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CONTENTS

How psychology can help the planet stay cool

- 19 August 2009 by **Peter Aldhous**

Magazine issue 2722

Who's the environmental hero on this neighbourhood? (Image: IRT Surveys LTD. http://www.irtsurveys.co.uk/)

Editorial: *Positive thinking for a cooler world*

"I'M NOT convinced it's as bad as the experts make out... It's everyone else's fault... Even if I turn down my thermostat, it will make no difference." The list of reasons for not acting to combat global warming goes on and on.

This month, an American Psychological Association (APA) task force released a report highlighting these and other psychological barriers standing in the way of action. But don't despair. The report also points to strategies that could be used to convince us to play our part. Sourced from psychological experiments, we review tricks that could be deployed by companies or organisations to encourage climate-friendly behaviour. Also, on page 40 of this issue, psychologist Mark van Vugt of the Free University of Amsterdam in the Netherlands describes the elements of human nature that push us to act altruistically.

As advertisers of consumer products well know, different groups of people may have quite distinct interests and motivations, and messages that seek to change behaviour need to be tailored to take these into account. "You have to target the marketing to the demographic," says Robert Gifford of the University of Victoria in British Columbia, Canada, another of the report's authors.

Messages that seek to change behaviour need to be tailored to the interests of individual groups
The affluent young, for instance, tend to be diet conscious, and this could be used to steer them away from foods like cheeseburgers - one of the most climate-unfriendly meals around because of the

energy it takes to raise cattle. So when trying to convince them to forgo that carbon-intensive beef pattie, better to stress health benefits than harp on about the global climate.

Though conservative pundits have been known to attack such efforts, characterising them as psychological manipulation or "mind control", experiments indicate that people are willing to be persuaded. "From participants in our experiments, we've never heard a negative backlash," says Wesley Schultz of California State University in San Marcos. In fact, according to John Petersen of Oberlin College, Ohio, we are used to far worse. "Compared to the barrage of advertising, it seems milder than anything I experience in my daily life," he says.

Good neighbours

DEEP down, most of us want to fit in with the crowd, and psychologists are exploiting this urge to conform to encourage environmentally friendly behaviour.

Researchers led by Wesley Schultz at California State University in San Marcos and Jessica Nolan, now at the University of Scranton in Pennsylvania, have found that people will cut their electricity usage if told that their neighbours use less than they do.

In one experiment, the researchers left information with households in San Marcos asking them to use fans rather than air conditioners at night, turn off lights and take shorter showers. Some messages simply stressed energy conservation, some talked about future generations, while others emphasised the financial savings. But it was the flyers that implored residents to join with their neighbours in saving energy that were most effective in cutting electricity consumption (*Personality and Social Psychology Bulletin*, vol 34, p 913).

In another study, the researchers told households what others in their neighbourhood used on average. High users cut their consumption in response, but low users increased theirs. The problem disappeared if the messages were reinforced with sad or smiley faces. The smileys received by the residents who were already saving energy provided sufficient encouragement for them to keep doing so (*Psychological Science*, vol 18, p 429).

Information economy

MOST people seem to conserve energy if provided with real-time feedback on how much they are using. But feedback can be too immediate.

For instance, Janet Swim has a General Motors car that shows her mileage per gallon plummeting each time she accelerates. It's just not very useful, she argues, because it's hard to place that momentary piece of feedback in the context of her overall driving behaviour and fuel efficiency.

In contrast, the Toyota Prius display shows mileage per gallon over 5-minute intervals for the previous half-hour. With that contextual information, people can experiment with different driving styles to see how they affect mileage, and even compete with themselves to improve over time. The 2010 Honda Insight goes one better, flashing up an image of a trophy to reward thrifty driving.

The benefits of feedback are not restricted to car gadgets. Studies show that devices that display domestic energy usage produce savings of between 5 and 12 per cent.

Competitive instincts

EVERY spring, selected student dormitories at Oberlin College in Ohio compete to discover which one can cut energy use by the most. Computer screens give the students detailed feedback on electricity consumption, and in one study dorms cut their electricity use by 55 per cent (*International Journal of Sustainability in Higher Education*, vol 8, p 16).

