings with its Ultraviolet Imaging Spectrograph (UVIS). It has looked at light reflected off and passing through the ring particles, which range in size from grains of sand to boulders.

It has concluded there is far more clumpiness in the water-ice particles than was previously thought - that there may actually be three times the mass than was assumed from the Voyager observations.

We are able to reach the paradoxical conclusion - because the rings appear so young, they may actually be as old as the Solar System

Prof Larry Esposito
University of Colorado at Boulder

Cassini sees features that suggest the rings cannot have formed in a recent one-off cataclysmic event because they display a range of ages - some of them very young.

To explain this, Professor Esposito and colleagues have put forward the idea that material is constantly coming together to form small "moonlets" and that these aggregations are then breaking up in what is a seemingly perpetual process.

In other words, there is a major recycling process going on.

"Although the Voyager observations indicated Saturn's rings were youthful, Cassini shows even younger ages; and because we see such transient, dynamic phenomena in the rings we are able to reach the paradoxical conclusion - because the rings appear so young, they may actually be as old as the Solar System," the University of Colorado at Boulder researcher said.

Scientists had previously believed that really ancient rings should be quite dark due to ongoing pollution from the "infall" of meteoric dust. But if there is recycling going on, this would explain why the rings overall appear relatively bright to ground-based telescopes and spacecraft.

Late collisions

"The more mass there is in the rings, the more raw material there is for recycling, which essentially spreads this cosmic pollution around," Professor Esposito said.

"If this pollution is being shared by a much larger volume of ring material, it becomes diluted and helps explain why the rings appear brighter and more pristine than we expected."

The question is when did the rings actually form? No-one can say for sure.

The scientists still hold to the idea that the rings resulted from a collision event - but it must have been a long time in the past.

There is enough mass in the rings to make a moon with a diameter of 300km.

"To break up an object that big is really difficult," explained Professor Esposito. He suggested the last obvious time to consider was the so-called Late Heavy Bombardment, when the Solar System experienced its last period of concentrated impacts.

This was about four billion years ago.

Jonathan.Amos-INTERNET@bbc.co.uk

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/1/hi/sci/tech/7141628.stm

Body clock 'control switch' found
Researchers say they have identified the chemical switch that controls the genetic mechanism regulating people's internal body clocks.

Although the process involves complex genes, the whole mechanism is controlled by a single amino acid - a building block of protein - they say.

It is hoped the discovery may lead to more effective drugs to treat sleep disorders and related ailments.

The University of California study appears in the journal Nature.

People's sleep problems tend to be very individual, but we currently have a one-size-fits-all approach
Dr Neil Stanley
Norwich University Hospital

Lead researcher Professor Paolo Sassone-Corsi said: "Because the triggering action is so specific, it appears to be a perfect target for compounds that could regulate this activity.

"It is always amazing to see how molecular control is so precise in biology."

Sensitive mechanism

The body's internal clock, a highly sensitive mechanism able to anticipate changes in the environment, regulates a host of body functions, from sleep patterns to metabolism and behaviour.

It is estimated that it regulates up to 15% of all human genes.

Disruption of these rhythms can profoundly influence human health and has been linked to insomnia, depression, heart disease, cancer and neurodegenerative disorders.

The gene CLOCK and its partner BMAL1 control the body's internal clock.

The latest study found that a single amino acid in a protein produced by BMAL1 undergoes a modification that triggers the genetic chain of events involved with setting the body's rhythms.

The researchers found that if this modification is impaired in any way, the switching mechanism can be thrown off, undermining the whole system.

They are currently testing antibodies that can target the activity of this amino acid.

Dr Neil Stanley, a sleep expert at Norwich University Hospital, said 89 different types of sleep disorder had so far been classified, but all sleep medications - hypnotics - currently targeted the same neurotransmitter called GABA.

"People's sleep problems tend to be very individual, but we currently have a one-size-fits-all approach - our armamentarium is not exactly huge," he said.

"A new target may allow us to develop more specific treatments and to offer patients more personalised care."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/7140017.stm

Published: 2007/12/13 00:14:57 GMT

Extinction threat to wild salmon

By Helen Briggs
Science and nature reporter, BBC News

Wild salmon on Canada's west coast are being driven to extinction by parasites from nearby fish farms, a study claims.

Wild pink salmon around the Broughton Archipelago are declining rapidly and will die out within 10 years if no action is taken, say researchers.

They say the data, published in Science, raises serious concerns about the global expansion of aquaculture.

Sea lice from farms are known to infect wild salmon, but until now the impact on wild populations has been uncertain.

"The impact is so severe that the viability of the wild salmon populations is threatened," said lead researcher Martin Krkosek from the University of Alberta in Edmonton, Canada.

Modelling studies

Dr Krkosek and colleagues compiled data on the numbers of pink salmon in rivers around the central coast of British Columbia.

> **It means that the probability of extinction is 100% and the only question is how long it is going to take**
> Dr Martin Krkosek

They compared populations of salmon that had come into contact with salmon farms with those that had not been exposed, from 1970 to the present day.

Using a mathematical model of population growth rates, they show that sea lice from industrial fish farms are reducing the numbers of wild pink salmon - a Pacific salmon species - to the extent that the fish could be locally extinct in eight years or less.

Dr Krkosek said the population growth rate was "severely depressed".

"It means that the probability of extinction is 100% and the only question is how long it is going to take," he told BBC News.

Natural parasites

Scientists say commercial open-net salmon farms are a "haven" for sea lice - naturally occurring parasites that attach to the skin and muscle of salmon.

Mature fish can survive being infested by a few lice but tiny juvenile salmon are particularly vulnerable to attack.

They come into contact with sea lice when they swim past fish farms on their migratory routes from rivers to the sea.

"Salmon farming breaks a natural law," explained study co-author Alexandra Morton, director of the Salmon Coast Field Station, located in the Broughton Archipelago.

"In the natural system, the youngest salmon are not exposed to sea lice because the adult salmon that carry the parasite are offshore. But fish farms cause a deadly collision between the vulnerable young salmon and sea lice. They are not equipped to survive this, and they don't."

Scientists say there are a number of solutions to the problem, including moving farms away from rivers used by wild salmon or putting farmed salmon in pens that are completely sealed off from the surrounding environment.

"The most obvious thing to do is to move the farm out of the way of the wild fish," Dr Krkosek told BBC News.

"Don't put them on the migration route, and don't put them near the spawning rivers. Another option is to move to closed containment technology where the net pen is replaced with a physical barrier that prevents the exchange of parasites - that would solve the problem too."

National treasure

Dr Krkosek said the impact of fish farms on wild salmon has been "an emotionally, politically and economically charged debate" in Canada.

"Salmon are considered a natural treasure to Canadians, but salmon farming has a lot of economic opportunity - we really need economic activity to supplement coastal economies where fisheries and other resource centres are not doing as well," he explained.

"So there are economic benefits to having salmon farms, but the way that it is currently being done is very damaging to the environment and there are better ways of doing it."

The report in Science has implications for other parts of the world where salmon is farmed, such as Norway and Scotland.

Other species of salmon are known to become infected with sea lice, but they vary in their ability to withstand this.

Sid Patten, chief executive of the Scottish Salmon Producers' Organisation, said the Canadian research bore "little resemblance to the situation in Scotland".

He said fish farmers, wild fish interests and the Scottish government had been working together for many years around the north-west coast and islands to develop local area management plans "for the benefit of both wild and farmed salmon".

"I am delighted to report that there are very positive results coming from this process such as increased numbers of wild salmon returning to some rivers," he said.

"This summer, the Scottish government presented our work to the Canadians who were very interested in exploring a similar model for Canada."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/7142053.stm

Published: 2007/12/13 19:05:56 GMT

Foot-and-mouth 'wasn't contained'

By Pallab Ghosh
Science Correspondent, BBC News

Environment department Defra failed to contain the first foot-and-mouth outbreak this summer despite declaring the nation virus-free, a study says.

The first outbreak in August was traced to the Pirbright lab site in Surrey.

A second outbreak - 11 miles (17km) away in September - was thought to have been caused by separate contamination.

But the Institute of Animal Health research concluded the two outbreaks came from the same source, suggesting the first was not fully eradicated.

Transmission sequence

Its scientists studied the genetic fingerprints of the virus recovered from the different infected premises in the 2007 outbreak.

After analysing the evidence they have been able to determine the probable sequence of transmission between infected premises.

An independent expert peer review process has accepted the study's conclusions that the second phase of the outbreak originated from the first phase and was not from a separate release.

It suggests that the Department for Environment, Food and Rural Affairs (Defra) failed to identify premises that had continued to be infected throughout August.

Defra, however, says it was not a failure on their part, "This infected premises was located outside of the original 10km surveillance zone and therefore could not have been picked up by the extensive surveillance and sampling we carried out according to internationally recognised standards."

The second outbreak in September came as a surprise and embarrassment to the government.

It had taken credit for successfully containing the virus leak from the Pirbright site in Surrey, which houses both the IAH's Pirbright Laboratory and the vaccine company Merial.

But according to the IAH investigation, the virus was somehow transported 17km from the first infected premises in Normandy to another farm in the Virginia Water area.

Conflict of interest

This raises the possibility that Defra supervised disinfection of the original Pirbright premises and disposal of infected animals, but did not eradicate the virus.

The research was made public by the scientists to refute newspaper claims that there was a second breach in biosecurity at the site.

The IAH scientists' decision to publish their findings came as the government announced Defra was to be stripped of its role as regulator for laboratories which handle animal viruses.

The decision was triggered after a review found there was a conflict of interest in Defra being both a major recipient of research carried out at Pirbright, and the site's regulator.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/7143260.stm

Published: 2007/12/14 05:45:09 GMT

Andean Highlands In Chile Yield Ancient South American Armored Mammal Fossil

Artist's reconstruction of Parapropalaehoplophorus septentrionalis, which likely weighed 200 pounds. (Credit: Art by Velizar Simeonovski)

ScienceDaily (Dec. 14, 2007) — A paleontological dig in Chile at an altitude of more than 14,000 feet in the Andes has yielded fossils of an 18-million-year-old armored mammal. It appears to be one of the most primitive members of a family of extinct mammals known as "glyptodonts," a group closely related to the modern-day armadillo.

Darin Croft from Case Western Reserve University, John Flynn from the American Museum of Natural History and Andre R. Wyss from the University of California Santa Barbara report the discovery and describe the mammal in the Journal of Vertebrate Paleontology.

Researchers have named the animal, Parapropalaehoplophorus septentrionalis. They derived the first part of the name from the new mammal's resemblance to a slightly younger animal from Argentina (Propalaehoplophorus). Septentrionalis means northern in Latin.

The newly discovered animal lived in the early Miocene epoch about 18 million years ago and its family went extinct about the time humans arrived in the New World.

P. septentrionalis is a member of the glyptodonts, a large group of extinct animals that lived almost exclusively in South America. (A few species reached North America several million years ago when the two continents were reconnected by the Panamanian land bridge.) They are recognized for their thick shells of hardened and immovable bony plates and their large, grooved teeth. But unlike their modern day armadillo relatives (who have thinner shells with movable plates and smaller, simple teeth), these animals could grow to the size of a small car and weigh as much at two tons.

According to Croft, the new species was relatively small for a glyptodont and is the first one found in Chile. "It would have looked like a cross between a tortoise and an armadillo, but of course is much more closely related to armadillos," he said. He described P. septentrionalis as roughly the size of an African spurred tortoise, which is less than three feet long and weighs about 200 pounds.

The glyptodont was reconstructed from fossils of the jaw, shell, leg and backbone. These were compared with other known glyptodonts and with close glyptodont relatives. "These different skeletal parts all gave the same answer -- this was a new species of glyptodont that had a greater number of primitive features than any other species," said Croft.

"When we collected the fossil, we had no idea that it would turn out to be a new species. We knew that it would be an important specimen, given its completeness, but it was only after cleaning it and carefully studying it that we realized how unusual it was," Croft said.

The P. septentrionalis fossil was found during a field expedition in 2004 to the Salar de Surire region. This area has yielded the Chucal fauna, the collective name given to the 18 fossil animal species from the region. This fauna includes armored mammals (armadillos and their relatives), marsupials (relatives of the opossum), rodents, frogs and many ungulates (hoofed animals).

Finding the new species was no easy task as the researchers encountered the thin air at the high altitude, scarce water and temperatures that plummeted as night fell. But these are not the conditions under which the glyptodont lived. According to Flynn from the American Museum of Natural History in New York City, "Our studies and plant work elsewhere on the Altiplano suggest that the region was at much lower elevation when these fossils lived, giving us new insights into the timing and rate of uplift of the high Andes."

Flynn added that Chucal, at more than 14,000 feet above sea level, is the highest elevation vertebrate fossil site in the Western Hemisphere. The highest site in the world is much younger and is found in the Tibetan Plateau at an altitude of more than 15,000 feet.

Like other glyptodonts, P. septentrionalis probably spent a lot of its time grazing on ground vegetation in open areas, much like cows do today. This interpretation is supported by the presence of many other open habitat mammals at Chucal and the presence of plant fossils typical of such environments.

A detailed description of the new mammal is found in the article, "A New Basal Glyptodontid and other Xenarthra of the Early Miocene Chucal Fauna, Northern Chile." The research was undertaken in collaboration with the Field Museum of Natural History in Chicago and the Museo Nacional de Historia Natural and the Consejo de Monumentos Nacionales in Santiago, Chile. Research support came from the National Geographic Society, the National Science Foundation, and FONDECYT Chile.

Adapted from materials provided by Case Western Reserve University.

http://www.sciencedaily.com/releases/2007/12/071214002808.htm

Captain Kidd's Shipwreck Of 1699 Discovered

Charles Beeker examines possible wreckage from Captain Kidd's Quedagh Merchant. (Credit: Image courtesy of Indiana University)

ScienceDaily (Dec. 14, 2007) — Resting in less than 10 feet of Caribbean seawater, the wreckage of Quedagh Merchant, the ship abandoned by the scandalous 17th century pirate Captain William Kidd as he raced to New York in an ill-fated attempt to clear his name, has escaped discovery -- until now.

An underwater archaeology team from Indiana University announced Dec. 13 the discovery of the remnants. IU marine protection authority Charles Beeker said his team has been licensed to study the wreckage and to convert the site into an underwater preserve, where it will be accessible to the public.

Beeker, director of Academic Diving and Underwater Science Programs in IU Bloomington's School of Health, Physical Education and Recreation, said it is remarkable that the wreck has remained undiscovered all these years given its location, just 70 feet off the coast of Catalina Island in the Dominican Republic, and because it has been sought actively by treasure hunters.

"I've been on literally thousands of shipwrecks in my career," Beeker said. "This is one of the first sites I've been on where I haven't seen any looting. We've got a shipwreck in crystal clear, pristine water that's amazingly untouched. We want to keep it that way, so we made the announcement now to ensure the site's protection from looters."

The find is valuable because of the potential to reveal important information about piracy in the Caribbean and about the legendary Capt. Kidd, said John Foster, California's state underwater archaeologist, who is participating in the research.

"I look forward to a meticulous study of the ship, its age, its armament, its construction, its use, its contents and the reconstructed wrecking process that resulted in the site we see today," Foster said.

"Because there is extensive, written documentation, this is an opportunity we rarely have to test historic information against the archaeological record."

Historians differ on whether Kidd was actually a pirate or a privateer -- someone who captured pirates. After his conviction of piracy and murder charges in a sensational London trial, he was left to hang over the River Thames for two years.

Historians write that Kidd captured the Quedagh Merchant, loaded with valuable satins and silks, gold, silver and other East Indian merchandise, but left the ship in the Caribbean as he sailed to New York on a less conspicuous sloop to clear his name of the criminal charges.

Anthropologist Geoffrey Conrad, director of IU Bloomington's Mathers Museum of World Cultures, said the men Kidd entrusted with his ship reportedly looted it, and then set it ablaze and adrift down the Rio Dulce. Conrad said the location of the wreckage and the formation and size of the canons, which had been used as ballast, are consistent with historical records of the ship. They also found pieces of several anchors under the cannons.

"All the evidence that we find underwater is consistent with what we know from historical documentation, which is extensive," Conrad said. "Through rigorous archeological investigations, we will conclusively prove that this is the Capt. Kidd shipwreck."

The IU team examined the shipwreck at the request of the Dominican Republic's Oficina Nacional De Patrimonio Cultural Subacuático.

"The site was initially discovered by a local prominent resident of Casa De Campo, who recognized the significance of the numerous cannons and requested the site be properly investigated," said ONPCS Technical Director Francis Soto. "So, I contacted IU."

Beeker and Conrad have worked closely with ONPCS for 11 years since they began conducting underwater and land-based archaeological research related to the era when the Old World and New World first met.

"It continues our work down there from the age of discovery to the golden age of piracy, the transformation of both the native and introduced cultures of the Caribbean," Conrad said.

Much of their work is focused in the area of La Isabela Bay, the site of the first permanent Spanish settlement established by Christopher Columbus. The Taino were the first indigenous people to interact with Europeans. Beeker said much of the history of this period is based on speculation, something he and Conrad are trying to change.

The IU research in the Dominican Republic typically involves professors and graduate students from various IU Bloomington schools and departments, including the School of HPER, the School of Public and Environmental Affairs, and the departments of anthropology, biology, geology and mathematics in the College of Arts and Sciences.

Anthropology doctorate student Fritz Hanselmann, who teaches underwater archaeology techniques in HPER, said there have only been a few pirate ships ever discovered in the Americas, and that IU's multi-disciplinary research will make a significant contribution to the field.

Adapted from materials provided by Indiana University.

http://www.sciencedaily.com/releases/2007/12/071213162036.htm

Call for rethink in obesity fight
Obesity cannot be tackled by just encouraging healthier eating and more exercise, health experts say.

The experts, led by a London-based academic, say governments should adopt more sophisticated approaches.

Work conditions, food subsidies, town planning and advert restrictions are all key, the experts wrote in the British Medical Journal.

The UK's Association of Directors of Public Health said change was happening but further improvements were needed.

Latest statistics show that a quarter of adults are obese in the UK, but the percentage is predicted to rise to over 50% if current trends continue.

> **There has been a lack of co-ordination over this and the response has therefore been slow**
> Dr Tim Crayford, of the Association of Directors of Public Health

The findings mirror the conclusions of the recent government-backed Foresight report in the UK, which said societal issues were also to blame for rising obesity levels.

These experts, led by a University College London academic, agreed, saying tackling obesity was far more complex than just encouraging healthy eating and more exercise.

They said large supermarket chains had displaced small, family-run stores and encouraged bulk purchases, convenience foods and super-sized portions.

They also criticised the impact of food advertising which they said encouraged children in particular to desire foods "high in saturated fats, sugars and salt".

And they said urban planning and design could play a key role in encouraging people to walk around towns rather than rely on cars.

These factors were particularly important for people from deprived areas as they were often more constrained by such barriers, they said.

'Dynamic'

The authors pointed to the example set by Norway, which has used a combination of food subsidies, price manipulation and clear nutrition labelling to steer people away from unhealthy food.

UCL expert Sharon Friel said a "dynamic" response was needed that included joined-up action at global, national and local levels.

"Missing in most obesity prevention strategies is the recognition that obesity - and its unequal distribution - is the consequence of a complex system that is shaped by how society organises its affairs."

Dr Tim Crayford, president of the Association of Directors of Public Health, said it was well-known that obesity was caused by multi-factoral problems.

"There has been a lack of co-ordination over this and the response has therefore been slow."

And he added: "There are signs that is now changing, but we are battling against the desire in western societies for more affluence which means more cars and richer food."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/7142176.stm

Published: 2007/12/14 01:13:26 GMT

Doctors urge folic acid progress
A group of UK doctors has urged the government to proceed with the move towards fortifying flour with folic acid to prevent birth defects.

The Food Standards Agency approved the move in June this year, which is aimed at cutting the number of babies born with conditions such as spina bifida.

But the government called for a further review of recent studies linking folic acid to colon cancer.

Writing in the Lancet, the doctors said there was no evidence of a connection.

Folic acid is a synthetic form of folate, a B vitamin found in a wide variety of foods including liver and green leafy vegetables.

The chief medical officer for England, Sir Liam Donaldson, sent a letter to the FSA in October to ask them to consider two recent studies on colon cancer and folic acid.

> **The issue has been delayed for many years, largely due to concerns which have turned out not to be well founded**
> Professor Roger Bayston

One study had looked at the effects of folic acid supplements in the prevention of colorectal adenomas - a type of benign tumour.

According to Professor Roger Bayston, associate professor for surgical infection at Nottingham University, the study found no reduction in adenoma risk but neither did the researchers find an increase.

Professor Bayston, who is also chairman of the medical committee of the Association for Spina Bifida and Hydrocephalus, also criticised suggestions that folic acid fortification in 1998 in the US and in 1999 in Canada had led to a rise in cases of colon cancer.

A paper published earlier this year had raised the possibility of a link.

But cases of colon cancer began to rise before the introduction of folic acid into bread flour, he said.

And there had been an increase in detection in the number of cancers in the late 1990s because of more widespread screening.

Confidence

"The FSA and the chief medical officer can be confident in recommending that the government introduce the mandatory fortification of flour," said Professor Bayston.

He added the experts on the FSA committee had already very carefully considered the issue of possible cancer risks before making their recommendations.

"The issue has been delayed for many years, largely due to concerns which have turned out not to be well founded."

A spokesperson for the FSA said they would be considering the studies in question at a meeting next month but that they had already looked at the preliminary results.

Claire Williamson, nutrition scientist at the British Nutrition Foundation, said: "It is of paramount importance that the benefits and risks are considered in detail, before any policy decision at the population level is made."

Mandatory fortification has already been introduced in the US, Canada and Chile, where it has cut birth defect rates by up to half.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/7143104.stm

Published: 2007/12/14 00:52:58 GMT

Talk more in class, experts say
Children should be allowed to talk more in class, education experts have argued, despite the traditional view that chatter can be disruptive.

The Cambridge University study also said that a competitive atmosphere in class could be counter-productive.

It questioned the theory that encouraging pupils to compete increases their motivation to learn.

Instead, it argued, tasks should aim to encourage co-operation and group cohesion instead of competitiveness.

'Points of view'

The academics said "social interaction and collaborative activity" in class could provide "valuable opportunities" for learning.

"This challenges the traditional view that talk and social interaction among children are irrelevant, if not disruptive to learning," the report added.

"The educational value of collaborative learning has been clearly demonstrated by research from more than one line of enquiry.

"In particular, encouraging children to pursue joint goals, explain their understanding, express different points of view and attempt to reach consensus through discussion have all been found to help learning and understanding."

Teachers should be encouraging pupils to engage in "exploratory talk" that involves children "sharing, challenging and evaluating their views", it said.

'Disputational talk'

This was because "talk and social interaction" played a key role in children's social development and learning.

The researchers warned: "Disputational talk, which is highly competitive and full of disagreements, is not conducive to learning in the particular context of pupil-led work."

Research showed that working together in arts, science and mathematics should be an intrinsic part of classroom life, they said.

But pupils seldom had the chance to engage in co-operative discussions, the team warned.

A spokesman for the Department for Children, Schools and Families said materials guiding teachers and children in using group discussion and talking about issues to solve problems were provided to England's schools.

"In addition to this, the Primary Framework for teachers is developing the focused use of discussion to improve specific skills such as writing, problem solving, and mathematics.

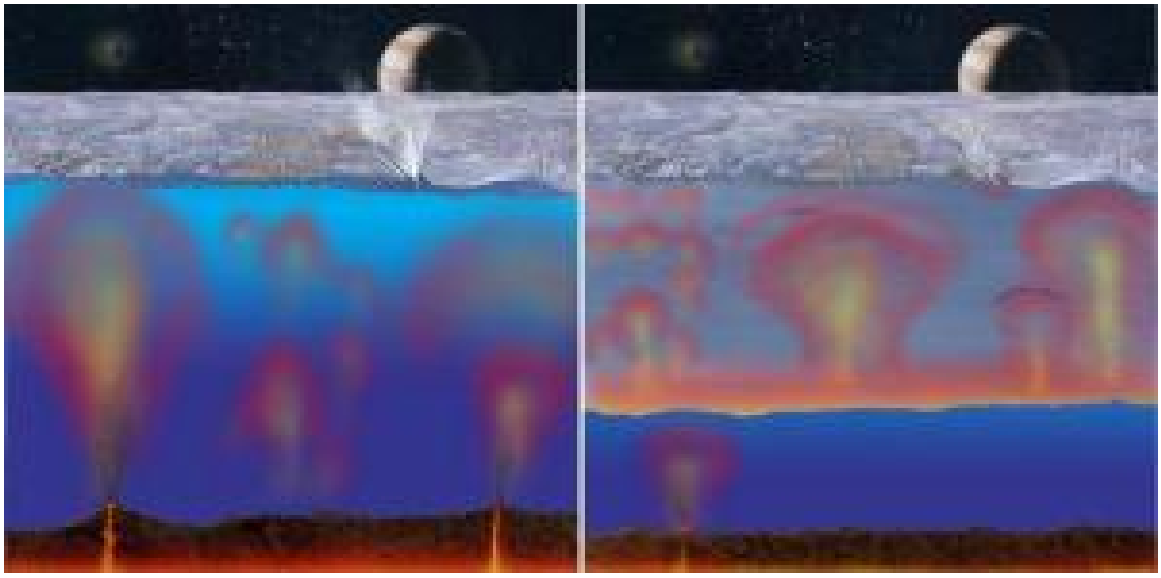
"This focus on the use of collaborative talking in teaching and learning is set to continue."

The research was part of a major independent two-year study into primary education, The Primary Review.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/uk_news/education/7142816.stm

Published: 2007/12/14 02:50:15 GMT

Jupiter's Moon Europa: What Could Be Under The Ice?



Thick or thin ice shell on Jupiter's moon Europa? Scientists are all but certain that Europa has an ocean underneath its surface ice, but do not know how thick this ice might be. This artists' conception illustrates two possible cut-away views through Europa's ice shell. (Credit: NASA/JPL, Artwork by Michael Carroll)

ScienceDaily (Dec. 14, 2007) — Jupiter's moon Europa is just as far away as ever, but new research is bringing scientists closer to being able to explore its tantalizing ice-covered ocean and determine its potential for harboring life.

"We've learned a lot about Europa in the past few years," says William McKinnon, professor of Earth and Planetary Sciences at Washington University in St. Louis, Mo.

"Before we were almost sure that there was an ocean, but now the scientific community has come to a consensus that there most certainly is an ocean. We're ready to take the next step and explore that ocean and the ice shell that overlays it. We have a number of new discoveries and techniques that can help us do that."

McKinnon is discussing some of these recent findings and new opportunities for exploring Europa in a news briefing today at the meeting of the American Geophysical Union in San Francisco. He is joined by colleagues Donald Blankenship, research scientist at the Institute for Geophysics at the University of Texas at Austin's Jackson School of Geosciences., and Peter Doran, associate professor of Earth and Environmental Sciences, University of Illinois at Chicago.

McKinnon points to refined methods that can use combined measurements of gravity and the magnetic field made from orbit to characterize Europa's ocean. By observing how the moon flexes and deforms and by measuring magnetic variations, researchers can determine how thick or thin the ice is over the ocean and even learn how salty the ocean is. A new model shows that radiation on Europa is much less, up to two-thirds less, than previous models predicted, making the environment much more hospitable for orbiting spacecraft or landers to operate.

Sophisticated reprocessing of data from the Galileo mission has revealed new information about the chemistry of Europa's surface. It maps the presence of carbon dioxide, an important chemical for life, most probably coming from the ocean beneath the surface. This indicates that improved measurements from orbit have the chance to detect compounds not found in the Galileo data.

Future explorations of Europa will benefit from lessons learned from the Cassini spacecraft's recent findings of active geysers on Saturn's moon Enceladus. "Europa is a young, geologically active body

like Enceladus," says McKinnon. Galileo didn't see any plumes on Europa like those spouting from Enceladus, but it didn't have the best instrumentation to detect the telltale hot spots. "Now we know what we should look for," says McKinnon, "and we should expect the unexpected."

New radar sounding techniques will be a key component for exploring Europa. "There have been theories about whether the ice above the ocean is thick or thin, and now we have the ability to determine this with radar," says Blankenship. "That's been proved by the radar on Mars Express, which imaged the north polar cap of Mars, and the higher-resolution radar on the Mars Reconnaissance Orbiter. Radar can give us a detailed cross section through the ice shell on Europa." The ice-penetrating radar will also be able to locate liquid water both within and beneath the shell, he continues, just as it can spot water within crevasses and lakes beneath the ice of Antarctica. "Free water within the icy shell and its relationship to the underlying ocean will be a critical factor in determining the habitability of Europa."

Researchers are also preparing for the day in the future when they will be able to get to Europa's surface and ultimately into its ocean to explore it directly. "In the meantime, we're using extreme environments on Earth as our laboratory," says Doran. "Ice-covered lakes in Antarctica are good, small-scale analogs to what we might find on Europa." Doran is lead investigator of a project called Endurance, which, in collaboration with Stone Aerospace, is developing an autonomous underwater robotic vehicle, to test approaches and procedures for exploring Europa's ocean. The project is funded by NASA's Astrobiology Science and Technology for Exploring Planets program.

"We're testing the vehicle in Wisconsin in February 2008," Doran says, "and then we'll be deploying it in Antarctica later in the year." The robotic explorer will be able to create three-dimensional maps of the subsurface Antarctic lake. It will also be able to map the biochemistry of the water body, pinpointing the chemical signatures that may indicate life.

For Europa, under-ice exploration lies in the distant future. In the meantime, say the researchers, a closer look at Europa is possible from an orbiting spacecraft able to measure gravity and magnetic fields, determine surface composition, search for active or recent eruptions, and use radar to understand the relationship between the surface and the sub-surface.

Adapted from materials provided by University of Texas at Austin.

http://www.sciencedaily.com/releases/2007/12/071213180823.htm

'Magma P.I.' Unearths Clues To How Earth's Crust Was Sculpted

Marsh Expedition (Credit: Image courtesy of Johns Hopkins University)

ScienceDaily (Dec. 14, 2007) — About a decade ago, Johns Hopkins University geologist Bruce Marsh challenged the century-old concept that the Earth's outer layer formed when crystal-free molten rock called magma oozed to the surface from giant subterranean chambers hidden beneath volcanoes.

Marsh's theory -- that the deep-seated plumbing underneath volcanoes is actually made up of an extensive system of smaller sheet-like chambers vertically interconnected with each other and transporting a crystal-laden "magmatic mush" to the surface -- has become far more widely accepted. This sort of system, known as a "magmatic mush column," is thought to exist beneath all of the world's major volcanic centers.

Now, Marsh -- using the windswept McMurdo Dry Valleys of Antarctica as his "walk in" laboratory -- posits that these channels did more than simply transport or supply magma and crystals to form the Earth's surface: As the magma pushed up through the earth, the pressure fractured the crust in such a way that it provided a sort of "template," guiding later erosion in sculpting a series of valleys and mountain ranges there.

Marsh described his latest findings to fellow scientists at a recent meeting of the American Geological Society.

"As the magma made its way to the surface, the pressure broke the crust up into pieces," Marsh says. "That fracturing reflected a pattern of stress in the same way that a windshield put under pressure will eventually fracture and the pattern of the broken glass would reflect where the stress was originally applied.

"Magma then seeped in," he says, "and 'welded' the fractures, sealing them temporarily until erosion -- in the form of snow, rain, ice and wind -- went to work on these weaknesses, carving out valleys, mountains and other landforms that we see there today and marking where the solidified magma originally was."

Marsh said that, in Antarctica, both of these functions date back at least 180 million years to the time when the continents split apart. He points out that this observation brings together the usually disparate study of deep-seated magmatic processes and land-surface evolution.

"It's one of those situations where, usually, never the twain shall meet, but they do in this case," the earth scientist said. "Having recognized evidence in this critical process in the McMurdo Dry Valleys is important because it may allow us to recognize it in other areas where the geologic record is scantier and less complete."

The Dry Valleys makes an ideal place to study these systems because it was eroded into its present form millions of years ago and has, unlike the rest of Earth's surface, undergone very little subsequent erosion. His colleagues George Denton of the University of Maine and David Marchant of Boston University call this region "a relic landscape," because it is the only known place on Earth that looks almost exactly as it did millions of years ago.

"The delicacy of the landscape in the Dry Valleys has preserved for us an unusually rich collection of geologic evidence of the processes that formed this terrain," Marsh said.

For more than a quarter of a century, Marsh -- who could be thought of by fans of 1980s detective television shows as sort of a "Magma P.I." -- has been working to understand the deep underground systems that bring magma to the Earth's surface. In 1993, he found the Dry Valleys, a walk-in "museum" that he calls "the one place on earth where the plumbing system is exposed in this way."

"You can stand on shelves of solidified lava that were deposited by magmatic activity 180 million years ago," he said. "It's awe inspiring."

Adapted from materials provided by Johns Hopkins University.

http://www.sciencedaily.com/releases/2007/12/071203135731.htm

Present-day Species Of Piranha Resulted From Marine Incursion Into Amazon Basin

Carnivorous Red Piranha, Pygocentrus nattereri. Photographed in an aquarium, they naturally live in South American rivers and freshwater lakes. (Credit: iStockphoto/George Clerk)

ScienceDaily (Dec. 14, 2007) — Piranhas inhabit exclusively the fresh waters of South America. Their geographical distribution extends from the Orinoco River basin (Venezuela) to the North, down to that of the Paraná (Argentina) to the South. Over this whole area, which also embraces the entire Amazon Basin, biologists have recorded 28 carnivorous species of these fish (2). In spite of the evolutionary success of this subfamily of fish, the mechanisms that generated the species richness of this group are still insufficiently known.

A team from the IRD, working in partnership with Bolivian and Peruvian scientists, aimed to establish how these species were able to evolve over the past 15 million years. They consequently took samples from around their whole distribution range. Between September 2002 and June 2003, numerous specimens of piranhas were collected from the Bolivian part of the Amazon. Complementary sampling was then conducted in the Brazilian and Peruvian sectors, from the Orinoco in Venezuela, and the São Francisco and the Paraná-Paraguay in Brazil. The team selected 57 specimens representative of 21 different species of piranhas, from 15 collection points distributed over the whole South-American hydrographic network,.

Mitochondrial DNA (mtDNA) of piranhas has a particularly high mutation rate and thus could be used as a molecular basis for reconstructing the evolution of the present-day species which are different yet very close to one another. These techniques using mtDNA sequences led to the conclusion that the origin of the piranha species inhabiting the rivers of South America today dates back to some ancestor at only a few million years B.P. Yet dating from fossils, whose morphologies are strikingly similar to those of present-day piranhas, strongly suggests that this fish subfamily already existed in South America's hydrographic system 25 million years ago. The modern species must therefore stem from a recent diversification.

Further investigation involving the construction of a phylogenetic tree by categorizing the study's 21 species allowed phylogenetic relationships between each of them to be established in order to test alternative hypotheses for the diversification that occurred over time. Examination of these data alongside geological-scale changes that have affected aquatic ecosystems with time brought out evidence that marine incursions played a fundamental role in the appearance then the distribution of

piranha species. Five million years ago, the Atlantic Ocean advanced, its waters finding their way far onto the Amazon flood plain. The saline water invaded the lowland expanse of the great river and penetrated its tributaries situated below 100 metres of altitude, provoking the disappearance of many species of freshwater fish. Some of these would nevertheless have succeeded in finding refuge at high altitude, in particular in rivers that flowed on the Guianan and Brazilian shields.

DNA analysis confirmed this hypothesis and showed that the piranha populations present in the Amazon flood plain but situated 100 metres above sea-level have been in existence for no more than 3 million years. Hitherto, certain specialists had suggested that the present-day piranha species had arisen in the lower sections of the great rivers of South America. The scientists thought that from centres of speciation, piranhas would subsequently have dispersed to colonize the more upstream reaches of the river system. However, the results of the study give sustenance to another scenario.

According to that new hypothesis, during the marine incursion phase some piranha populations would have survived in the upstream parts of the network. Such populations would have differentiated into species--following the fragmentation of their zone of distribution, but probably also in response to ecological constraints specific to the basin where they were kept in isolation from each other. Once the ocean had regressed again, 3 million years ago, these piranhas could finally have dispersed downstream, finding their way back to the Amazon's lowland plain which would have served as a gathering ground for biodiversity. What now remains to be found are the ecological parameters that could have favoured the diversification of piranha populations so confined to the upper reaches of the river network.

One of the hypotheses advanced highlights water quality as a factor in stimulating ecological and morphological differentiation of species. The field survey observations indicated that some of the species were highly localized, in both geographical and ecological terms. For example, Serrasalmus hollandi is mostly found in turbid, sediment-laden waters flowing down from Andean mountain streams. In contrast, a new species the biologists discovered, lives in the same hydrographic basin but only in rivers with crystal-clear waters bearing very little sediment content.

However, water quality cannot be considered as the sole factor behind speciation, seeing that a third piranha species was found living in either of these two categories of river. The research results as a whole suggest that the superimposition of factors linked to geographical history and ecological conditions, intervening at different spatial and temporal scales, is responsible for the diversification of the piranhas. This is an evolutionary progression which should be transposable to other fish communities inhabiting South American waters.

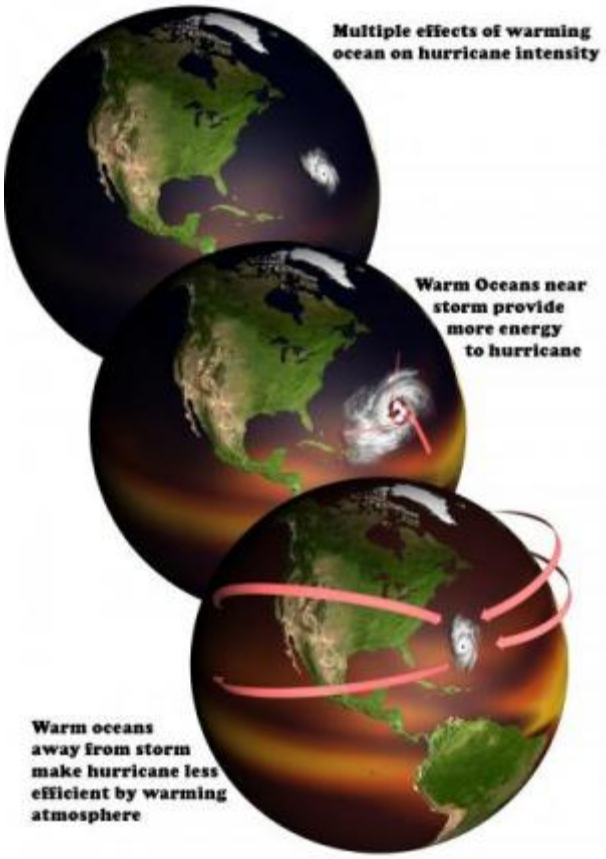
(1) These investigations were conducted jointly with Institute of Molecular Biology and Biotechnology, University Mayor San Andrés, La Paz (UMSA - Bolivia), the Institute of Research on the Peruvian Amazon (IIAP - Peru) and the Laboratoire Génome, Populations, Interactions, Adaptation (GPIA) in Montpellier.

(2) Herbivore piranhas also exist. In 2003, IRD scientists described new impressively sized species caught in French Guiana. (See scientific bulletin n° 168)

Adapted from materials provided by Institut de Recherche Pour le Développement.

http://www.sciencedaily.com/releases/2007/12/071203131505.htm

Natural Climate Changes Can Intensify Hurricanes More Efficiently Than Global Warming



The multiple effects of warming oceans on hurricane intensity. (Credit: NOAA, GFDL)

ScienceDaily (Dec. 13, 2007) — Natural climate variations, which tend to involve localized changes in sea surface temperature, may have a larger effect on hurricane activity than the more uniform patterns of global warming, a report in Nature suggests.

In the debate over the effect of global warming on hurricanes, it is generally assumed that warmer oceans provide a more favorable environment for hurricane development and intensification. However, several other factors, such as atmospheric temperature and moisture, also come into play.

Drs. Gabriel A. Vecchi of the NOAA Geophysical Fluid Dynamics Laboratory and Brian J. Soden from the University of Miami Rosenstiel School of Marine & Atmospheric Science analyzed climate model projections and observational reconstructions to explore the relationship between changes in sea surface temperature and tropical cyclone 'potential intensity' - a measure that provides an upper limit on cyclone intensity.

They found that warmer oceans do not alone produce a more favorable environment for storms because the effect of remote warming can counter, and sometimes overwhelm, the effect of local surface warming. "Warming near the storm acts to increase the potential intensity of hurricanes, whereas warming away from the storms acts to decrease their potential intensity," Vecchi said.

Their study found that long-term changes in potential intensity are more closely related to the regional pattern of warming than to local ocean temperature change. Regions that warm more than the tropical average are characterized by increased potential intensity, and vice versa. "A surprising result is that the current potential intensity for Atlantic hurricanes is about average, despite the record high

temperatures of the Atlantic Ocean over the past decade." Soden said. "This is due to the compensating warmth in other ocean basins."

"As we try to understand the future changes in hurricane intensity, we must look beyond changes in Atlantic Ocean temperature. If the Atlantic warms more slowly than the rest of the tropical oceans, we would expect a decrease in the upper limit on hurricane intensity," Vecchi added. "This is an interesting piece of the puzzle."

"While these results challenge some current notions regarding the link between climate change and hurricane activity, they do not contradict the widespread scientific consensus on the reality of global warming," Soden noted.

The journal article is entitled "Effect of Remote Sea Surface Temperature Change on Tropical Cyclone Potential Intensity."

Adapted from materials provided by University of Miami Rosenstiel School of Marine & Atmospheric Science.

http://www.sciencedaily.com/releases/2007/12/071212201954.htm

Semen Ingredient 'Drastically' Enhances HIV Infection

ScienceDaily (Dec. 14, 2007) — A plentiful ingredient found in human semen drastically enhances the ability of the human immunodeficiency virus (HIV) to cause infection, according to a report in the December 14, 2007, issue of the journal Cell. The findings help to understand the sexual transmission of HIV and suggest a potential new target for preventing the spread of AIDS, the researchers said.

Collaborating research groups in Hannover and Ulm, Germany, show that naturally occurring fragments of so-called prostatic acidic phosphatase (PAP) isolated from human semen form tiny fibers known as amyloid fibrils. Those fibrils capture HIV particles and help them to penetrate target cells, thereby enhancing the infection rate by up to several orders of magnitude.

"We were not expecting to find an enhancer, and were even more surprised about the strength," said Frank Kirchhoff of the University Clinic of Ulm, noting that they were initially looking for factors in semen that might help to block HIV infection. "Most enhancers have maybe a two- or three-fold effect, but here the effect was amazing--more than 50-fold and, under certain conditions, more than 100,000-fold. At first, I didn't believe it, but we ran the experiment over and over, always with the same result."

"The fibrils act like a ferry," said Wolf-Georg Forssmann of VIRO PharmaCeuticals GmbH & Co. KG and Hannover Medical School. "They pick the viruses up and then bring them to the cell."

HIV-1, the causative agent of AIDS, has infected about 60 million people and caused over 20 million deaths, the researchers said. More than 90 percent of those HIV-1 infections are acquired through sexual intercourse. Globally, most infections result from genital exposure to the semen of HIV-positive men, earlier studies showed. Women who acquired HIV-1 through vaginal intercourse constitute almost 60 percent of new infections in Africa. Yet the factors influencing the infectiousness of HIV in semen are poorly understood.

To identify natural agents that might play a role in sexual transmission of HIV/AIDS in the new study, the researchers sifted through a complex peptide/protein library derived from human seminal fluid in search of novel inhibitors and/or enhancers of HIV infection.

That comprehensive search turned up PAP fragments as a potent enhancer of HIV infection. They then verified that synthetic PAP fragments also enhanced HIV, confirming it as the active ingredient. Interestingly, they found that individual PAP fragments are inactive but efficiently form amyloid fibrils, which they call Semen-derived Enhancer of Virus Infection or SEVI, that enhance HIV-1 infection by capturing virions and promoting their physical interaction and fusion with target cells.

The enhancing activity of SEVI is most pronounced when the levels of infectious virus are low, resembling the conditions of sexual HIV-1 transmission, they reported. Physiological concentrations of SEVI amplified HIV infection of immune cells known as T cells and macrophages, most likely the cell types first targeted by HIV-1. SEVI lowered the amount of virus required to infect tissue taken from human tonsils and significantly enhanced the viral infection of transgenic rats with human receptors for HIV-1 infection.

The researchers said they will continue to explore SEVI's role in HIV transmission. While the peptide that conglomerates into fibrils is always present in large quantities in semen, they don't yet know if the absolute levels vary from man to man. "We also plan to further explore how exactly the fibrils allow the virus to enter cells and to search for compounds, with our technology, that might block the process," Forssmann said.

If such inhibitors can be found, they might be added to microbicide gels now under development for HIV prevention, added Kirchhoff. There could also be other ways to take advantage of the fibrils. "The high potency of SEVI in promoting viral infection together with its relatively low cytotoxicity suggests

that it may not only play a relevant role in sexual HIV transmission, but could also help to improve vaccine approaches and gene delivery by lentiviral vectors," the researchers said.

The researchers include Jan Munch, Institute of Virology, University Clinic of Ulm, Ulm, Germany; Elke Rucker, Institute of Virology, University Clinic of Ulm, Ulm, Germany; Ludger Standker, IPF PharmaCeuticals GmbH, Hannover, Germany, Hannover Medical School, Center of Pharmacology, Hannover, Germany; Knut Adermann, IPF PharmaCeuticals GmbH, Hannover, Germany, Hannover Medical School, Center of Pharmacology, Hannover, Germany, VIRO Pharmaceuticals GmbH & Co. KG, Hannover, Germany; Christine Goffinet, Department of Virology, University of Heidelberg, Heidelberg, Germany; Michael Schindler, Institute of Virology, University Clinic of Ulm, Ulm, Germany; Steffen Wildum, Institute of Virology, University Clinic of Ulm, Ulm, Germany; Raghavan Chinnadurai, Institute of Virology, University Clinic of Ulm, Ulm, Germany; Devi Rajan, Institute of Virology, University Clinic of Ulm, Ulm, Germany; Anke Specht, Institute of Virology, University Clinic of Ulm, Ulm, Germany; Guillermo Gime´ nez-Gallego, Centro de Investigaciones Biolo´ gicas (CIB/CSIC), Madrid, Spain;

Pedro Cuevas Sa´ nchez, Hospital Ramo´ n y Cajal, Madrid, Spain; Douglas M. Fowler, Department of Chemistry and the Skaggs Institute of Chemical Biology, The Scripps Research Institute, La Jolla, CA, USA; Atanas Koulov, Department of Chemistry and the Skaggs Institute of Chemical Biology, The Scripps Research Institute, La Jolla, CA, USA; Jeffery W. Kelly, Department of Chemistry and the Skaggs Institute of Chemical Biology, The Scripps Research Institute, La Jolla, CA, USA; Walther Mothes, Section of Microbial Pathogenesis, Yale University School of Medicine, New Haven, CT, USA; Jean-Charles Grivel, National Institute of Child Health and Human Development, Bethesda, MD, USA; Leonid Margolis, National Institute of Child Health and Human Development, Bethesda, MD, USA; Oliver T. Keppler, Department of Virology, University of Heidelberg, Heidelberg, Germany; Wolf-Georg Forssmann, IPF PharmaCeuticals GmbH, Hannover, Germany, Hannover Medical School, Center of Pharmacology, Hannover, Germany; and Frank Kirchhoff, Institute of Virology, University Clinic of Ulm, Ulm, Germany.