The researchers running the study have not yet crunched their numbers to separate out the effects of competition from the feedback on electricity consumption, but the large savings compared to other studies that lack a competitive element suggest a strong effect. "The competition, at least in this environment, is critical," says John Petersen, Oberlin's head of environmental studies.

Petersen concedes that Oberlin may attract students with green sensibilities atypical of society at large. The project is about to extend into the real world. Equipment to provide detailed feedback on electricity use will be fitted into 53 apartments and six business units in a development now under construction in the city of Oberlin. "We hope to create volunteer groups that will compete with one another," says psychologist Cindy Frantz.

Here and now

PEOPLE have to be persuaded to act on climate change even though the benefit won't be felt for decades. Research by David Hardisty and Elke Weber of Columbia University in New York suggests ways to achieve this.

Hardisty and Weber have found that people respond in exactly the same way to decisions involving future environmental gains and losses as they do when making financial decisions (*Journal of Experimental Psychology: General*, vol 138, p 329). This allows psychologists' knowledge of how to manipulate financial decision-making to be brought into play.

For instance, schemes that give people an upfront cash payment for insulating their home will work better than those promising long-term savings, even if the people receiving cash end up paying a little more in the long run.

And because we are generally more worried about future losses than we are impressed by future gains, messages are more effective if framed to warn people that they will lose $500 over 10 years if they don't follow a particular course of action to limit climate change than if they are told they'll be $500 better off if they do take action.

Social networks

AS SOCIAL animals, we like to interact with others and take inspiration from their actions. Psychologists are working out how to exploit this to spread behaviours that will help limit climate change. "My sense is that social networks are going to be important," says Swim.

Allowing people to document successes in saving energy on their Facebook pages could drive change among their friends, and the Oberlin team is considering integrating this into its urban residence experiment.

Tawanna Dillahunt and colleagues at Carnegie Mellon University in Pittsburgh, Pennsylvania, think such opportunities presented by Facebook can be combined with our liking for furry animals. Inspired by the attachment that people can develop towards Tamagotchi virtual pets, the team is testing the persuasive power of a "virtual polar bear" standing on an ice floe that grows bigger as people adopt environmentally friendly behaviours such as taking shorter showers. Initial results suggest the polar bear has pull.

http://www.newscientist.com/article/mg20327222.100-how-psychology-can-help-the-planet-stay-cool.html

Galaxies Demand A Stellar Recount

Images from NASA's Galaxy Evolution Explorer spacecraft and the Cerro Tololo International Observatory in Chile. (Credit: NASA/JPL-Caltech/JHU)

ScienceDaily (Aug. 20, 2009) — For decades, astronomers have gone about their business of studying the cosmos with the assumption that stars of certain sizes form in certain quantities. Like grocery stores selling melons alone, and blueberries in bags of dozens or more, the universe was thought to create stars in specific bundles. In other words, the proportion of small to big stars was thought to be fixed. For every star 20 or more times as massive as the sun, for example, there should be 500 stars with the sun's mass or less.

This belief, based on years of research, has been tipped on its side with new data from NASA's Galaxy Evolution Explorer. The ultraviolet telescope has found proof that small stars come in even bigger bundles than previously believed; for example, in some places in the cosmos, about 2,000 low-mass stars may form for each massive star. The little stars were there all along but masked by massive, brighter stars.

"What this paper is showing is that some of the standard assumptions that we've had -- that the brightest stars tell you about the whole population of stars -- this doesn't seem to work, at least not in a constant way," said Gerhardt R. Meurer, principal investigator on the study and a research scientist at Johns Hopkins University, Baltimore, Md.

Astronomers have long known that many stars are too dim to be seen in the glare of their brighter, more massive counterparts. Though the smaller, lighter stars outnumber the big ones, they are harder to see. Going back to a grocery story analogy, the melons grab your eyes, even though the total weight of the blueberries may be more.

Beginning in the 1950s, astronomers came up with a method for counting all the stars in a region, even the ones they couldn't detect. They devised a sort of stellar budget, an equation called the "stellar initial mass function," to estimate the total number of stars in an area of the sky based on the light from only the brightest and most massive. For every large star formed, a set number of smaller ones were thought to have been created regardless of where the stars sat in the universe.