Adapted from materials provided by Cell Press.

http://www.sciencedaily.com/releases/2007/12/071213121014.htm

Mom's Personality Means Survival For Her Squirrel Pups

Researchers have found that red squirrels have a range of personalities, from exploratory and aggressive to careful and passive. (Credit: iStockphoto/Richard Thornton)

ScienceDaily (Dec. 14, 2007) — A recent study indicates that mother squirrels have personalities, and they are essential for the growth rate and survival of her pups.

Researchers at the Kluane Red Squirrel Project found that red squirrels have a range of personalities, from exploratory and aggressive to careful and passive. Both kinds of squirrels persist in the population because neither personality type offers an exclusive advantage for survival.

The project is a collaborative research effort of the University of Alberta, Michigan State University and McGill University. The team described personalities of red squirrel mothers and the effect personality has on the fitness of their pups.

“We used to think of behavior as being unbelievably flexible, and that it could adapt based on immediate circumstance to increase fitness,” said Andrew McAdam, an MSU assistant professor of zoology and of fisheries and wildlife and one of the principal investigators in the Kluane Red Squirrel Project. “More recently, researchers have been finding that organisms are actually more consistent in their behavior. They may not be as flexible as we thought,” he said.

Giving a squirrel a personality test requires an open mind, the proper tools and patience. McAdam said that measuring a squirrel’s reaction to one situation could predict how it will behave in other circumstances.

To measure personality, squirrels were placed inside a large open box with holes in the floor, a mirror and a video camera. The way the squirrel explored the box and its reaction to seeing itself in the mirror also was measured. Because they don’t recognize their reflection, they think their reflection is an intruder. These tests were used to determine the activity level and aggressiveness of the squirrels.

In addition, researchers found squirrels that were active explorers were more likely to attack their reflection.

"Consistent behavior under different circumstances is personality," McAdam said. "We recognize personality in people, dogs and cats – some are more aggressive and some are shy. Maybe it shouldn't be so surprising that we see this in wild organisms as well."

In years with abundant food, McAdam said, more active squirrels use their extra energy to their advantage and the pups grow faster. When food is sparse, their high-energy lifestyle is costly and the offspring of passive squirrel mothers have the advantage.

"There is a range of personalities in squirrels because the personality that is better for fitness depends on the year," McAdam said.

Mother squirrel personalities also affected pup survival rates. Pups from aggressive mothers had lower survival rates when they were in their mother's nest, but it wasn't clear if it was a result of maternal style or other environmental effects. Once they left the nest, they had better survival rates through the first winter. McAdam said it's likely that this is because they are better at competing for territories than other pups.

The work was published this fall in Ecology Letters. The project is funded through grants from the National Science Foundation and the Natural Sciences and Engineering Research Council of Canada.

Other authors on the paper include Adrienne Boon and Stan Boutin of the University of Alberta and Denis Réale of Université du Quebec à Montreal.

Adapted from materials provided by Michigan State University.

http://www.sciencedaily.com/releases/2007/12/071203204150.htm

Blind Humans Lacking Rods And Cones Retain Normal Responses To Non-visual Effects Of Light

ScienceDaily (Dec. 14, 2007) — In addition to allowing us to see, the mammalian eye also detects light for a number of "non-visual" phenomena. A prime example of this is the timing of the sleep/wake cycle, which is synchronized by the effects of light on the circadian pacemaker in the hypothalamus.

Researchers have identified two totally blind humans whose non-visual responses to light remain intact, suggesting that visual and non-visual responses to light are functionally distinct. Indeed, this separation was suggested by earlier studies in mice that demonstrated that circadian rhythms and other non-visual responses remain sensitive to light in the absence of rods and cones, the two photoreceptor types that are responsible for vision.

It turns out that mammals have an additional light-sensitive photoreceptor in the retinal ganglion cell layer (pRGCs) that is directly sensitive to light and is primarily responsible for mediating these responses. These cells are most sensitive to short-wavelength light with a peak sensitivity at ~480 nm, in the visible blue light range. While these studies and others in sighted subjects suggested that this non-rod, non-cone photoreceptor might play an important role in human photoreception, this had yet to demonstrated unequivocally until now.

To address whether the cells identified in rodents and primates also exist in humans, Zaidi and colleagues first had to find patients who lacked functional rods and cones, but retained pRGCs--a formidable task, given that fewer than 5% of totally blind people are thought to retain this response.

This group of researchers was able to identify two such rare patients, allowing them to perform a series of complementary experiments to address whether non-visual responses are possible in the absence of rods and cones and to determine the most effective wavelength, or color, of light that induced a response. In the first patient, the effect of light on melatonin secretion was examined. Melatonin is a hormone produced at night that influences arousal and is secreted in a cyclic fashion. Just like sighted individuals, the blind patient exhibited acute suppression of melatonin in response to light and was most sensitive to blue-light exposure.

Furthermore, blue light also shifted the timing of the circadian pacemaker and improved alertness, as measured by subjective scales, auditory reaction time, and changes in brain activity. While a few rods and/or cones may remain, Zaidi and colleagues have strong evidence to show that they contribute little, if at all, to these effects. Thus the authors were able to show that the effects were maximal in response to wavelengths of light that the retinal ganglion cells respond best to, and not the wavelength that the visual system detects best.

In the second patient, a different a set of tests was administered to assess the effects of light. First, the pupil-constriction response to various wavelengths and intensities of light was examined. Consistent with the major role of the pRGCs in mediating this response, pupillary contriction was stimulated most by blue light (~480 nm), the wavelength that pRGCs are most stimulated by.

Given that the non-visual responses to light appeared to be intact in this patient, the researchers were prompted to ask whether some minimal awareness of light might still be retained despite the inability to detect any response to light by conventional measures and the patient's inability to see light. Remarkably, the patient was able to tell that the blue light, but not any other color, was switched on, demonstrating that the pRGCs also contribute to our ability to "see" light.

These results have a number of important implications for human vision and vision-related diseases. First, they suggest humans possess light-sensitive cells, apart from rods and cones, that are important for non-visual light responses such as the entrainment of circadian rhythms and elevating arousal and brain activity. Second, this information may change how injuries to the eye are treated.

For example, surgeons might want to think twice about removing a damaged eye that still possesses functioning pRGCs, given the important physiological role that these cells play in maintaining normally timed sleep. We will now need to begin to think about these additional functions of the human eye, and consider not just vision, but also how light affects sleep, alertness, performance, and human health. The remarkable discovery of a novel photoreceptor in the mammalian eye has shed new light on an organ that has been studied for thousands of years.

This study was published online on December 13th in Current Biology.

The researchers include Farhan H. Zaidi, Division of Neuroscience and Mental Health Faculty of Medicine, Imperial College London, London, UK; Joseph T. Hull, Division of Sleep Medicine, Brigham and Women's Hospital, Boston, MA, USA; Stuart N. Peirson, Nuffield Laboratory of Ophthalmology, University of Oxford, Wellcome Trust Centre for Human Genetics, Oxford, UK; Katharina Wulff, Nuffield Laboratory of Ophthalmology, University of Oxford, Wellcome Trust Centre for Human Genetics, Oxford, UK; Daniel Aeschbach, Division of Sleep Medicine, Brigham and Women's Hospital, Boston, MA, USA, and Division of Sleep Medicine, Harvard Medical School, Boston, MA, USA; Joshua J. Gooley, Division of Sleep Medicine, Brigham and Women's Hospital, Boston, MA, USA, and Division of Sleep Medicine, Harvard Medical School, Boston, MA, USA; George C. Brainard, Department of Neurology, Thomas Jefferson University, Philadelphia, PA, USA; Kevin Gregory-Evans, Division of Neuroscience and Mental Health Faculty of Medicine, Imperial College London, London, UK; Joseph F. Rizzo III, Department of Ophthalmology, Massachusetts Eye and Ear Infirmary, Harvard Medical School, Boston, MA, USA; Charles A. Czeisler, Division of Sleep Medicine, Brigham and Women's Hospital, Boston, MA, USA, Division of Sleep Medicine, Harvard Medical School, Boston, MA, USA; Russell G. Foster, Nuffield Laboratory of Ophthalmology, University of Oxford, Wellcome Trust Centre for Human Genetics, Oxford, UK; Merrick J. Moseley, Department of Optometry and Visual Science, City University, London, UK; and Steven W. Lockley, Division of Sleep Medicine, Brigham and Women's Hospital, Boston, MA, USA, and Division of Sleep Medicine, Harvard Medical School, Boston, MA, USA.

Adapted from materials provided by Cell Press.

http://www.sciencedaily.com/releases/2007/12/071213120939.htm

Drug Study For Brain Cancer Shows Promising Results

ScienceDaily (Dec. 14, 2007) — A clinical study conducted at Henry Ford Hospital on the use of a drug to extend the survival of patients with the most common and aggressive type of brain cancer, has yielded results that were significantly better than expected.

The randomized Phase II study focused on patients with glioblastoma multiforme (GBM), whose cancer had recurred after first- or second-line therapy. The study revealed that more than a third who were treated with Avastin (bevacizumab) alone, as well as more than half of those treated with Avastin in combination with the chemotherapy drug irinotecan, lived without further progression of the disease for a period of six months. In addition, no new or unexpected adverse effects from the use of Avastin were observed during the study.

"This is very encouraging news," says Tom Mikkelsen, M.D., a neuro-oncologist who is the study's principal investigator at Henry Ford and co-director of the Hermelin Brain Tumor Center. "Historical estimates suggest that only 15 percent of patients with this aggressive type of brain cancer live without their cancer progressing within six months. Although gliomas [fast-growing malignant brain tumors] are nearly always incurable, use of a drug like Avastin may help to buy precious time for patients, as well as to preserve their physical and mental functions longer than was previously possible."

Avastin is a therapeutic antibody designed to inhibit Vascular Endothelial Growth Factor (VEGF), a protein that stimulates development of new blood vessels in a process known as angiogenesis, while maintaining existing tumor vessels. By binding to VEGF, Avastin acts as an anti-angiogenesis agent that chokes off the blood supply to tumors, which in turn inhibits their growth and metastasis.

The national study is sponsored by Genentech and Henry Ford Hospital is one of the large study sites.

"The same process that makes gliomas so deadly may turn out to be exactly the same thing that makes it possible to slow down their progression," Dr. Mikkelsen says. "This is a very significant advance in the battle to control these aggressive tumors because it could lead to treatment options where none existed previously for patients with recurrent disease."

Previously Avastin had been used in combination with chemotherapy as a first-line treatment for metastatic colorectal cancer and lung cancer. Because of its demonstrated success rate with these cancers, Avastin currently is being studied worldwide in more than 300 clinical trials for 20 different tumor types.

"With currently approved therapies, the chances of suppressing GBM are poor at less than 10 percent," says Dr. Mikkelsen. "This type of targeted therapy using Avastin may prove to be the best new hope we have for helping patients with recurrent disease who previously had few options available to them."

According to the American Cancer Society (ACS), the five-year survival rate for patients with GBM is 3 percent, a figure that has not changed in more than 25 years. The ACS estimates there will be 20,500 new cases of brain cancer and 12,740 brain cancer deaths in 2007.

Adapted from materials provided by Henry Ford Health System.

http://www.sciencedaily.com/releases/2007/12/071213120952.htm

Experts Urge Complete Global Access To Iodized Salt; Prevents IQ Loss And Brain Damage In Babies

ScienceDaily (Dec. 13, 2007) — World experts in iodine deficiency today urged renewed international commitment to help prevent loss of IQ due to fetal brain damage by facilitating access to iodized salt for the final 30 percent of world households that don't yet have it -- most of them found in just 20 countries.

At United Nations Headquarters, New York Weds. Dec. 12, the Network for Sustained Elimination of Iodine Deficiency and other issue stakeholders mark a major public health advance achieved in two decades: iodized salt now reaches 70 percent of world households, up from less than 20 percent in the early 1990s. They urge accelerated action to reach 100 percent coverage.

Thanks to successful production and marketing of iodized salt since the early 1990s, an additional 84 million annual births are now protected from the danger of significant brain damage due to iodine deficiency disorders (IDD).

However, experts report progress towards universal iodine coverage has slowed since 2002 and an estimated 1.6 billion people remain at risk of IDD. According to UNICEF, 38 million newborns worldwide remain unprotected and there are still 36 countries where fewer than half of households consume iodized salt.

Says Network Chair Alan Court, Director of the UNICEF Programme Division: "Poverty and associated health, nutrition, and social factors prevent at least 200 million children in developing countries from attaining their development potential. Among these factors the estimated impact of iodine deficiency is considered the largest and affects at least 20-25% of children in developing countries. This overwhelming evidence makes prevention of iodine deficiency a high priority which fosters children's development. The good news is that all of these disorders are easily preventable at very low cost ensuring adequate intake of iodine through the addition of a small amount of iodine to salt."

Fetal brain function damage due to iodine deficiency ranges from loss of up to10 to 15 points of IQ to severe mental retardation. In problem areas, entire school classes score lower on their educational achievement, with fewer students progressing to higher education. And, for a nation, the consequences are lower productivity, lower competitiveness in the global marketplace and higher health care costs.

To avoid suffering IDD, a human requires in a life time a total just one teaspoon of iodine -- this can be added to salt at a cost of about 10 cents worth per year. But it is necessary to ingest micro amounts of iodine on a regular basis. Consumption of iodized salt is the best form of IDD prevention and Universal Salt Iodization (USI) is the goal. The greatest need for micro amounts of iodine is in the mother's womb.

The Network for Sustained Elimination of Iodine Deficiency has assigned top priority in 2005-2010 to supporting the following countries: Afghanistan, Angola, Bangladesh, Bolivia, China, Egypt, Ethiopia, Ghana, Guatemala, Haiti, India, Indonesia, Niger, Pakistan, The Philippines, Russia, Senegal, Sudan, Ukraine, Vietnam.

The Network credits a strongly dedicated partnership, coupled with enlightened public policies, private industry action and civic sector commitment with the rapid progress towards universal iodization of edible salt. Since 1990 more than two billion people have become users of iodized salt, a remarkable feat in dietary behavior change.

Governments have pursued policies that support and sustain salt iodization and monitored progress. The salt industry and vendors produce and sell adequately iodized salt at a fair price in cities and

villages. Civil society groups -- including Kiwanis International -- assist with public education about the dangers of iodine deficiency, strengthening public demand for iodized salt.

As a result:

- At least 34 countries have reached the USI goal, with 90% of households consuming iodized salt;
- At least 60 countries are well on their way towards the goal, with at least 70% of their households having access to adequately iodized salt; and
- The number of countries which face iodine deficiency as a public health problem has reduced from 110 countries in 1993 to 47 currently.

Efforts to date have involved nearly US $400 million in funds raised in large part by Kiwanis International and through contributions of the governments of Canada, the Netherlands, Australia and the US, as well as The Bill and Melinda Gates Foundation. In addition, an estimated investment of US $2 billion has been made by the salt industry.

"There is no other activity that has drawn together the productive sector of society, the government sector, civic society and the general public in a manner that iodine deficiency elimination has done," says Dr. Gerard Burrow, Chair of The International Council for Control of Iodine Deficiency Disorders (ICCIDD) and Dean Emeritus of the Yale University School of Medicine, noting that salt iodization represents the first large-scale fortification of a commodity to address a public health problem.

Households yet to be reached include the world's most marginalized -- typically poor, rural and in greatest need of IDD protection. Experts predict that the remaining distance from today to USI will be the hardest to cover. Needed is customization of the strategies successfully deployed to date in order to reach the unprotected population left, coupled with political commitment, education and awareness, and improved monitoring.

Where salt iodization has yet to occur, the main challenges include:

- Absent political commitment;
- Salt iodization legislation has not been enacted or does not extend to iodization of salt licks for animals or processed food;
- Legislation is not backed by effective enforcement and monitoring;
- Though salt iodization is a simple process, small scale producers are not supported and organized to ensure that their products are iodized;
- Consumer awareness and demand for iodized salt is lacking.

Meanwhile, the threat of IDD has re-emerged in some countries and regions. According to Alan Court, "We are warned against premature perceptions that the problem is solved where iodization has been successfully introduced."

To sustain the achievement and prevent a retreat in progress experts are calling for strong national coalitions that include officials from government, the salt industry, scientific groups and civil society.

"These coalitions must permanently oversee that high-quality iodized salt is produced and is sold in all markets, that political commitment to ending iodine deficiency is consistently renewed, and that the public remains aware of the dangers of IDD associated with accepting un-iodized salt," says M.G. Venkatesh Mannar, President of the Ottawa-based Micronutrient Initiative, a founding member of the Network.

Adapted from materials provided by Micronutrient Initiative.

http://www.sciencedaily.com/releases/2007/12/071212201453.htm

Why Time Seems to Slow Down in Emergencies

By Charles Q. Choi, Special to LiveScience.com
posted: 11 December 2007 08:01 pm ET

In The Matrix, the hero Neo could dodge bullets because time moved in slow motion for him during battles. Indeed, in the real world, people in danger often feel as if time slowed down for them.

This warping of time apparently does not result from the brain speeding up from adrenaline when in danger. Instead, this feeling seems to be an illusion, scientists now find. To see if danger makes people experience time in slow motion, scientists at Baylor College of Medicine in Houston tried scaring volunteers. However, roller coasters and other frightening amusement park rides did not cause enough fear to make time warp.

Instead, the researchers dropped volunteers from great heights. Scientists had volunteers dive backward with no ropes attached, into a special net that helped break their fall. They reached 70 mph during the roughly three-second, 150-foot drop. "It's the scariest thing I have ever done," said researcher David Eagleman, a neuroscientist at Baylor College of Medicine. "I knew it was perfectly safe, and I also knew that it would be the perfect way to make people feel as though an event took much longer than it actually did."

Indeed, volunteers estimated their own fall lasted about a third longer than dives they saw other volunteers take.

To see if this meant people in danger could actually see and perceive more—like a video camera in slow motion can—Eagleman and his colleagues developed a device called a "perceptual chronometer" that was strapped onto volunteers' wrists. This watch-like device flickered numbers on its screen. The scientists could adjust the speed at which numbers appeared until they were too fast to see.

If the brain sped up when in danger, the researchers theorized numbers on the perceptual chronometers would appear slow enough to read while volunteers fell. Instead, the scientists found that volunteers could not read the numbers at faster-than-normal speeds.

"We discovered that people are not like Neo in The Matrix, dodging bullets in slow-mo," Eagleman said.

Memory trick

Instead, such time warping seems to be a trick played by one's memory. When a person is scared, a brain area called the amygdala becomes more active, laying down an extra set of memories that go along with those normally taken care of by other parts of the brain.

"In this way, frightening events are associated with richer and denser memories," Eagleman explained. "And the more memory you have of an event, the longer you believe it took."

Eagleman added this illusion "is related to the phenomenon that time seems to speed up as you grow older. When you're a child, you lay down rich memories for all your experiences; when you're older, you've seen it all before and lay down fewer memories. Therefore, when a child looks back at the end of a summer, it seems to have lasted forever; adults think it zoomed by."

This work could help better understand disorders linked with timing, such as schizophrenia. Still, in the end, "it's really about understanding the virtual reality machinery that we're trapped in," Eagleman told LiveScience. "Our brain constructs this reality for us that, if we look closely, we can find all these strange illusions in. The fact that we're now seeing this with how we perceive time is new."

Eagleman and his colleagues detailed their findings online Dec. 11 in the journal *PLoS ONE*.

http://www.livescience.com/health/071211-time-slow.html

The Polarization of Extremes

By CASS R. SUNSTEIN

In 1995 the technology specialist Nicholas Negroponte predicted the emergence of "the Daily Me" — a newspaper that you design person-ally, with each component carefully screened and chosen in advance. For many of us, Negroponte's prediction is coming true. As a result of the Internet, personalization is everywhere. If you want to read essays arguing that climate change is a fraud and a hoax, or that the American economy is about to collapse, the technology is available to allow you to do exactly that. If you are bored and upset by the topic of genocide, or by recent events in Iraq or Pakistan, you can avoid those subjects entirely. With just a few clicks, you can find dozens of Web sites that show you are quite right to like what you already like and think what you already think.

Actually you don't even need to create a Daily Me. With the Internet, it is increasingly easy for others to create one for you. If people know a little bit about you, they can discover, and tell you, what "people like you" tend to like — and they can create a Daily Me, just for you, in a matter of seconds. If your reading habits suggest that you believe that climate change is a fraud, the process of "collaborative filtering" can be used to find a lot of other material that you are inclined to like. Every year filtering and niche marketing become more sophisticated and refined. Studies show that on Amazon, many purchasers can be divided into "red-state camps" and "blue-state camps," and those who are in one or another camp receive suitable recommendations, ensuring that people will have plenty of materials that cater to, and support, their predilections.

Of course self-sorting is nothing new. Long before the Internet, newspapers and magazines could often be defined in political terms, and many people would flock to those offering congenial points of view. But there is a big difference between a daily newspaper and a Daily Me, and the difference lies in a dramatic increase in the power to fence in and to fence out. Even if they have some kind of political identification, general-interest newspapers and magazines include materials that would not be included in any particular Daily Me; they expose people to topics and points of view that they do not choose in advance. But as a result of the Internet, we live increasingly in an era of enclaves and niches — much of it voluntary, much of it produced by those who think they know, and often do know, what we're likely to like. This raises some obvious questions. If people are sorted into enclaves and niches, what will happen to their views? What are the eventual effects on democracy?

To answer these questions, let us put the Internet to one side for a moment and explore an experiment conducted in Colorado in 2005, designed to cast light on the consequences of self-sorting. About 60 Americans were brought together and assembled into a number of groups, each consisting of five or six people. Members of each group were asked to deliberate on three of the most controversial issues of the day: Should states allow same-sex couples to enter into civil unions? Should employers engage in affirmative action by giving a preference to members of traditionally disadvantaged groups? Should the United States sign an international treaty to combat global warming?

As the experiment was designed, the groups consisted of "liberal" and "conservative" enclaves — the former from Boulder, the latter from Colorado Springs. It is widely known that Boulder tends to be liberal, and Colorado Springs tends to be conservative. Participants were screened to ensure that they generally conformed to those stereotypes. People were asked to state their opinions anonymously both before and after 15 minutes of group discussion. What was the effect of that discussion?

In almost every case, people held more-extreme positions after they spoke with like-minded others. Discussion made civil unions more popular among liberals and less popular among conservatives. Liberals favored an international treaty to control global warming before discussion; they favored it far more strongly after discussion. Conservatives were neutral on that treaty before discussion, but they strongly opposed it after discussion. Liberals, mildly favorable toward affirmative action before discussion, became strongly favorable toward affirmative action after discussion. Firmly negative

about affirmative action before discussion, conservatives became fiercely negative about affirmative action after discussion.

The creation of enclaves of like-minded people had a second effect: It made both liberal groups and conservative groups significantly more homogeneous — and thus squelched diversity. Before people started to talk, many groups displayed a fair amount of internal disagreement on the three issues. The disagreements were greatly reduced as a result of a mere 15-minute discussion. In their anonymous statements, group members showed far more consensus after discussion than before. The discussion greatly widened the rift between liberals and conservatives on all three issues.

The Internet makes it exceedingly easy for people to replicate the Colorado experiment online, whether or not that is what they are trying to do. Those who think that affirmative action is a good idea can, and often do, read reams of material that support their view; they can, and often do, exclude any and all material that argues the other way. Those who dislike carbon taxes can find plenty of arguments to that effect. Many liberals jump from one liberal blog to another, and many conservatives restrict their reading to points of view that they find congenial. In short, those who want to find support for what they already think, and to insulate themselves from disturbing topics and contrary points of view, can do that far more easily than they can if they skim through a decent newspaper or weekly newsmagazine.

A key consequence of this kind of self-sorting is what we might call enclave extremism. When people end up in enclaves of like-minded people, they usually move toward a more extreme point in the direction to which the group's members were originally inclined. Enclave extremism is a special case of the broader phenomenon of group polarization, which extends well beyond politics and occurs as groups adopt a more extreme version of whatever view is antecedently favored by their members.

Why do enclaves, on the Internet and elsewhere, produce political polarization? The first explanation emphasizes the role of information. Suppose that people who tend to oppose nuclear power are exposed to the views of those who agree with them. It stands to reason that such people will find a disproportionately large number of arguments against nuclear power — and a disproportionately small number of arguments in favor of nuclear power. If people are paying attention to one another, the exchange of information should move people further in opposition to nuclear power. This very process was specifically observed in the Colorado experiment, and in our increasingly enclaved world, it is happening every minute of every day.

The second explanation, involving social comparison, begins with the reasonable suggestion that people want to be perceived favorably by other group members. Once they hear what others believe, they often adjust their positions in the direction of the dominant position. Suppose, for example, that people in an Internet discussion group tend to be sharply opposed to the idea of civil unions for same-sex couples, and that they also want to seem to be sharply opposed to such unions. If they are speaking with people who are also sharply opposed to these things, they are likely to shift in the direction of even sharper opposition as a result of learning what others think.

The final explanation is the most subtle, and probably the most important. The starting point here is that on many issues, most of us are really not sure what we think. Our lack of certainty inclines us toward the middle. Outside of enclaves, moderation is the usual path. Now imagine that people find themselves in enclaves in which they exclusively hear from others who think as they do. As a result, their confidence typically grows, and they become more extreme in their beliefs. Corroboration, in short, reduces tentativeness, and an increase in confidence produces extremism. Enclave extremism is particularly likely to occur on the Internet because people can so easily find niches of like-minded types — and discover that their own tentative view is shared by others.

It would be foolish to say, from the mere fact of extreme movements, that people have moved in the wrong direction. After all, the more extreme tendency might be better rather than worse. Increased extremism, fed by discussions among like-minded people, has helped fuel many movements of great value — including, for example, the civil-rights movement, the antislavery movement, the antigenocide movement, the attack on communism in Eastern Europe, and the movement for gender

equality. A special advantage of Internet enclaves is that they promote the development of positions that would otherwise be invisible, silenced, or squelched in general debate. Even if enclave extremism is at work — perhaps *because* enclave extremism is at work — discussions among like-minded people can provide a wide range of social benefits, not least because they greatly enrich the social "argument pool." The Internet can be extremely valuable here.

But there is also a serious danger, which is that people will move to positions that lack merit but are predictable consequences of the particular circumstances of their self-sorting. And it is impossible to say whether those who sort themselves into enclaves of like-minded people will move in a direction that is desirable for society at large, or even for the members of each enclave. It is easy to think of examples to the contrary — the rise of Nazism, terrorism, and cults of various sorts. There is a general risk that those who flock together, on the Internet or elsewhere, will end up both confident and wrong, simply because they have not been sufficiently exposed to counterarguments. They may even think of their fellow citizens as opponents or adversaries in some kind of "war."

The Internet makes it easy for people to create separate communities and niches, and in a free society, much can be said on behalf of both. They can make life a lot more fun; they can reduce loneliness and spur creativity. They can even promote democratic self-government, because enclaves are indispensable for incubating new ideas and perspectives that can strengthen public debate. But it is important to understand that countless editions of the Daily Me can also produce serious problems of mutual suspicion, unjustified rage, and social fragmentation — and that these problems will result from the reliable logic of social interactions.

Cass R. Sunstein, a professor of law and political science at the University of Chicago, is author of Republic 2.0, *published in October by Princeton University Press.*

http://chronicle.com
Section: The Chronicle Review
Volume 54, Issue 16, Page B9

http://chronicle.com/temp/reprint.php?id=w218t7yc6kv2lhqvrq4450bllm36hgjc

Cooler, Faster, Cheaper: Researchers Advance Process To Manufacture Silicon Chips

Prototype of the semiconductor processing equipment may lead to commercial manufacturing tools for developing future generations of silicon chips. (Credit: Image courtesy of Clemson University)

ScienceDaily (Dec. 11, 2007) — The next generation of laptops, desk computers, cell phones and other semiconductor devices may get faster and more cost-effective with research from Clemson University.

"We've developed a new process and equipment that will lead to a significant reduction in heat generated by silicon chips or microprocessors while speeding up the rate at which information is sent," says Rajendra Singh, D. Houser Banks Professor and director for the Center for Silicon Nanoelectronics at Clemson University.

The heart of many high-tech devices is the microprocessor that performs the logic functions. These devices produce heat depending on the speed at which the microprocessor operates. Higher speed microprocessors generate more heat than lower speed ones. Presently, dual-core or quad-core microprocessors are packaged as a single product in laptops so that heat is reduced without compromising overall speed of the computing system. The problem, according to Singh, is that writing software for these multicore processors, along with making them profitable, remains a challenge.

"Our new process and equipment improve the performance of the materials produced, resulting in less power lost through leakage. Based on our work, microprocessors can operate faster and cooler. In the future it will be possible to use a smaller number of microprocessors in a single chip since we've increased the speed of the individual microprocessors. At the same time, we've reduced power loss six-fold to a level never seen before. Heat loss and, therefore, lost power has been a major obstacle in the past," said Singh.

The researchers say the patented technique has the potential to improve the performance and lower the cost of next-generation computer chips and a number of semiconductor devices, which include green energy conversion devices such as solar cells.

"The potential of this new process and equipment is the low cost of manufacturing, along with better performance, reliability and yield," Singh said. "The semiconductor industry is currently debating whether to change from smaller (300 mm wafer) manufacturing tools to larger ones that provide more chips (450 mm). Cost is the barrier to change right now. This invention potentially will enable a reduction of many processing steps and will result in a reduction in overall costs."

Participants in the research included Aarthi Venkateshan, Kelvin F. Poole, James Harriss, Herman Senter, Robert Teague of Clemson and J. Narayan of North Carolina State University at Raleigh. Results were published in Electronics Letters, Oct. 11, 2007, Volume: 43, Issue: 21, pages: 1130-1131. The work reported here is covered by a broad-base patent of Singh and Poole issued to Clemson University in 2003.

Adapted from materials provided by Clemson University.

http://www.sciencedaily.com/releases/2007/12/071203111304.htm

New 3-D Real-time Heart 'Mapping' Technology Improves Precision And Patient Safety

ScienceDaily (Dec. 13, 2007) — Specialists at Loyola University Health System are the first in the nation to use new ultrasound technology to guide ablation of atrial fibrillation (AF), offering potential improvements in both the precision and safety of this therapy. AF is the most common type of heart rhythm disorder.In treating AF with catheter ablation, cardiac electrophysiologists traditionally use standard X-ray technology to guide proper placement of radiofrequency energy to ablate the tissues (cause small areas of scarring) in the heart responsible for starting and maintaining the irregular rhythm. These physicians also generate a computer reconstruction of the heart's interior, often with the help of pictures obtained from CT or MRI scans done prior to the procedure. While helpful, these reconstructions can be time consuming, difficult to produce, and expose patients to additional radiation.

With the newly installed software imaging technology, the CartoSound™ Image Integration Module and SoundStar™ 3D Catheter, Loyola physicians now are able to visualize and create a whole new kind of "map" of the heart in order to perform atrial ablation. They use ultrasound imaging to produce pictures of the heart during the ablation procedure. The ultrasound technique produces three-dimensional images of the heart's anatomy within a few minutes at the bedside, and allows real-time, simultaneous monitoring of catheter position and orientation during the procedure, improving both precision and patient safety.Dr. David Wilber, professor of cardiovascular sciences, Loyola University Stritch School of Medicine, said he and his team have used the new technology with 20 patients with "excellent results.

While the previous method provided three-dimensional images of the heart, they often lacked sufficient detail. Incorporating CT pictures images from a scan obtained several days earlier provided more detail, but it was difficult to accurately register the older picture to the precise orientation of the heart during the procedure. "The new 3-D ultrasound images provide a very detailed view of the heart, and most importantly, they reflect the condition of the heart during the procedure. Since the image is generated by the same computer program that tracks the location of the catheter, the points of interest match very closely," Dr Wilber explained. "This allows very accurate placement of lesions (the 'scarring') to assure elimination of the arrhythmia, while avoiding injury to important nearby structures, such as the pulmonary veins or the esophagus. We can now image these structures with unprecedented accuracy continuously during the procedure."

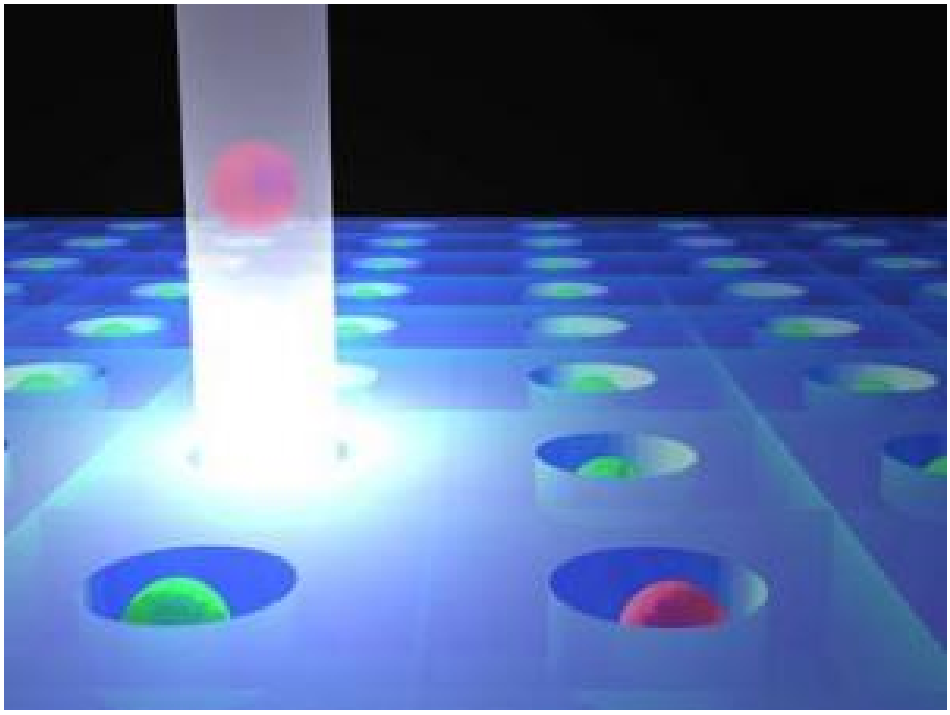
"Patients experience shorter X-ray times, and physicians can create more precise 'heart maps' for the ablation," Dr. Wilber noted. He added that "the technology also allows us to map both the right and left sides of the heart from the right atrium (right upper heart chamber) before we must move into the left side to complete the actual ablation ('scarring') procedure." Dr. Wilber explained that with less time spent in the left side of the heart, the patient has a decreased risk of having a blood clot form during the procedure that could lead to a stroke. Overall procedure time is decreased by more than 30 minutes, Dr. Wilber added, and the need for additional imaging procedures prior to ablation may be completely eliminated. "This is real breakthrough in making these procedures safer, more precise and less taxing on the patient. We are extremely excited about being able to bring these benefits to patients here at Loyola," he said.AF is the most common irregular heart rhythm disorder in the U.S., affecting about 2.2 million Americans. Approximately 160,000 new cases are diagnosed in the U.S. alone each year.

AF may be related to coronary artery disease, thyroid disease, high blood pressure, or other structural heart defects, but often has no detectable cause. If left untreated, AF can cause structural heart changes that diminish heart function. It can also increase the risk of stroke, congestive heart failure and other heart disease. Approximately 50,000 ablation procedures for atrial fibrillation are performed annually in patients who do not respond to medical therapy.

Adapted from materials provided by Loyola University Health System.

http://www.sciencedaily.com/releases/2007/12/071208172537.htm

Laser Beam 'Fire Hose' Used To Sort Cells; Could Enable New Kinds Of Biological Research



MIT has developed a new system for sorting cells that involves special "traps" in a silicone layer bonded to a microscope slide. Cells with specific properties are then levitated out of their traps using the pressure of a beam of targeted light from a low-cost laser. A flowing fluid then sweeps the selected cells off to a separate reservoir. (Credit: Joseph Kovac, MIT)

ScienceDaily (Dec. 17, 2007) — Separating particular kinds of cells from a sample could become faster, cheaper and easier thanks to a new system developed by MIT researchers that involves pushing up the cells with a laser beam "fire hose."

The system, which can sort up to 10,000 cells on a conventional glass microscope slide, could enable a variety of biological research projects that might not have been feasible before, its inventors say. It could also find applications in clinical testing and diagnosis, genetic screening and cloning research, all of which require the selection of cells with particular characteristics for further testing.

Joel Voldman, an associate professor in MIT's Department of Electrical Engineering and Computer Science, and Joseph Kovac, a graduate student in the department, developed the new system, which is featured as the cover story in the Dec. 15 issue of the journal Analytical Chemistry.

Present methods allow cells to be sorted based on whether or not they emit fluorescent light when mixed with a marker that responds to a particular protein or other compound. The new system allows more precise sorting, separating out cells based not just on the overall average fluorescent response of the whole cell but on responses that occur in specific parts of the cell, such as the nucleus. The system can also pick up responses that vary in how fast they begin or how long they last.

"We've been interested in looking at things inside the cell that either change over time, or are in specific places," Voldman said. Separating out cells with such characteristics "can't be done with traditional cell sorting."

For example, if cells differ in how quickly they respond to a particular compound used in the fluorescent labeling, the new system would make it possible to "select out the ones that are faster or

slower, and see what's different," said Voldman, who also has appointments in MIT's Research Laboratory of Electronics and the Microsystems Technology Laboratories.

"It seems like that should be easy, but it isn't," he said. There are other ways of accomplishing the same kind of cell separation, but they require complex and expensive equipment, or are limited in the number of cells they can process.

The new system uses a simple transparent silicone layer bonded to a conventional glass microscope slide. Fabricated in the layer are a series of tiny cavities, or traps, in which cells settle out after being added to the slide in a solution. Up to 10,000 cells could be sorted on a single slide.

Looking through the microscope, either a technician or a computerized system can check each cell to determine whether it has fluorescence in the right area or at the right time to meet the selection criteria. If so, its position is noted by the computer. At the end of the selection process, all of the cells whose positions were recorded are then levitated out of their traps using the pressure of a beam of targeted light from a low-cost laser. A flowing fluid then sweeps the selected cells off to a separate reservoir.

The laser levitation of the cells acts like "a fire hose pushing up a beach ball," Voldman said. But the laser method is gentle enough that the living cells remain viable after the process is complete, allowing further biological testing.

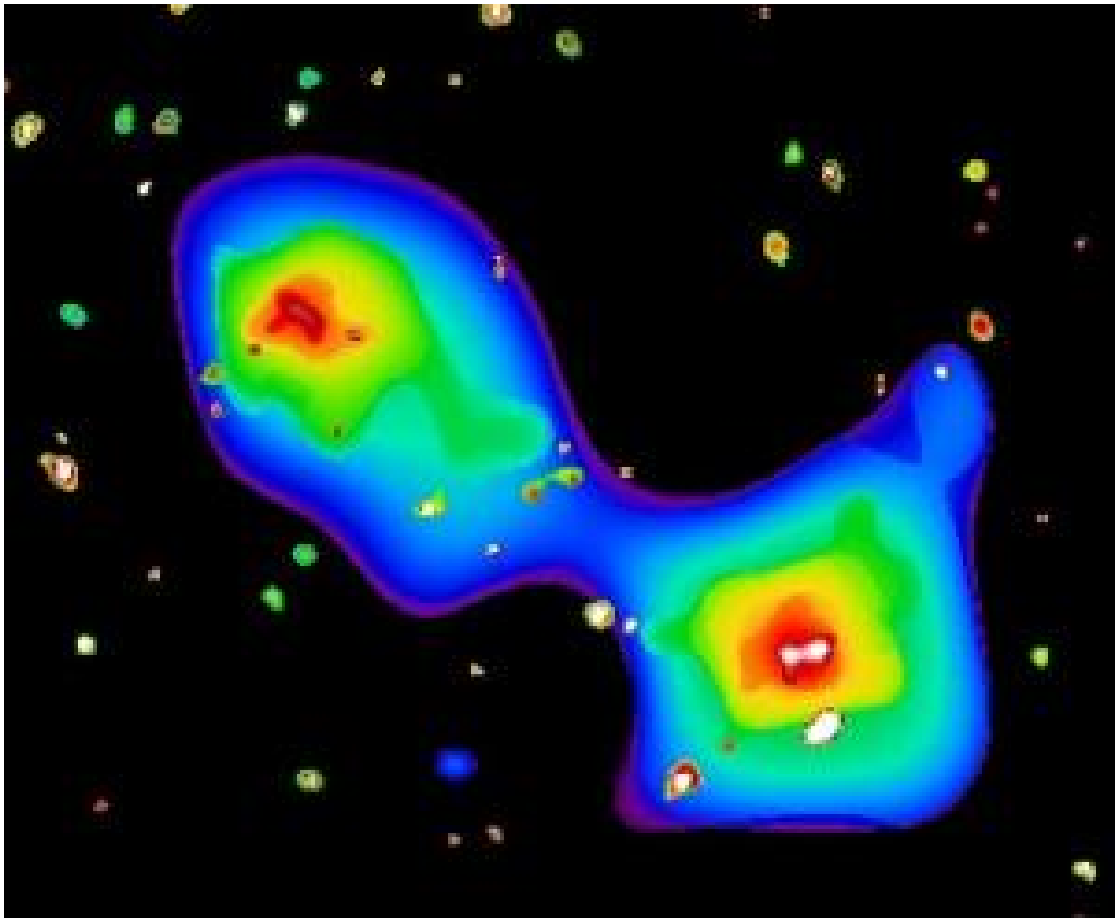
Voldman and Kovac are continuing to refine the system, working on making it easier to use and on improving its ability to keep samples sterile. Voldman said that unlike expensive separation techniques such as optical tweezers, the new system could cost only a few thousand dollars. As a result, it could be employed in a variety of biological research laboratories or clinical settings, not just in big, centralized testing facilities.

The research was funded by the National Institutes of Health and the Singapore-MIT Alliance; Kovac is supported by an ASEE National Defense Science and Engineering Graduate Fellowship.

Adapted from materials provided by Massachusetts Institute of Technology.

http://www.sciencedaily.com/releases/2007/12/071210163008.htm

Hidden Cosmic Giant: New Cluster Of Galaxies Discovered



X-ray image of the area around the cluster Abell 3128 made by XMM Newton. The bright spot on the left is hot gas in the recently discovered distant cluster, the spot on the right is hot gas in the cluster Abell 3128. (Credit: Werner et al. 2007)

ScienceDaily (Dec. 17, 2007) — Astronomers of SRON have discovered a new cluster of galaxies, hidden behind a previously identified cluster of galaxies. The recently exposed cosmic giant is apparently just as bright as the first group, but is six times further away. The astronomers made the discovery as part of an international team using the space telescope XMM-Newton.

Being fooled by a cosmic giant is no laughing matter for an astronomer. For years astronomers racked their brains over the relation between two in X-rays equally bright and large regions in the cluster of galaxies known as Abell 3128. 'That is the charm of science', says Norbert Werner, PhD student at SRON. 'You are always finding things that you did not expect.'

Clusters of galaxies are the largest structures in the universe. They consist of tens to hundreds of massive galaxies, of which each in turn consists of hundreds of billions of stars. Gravity is the binding factor. The hot gas of tens of millions degrees Celsius, present in the clusters, emits X-rays, which renders the cluster visible for space telescopes such as XMM-Newton. Detailed analyses of these X-rays tell astronomers more about the composition of the gas and accordingly, its origin.

What was so intriguing about the two X-ray spots in cluster Abell 3128 was the fact that although they had the same size and brightness, the gas clouds seemed to have completely different compositions. Werner: 'While one spot was clearly caused by a hot gas cloud rich in metals released by supernova explosions in the galaxies, the other spot seemed to contain a much lower amount of metals than any

other cluster previously observed. What we observed completely contradicted the current theories about how large structures in the universe arise.'

Image of the area in visible light made by the 6.5 meter Magellan Telescope in Chile. Visible in the centre of this image is the light arc around the very massive galaxy in the centre of the newly found distant cluster. The light arc is caused by the gravity field of the galaxy that works as a lens magnifying an object that lies even much farther away, behind the cluster. (image credits: Werner et al. 2007)

The observations with the XMM-Newton made the surprise complete. The gas cloud behind the puzzling X-ray spot was found to be 4.6 billion light years away, at least six times further than cluster Abell 3128. 'We were therefore looking at two completely different objects, which from our perspective were in exactly the same line of sight', says Norbert Werner.

'The research into this large cluster of galaxies mainly centres on the question as to how the large structures of the universe have been formed', explains project leader Jelle Kaastra. According to current insights, material is spread throughout the universe as a web of thread-like structures of rarefied hot gas: the cosmic web. Between these threads are cavities that are becoming increasingly larger as the universe expands. 'Compare it to bubbles in a bubble bath', says the astronomer. The density of the material is highest at the intersections in the web. Therefore that is where clusters of galaxies develop.

Due to their enormous mass and attractive force, the clusters have their own dynamics. Kaastra: 'They attract each other, collide and fly through each other; a whole host of things happen that we can study with X-ray telescopes such as the XMM-Newton.'

XMM-Newton is the X-ray telescope of the European Space Agency (ESA) for which SRON built an instrument capable of analysing the X-rays in detail. XMM-Newton was launched in 1999 from French Guyana and still functions superbly. ESA recently extended the operation of the satellite for a further 5 years.

The results from the research of Norbert Werner and Jelle Kaastra were recently published in the scientific journal Astronomy & Astrophysics. Reference: Werner, N., Churazov, E., Finoguenov, A., Markevitch, M., Burenin, R., Kaastra, J. S., and Böhringer, H., "Complex X-ray morphology of Abell 3128: a distant cluster behind a disturbed cluster" A&A 474, 707–716 (2007).

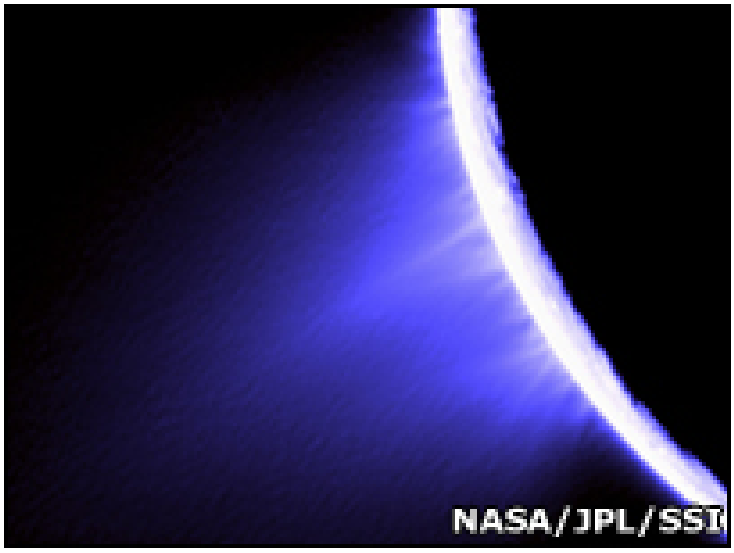
Adapted from materials provided by SRON Netherlands Institute for Space Research.

http://www.sciencedaily.com/releases/2007/12/071216125519.htm

Sodium issue clouds Enceladus

By Molly Bentley
Science reporter, San Francisco

An ocean is not the source of the jets emanating from Saturn's moon Enceladus, a new study concludes.