"We tried to understand properties of galaxies and their mass by looking at the light we can see," Meurer said.

But this common assumption has been leading astronomers astray, said Meurer, especially in galaxies that are intrinsically small and faint.

To understand the problem, imagine trying to estimate the population on Earth by observing light emitted at night. Looking from above toward North America or Europe, the regions where more people live light up like signposts. Los Angeles, for example, is easily visible to a scientist working on the International Space Station. However, if this method were applied to regions where people have limited electricity, populations would be starkly underestimated, for example in some sections of Africa.

The same can be said of galaxies, whose speckles of light in the dark of space can be misleading. Meurer and his team used ultraviolet images from the Galaxy Evolution Explorer and carefully filtered red-light images from telescopes at the Cerro Tololo International Observatory in Chile to show that many galaxies do not form a lot of massive stars, yet still have plenty of lower-mass counterparts. The ultraviolet images are sensitive to somewhat small stars three times or more massive than the sun, while the filtered optical images are only sensitive to the largest stars with 20 or more times the mass of the sun.

The effects are particularly important in parts of the universe where stars are spread out over a larger volume -- the rural Africa of the cosmos. There could be about four times as many stars in these regions than previously estimated.

"Especially in these galaxies that seem small and piddling, there can be a lot more mass in lower mass stars than we had previously expected from what we could see from the brightest, youngest stars," Meurer said. "But we can now reduce these errors using satellites like the Galaxy Evolution Explorer."

This research was published in the April 10, 2009, issue of *Astrophysical Journal*.

Adapted from materials provided by NASA/Jet Propulsion Laboratory.

http://www.sciencedaily.com/releases/2009/08/090819145846.htm

Scientists Help Explain Effects Of Ancient Chinese Herbal Formulas On Heart Health

Shedding new light on ancient Chinese herbal formulas for cardiovascular indications from left to right are: Yong-Jian Geng, M.D., Ph.D.; Yaoping Tang, M.D., Nathan S. Bryan, Ph.D.; and Harsha Garg. (Credit: The University of Texas Health Science Center at Houston)

ScienceDaily (Aug. 20, 2009) — New research at The University of Texas Health Science Center at Houston suggests that ancient Chinese herbal formulas used primarily for cardiovascular indications including heart disease may produce large amounts of artery-widening nitric oxide. Findings of the preclinical study by scientists in the university's Brown Foundation Institute of Molecular Medicine for the Prevention of Human Diseases (IMM) appear in the Sept. 15 print issue of the journal *Free Radical Biology & Medicine*.

Nitric oxide is crucial to the cardiovascular system because it signals the inner walls of blood vessels to relax, which facilitates the flow of blood through the heart and circulatory system. The messenger molecule also eliminates dangerous clots, lowers high blood pressure and reduces artery-clogging plaque formation.

The results from this study reveal that ancient Chinese herbal formulas "have profound nitric oxide bioactivity primarily through the enhancement of nitric oxide in the inner walls of blood vessels, but also through their ability to convert nitrite and nitrate into nitric oxide," said Nathan S. Bryan, Ph.D., the study's senior author and an IMM assistant professor.

Herbal formulas are a major component of traditional Chinese medicines (TCMs), which also include acupuncture and massage. "TCMs have provided leads to safe medications in cancer, cardiovascular disease and diabetes," said C. Thomas Caskey, M.D., IMM director and CEO. "The opportunity for Dr. Bryan's work is outstanding given that cardiac disease is the No. 1 cause of death in the United States."

In the study, researchers performed laboratory tests on DanShen, GuaLou and other herbs purchased at a Houston store to assess their ability to produce nitric oxide. Ancient Chinese herbal formulas used

primarily for cardiovascular indications are made up of three to 25 herbs. The formulas can be administered as tablets, elixirs, soups and teas.

Most Chinese herbal formulas marketed in the United States are not considered drugs by the U.S. Food and Drug Administration, said Yong-Jian Geng, M.D., Ph.D., study co-author and cardiology professor at The University of Texas Medical School at Houston. They are considered dietary supplements and are not regulated as strictly as drugs.