The research questions the moon's promise as a target in the search for life beyond Earth and has stirred controversy among scientists who dispute its conclusions.

A chemical analysis of Enceladus, led by University of Colorado planetary scientist Nick Schneider, failed to detect sodium, an element scientists say should be in a body of water that has had billions of years of contact with rock.

"If you have a long-lived ocean, it's going to have salt in it," said Dr Schneider, at the American Geophysical Union (AGU) meeting in San Francisco this week, "but that ocean, if it exists on Enceladus, isn't leaking out into space."

Spectral analysis with the Keck Telescope found no sodium in the plumes or in the vapour that's in orbit around the moon.

The source of the plumes is "very, very pure water," Dr Schneider concluded, and proposed clean ice, melt water or clathrates - a crystal of water, carbon dioxide and ammonia - as alternative sources.

Heated debate

The fountains on Enceladus tantalise scientists by suggesting an ocean beneath the moon's icy crust. An ancient sea is the best bet for where life might evolve off Earth, scientists say.

At stake is whether Saturn's moon could support alien life and is a worthy target for a US space agency (Nasa) exploratory mission to detect it. Such a mission to Enceladus is one of four currently under review for further development.

> **If you took salt from a salt-shaker and threw it into the air, the telescope wouldn't see any sodium, even though half the salt is sodium**
> Torrence Johnson, Cassini Imaging Team

Dr Schneider didn't rule out the possibility of an ocean on Enceladus, only that it is the source of the spraying water.

Critics of the study accept his observations, but disagree with his conclusion; and it has led to some robust exchanges here at the AGU meeting this past week.

"There is tremendous dispute about his interpretation of the results," said Carolyn Porco, the Imaging Team leader on the Cassini spacecraft.

He may not have detected sodium, she said, but it did not follow that the plumes were not connected to an ocean.

The absence of detectable sodium might mean only that; it's not detectible, said Dr Porco. It could be in a solid form that eludes detection by this method, she said.

Salty secrets

Dr Schneider used the Keck Telescope to look for a glow from sodium atoms, the same colour found in sodium streetlights. He failed to detect it in the plume or in the ring of particles that encircle Saturn at Enceladus' orbit.

ENCELADUS ORBITER CONCEPT
To look at biological potential, composition and structure
Instruments to image and sample surface and jets
Lander to provide unique close-up view of surface processes
Probable cost about $3bn; 2018 launch on biggest Delta rocket

Yet sodium is quite abundant in the Solar System, said Torrence Johnson, Cassini Imaging Team member at Nasa's Jet Propulsion Laboratory.

"It's a very surprising result not to find sodium at all," he explained. "So the question is: can you hide the sodium?"

One way to hide sodium is to put it in a salt crystal that becomes the nucleus of a water particle. If a sodium atom were tied up in a solid form, the Keck Telescope would not detect it. It only detects liberated sodium atoms, he said.

"If you took salt from a salt-shaker and threw it into the air, the telescope wouldn't see any sodium, even though half the salt is sodium," added Dr Johnson.

Dr Schneider said that the molecules would release sodium as they made their way into the particles that encircle Saturn.

Near fly-by

Scientists have detected sodium around Jupiter's moons Io and Europa. Volcanoes produce Io's sodium and their heat liberates it. Scientists believe Jupiter's energetic radiation belt kicks the sodium out of minerals that entrap it on Europa.

But Saturn is cooler in temperature and its radiation levels may also be too weak to free sodium.

At any rate, said Dr Johnson, the sodium-free test results do not rule out the existence of an ocean on the moon or an ocean as the source of the plumes.

The Cassini spacecraft is scheduled to fly close to the jets in March of next year. It will analyse the water further, but is not able to test for sodium.

Nonetheless, the discovery of water spewing from cracks - dubbed "tiger stripes" -on Enceladus in 2006, has promoted the moon into an elite club of outer Solar System bodies that are considered high priority for future Nasa missions.

Design competition

The possibility that the plumes tap directly into a lunar ocean is the impetus behind a flagship mission that would explore Enceladus further.

A spacecraft that flew through the spray might be designed to sample the water directly and run tests to detect the presence of alien microbes.

The mission is much more difficult - and expensive - if the data is not obtainable at altitude and a lander has to be put on the icy surface to reach it.

The Enceladus flagship mission is one of four - along with those to Europa, Titan and Jupiter - competing for funding and currently under review by Nasa.

Dr Johnson says Dr Schneider's study might influence how inclined people are to send a spacecraft to Enceladus and fly through the plumes.

"If Nick is right," he said, "all they'd see is pure water."

Nasa is scheduled to select which flagship missions will advance at the end of December.

The concept that eventually emerges in the process will launch no earlier than 2015 and is likely to include sizeable input from the Europeans.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/1/hi/sci/tech/7145530.stm

Published: 2007/12/16 17:21:18 GMT

Google debuts knowledge project
Google has kicked off a project to create an authoritative store of information about any and every topic.

The search giant has already started inviting people to write about the subject on which they are known to be an expert.

Google said it would not act as editor for the project but will provide the tools and infrastructure for the pages.

Many experts see the initiative as an attack on the widely used Wikipedia communal encyclopaedia.

'**Knol**'

Writing about the project on the official Google blog, Udi Manber, one of the heads of engineering at the search firm, said it was all about sharing useful knowledge.

By indexing the web, Google strives to make information more easily accessible. However, wrote Mr Manber, not all the information on the web was "well organised to make it easily discoverable".

By getting respected authors to write about their specialism Google hopes to start putting some of that information in better order.

The system will centre around authored articles created with a tool Google has dubbed "knol" - the word denotes a unit of knowledge - that will make webpages with a distinctive livery to identify them as authoritative.

Mr Manber wrote: "A knol on a particular topic is meant to be the first thing someone who searches for this topic for the first time will want to read."

The knol pages will get search rankings to reflect their usefulness. Knols will also come with tools that readers can use to rate the information, add comments, suggest edits or additional content.

Revenue from any adverts on a knol page will be shared with its author.

Industry commentator Nicholas Carr said the knol project was a "head-on competitor" with Wikipedia. He said it was an attempt by Google to knock ad-free Wikipedia entries on similar subjects down the rankings.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/7144970.stm

Published: 2007/12/15 08:09:25 GMT

Hi-tech tools divide social sites
Social network sites are moving to make it much easier for software developers to write add-ons for the hugely popular web destinations.

Bebo, Facebook, Meebo and Friendster have unveiled plans to help them become more than places to keep in touch.

The add-ons will allow users to add extras, such as video and music clips, to the personal profiles they maintain.

The alliances behind the technologies also reveal the fierce competition between social sites for users.

Tough choices

In one of the broader announcements Bebo unveiled its Open Application platform which will produce a set of common interfaces that developers can use to create programs and applications that will work with the social network site.

At the launch Bebo unveiled partnerships with more than 40 developers, including NBC Universal, Flixster and Gap. A sample application produced using the tools allows Beboers to create an interactive avatar that models Gap clothes.

Significantly, Bebo's interface tools will work with Facebook's already announced development system. This will make it possible for the many developers who have written applications for Facebook to use their code almost unchanged for the Bebo network.

Despite the tie-up on tools, Bebo and Facebook will not become a unified network.

SOCIAL SITES: DAILY VISITORS
MySpace - 29 million
Facebook - 15 million
Friendster - 5.9 million
Orkut - 9.6 million
Bebo - 4.8 million
Source: ComScore July 2007

Bebo said it would also support Google's Open Social initiative which aims to create a unified system of tools that can be used on any and every social network site. The Open Social tools are due to appear in early 2008.

Social networking giant MySpace is backing Google's initiative.

In a further boost for Facebook instant messaging network Meebo announced its support for the tool set. Meebo said it had no plans to support Google's initiative.

At the same time Friendster announced that its development tools would be "open" so they can work on as many networks as possible. It has declared its support for Google's Open Social initiative.

Finally, Facebook has announced plans to license its development system to other sites. Since it was announced in May 2007 more than 7,000 applications have been written for Facebook.

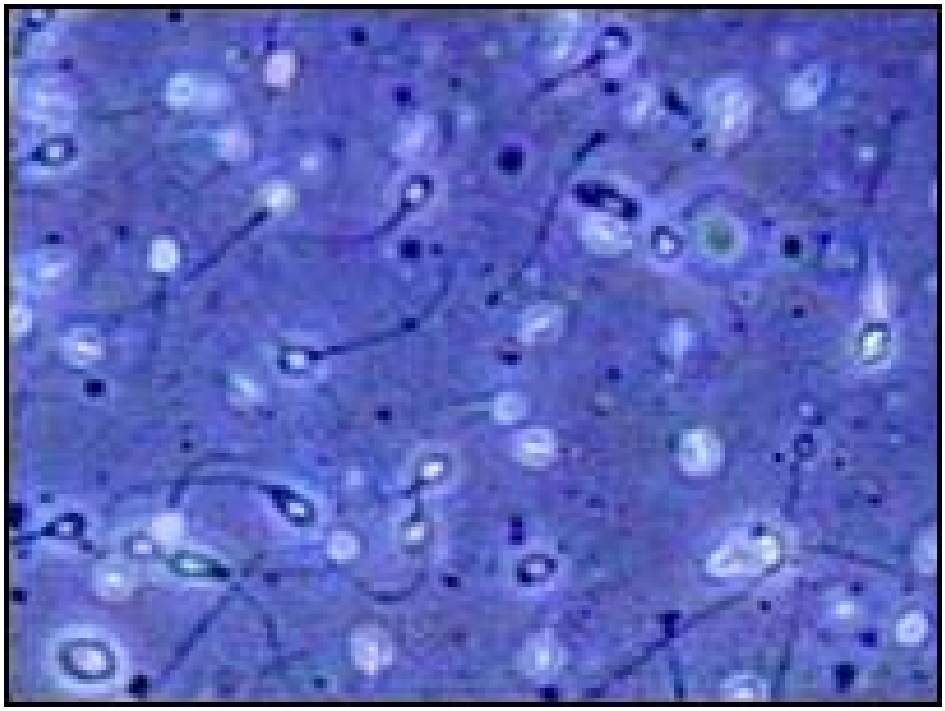
This series of announcements shows how keenly contested this sector of the hi-tech market has become.

The deals and technological tie-ups are all about building up as large an audience as possible in a bid to dominate the sector.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/7144143.stm

Published: 2007/12/14 12:46:05 GMT

Sperm clue to 'disease immunity'
Sperm could provide a vital clue to how diseases like cancer and HIV spread through the body, a study suggests.



UK researchers have identified markers on the surface of human sperm which prevent them being attacked by the female immune system.

The markers are also found on cancer cells and HIV-infected blood cells and may help the diseases to take hold.

The study, by researchers at Imperial College London, is published in the Journal of Biological Chemistry.

Experts say little is known about how sperm dodge immune system barriers but there are likely to be many mechanisms.

> **If aggressive cancers and pathogens are using the same system of universally-recognisable markers to trick the immune system into thinking they're harmless, we need to work out exactly how this interaction works**
> Professor Anne Dell
> Study leader

The female reproductive tract is a "hostile environment" for foreign cells which are readily attacked by the immune system but sperm move through apparently undetected.

Sperm are also protected from harm in the testes from the male's own immune system.

Sugar molecules

The Imperial College team says it has found specific sugar molecules on the surface of sperm which seem to be responsible for evading the immune response.

These glycoproteins are universally recognised by all human immune systems, regardless of the individual, say the researchers.

This differs from other cells which carry chemical markers recognised by the individual's own immune system, but may come under attack if placed in a foreign body - for example in the case of organ transplant.

The glycoproteins found on sperm are also present on some types of cancer cell, some bacterial cells, parasitic worms and HIV-infected white blood cells.

The researchers are now planning to look at how exactly the glycoproteins trick the immune system into believing they are harmless.

Dr Stuart Haslam, a lecturer in molecular biosciences, said in the case of sperm, it is in the human's benefit not to recognise it as dangerous.

"But it looks like some cancers and HIV-infected cells have hijacked this lack of recognition."

His colleague Professor Anne Dell added: "If aggressive cancers and pathogens are using the same system of universally-recognisable markers to trick the immune system into thinking they're harmless, we need to work out exactly how this interaction works.

"Understanding how these markers work at a basic biological and chemical level could lead to new ways to treat or prevent cancers and other diseases."

Professor Richard Sharpe, from the Medical Research Council Human Reproductive Sciences Unit, said the research was extremely interesting.

"The whole process of immunity in the male reproductive system is something that is quite puzzling."

He explained that when sperm cells begin to develop they are "locked away" in the testes so the immune system does not have access to them and destroy them.

"This study is suggesting there are other ways in which sperm can evade the immune system.

"In terms of fertility, women are exposed to these foreign bodies constantly but very few develop antibodies."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/7143889.stm

Published: 2007/12/17 00:01:39 GMT

The beauty of maths
A POINT OF VIEW
By Lisa Jardine

The story of an Indian clerk with an extraordinary talent for mathematics should inspire young people to see the beauty that lies in numbers.

I have been thinking recently about the way in which stories we are told when we are young shape our adult lives.

I am reading with great enjoyment a new novel entitled The Indian Clerk, by David Leavitt, based on the life of the early twentieth-century Indian mathematician Srinivasa Ramanujan.

I picked it up because I have such intense memories of my father telling me Ramanujan's story, at about the time I started secondary school, shortly after I had won a scholarship to a famous girls' school on the strength of my own mathematical promise. I even had a black-and-white photograph of Ramanujan, looking sultry and faintly like Elvis Presley, on the table at home at which I did my homework.

A humble clerk at the Port Trust in Madras, Ramanujan first came to the attention of European mathematicians in 1913, when he wrote a ten-page letter to the Cambridge mathematician and fellow of Trinity College, GH Hardy, which contained over 100 statements of theorems on infinite series and number theory.

Number theory is a fascinating field of mathematics. It consists of the study of the properties of whole numbers or integers. Among these, primes or prime numbers hold a special charm for number theorists, because of their peculiar power among the naturally occurring numbers.

A prime number is a number divisible only by itself and the number one (which is itself a prime, but for reasons I won't go into here is usually omitted from the list). The primes under 20 are two, three, five, seven, 11, 13, 17, and 19.

After that, primes occur increasingly far apart, sporadically and apparently unpredictably. For centuries, a great deal of mathematical effort has been expended on trying - unsuccessfully - to predict some patterned way in which large primes occur.

Let me try to give you something of the flavour of the way in which prime numbers seem intriguing to someone with a passion for numbers in general.

Genius

Take the number two. Two is the smallest prime number. It is also the unique prime which is even, because all even numbers are divisible by two and any number apart from two which is divisible by two is not a prime, by definition.

So mathematicians refer to two, the only "even" prime, as the "oddest" prime.

Hardy was immediately intrigued by the extraordinary nature and complexity of the mathematics in Ramanujan's letter. But he was torn between believing that his correspondent was a crank, and wanting to recognise him as a natural mathematical genius.

Having worked through some of the material in the letter with his fellow-mathematician and collaborator JE Littlewood, however, both men became convinced of Ramanujan's unusual ability and, after some initial difficulties, Hardy contrived to get him to Cambridge.

As a child, I found the whole story of the brilliant, self-taught Indian clerk who solved some of the most difficult problems in number theory and died so young, extremely romantic

There followed an extremely productive five-year collaboration between Ramanujan and Hardy. The two perfectly complemented one another's abilities: Hardy was a great exponent of rigour in analysis, while Ramanujan arrived at his results by what Hardy described as "a process of mingled argument, intuition, and induction, of which he was entirely unable to give any coherent account".

Through his work in Cambridge, Ramanujan achieved the recognition he had sought when he first approached Hardy, and in 1918 he was elected a Fellow of the Royal Society (the first Indian to be so honoured).

The British climate, however, took its toll on his health. In 1917 he collapsed with a mysterious stomach complaint and was rushed into hospital, where doctors feared for his life. By late 1918 his health had slightly improved and in 1919 he returned to India. But his health failed again, and he died the following year at the age of 32.

As a child, I found the whole story of the brilliant, self-taught Indian clerk who solved some of the most difficult problems in number theory and died so young, extremely romantic. But it was one specific anecdote about Ramanujan that particularly captivated me.

Ramanujan was recovering from his first bout of serious illness in a nursing home in Putney and Hardy had gone there by taxi to visit him.

Terror

Hardy (never much of a conversationalist) greeted the sick man abruptly with the words: "The number of the taxi-cab that brought me here was 1729. It seemed to me rather a dull number."

To which Ramanujan replied without hesitation: "Not at all, Hardy! It is a very interesting number. It is the smallest number expressible as the sum of two cubes in two different ways."

1729 can indeed be represented as $1^3 + 12^3$ and as $9^3 + 10^3$, and is the lowest integer for which such a combination is possible.

What intrigued me about the story was that someone could have such a familiarity with the integers that he would spontaneously recognise an attribute of an apparently "dull" or unprepossessing number as being susceptible of expression in a (for a mathematician) attractively patterned way.

"Every positive integer is one of Ramanujan's personal friends" was how Hardy's friend Littlewood described it.

Caring deeply about numbers and their properties may in part at least be something that runs in families. At the age of four, my eldest son used to wake in terror from a recurrent nightmare. He was on a wide sandy beach at low tide.

"I had to count the grains of sand," he would tell me, tearfully, "and I knew that I just wouldn't be able to do it."

Even at that age, numbers mattered to him intensely enough for him to dream about them. But just as in some families, fear of spiders is passed on to the children who witness their parents' alarm at an arachnid in the bath tub, so terror of mathematics can be passed on from generation to generation.

The role of good maths teachers in schools to encourage pupils in this area, is particularly important, to overcome openly-displayed anxiety on the part of parents about dealing with maths homework.

Alarming

Last Monday the Royal Society published a "state of the nation" report on the UK's science and mathematics teaching workforce.

The report concluded that there is a crisis in the provision of qualified specialist maths and science teachers in our schools, of which the government is largely unaware.

This shortage is particularly alarming, the report goes on, because "the skills, knowledge and understanding that come from learning and enjoying science and mathematics at school and college prepare young people for jobs in a demanding workplace and life in the modern world".

I watch my adult friends back away from a simple arithmetical calculation

The shortage of well-qualified and committed teachers in maths has, I suggest, a particularly unfortunate effect in girls' schools, where it amplifies an existing inclination among many girls to insist that they simply do not like doing maths.

A London inner-city girls secondary school of which I am a governor recently received a dazzling Ofsted report for its achievement across the board. The only area in which there was even a hint of criticism was in maths teaching at key stage four.

When a small group of us discussed the inspection report in detail with the head teacher, she was quick to explain that the problem was a rapid turnover in teachers and serious difficulty in recruiting well-qualified maths teachers at all.

But several people round the table inevitably also mentioned the likelihood that girls simply did not feel comfortable with maths, or even, could not do maths. It was not surprising, was it, if the school had difficulty getting all of them to succeed when it came to numbers and equations?

Thinking back to my own upbringing I feel sure that the problem lies elsewhere. All too often I watch my adult friends back away from a simple arithmetical calculation with the words "I never could do maths".

This is not an excuse they would dream of making publicly with regard to reading.

Perhaps, just as we try so hard to instil a love of great writers in successive generations, we should be looking for more stories like that of Ramanujan, to inspire all our young people with a lasting love for the beauty of numbers.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/uk_news/magazine/7144874.stm

Published: 2007/12/14 17:12:10 GMT

Ladies of the French Resistance

By Emma-Jane Kirby
BBC News, Paris and London

Through the steamed-up windows of a black cab, beaded with heavy raindrops, a white-haired old lady peers out on to London.

Impatiently, she wipes the glass with her sleeve and shakes her head, perplexed.

"I don't recognise anything," she mutters and sits back on her seat, indignant at having been deceived by the slipperiness of memory.

Tereska Torres is a French writer who worked with General de Gaulle's Free French forces in London during World War II.

I have joined her on a nostalgic visit to the settings of her 1951 novel, Women's Barracks, which broke taboos by telling of unmarried mothers and lesbian affairs.

We drive on in silence. And then, quite suddenly, she lurches forward and shouts to the driver, "Here! Turn here for Hill Street!"

I knew she would remember.

It may be almost 70 years since she first arrived at this Mayfair address but her recollection of the years she spent as a soldier in Charles de Gaulle's Free French forces is still acute.

As I had listened to her telling me stories back in her Paris atelier, the browning photos of uniformed girls in her scrapbooks had ceased to be still images and instead had seemed to dance with the sounds and smells of life in the Gallic Women's Barracks.

She told tales of camaraderie, of women from all walks of life thrown together in an alien country, tales of lonely Christmases singing French carols and desperately trying not to think of home.

There were apocalyptic accounts too of watching London burn, of courage in the Blitz and proud memories of moments on the number nine bus when a Londoner would notice her French uniform and lean over to say: "Vive La France!"

Despite the incessant rain, Tereska is anxious to get out of the taxi.

Armed with an umbrella and laughing that it rained here incessantly throughout the war, she stands on tiptoe and squints through the windows of the big house which was once her old barracks, beaming.

Capitulation shame

I think back to my favourite photograph of her in her frayed albums.

It was snapped on the day she first reported to Hill Street, a pretty young girl caught in mid-step, kit bag slung over her shoulder and cheekily smiling sideways at the camera, her eyes sparkling with an infectious excitement.

I had asked her then what possessed a cosseted, convent-educated 19-year-old to leave everything she knew to come to Britain.

She had spoken bitterly of the shame she had felt when the Vichy government capitulated to the Nazis in July 1940.

The minute she had heard that a French general was continuing the Resistance in London, she had packed her case immediately and begun the long journey through Spain and Portugal to Liverpool.

It was, she told me, the obvious thing to do.

Royal encounter

Every place we pass is now triggering vivid memories.

As we drive down Pall Mall, she giggles about the day she was riding her bicycle here and two "sweet little girls" wound down the window of their expensive car to get a good look at this strange French woman cycling in central London.

As she waved back, she realised those two sweet children were Princess Elizabeth and Princess Margaret.

In the distance are Westminster and 10 Downing Street, where once she and her fiance Georges (the son of the exiled French prime minister) went to beg the Churchills to put pressure on his father to allow them to marry.

I wonder, when she falls silent, if her mind is being flooded by heavier recollections too.

I ask myself is she is remembering the aching homesickness of exile or the moment when, five months pregnant, she was told her husband Georges had been killed, back in France, and would never come home to her again.

The soldiers' return

In Trafalgar Square we meet Claire, Tereska's great confidante during the war and one of the only other surviving members of the barracks.

In Carlton Gardens, where de Gaulle's headquarters had been, the two old ladies stare at the faded plaque on the wall and stand before his statue.

"Look at us," Tereska laughs. "How strange that we should be here, two old soldiers loyally returned to their posts though their general's long dead and gone."

Later, at lunch in Fortnum and Mason, I see a young French waitress shyly ask Tereska what they are doing here, their table scattered with black and white photographs.

When she is told their history, the waitress immediately thanks them for everything they have done for France.

Leafing through the pictures myself, I ask Tereska whether - when she looks at herself now and when she looks at Claire - she still sees those two youthful French teenagers who all those years ago proudly signed up to join de Gaulle's army.

Tereska carefully takes in Claire's soft wrinkles and white hair and glances at the few liver spots on her own thin hands.

"I remember a girl called Claire and I remember a girl called Tereska," she says slowly.

"But they were two girls from a long time ago. They're no longer us."

I sit on a bar stool and watch the pair of them giggling together in French, conspiratorial, delighting in the absurdity of eating English oysters in a restaurant that 70 years ago had been way beyond the reach of an army pay packet.

As Tereska looks up, I see in a flash - only slightly refracted - the pretty young girl in the browning photograph, kit bag slung over her shoulder, determined to fight for France's freedom.

From Our Own Correspondent was broadcast on Saturday 15 December, 2007 at 1130 GMT on BBC Radio 4. Please check the programme schedules for World Service transmission times.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/programmes/from_our_own_correspondent/7142424.stm

Published: 2007/12/15 12:16:47 GMT

Largest Digital Survey Of The Milky Way Released

This is an image of the centre of the Rosette Nebula, as imaged in Hydrogen alpha emission in the IPHAS survey. The centre of this HII region, where the exciting star cluster (NGC 2244) is located, lies at the middle-bottom of this image (N is to the left, and E down). The longer dimension in this image is approximately 30 arcminutes. (Credit: Nick Wright, University College London, (Image taken using the Isaac Newton Telescope))

ScienceDaily (Dec. 17, 2007) — A collaboration of over 50 astronomers, The IPHAS consortium, led from the UK, with partners in Europe, USA, Australia, has released today (10th December 2007) the first comprehensive optical digital survey of our own Milky Way. Conducted by looking at light emitted by hydrogen ions, using the Isaac Newton Telescope on La Palma, the survey contains stunning red images of nebulae and stars.

To date, the IPHAS survey includes some 200 million unique objects in the newly released catalogue. This immense resource will foster studies that can be at once both comprehensive and subtle, of the stellar demographics of the Milky Way and of its three-dimensional structure.

Professor Janet Drew of the University of Hertfordshire said "Using the distinctive Hydrogen marker we are able to look at some of the least understood stars in the Galaxy -- those at the early and very late stages of their life cycles. These represent less than one in a thousand stars, so the IPHAS data will greatly improve our picture of stellar evolution."

IPHAS is embracing a recent change in the way astronomers share data. As well as being available through traditional web access it is also being published through a Virtual Observatory interface, where it can automatically be cross-referenced with other relevant data catalogues.

Dr Nic Walton of the University of Cambridge said "Using the standard Virtual Observatory interface is a very effective way of exploiting the IPHAS survey data. This is a substantial and significant survey, which aims to eventually contain 7-800 million objects. Access through the AstroGrid Virtual Observatory opens up a full range of analysis options and should allow astronomers to make greater

use of the information. IPHAS is the largest dataset published primarily through Virtual Observatory interfaces to date, and as such heralds the future of survey data mining."

This initial data release is of observations of the Northern Plane of the Milky Way (the star filled section) that cover 1600 sq deg, in two broadband colours, and a narrow band filter sensitive to the emission of Hydrogen in the red part of the spectrum (H-alpha emission). The image resolution is high enough to permit the detection of individual stars exhibiting H-alpha emission, in addition to the diffuse gas that makes up the often-beautiful glowing nebulae that lower spatial resolution surveys have made known to us before.

The IPHAS database is already revealing a wealth of new science. For example, IPHAS team members from the University of Southampton, have led an effort to extract and catalogue the brighter H-alpha emission line stars revealed so far by the survey. This list of nearly 5000 objects is already the longest single list of its kind. The distribution of these special objects, across the northern sky, traces 'hot spots' of recently formed stars in our Galaxy much more convincingly than has been possible hitherto.

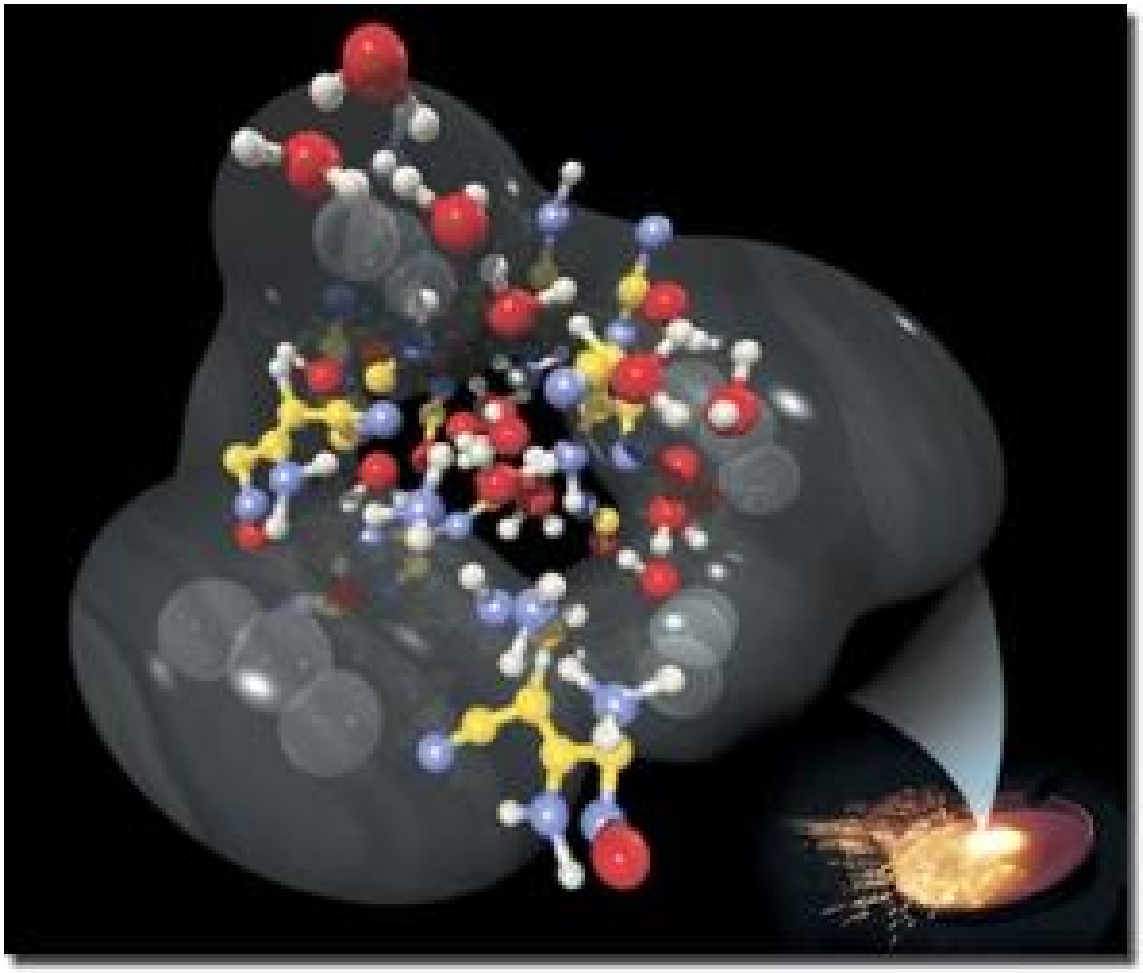
The IPHAS survey will eventually be extended to cover the entire galactic plane of our galaxy, with a coverage approaching 4000 square degrees (for comparison, the moon on the sky as seen from Earth covers ~0.1 square degrees).

The data is described in a paper submitted to the Monthly Notices of the Royal Astronomical Society.

Adapted from materials provided by Science and Technology Facilities Council.

http://www.sciencedaily.com/releases/2007/12/071210112009.htm

Explosives At The Microscopic Scale Produce Shocking Results



Sparks are emitted from rapid chemical reactions in an energetic material. This zoomed microscopic view shows a mixture of reaction intermediates observed during a computer simulation of detonating nitromethane. (Credit: Illustration by Scott Dougherty)

ScienceDaily (Dec. 17, 2007) — U.S. troops blew up enemy bridges with explosives in World War II to slow the advance of supplies or enemy forces.

In modern times, patrollers use explosives at ski resorts to purposely create avalanches so the runs are safer when skiers arrive.

Other than creating the desired effect (a destroyed bridge or avalanche), the users didn't exactly know the microscopic details and extreme states of matter found within a detonating high explosive.

In fact, most scientists don't know what happens either.

But researchers from Lawrence Livermore National Laboratory and the Massachusetts Institute of Technology have created the first quantum molecular dynamics simulation of a shocked explosive near detonation conditions, to reveal what happens at the microscopic scale.

What they found is quite riveting: The explosive, nitromethane, undergoes a chemical decomposition and a transformation into a semi-metallic state for a limited distance behind the detonation front.

Nitromethane is a more energetic high explosive than TNT, although TNT has a higher velocity of detonation and shattering power against hard targets. Nitromethane is oxygen poor, but when mixed with ammonium nitrate can be extremely lethal, such as in the bombing of the Alfred P. Murrah Federal Building in Oklahoma City.

“Despite the extensive production and use of explosives for more than a century, their basic microscopic properties during detonation haven’t been unraveled,” said Evan Reed, the lead author of a paper appearing in the Dec. 9 online edition of the journal, Nature Physics. “We’ve gotten the first glimpse of the properties by performing the first quantum molecular dynamics simulation.”

In 2005 alone, 3.2 billion kilograms of explosives were sold in the United States for a wide range of applications, including mining, demolition and military applications.

Nitromethane is burned as a fuel in drag racing autos, but also can be made to detonate, a special kind of burning in which the material undergoes a much faster and far more violent type of chemical transformation. With its single nitrogen dioxide (NO2) group, it is a simple representative version of explosives with more NO2 groups.

Though it is an optically transparent, electrically insulating material, it undergoes a shocking transformation: It turns into an optically reflecting, nearly metallic state for a short time behind the detonation shock wave front.

But further behind the wave front, the material returns to being optically transparent and electrically insulating.

“This is the first observation of this behavior in a molecular dynamics simulation of a shocked material,” Reed said. “Ultimately, we may be able to create computer simulations of detonation properties of new, yet-to-be synthesized designer explosives.”

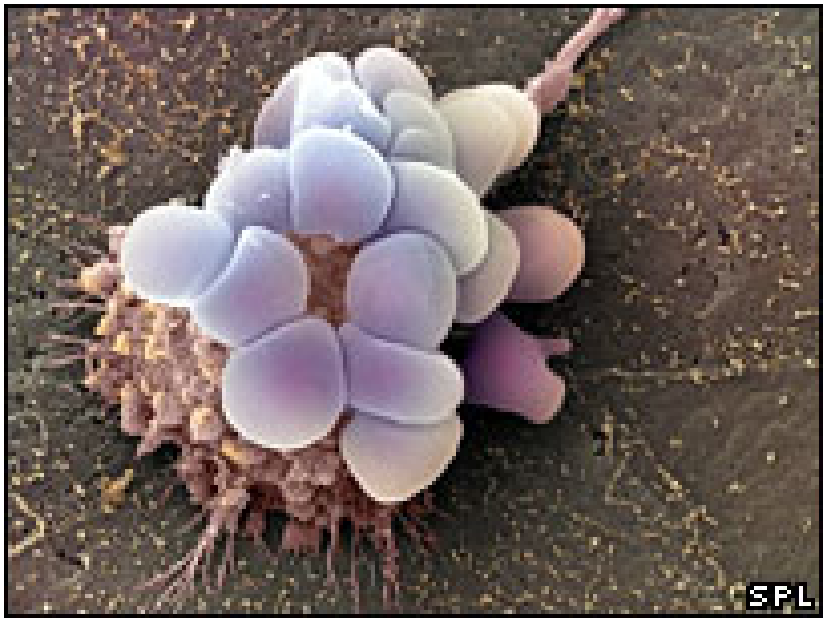
Other Livermore researchers include M. Riad Manaa, Laurence Fried, Kurt Glaesemann and J.D. Joannopoulos of MIT.

The work was funded by the Laboratory Directed Research and Development program.

Adapted from materials provided by DOE/Lawrence Livermore National Laboratory.

http://www.sciencedaily.com/releases/2007/12/071211094952.htm

Key to cancer drug use pinpointed
Scientists have discovered why a treatment for ovarian cancer only works in half of the patients who have it.



Paclitaxel shrinks ovarian tumours - but Cambridge University researchers found that patients lacking a specific type of protein tend to be immune.

Cancer Research UK, who funded the survey along with the Medical Research Council, said it will help ensure drugs are given to those likely to benefit.

There are 7,000 cases of ovarian cancer diagnosed in the UK each year.

Paclitaxel is part of a family of drugs called taxanes - originally derived from yew trees.

The researchers, based at the Cambridge Research Institute, examined ovarian cancer cells and data from 20 patients.

> **We are entering a period of cancer treatment where more drugs are targeted at those people who will benefit the most**
> Professor Herbie Newell
> Cancer Research UK

They found those who did not respond to paclitaxel had lower levels of a protein called TGFBI in their pre-treatment samples.

And further analysis revealed that cancer cell death rate was higher following treatment where levels of TGFBI were high.

Lead researcher Dr James Brenton said: "TGFBI is lost in one third of primary ovarian cancers and it is possible that this protein could be used as a biomarker for selecting patients likely to respond to this class of drug.

"Our findings offer hope not only for improved ovarian cancer treatment, it may also lead to improvements in the success rate of other taxane drugs used to treat lung and breast cancer."

Personalised medicine

Dr Ahmed Ashour Ahmed, who also worked on the study, said: "Our work reveals that some proteins that surround cancer cells such as TGFBI send messages to microtubules, the backbone of the cell, sensitising them to paclitaxel.

"Deciphering the code by which these messages are sent will enable the discovery of new treatments that will simulate the coded messages leading to a significant improvement in paclitaxel response."

Professor Herbie Newell, of Cancer Research UK, said: "We are entering a period of cancer treatment where more drugs are targeted at those people who will benefit the most.

"This personalised medicine approach potentially means treatments will be more effective with fewer side effects.

"This is really important for diseases like ovarian cancer that can be challenging to treat."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/7136632.stm

Published: 2007/12/16 00:45:22 GMT

New target for anti-malaria drugs
Targeting a key protein may help overcome the malaria parasite's increasing resistance to conventional drugs, UK researchers say.

The protein triggers the release of the parasite from red blood cells enabling it to invade neighbouring cells.

Blocking the protein stops the parasite in its tracks and could lead to the development of new anti-malaria drugs, a study in Cell suggests.

Malaria causes around three million deaths worldwide each year.

The team at the National Institute for Medical Research have been working on the protein - an enzyme called PfSUB1 - for a decade but they did not know until now it was involved in helping malaria propagate inside the body.

> **There is widespread resistance to anti-malaria drugs and that's a real issue in many parts of the world**
> Dr Mike Blackman

The Plasmodium falciparum parasite that causes malaria multiplies inside red blood cells until the daughter parasites, known as merozoites, are ready to infect other cells.

Invasion

It was found that merozoites contain a set of previously unrecognised components called exonemes that are packed full of the PfSUB1 enzyme.

The enzyme is able to destroy existing cell structures allowing the parasite to escape the red blood cell and go on to infect other cells.

By scanning thousands of compounds, the researchers found a plant-derived molecule that was able to block the PfSUB1 enzyme preventing the merozoites from escaping.

In some developing countries, malaria is a huge problem, causing millions of deaths, but there is increasing resistance to existing treatments.

Dr Mike Blackman, an expert in parasitology said the research had identified a "druggable" target as the team had shown that it was possible to block the enzyme in question.

"It means there's a real potential for developing treatments.

"There is widespread resistance to anti-malaria drugs and that's a real issue in many parts of the world.

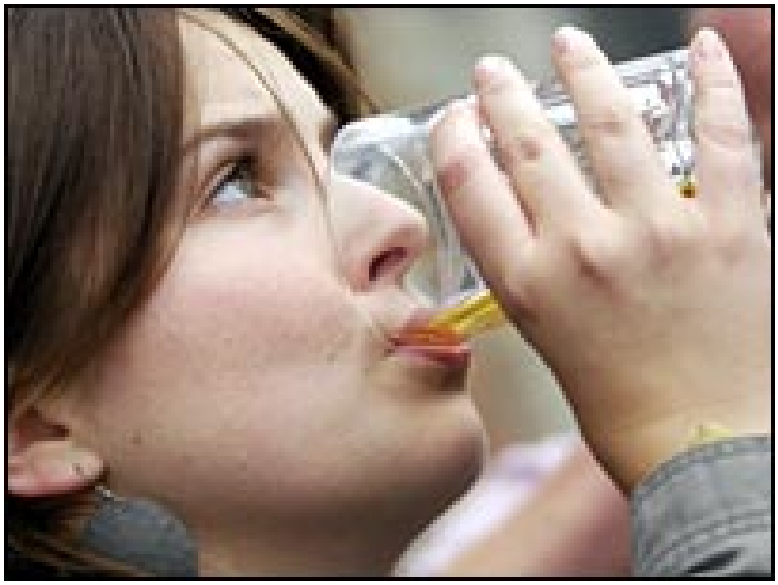
"We need to identify another Achilles heel that works in a novel way. The fact this is quite a different target would allow people to use a combination of drugs."

He added it would be several years before they could develop a treatment but the next step was to identify better inhibitors of the enzyme and to understand more about how the protein works.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/7143917.stm

Published: 2007/12/15 02:47:54 GMT

Stronger drinks put many at risk
Experts are warning that many more people than thought may be putting their health at risk by excessive alcohol consumption.



The Office for National Statistics has revamped its assessment method to take account of bigger glasses, and the increased strength of alcoholic drinks.

As a result average UK consumption for 2005 has been recalculated at 14.3 units a week, up from 10.8 units.

The figures suggest many more women than previously thought may be at risk.

> **Current confusion may mean that large numbers of people are drinking at harmful or hazardous levels and aren't aware that they are putting themselves at risk in the long run**
> Alcohol Concern

This is because they tend to drink wine, the strength of which was particularly under-estimated under the old assessment system.

Using the new system, the average woman is estimated to have drunk 9.4 units a week in 2005 - a 45% increase on the old figure from 6.5 units a week.

For men, the new figure is 19.9 units a week - a 26% increase on the old figure of 15.8 units a week.

Men are advised to drink no more than 21 units a week, and women no more than 14.

The report warns that the strength of wine has increased sharply in recent years, with most table wines now 11.5% to 13.5% alcohol by volume (ABV).

This has been mirrored by many types of lager and beer.

In addition, research suggests the average size of a wine glass used in pubs and bars is now 169ml, compared to the 125ml measure previously used in the calculations.

Old assumptions

When drinking surveys were first carried out in the 1970s it was assumed that a glass of table wine, a single measure of spirits or half a pint of beer equalled one unit of alcohol.

Now the ONS will assume that a glass of wine equals two units, while a large can of strong beer (6.5%) will count as three units. An Alcohol Concern spokesman said the government and the drinks industry had to work harder to improve consumer awareness.

"There's always been big gap between how much people think they drink and how much they actually drink, but with changes in alcoholic strength this has clearly gotten worse.

"Current confusion may mean that large numbers of people are drinking at harmful or hazardous levels and aren't aware that they are putting themselves at risk in the long run."

Dr Vivienne Nathanson, of the British Medical Association, said: "This doesn't come as a surprise. Poor labelling, variations in glass size, and rising alcoholic percentages - especially in wine - all make it hard for people to know how much they're drinking, and to control it."

Public Health Minister Dawn Primarolo said the government was committed to tackling the problem of excessive alcohol consumption.

"The government is planning a major new multi-million pound campaign in the spring to coincide with the introduction of new labelling on all bottles and cans that will show the government's sensible drinking message and the alcohol unit content."

New units for alcoholic drinks

Drink	Volume	Strength	Units
Normal beer/lager/cider			
half pint	284ml	4	1
large can/bottle	440ml	4.50%	2
Strong beer/lager/cider			
half pint	284ml	6.50%	2
large can/bottle	440ml	6.50%	3
Table wine			
small glass	125ml	12.50%	1.5
medium glass	175ml	12.50%	2
large glass	250ml	12.50%	3
bottle	750ml	12.50%	9
Spirits			
single shot	25ml	40.00%	1
bottle	750ml	40.00%	30
Alcopops			
bottle	275ml	5.00%	1.5

Office for National Statistics

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/7144011.stm

Published: 2007/12/14 11:11:45 GMT

Deep Impact Spacecraft Heads For Comet Hartley 2

Artist rendering of Deep Impact spacecraft during flyby of Tempel I. (Credit: Courtesy of NASA Artwork by Pat Rawlings)

ScienceDaily (Dec. 16, 2007) — NASA has given a University of Maryland-led team of scientists the green light to fly the Deep Impact spacecraft to Comet Hartley 2 on a two-part extended mission known as EPOXI. The spacecraft will fly by Earth on New Year's Eve at the beginning of a more than two-and-a-half-year journey to Hartley 2.

The EPOXI mission is actually two new missions in one. During the first six months of the journey to Hartley 2, the Extrasolar Planet Observations and Characterization (EPOCh) mission will use the larger of the two telescopes on the Deep Impact spacecraft to search for Earth-sized planets around five stars selected as likely candidates for such planets. Upon arriving at the comet the Deep Impact eXtended Investigation (DIXI) will conduct an extended flyby of Hartley 2 using all three of the spacecraft's instruments (two telescopes with digital color cameras and an infrared spectrometer).

"It's exciting that we can send the Deep Impact spacecraft on a new mission that combines two totally independent science investigations, both of which can help us better understand how solar systems form and evolve," said Deep Impact leader and University of Maryland astronomer Michael A'Hearn, who is principal investigator (PI) for both the overall EPOXI mission and its DIXI component.

The EPOXI mission brings back the Deep Impact partnership between the University of Maryland, NASA's Jet Propulsion Laboratory (JPL) and Ball Aerospace & Technologies Corporation, and adds NASA's Goddard Space Flight Center.

Daughters of Deep Impact

On July 4th 2005, the University of Maryland-led NASA mission Deep Impact made history and world-wide headlines when it smashed a probe into Comet Tempel. The mission yielded a wealth of new cometary information, but the data on Tempel 1 was in many cases startlingly different from that from comet missions Deep Space 1 and Stardust. As a result, rather than revealing the true nature of

comets, the sometimes conflicting data from these three missions has left scientists questioning most of what they thought they knew about these fascinating, and potentially dangerous, objects; and longing for new data from other comets.

"One of the great surprises of comet explorations has been the wide diversity among the different cometary surfaces imaged to date," said A'Hearn. "We want a close look at Hartley 2 to see if the surprises of Tempel 1 are more common than we thought, or if Tempel 1 really is unusual."

After the completion of Deep Impact, the mission team knew they had a still healthy and flight-proven spacecraft that was capable of traveling to a never-before-visited comet at a fraction of the cost of a newly built and launched mission. In 2006 the A'Hearn-led team began the proposal process that eventually became EPOXI.

Trajectory of a dual mission

When the Deep Impact/EPOXI spacecraft passes by Earth on December 31, 2007, it will use the pull of our planet's gravity to direct and speed itself toward comet Hartley 2. In doing this the spacecraft is aimed toward an encounter with comet Hartley 2 at a time when tracking stations in two different locations on Earth can "see" the spacecraft to receive data from it and send commands to it. In late December 2007, the spacecraft's instruments will be recalibrated using the Moon as a target.

Hartley 2 was not the original destination of the new mission. It was selected in October following the surprising realization that despite tremendous efforts by many observatories and observers, the scientists could not reliably identify their first choice, comet Boethin, and its orbit in time to plan the mission flyby of Earth. The team then recommended to NASA that it be allowed to fly to the backup target, comet Hartley 2.

"Hartley 2 is scientifically just as interesting as comet Boethin since both have relatively small, active nuclei," said A'Hearn. "As we have worked the details of the comet Hartley 2 encounter, we are confident that the observations will turn out to be even better than Boethin."

The journey's EPOCh leg

The first part of the Deep Impact extended mission -- the search for alien worlds -- will begin in late January as the spacecraft cruises toward Hartley 2. More than 200 alien (extrasolar) planets have been discovered to date. Most of these are detected indirectly, by the gravitational pull they exert on their parent star. Directly observing extrasolar planets by detecting the light reflected from them is very difficult, because a star's brilliance obscures light coming from any planets orbiting it.

However, sometimes the orbit of an extrasolar world is aligned so that it eclipses its star as seen from Earth. In these rare cases, light from that planet can be seen directly.

"When the planet appears next to its star, your telescope captures their combined light. When the planet passes behind its star, your telescope only sees light from the star. By subtracting light from just the star from the combined light, you are left with light from the planet," said Goddard scientist Drake Deming, who heads EPOCh and is deputy principal investigator for EPOXI. "We can analyze this light to discover what the atmospheres of these planets are like."

Planets as small as three Earth masses can be detected in this way. EPOCh will also observe the Earth in visible and infrared wavelengths to allow comparisons with future discoveries of Earth-like planets around other stars.

The mission will observe five nearby stars with "transiting extrasolar planets," so named because the planet transits, or passes in front of, its star. The planets were discovered earlier and are giant planets with massive atmospheres, like Jupiter in our solar system. They orbit their stars much closer than

Earth does the sun, so they are hot and belong to the class of extrasolar planets nicknamed "Hot Jupiters."

However, these giant planets may not be alone. If there are other worlds around these stars, they might also transit the star and be discovered by the spacecraft. Even if they don't transit, Deep Impact could find them indirectly. Their gravity will pull on the transit planets, altering their orbits and the timing of their transits.

"Since Deep Impact will be able to stare at these stars for long periods, we can observe multiple transits and compare the timing to see if there are any hidden worlds," said Deming.

Are we there yet?

In June of 2008, the extended mission will end its EPOCh portion and transition to a long, quiet journey to comet Hartley 2. The total trip -- measured from its December 31, 2007 flyby of Earth to its closest encounter with the comet on October 11, 2010 -- will be roughly 1.6 billion miles or some 18 times the distance from the Earth to the sun. It will take the spacecraft three trips around the sun before it can intercept the comet, which at that time will be at a distance of some 12.4 million miles from Earth.

At the nearest point of its flyby of Hartley 2, the spacecraft will be some 550 miles from the comet. Deep Impact does not have another probe, so Hartley 2 will not get hit, but the close-up view will allow the spacecraft's two telescopes to closely observe surface features of the comet while its infrared spectrometer maps the composition of any outbursts of gas from the surface.

Comet science goals for this phase of the mission are to:

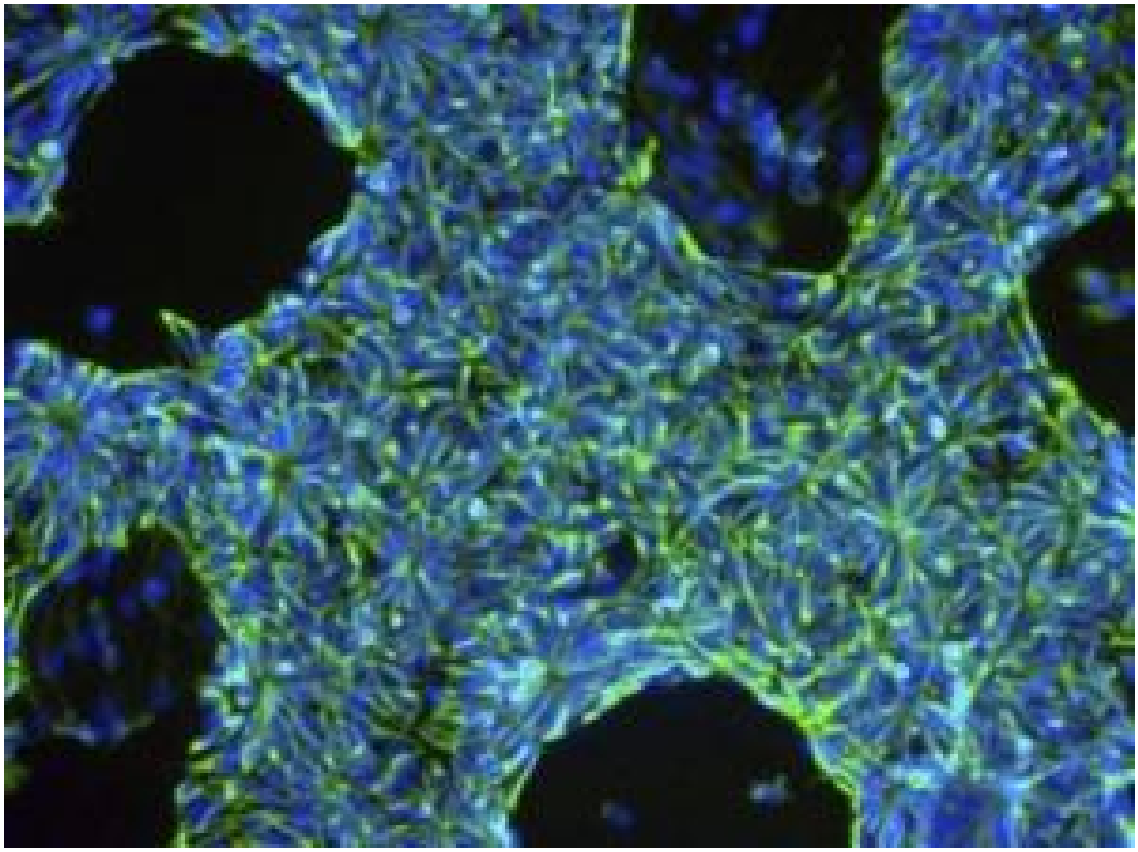
- Search for and, if found, produce maps of outbursts of gas from the surface of comet Hartley 2. Track the outburst as the comet rotates. Correlate outbursts with surface features. Such outbursts were observed during the spacecraft's flyby of comet Tempel 1.
- Obtain infrared spectral maps of gasses in the innermost portion of the coma. The coma is the cloud of gas and dust that surrounds the comet. Investigate the distribution of dust and gas in the coma.
- Search for frozen volatiles (SUCH AS?) on the surface of the comet. Water ice, for example, was discovered when the flyby explored Tempel 1.
- Produce broad band images of the comet that will establish limits on the size of the nucleus. Produce a model of its shape.
- Map the brightness and color variations of the surface. Locate landscape features that indicate the processes by which the comet was formed. Compare the distribution of crater sizes with the distribution of the size of craters on other comets, asteroids and planetary satellites.
- Map the temperature of the surface to assess how readily heat is transmitted to the interior and the flow of subsurface volatiles, such as water vapor, to the surface.

For A'Hearn and his DIXI team the most rewarding time will come after the flyby, as they turn the raw data into new insights on the structure and formation of comets and their place in the history of our solar system.

Adapted from materials provided by University of Maryland, College Park.

http://www.sciencedaily.com/releases/2007/12/071215203737.htm

Stem Cells Show Power To Predict Disease, Drug Toxicity



Microscopic view of neural precursor cells from the research lab of Gabriela Cezar,UW-Madison professor of animal science. The cells were derived from human embryonic stem cells and were exposed to a drug known to cause autism in a small percentage of cases. By assessing the small-molecule chemicals expressed by the cells when they are exposed to the drug, scientists can gain fundamental insight into the toxic effects of drugs on cells in development. (Credit: courtesy Gabriela Cezar)

ScienceDaily (Dec. 16, 2007) — For the first time, scientists have used human embryonic stem cells to predict the toxic effects of drugs and provide chemical clues to diagnosing disease.

Writing in the journal Stem Cells and Development, a team led by UW-Madison biologist Gabriela Cezar reports the use of all-purpose stem cells to elicit and identify the telltale chemical signals secreted by the cells when exposed to a drug known to cause autism.

The work is important because it is a critical first step toward fulfilling the promise of embryonic stem cells not only to screen drugs for safety but one day, possibly, to use the cells themselves as crucibles for making new drugs. What's more, the work shows that stem cells have an immediate clinical application as they generate chemicals, biomarkers, that can be used to predict the onset of disease, much like cholesterol or sugar in the blood can be used to forecast heart disease or diabetes.

"We're measuring active metabolites produced by the cells in response to an insult," explains Cezar, a UW-Madison professor of animal science. "These are de facto signatures of what is happening in response to a drug or a disease state."

In the new study, Cezar and her colleagues measured the response of undifferentiated stem cells as well as precursor neural cells to the drug valproate, which is known to cause autism in the offspring of a small percentage of users. The drug is used to treat epilepsy, bipolar disease and migraine headaches.

Cells exposed to the drug, according to the new study, secreted more of the small-molecule chemicals involved in development and in brain cell signaling than unexposed cells.

"Some of the chemicals we detected are critical for formation of the brain," Cezar explains. "It seems the drug may induce excess chemicals that alter neural development."

An increase in glutamate metabolism in cells exposed to valproate, for example, may be a critical clue to understanding what goes wrong in development to cause autism: "Excess glutamate kills neurons," says Cezar. "If you have higher levels during the formation of the brain, you may have fewer neurons of different types. In autism, there are areas of the brain where you have fewer neurons" than would occur under ordinary circumstances.

"Autism is a condition that begins during pregnancy," notes Cezar. "In this study, we asked what could valproate tell us about autism given its known involvement in a small percentage of cases? How does it make brain development different?"

Cells of all kinds use so-called small-molecule chemicals as a way to communicate with other cells. Precise communication between cells is essential for normal development and the health of an organism. Such chemicals can be detected in blood, suggesting it may be possible to devise simple tests that can provide disease diagnosis before birth or shortly after.

"These are small molecules that are indicators of susceptibility to disease," says Cezar.

The work by Cezar and her colleagues, including noted central nervous system expert Fred Gage of the Salk Institute, opens a raft of possibilities for early disease diagnosis of developmental disorders. In short, the ability to tune in to the chemical chatter of stem cells may become a promising new window to helping scientists figure out, at the most fundamental level, what goes wrong to cause things such as birth defects and miscarriage.

In addition, the work shows how human embryonic stem cells and early precursor cells can be used to screen drugs for potentially harmful effects. Drug discovery and testing had been predicted to be one of the first technologies to emerge from embryonic stem cells.

In terms of drug discovery and screening, human cells offer an alternative to animal testing that may be more accurate and could help ferret out safety issues that animal models fail to identify.

The new study was supported in part by grants from the Draper Technology Innovation Fund and the UW-Madison Graduate School.

In addition to Cezar and Gage, authors of the new study include Jessica A. Quam, Alan M. Smith, Guilherme J.M. Rosa, and James F. Brown, all of UW-Madison; Marian S. Piekarczyk of the WiCell Research Institute; and Alysson R. Muotri of the Salk Institute.

Adapted from materials provided by University of Wisconsin-Madison.

http://www.sciencedaily.com/releases/2007/12/071213170722.htm

New Oil-repelling Material Created

A droplet of water forms a bead on the surface of a lotus left, top left, while a drop of hexadecane soaks the surface, top right. After the lotus leaf is coated with a new oil-repelling material developed at MIT, water still beads up, bottom left, and so does hexadecane, bottom right. Inset photo in the top left square shows an SEM micrograph of the lotus leaf surface. (Credit: Image courtesy / Anish Tuteja and Wonjae Choi, MIT)

ScienceDaily (Dec. 15, 2007) — MIT engineers have designed the first simple process for manufacturing materials that strongly repel oils. The material, which can be applied as a flexible surface coating, could have applications in aviation, space travel and hazardous waste cleanup.

For example, the material could be used to help protect parts of airplanes or rockets that are vulnerable to damage from being soaked in fuel, such as rubber gaskets and o-rings.

"These are vulnerable points in many aerospace applications" said Robert Cohen, the St. Laurent Professor of Chemical Engineering and an author of a paper on the work that will appear in the Dec. 7 issue of Science.

"It would be nice if you could spill gasoline on a fabric or a gasket or other surface and find that instead of spreading, it just rolled off," Cohen said.

Creating a strongly oil-repelling, or "oleophobic" material, has been challenging for scientists, and there are no natural examples of such a material.

"Nature has developed a lot of methods for waterproofing, but not so much oil-proofing," said Gareth McKinley, MIT School of Engineering Professor of Teaching Innovation in the Department of Mechanical Engineering and a member of the research team. "The conventional wisdom was that it couldn't be done on a large scale without very special lithographic processes."

The tendency of oils and other hydrocarbons to spread out over surfaces is due to their very low surface tension (a measure of the attraction between molecules of the same substance).

Water, on the other hand, has a very high surface tension and tends to form droplets. For example, beads of water appear on a freshly waxed car (however, over a period of time, oil and grease contaminate the surface and the repellency fades). That difference in surface tension also explains why water will roll off the feathers of a duck, but a duck coated in oil must be washed with soap to remove it.

The MIT team overcame the surface-tension problem by designing a material composed of specially prepared microfibers that essentially cushion droplets of liquid, allowing them to sit, intact, just above the material's surface.

When oil droplets land on the material, which resembles a thin fabric or tissue paper, they rest atop the fibers and pockets of air trapped between the fibers. The large contact angle between the droplet and the fibers prevents the liquid from touching the bottom of the surface and wetting it.

The microfibers are a blend of a specially synthesized molecule called fluoroPOSS, which has an extremely low surface energy, and a common polymer. They can be readily deposited onto many types of surfaces, including metal, glass, plastic and even biological surfaces such as plant leaves, using a process known as electrospinning.

The researchers have also developed some dimensionless design parameters that can predict how stable the oleophobicity or oil-resistance between a particular liquid and a surface will be. These design equations are based on structural considerations, particularly the re-entrant nature (or concavity) of the surface roughness, and on three other factors: the liquid's surface tension, the spacing of the fibers, and the contact angle between the liquid and a flat surface.

Using these relationships, the researchers can design fiber mats that are optimized to repel different hydrocarbons. They have already created a non-woven fabric that can separate water and octane (jet fuel), which they believe could be useful for hazardous waste cleanup.

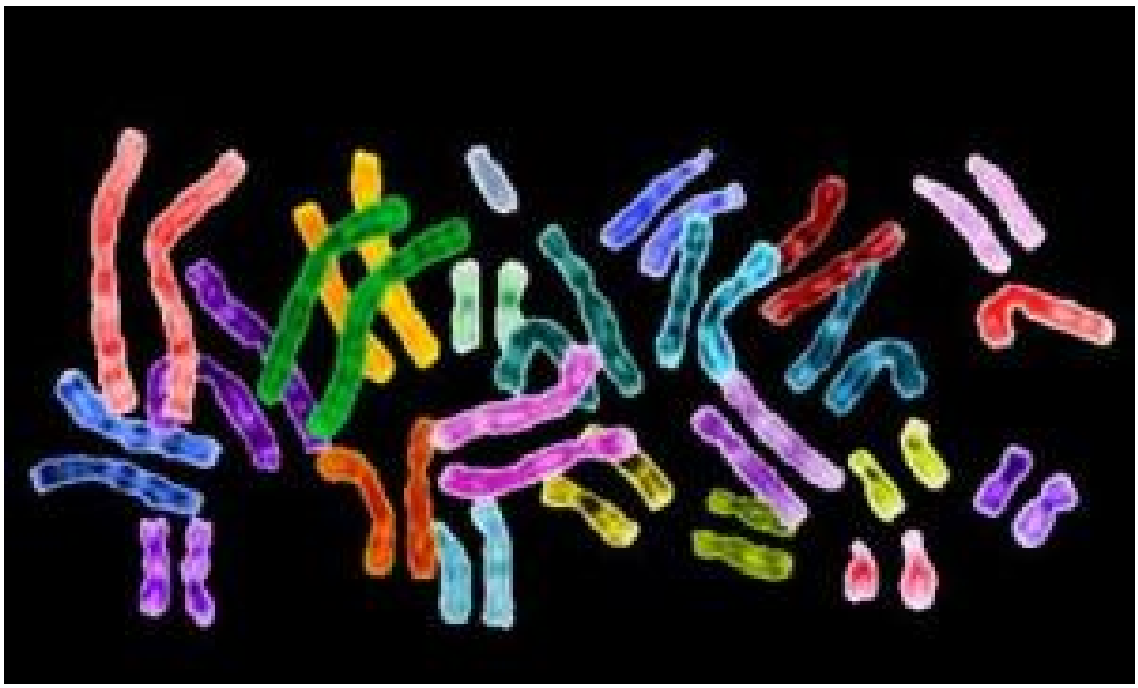
The Air Force, which funded the research and developed the fluoroPOSS molecules, is interested in using the new material to protect components of airplanes and rockets from jet fuel.

Lead author of the paper is Anish Tuteja, a postdoctoral associate in MIT's Department of Chemical Engineering. Other MIT authors are Wonjae Choi, graduate student in mechanical engineering, Minglin Ma, graduate student in chemical engineering, and Gregory Rutledge, professor of chemical engineering. Joseph Mabry and Sarah Mazzella of the Air Force Research Laboratory at Edwards Air Force Base are also authors on the paper.

Adapted from materials provided by Massachusetts Institute of Technology.

http://www.sciencedaily.com/releases/2007/12/071206145231.htm

Losses Of Long-established Genes Contribute To Human Evolution



Human chromosomes. (Credit: Jane Ades, NHGRI)

ScienceDaily (Dec. 15, 2007) — While it is well understood that the evolution of new genes leads to adaptations that help species survive, gene loss may also afford a selective advantage. A group of scientists at the University of California, Santa Cruz led by biomolecular engineering professor David Haussler has investigated this less-studied idea, carrying out the first systematic computational analysis to identify long-established genes that have been lost across millions of years of evolution leading to the human species.

Haussler and five others in his group--postdoc Jingchun Zhu, graduate students Zack Sanborn and Craig Lowe, technical projects manager Mark Diekhans, and evolutionary biologist Tom Pringle--are co-authors on the paper*.

"The idea that gene losses might contribute to adaptation has been kicked around, but not well studied," said Zhu, who is first author of the paper. "We found three examples in the literature, and all of them could have medical implications."

To find gene losses, Zhu employed a software program called TransMap that Diekhans had developed. The program compared the mouse and human genomes, searching for genes having changes significant enough to render them nonfunctional somewhere during the 75 million years since the divergence of the mouse and the human.

"This is the first study designed to search the entire genome for recent loss of genes that do not have any near-duplicate copies elsewhere in the genome," said Haussler. "These are likely to be the more important gene losses."

Genes can be lost in many ways. This study focused on losses caused by mutations that disrupt the open reading frame (ORF-disrupting mutations). These are either point mutations, where events such as the insertion or substitution of a DNA base alter the instructions delivered by the DNA, or changes that occur when a large portion of a gene is deleted altogether or moves to a new place on the genome.

"We used the dog genome as an out-group to filter out false positives," Sanborn explained, because the dog diverged from our ancient common ancestor earlier than the mouse. "If a gene is still living in both

dog and mouse but not in human, it was probably living in the common ancestor and then lost in the human lineage."

Using this process, they identified 26 losses of long-established genes, including 16 that were not previously known.

The gene loss candidates found in this study do not represent a complete list of gene losses of long-established genes in the human lineage, because the analysis was designed to produce more false negatives than false positives.

Next they compared the identified genes in the complete genomes of the human, chimpanzee, rhesus monkey, mouse, rat, dog, and opossum to estimate the amount of time the gene was functional before it was lost. This refined the timing of the gene loss and also served as a benchmark for whether the gene in question was long-established, and therefore probably functional, or merely a loss of a redundant gene copy. Through this process, they found 6 genes that were lost only in the human.

One previously unknown loss, the gene for acyltransferase-3 (ACYL3), particularly caught their attention. "This is an ancient protein that exists throughout the whole tree of life," said Zhu. Multiple copies of the ACYL3 gene are encoded in the fly and worm genomes. "In the mammalian clade there is only one copy left, and somewhere along primate evolution, that copy was lost."

"In our analysis, we found that this gene contains a nonsense mutation in human and chimp, and it appears to still look functional in rhesus," said Sanborn. Further, they found that the mutation is not present in the orangutan, so the gene is probably still functional in that species.

"On the evolutionary tree leading to human, on the branch between chimp and orangutan sits gorilla," explained Sanborn. Knowing if the gene was still active in gorilla would narrow down the timing of the loss.

Sanborn took to the wet laboratory to sequence the corresponding region in a DNA sample from a gorilla. The gorilla DNA sequence showed the gene intact, without the mutation, so the loss likely occurred between the speciation of gorilla and chimpanzee.

"Acyltransferase-3 was not the only lost gene that doesn't have any close functional homologues in the human genome. A highlight of our research was that we were able to find a list of these 'orphan losses,'" said Zhu. "Some of them have been functional for more than 300 million years, and they were the last copies left in the human genome." While the copies of these genes remaining in the human genome appear to be nonfunctional, functional copies of all of them exist in the mouse genome.

"These orphan genes may be interesting candidates for experimental biologists to explore," said Zhu. "It would be interesting to find out what was the biological effect of these losses. Once their function is well characterized in species that still have active copies, we could maybe speculate about their effects on human evolution."

*Their findings appear in the December 14 issue of PLoS Computational Biology.

This research was funded by the National Human Genome Research Institute, the National Institutes of Health, the National Cancer Institute, and the Howard Hughes Medical Institute.

Adapted from materials provided by University of California - Santa Cruz.

http://www.sciencedaily.com/releases/2007/12/071214094129.htmg

Two New Mammal Species Discovered In Indonesia's Wilderness

A probable new species of pygmy possum in the genus Cercartetus(Pygmy Possum). Foja Mts, western New Guinea, Indonesia. (Credit: Bruce M Beehler)

ScienceDaily (Dec. 17, 2007) — A tiny possum and a giant rat were recorded by scientists as probable new species on a recent expedition to Indonesia's remote and virtually unknown "Lost World" in the pristine wilderness of western New Guinea's Foja Mountains. The Foja Wilderness is part of the great Mamberamo Basin, the largest unroaded tropical forest in the Asia Pacific region.

During the June expedition, the team* documented two mammals, a Cercartetus pygmy possum, one of the world's smallest marsupials, and a Mallomys giant rat, both currently under study and apparently new to science. They also recorded the mating displays of several rare and little-known birds for the first time.

"The giant rat is about five times the size of a typical city rat," said Kristofer Helgen, a scientist with the Smithsonian Institution in Washington, D.C. "With no fear of humans, it apparently came into the camp several times during the trip."

The film crew obtained the first film documentation of several spectacular birds found in Foja, capturing on tape the full courtship displays of the golden-fronted bowerbird (Amblyornis flavifrons) and of the black sicklebill bird of paradise (Epimachus fastuosus).

They also recorded the "lost" Bird of Paradise -- Parotia berlepschi (known as Berlepsch's six-wired bird of paradise), and the newly described wattled smoky honeyeater (Melipotes carolae), both known only from the Foja Mountains.

The Indonesian Government has declared the region a National Wildlife Sanctuary, and CI continues to work with the government and local communities to build on this conservation success and ensure even greater protection of the area. As the global community searches for solutions to climate change, large untouched forested areas such as these will become more and more valuable as essential carbon sinks.

The cutting and burning of tropical forests worldwide emits at least 20 percent of total global greenhouse gases. Protecting these forests minimizes the impact of climate change while providing direct benefits to local populations, such as fresh water, clean air, food, seed dispersal, pollination and sources of medicines.

*Conservation International (CI) and Indonesia Institute of Science (LIPI) scientists were accompanied by the first film crew to obtain footage of the region and its wildlife on an expedition to the Fojas in June 2007. A National Geographic photographer/scientist and a CBS News camera crew joined the team as they returned to the mountains. CI and LIPI scientists discovered dozens of new plants and animals on their first expedition to the region in late 2005. An account of the 2007 expedition was aired on the CBS News program, "60 Minutes" on Dec. 16.

"It's comforting to know that there is a place on earth so isolated that it remains the absolute realm of wild nature," said CI Vice President Bruce Beehler, who led the expedition. "We were pleased to see that this little piece of Eden remains as pristine and enchanting as it was when we first visited."

CI and LIPI plan another expedition back to the Foja Mountains in late 2008 or 2009. This proposed expedition will seek to survey the summit forests of the highest peak, and the little-studied lower montane elevations. They expect to find additional new species of frogs, mammals, butterflies, and plants.

Adapted from materials provided by Conservation International.

http://www.sciencedaily.com/releases/2007/12/071217092939.htm

The Skyline as Architectural History

BY JAMES GARDNER
December 17, 2007
URL: http://www.nysun.com/article/68144

There are times when you walk through Midtown Manhattan, among the soulless slabs and towers of Modernism, and you wonder how an entire generation could have tolerated such unrelenting rectilinearity. Was no one bored? Was no one disgusted? Surely some people were, but their voices went unheard. Or more precisely, they were heard on the streets and around the dinner tables of New York, but not in the studios of practicing architects or in the halls of academe, where Modernist consensus reigned supreme. At the time, these voices seemed so obviously on the wrong side of architectural history that they could be rejected out of hand.

In her new book, "Architecture or Techno-Utopia: Politics After Modernism" (MIT Press), Felicity D. Scott seeks to revisit some of the dissenters who opposed the International Style's nearly total hegemony in the 1960s and '70s, whose attacks were instrumental in the rise of the Postmodern movement of the early 1980s. She examines visionaries such as R. Buckminster Fuller and his nearly cultic following in hippie communes like Drop City and Ant Farm, as well as critics of such varied stripes as Robert A.M. Stern and Manfredo Tafuri.

In a sense, however, books such as "Architecture or Techno-Utopia" answer a question that, in a better world, would never need to be asked in the first place. Early on, the academy agreed on one narrative for the history of modern architecture — that of the evolution of the International Style, as promulgated in Philip Johnson's groundbreaking Museum of Modern Art exhibition of 1932. But now the inadequacies of that perspective are so evident that the academy is forced to correct its earlier error. Just as the development of modern painting was a far messier and more complicated affair than Clement Greenberg's formalism understood or allowed, so was modern architecture far more than the Bauhaus: It was a raucous chorus of competing voices, from the messianic visions of Bruno Taut and Antonio Sant'Elia to Brutalism and the incipient contextualism of Louis Kahn.

Here in Manhattan, as early as 1964, Edward Durell Stone confected the now mutilated 2 Columbus Circle, otherwise known as the Lollipop Building, whose marble facings and Venetian motifs were a welcome slap in the face of Modernism. At the same time, several blocks to the north, Wallace K. Harrison, Max Abramovitz, Pietro Belluschi and an increasingly penitent Philip Johnson were designing Lincoln Center, its travertine campus littered with halfway houses between Modernist purity and the historicism of Postmodernism.

But, as Ms. Scott's book suggests, perhaps the inaugural moment in the emergence of Postmodernism as a conscious reaction to the arid purity of the International Style came in 1972, with the publication of "Learning From Las Vegas: the Forgotten Symbolism of Architectural Form" by Robert Venturi and Denise Scott Brown. The title speaks for itself. Four years later, Arthur Drexler curated a hugely controversial exhibition at MoMA titled "The Architecture of the Ecole des Beaux-Arts," which amounted to a coming out party for what would soon be called postmodern classicism.

Putting the ideas of this exhibition into practice, the first serious revolt against modern architecture, the first response that could actually be seen on the streets of New York, came in the form of the neoclassicism of Johnson and others. This style was allied to similar movements in literature, painting, and music. Taken together they were a collective, almost spasmodic gasp of joy at the full and conscious realization that there was more to the world than the arid towers of the Bauhaus, the meta-narratives of the Nouveau Roman, and the dissonances of Schöenberg and Boulez.

In assessing the architectural success of Postmodernism in New York, it is important to note that, like the International Style itself, it was not a formulaic or predictable entity. Some of the buildings erected

under its standard were quite good, others quite bad, as was exactly the case with the products of Modernism.

Among the better and more controversial examples of the movement was Johnson's AT&T (now Sony) Building at Madison Avenue and 56th Street, a granite-clad high-rise from 1984 that was promptly dubbed the Chippendale Building because the ornamental oculus at its summit recalled the top of an 18th-century commode. What seemed so galling about this stately and finely-detailed building was that it not only revolted against the International Style, but constituted an apostasy from it, coming as it did from the very man who had invented that label nearly 50 years before.

Among the worst buildings in this style — and there are many to chose from — one might mention the Equitable Building at 787 Seventh Ave., between 51st and 52nd streets, which was completed two years later by Edward Larrabee Barnes and has some of the historicist references of the AT&T Building, but none of its refinement of detail. But at least it is not quite as awful as the renovations that were completed in the same year at Manhattan Mall, at 33rd Street and Sixth Avenue. Here a few insultingly insufficient classical decals were slapped onto the drab armature of its gray façade. But other buildings, such as Mr. Stern's all but completed 15 Central Park West, not only succeed structurally and functionally, but are also are vast enhancements of the way New Yorkers experience life on the streets surrounding the building. Even now, when the area is still in some sense a construction site, it is practically a privilege to walk by it.

True, neither it nor the other examples of historicist Postmodernism can ever quite aspire to the pure and eternal values of form that true classical architecture possessed and that Modernism, at its best, transmuted into a contemporary idiom. But if Postmodernism can never quite rise to the heights of the best Modernist architecture, it is also never quite as viscerally obnoxious as most of the buildings created by that earlier movement which were mediocre or worse. And given that the products of both movements were generally mediocre, it may be the foremost contribution of Postmodernism that its mediocrity is slightly more interesting, more varied, and more tolerable than the abounding mediocrities of the modern movement.

jgardner@nysun.com

http://www.nysun.com/pf.php?id=68144&v=4018197911

Science Cafés Tap Nation's Fascination With Research and Discoveries
By David Ferris 12.15.07 | 10:00 PM

Melissa Capria, the climate-change coordinator for the City of San Francisco, speaks at 330 Ritch in San Francisco. The topic was how climate change will affect the Bay Area.
Photo: David Ferris

On a recent Wednesday night the crowd spilled out the door at San Francisco's Axis Café, where the draw wasn't a hot band or a talented bartender, but a lecture. On physics.

Toby Garfield, an oceanographer at San Francisco State University, was explaining the science of big ocean waves, like the giant Mavericks surf break about 25 miles away. As he showed slides of the ocean floor and explained that the coast is a system of energy dissipation, the crowd peppered him with questions. Why do waves come in sets? What are rogue waves? How is the United States harnessing the power of waves to make renewable energy?

Scenes like this are being repeated across the country at science cafes, where contemporary science -- a topic that Americans supposedly find dull -- is drawing substantial crowds month after month, even on topics as nerdy as gene sequencing and dark matter.

"It gets me exposed to more areas of science," said Jodie Kasmir, a health care communications specialist, during a break at the big-waves lecture. "Where else am I going to learn about things like sea urchins, or astronomy? How else am I going to find these scientists? Am I going to e-mail them, or go to their lab?"

These cafés seem to have hit a sweet spot in adult science education, offering access to cutting-edge discoveries and the scientists who make them, minus the notes and tests required in school (plus wine, coffee or beer flowing freely from the bar).

About 60 science cafés have cropped up across the United States. The first café was held in England in 1998, and the movement is spreading elsewhere in Europe, as well as South America and Australia. Most are held free of charge and are loosely affiliated through an international umbrella organization called Café Scientifique.

Café coordinators say that crowds come with minimal advertising and represent a wide demographic, from teenagers to thirty-somethings to retired folks.

Most get-togethers follow a friendly and informal format: Bring a local scientist to present a short lecture, and give the guests plenty of opportunities to ask questions, especially at the end.

"The idea is to get everyone engaged in the conversation and involved in the discourse to where they're not just asking questions but challenging the scientist and going off on tangents," said Ben Wiehe, who hosts a café at a bar called The Thirsty Scholar in Somerville, Mass.

The topics are as diverse as science itself. An upcoming café in Portland, Oregon, will advise how to survive a pandemic, while a past event in St. Louis explored the secret life of lichens, and another in Pittsburgh explained patterns in computational biology.

Many cafés are sponsored by educational institutions such as universities and museums. They're seizing on the opportunity to introduce their research and experts to a new audience.

Katey Ahmann, who organizes a café for the North Carolina Museum of Natural Sciences in Raleigh, said she had doubts whether anyone would show up when she dedicated an early café to new research on the 19th Century Irish potato blight. Thirty-five inquisitive people showed up. A year later, the museum is

offering monthly cafés on Tuesday nights at an Irish bar that draw up to 120 people, and Ahmann often has to cut off a lively discussion for time.
"It provides something for adults to do that's fun, and they learn something, too," Ahmann said. "The idea of having adult programs that work is really exciting."
The science-café phenomenon is also giving new exposure to public-television shows focused on science, such as NOVA scienceNOW, produced by WGBH in Boston, and Quest, created by KQED in San Francisco, which supplied a clip from a show on big ocean waves to the audience at the Axis Café.
A video especially can attract the casual bar patron who came out for a Coors, not a classroom, said Wiehe, who is also an outreach coordinator for WGBH.
"I do a little introduction and the people who aren't there for the café pay no attention," he said. Once the film is cued up, though, "Everyone's paying attention and laughing on cue. And then they're all involved."
To find a café, visit Science Cafes. http://www.sciencecafés.org/

http://www.wired.com/science/discoveries/news/2007/12/science_cafe

World is not flat, academic says

By Eddie EvansSat Dec 15, 8:43 AM ET

One of the most talked-about books of the last two years was "The World is Flat," in which author Thomas Friedman argued that borders between countries were becoming less and less important.

Now, Pankaj Ghemawat warns in "Redefining Global Strategy" (Harvard, $29.95) that businesses suffer when they follow such globalization logic too far.

The real state of the world is neither globalized nor local, Ghemawat writes. It is semiglobalized, and will remain so for decades to come.

Ghemawat, on leave from Harvard and visiting professor of global strategy at IESE Business School in Barcelona, found that the average level of globalization in investments, phone calls, tourism and immigration is just 10 percent.

And some measures, like the international share of total Internet traffic, are actually decreasing. "This calls into question the other common myth that even if the world isn't quite flat today, it will be tomorrow," he said.

He cites Google Inc (GOOG.O), Coca-Cola Co (KO.N) and Wal-Mart Stores Inc (WMT.N) as examples of companies that have suffered when they tried to treat all the world the same.

Google, whose English-language search engine and Internet advertising businesses are explosively successful, has struggled for market share in Russia because of a difficult language and has run into censorship difficulties in China.

Wal-Mart has failed to replicate its U.S. success uniformly around the world, and even pulled out of Germany. Its most profitable operations abroad are in Canada, Mexico and Britain, places that according to Ghemawat are culturally or graphically closest to the United States.

"The point is not that Wal-Mart shouldn't have ventured into more distant markets, but instead, that it needed to think differently about how to compete in them -- something it is now starting to do in markets such as India," he said.

Under Ghemawat's analysis, Coca-Cola lost its way as it seesawed between extreme centralization under Roberto Goizueta in the 1990s and excessive localization under Douglas Daft between 2000 and 2004.

Now, Coca-Cola is attempting to compete in a way that neither ignores the differences between countries nor caves in to their cultures and customs entirely. "It recognizes the reality of semiglobalization," he writes.

And, Daimler's purchase of Chrysler was doomed because the costs of combining such different companies exceeded the savings, a point Ghemawat made at the time.

"Obviously the world is not yet flat," Friedman replied in Foreign Policy magazine. But the evidence of "flattening" and globalization is all around.

"Anyone who thinks that some protectionist measures are going to put YouTube back in the bottle ... is blind to the dramatic changes that have already taken hold," wrote Friedman, who is also a columnist for the New York Times.

For Ghemawat, it is not globalization, but "semiglobalization" that accounts for the success of Japan's Toyota Motor Corp (7203.T)(TM.N), which has overtaken General Motors Corp (GM.N) to become the world's biggest automaker.

Toyota anticipates expanded free-trade agreements within the Americas, Europe and East Asia, but not across them, according to Ghemawat.

"This is a more modest -- but also more realistic -- vision in which neither the bridges nor the barriers between countries can be ignored."

(Reporting by Eddie Evans; Editing by Jeffrey Benkoe)

http://news.yahoo.com/s/nm/20071215/bs_nm/books_global_dc&printer=1;_ylt=AtimF.25Fxuq..ayroXoSpGb.HQA

Building Respect at Yale
By ROBIN POGREBIN

WHEN Robert A. M. Stern was appointed dean of the Yale School of Architecture in 1998, the reaction among a broad swath of students, faculty members and prominent architects was shock mixed with disdainful indignation. Too traditional, they argued, a backward decision for an institution known for producing the progressive architects of tomorrow.

"Who's got the mojo to lead the fabled school into the 21st century?" wrote Reed Kroloff, then the editor of Architecture magazine. "Are you sitting down?" He then went on to describe Mr. Stern as a "suede-loafered sultan of suburban retrotecture, Disney party boy and notorious academic curmudgeon."

On Wednesday Mr. Stern, 68, was appointed to a third term at Yale, where for the past nine years he has earned wide admiration as a committed educator with an openness to many different architectural styles, qualities critics often find lacking in the tradition-bound aesthetic of his buildings. But even those who dislike — or even dismiss — his architecture as retrograde say he has transformed Yale's Architecture School from a complacent institution that mirrored the likes and dislikes of its deans into a vibrant nexus of ideas and debate in which multiple views are represented and conflict encouraged.

"Bob Stern may be the best school of architecture dean in the United States," Mr. Kroloff said in a recent interview. Mr. Kroloff, who recently stepped down as dean of the architecture school at Tulane to become the director of the Cranbrook Academy of Art and Art Museum in Michigan, said that if he "saw Bob face to face, I'd have to say: 'Congratulations. I wish I could do what you've done.' "

The architect Frank Gehry, who said in an interview that Mr. Stern's neo-Classical-style buildings are too anchored in the past, added that Mr. Stern had made Yale "probably the most exciting school in the country right now, maybe in the whole world."

The two public records of Mr. Stern's work — on the one hand, countless homes, libraries, museums and schools that have made his firm rich in remunerative commissions while at the same time drawing critical ire, and on the other hand, a dynamic curriculum at Yale that will influence hundreds of students — expose a provocative duality in someone many had pegged as the guy who designs Disney resorts. But for Mr. Stern these two sides have comfortably coexisted for years. "I'm a representative of tradition in architecture," he said. "I am not an ideologue."

Mr. Stern knows full well how he is perceived. His name is repeatedly passed over in design competitions for high-profile commissions in favor of more avant-garde practitioners like Rem Koolhaas, Zaha Hadid,

Thom Mayne and Renzo Piano. And he is accustomed to being derided, as he recently was in New York magazine as “an architect who specializes in the best nostalgia money can buy.”

But even as he encourages risk and experimentation at Yale, Mr. Stern is a staunch defender of his more traditional buildings. There is an important place, he argues, for structures that put function before form and attend to a client’s needs rather than draw attention to themselves. “Many modernist works of our time tend to be self-important objects, and that’s a real quarrel that I have,” Mr. Stern said. “Buildings can be icons or objects, but they still have to engage with the larger whole.”

“I’m not considered avant-garde because I’m not avant-garde,” he added. “But there is a parallel world out there — of excellence.”

For Mr. Stern that world tends to consist of stone or brick buildings with a heft and gravitas that brazenly pay tribute to buildings that have come before. “You can’t have a world that is built of only original things, where every shape is different from every other,” he said. “You can, but then it becomes a World Fair. You can’t have caviar five nights in a row.”

Mr. Stern developed his views as an architecture student at Yale in the 1960s under Paul Rudolph, who was then dean and designed the school’s Art and Architecture building. Although they had starkly different design sensibilities, they shared a belief in the importance of history.

“Paul Rudolph always measured the work of the present against the standards of the past,” Mr. Stern said. “So in critiquing student work, he might suggest how Le Corbusier or Frank Lloyd Wright might have approached a problem, but also how it might have been approached in the full background of architectural history — past and present — and not just Western architectural history but also the architecture of other cultures, especially Japanese architecture.”

None of Mr. Stern’s buildings are meant to be ersatz, he maintains. “They are recollective and reinterpretations,” he said. “The history of art is full of interpretations of things that went before.”

That is not to say Mr. Stern completely eschews a contemporary approach. He has incorporated glass-curtain facades into his tallest commercial skyscraper, the 57-story Comcast Center, being built in Philadelphia. And his American Revolution Center, a museum under way in Valley Forge, Pa., is carved into the land in warped planes, while allowing for expansive views of the historic encampment of 1777-78. “I’m interested in experimental forms where I think it works,” he said.

To be sure, there is clearly a market for what Mr. Stern makes, since the commissions keep coming, his office has grown to 325 people (up from 260 last year), and he has more work in New York than ever before. His limestone condo tower for Zeckendorf Development, with its prewar-style setbacks and terraces, is nearly completed at 15 Central Park West, as was his high-end brick loft tower and town houses for Related Companies on the site of the old Superior Ink building on the Hudson waterfront in the West Village.

His other current New York projects include a renovation of the Kaufman Center on West 67th Street, which houses Merkin Concert Hall; a new home for the Museum for African Art on Fifth Avenue at 110th Street; and an apartment building for the developer Larry A. Silverstein.

“There are very few architects who understand luxury residential as well as Bob does,” Mr. Silverstein said.

At Yale some might have expected Mr. Stern to try to win converts to his way of thinking about architecture. Instead he has done just the opposite and thrown the doors wide open to give many design perspectives their due. Students are simultaneously exposed to the teachings of experimentalists like Joel Sanders and Peter Eisenman and to traditionalists like Demetri Porphyrios and Léon Krier.

“Bobby’s had everybody,” Mr. Gehry said.

It has been a noteworthy transformation. While arguably the epicenter of groundbreaking architecture in the 1950s and '60s, Yale had grown tired over the years, many architects said, losing status and students to more cutting-edge institutions like Columbia. Rudolph's infamous Art and Architecture building stood in a sorry state of neglect: a glaring metaphor, many thought, for the condition of the school.

But Mr. Stern has tackled these problems. Rudolph's building is now being renovated by Charles Gwathmey, and architects and critics have embraced Mr. Stern's pluralist vision for the curriculum.

"In the current climate of institutionalized Modernism, Stern's agenda seems absolutely radical," Ned Cramer, editor in chief of Architect magazine, wrote in the November issue. "Where else on earth would I be able to choose between studios run by Peter Eisenman and Léon Krier?"

Such assessments have been validating to Richard C. Levin, Yale's president, who hired Mr. Stern despite the naysayers, some of whom were on his very own search committee. Mr. Levin said he was impressed by reports on Mr. Stern from professors at Columbia's architecture school — Mr. Stern taught there — and by Mr. Stern himself.

"Bob had a strong vision that his role as dean was not to impose his ideas," Mr. Levin said. "He said he wanted to restore the school to a place of intellectual liveliness and ferment. And sure enough, he's delivered on that."

Physically slight and wiry, Mr. Stern has an impatient energy that pulls focus in a room and makes students and colleagues pay attention. As something of an elder statesman, he knows just about everybody in the business and has drawn on these connections to enhance Yale's curriculum, attracting visiting professors like Mr. Gehry, Ms. Hadid, Richard Meier, Greg Lynn and Billie Tsien.

He has also introduced the perspectives of developers and engineers into the design studio so that students get a taste of real-world architecture practice, with all of its inevitable compromises. And he has organized challenging conferences and symposiums on topics like "space and race," which explored how architecture is influenced by cultural and racial identity.

"He believes in the productive friction between different points of view," said DaeWha Kang, who graduated from the architecture school in 2004 and now works for Ms. Hadid in London.

At a conference in October titled "Constructing the Ineffable: Contemporary Sacred Architecture" the participants included marquee names like Moshe Safdie, Rafael Moneo, Steven Holl and Mr. Meier.

Not everyone has been thrilled with Mr. Stern's work at Yale. Some students objected to having to study with Mr. Krier, for example, because they were not interested in pursuing traditional architectural styles.

At the same time Mr. Stern makes no secret of his personal views and seems to have reveled in using Yale as something of a bully pulpit. He fought to preserve 2 Columbus Circle, the not universally loved 1964 "lollipop" building with Venetian flourishes by Edward Durell Stone. (Mr. Stern and West Side preservationists lost the fight two years ago.)

Mr. Stern clashed with Mr. Mayne of the Los Angeles firm Morphosis during a recent panel discussion about whether new university buildings should continue the traditional language of the campus or be more innovative. Mr. Stern had recently designed the Farmer School of Business at Miami University in Oxford, Ohio, a building in keeping with its Georgian campus; Mr. Mayne had designed the Campus Recreation Center at the University of Cincinnati, a fusion of blocky and curved buildings clad in perforated metal.

"I do disagree with Thom Mayne because he truly thinks that it's only tomorrow that counts," Mr. Stern said in an interview. "I think some of his buildings are amazingly wonderful, and some of them are bombastic."

Mr. Mayne said: “We have completely different notions of architecture. But isn’t it important that we have that dialogue?”

Mr. Stern has been known to drop in on presentations of students’ work where he offers up withering queries and criticisms. “He’s not afraid to say his mind, so he’ll be harsh,” said Ceren Bingol, a former student who works for Grimshaw Architects.

He is also tireless, “the Energizer Bunny,” according to John D. Jacobson, the associate dean of the Yale architecture school. When he’s not zipping around the campus, Mr. Stern regularly shows up on weekends at his architecture office in Manhattan, where “he looks at every material sample,” said Ms. Bingol, who worked for him before graduate school.

Born in Flatbush, Brooklyn, in 1939, Robert Arthur Morton Stern has always been a “New York boy,” as he puts it. He earned his bachelor’s degree from Columbia University. His first major position was working for the city in Mayor John V. Lindsay’s administration.

Divorced in 1977, he lives on the Upper East Side of Manhattan, in the Chatham apartment building, which he designed, and in a loft apartment at Yale that he also designed. (He has one son, Nicholas, an executive vice president at Taconic Builders, a Manhattan contractor.)

In a five-volume history of the city (the most recent volume was issued in 2004), Mr. Stern examined architectural growth and development from the end of the Civil War to the 21st century.

For years Mr. Stern did not get many New York City commissions — “You’re never a hero in your own town,” he said — but that seems to be changing. He has designed 12 residential buildings for New York. Related Companies recently featured Mr. Stern in a multipage advertising spread. “He creates real value for a buyer,” said Stephen M. Ross, Related’s chairman and chief executive.

Even as Mr. Stern enjoys his reputation as an expert in dignified residential architecture, he concedes that it is also a mixed blessing, that sometimes it bothers him to be pigeonholed as old-fashioned. Just as Mr. Gehry “doesn’t want to do Bilbao over and over again,” Mr. Stern said, referring to the 1997 Guggenheim museum in Spain, “nobody likes to be typecast.”

http://www.nytimes.com/2007/12/16/arts/design/16pogr.html?ex=1355461200&en=0557599dce39e425&ei=5088&partner=rssnyt&emc=rss