Scientists also tested the capacity of the store-bought TCMs to widen blood vessels in an animal model. "Each of the TCMs tested in the assays relaxed vessels to various degrees," the authors stated.

"Further studies should be considered in humans, particularly those with cardiac indications," Geng said. "Hopefully, we will have more data to report in the near future."

While fully integrated into the healthcare systems in some parts of Asia, ancient Chinese herbal formulas are often considered alternative medicines in Western nations. Part of the reason, according to Bryan, may be that until recently little was known about how they work.

"The next step is to identify the active components of the TCMs that are responsible for producing the NO. We are currently trying to isolate and identify the active component or components," Bryan said.

Yaoping Tang, M.D., an IMM postdoctoral fellow, was the lead author of the study titled "Nitric oxide bioactivity of traditional Chinese medicines used for cardiovascular indications." Also collaborating on the study was Harsha Garg, an IMM senior research assistant.

Bryan is the editor of a new book titled "Food, Nutrition and the Nitric Oxide Pathway: Biochemistry and Bioactivity" published by DesTech Publishing and works in the IMM Center for Cell Signaling directed by Ferid Murad, M.D., Ph.D., who won the 1998 Nobel Prize in Physiology and Medicine for his work with nitric oxide as a signaling molecule in the cardiovascular system. Bryan and Geng are on the faculty of The University of Texas Graduate School of Biomedical Sciences at Houston.

Adapted from materials provided by University of Texas Health Science Center at Houston.

http://www.sciencedaily.com/releases/2009/08/090818182055.htm

Computer Scientists Scale 'Layer 2' Data Center Networks To 100,000 Ports And Beyond

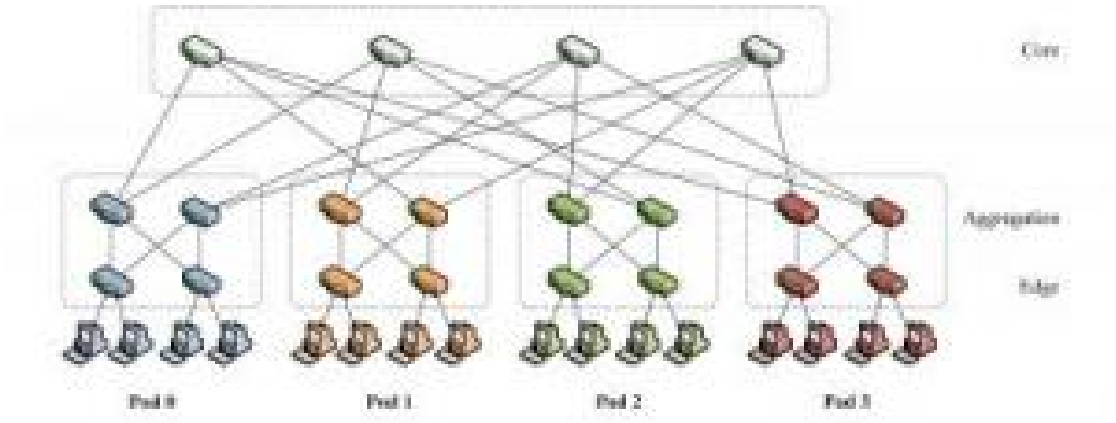


Figure 1: Sample fat tree topology.

A full prototype of PortLand, illustrated in Figure 1 from the paper, is currently running on a network in the Department of Computer Science and Engineering at UC San Diego's Jacobs School of Engineering. PortLand is a fault-tolerant, layer 2 data center network fabric capable of scaling to 100,000 nodes and beyond. PortLand is fully compatible with existing hardware and routing protocols and holds promise for supporting large-scale, data center networks by increasing inherent scalability, providing baseline support for virtual machines and migration, and dramatically reducing administrative overhead. (Credit: UC San Diego Jacobs School of Engineering)

ScienceDaily (Aug. 20, 2009) — University of California, San Diego computer scientists have created software that they hope will lead to data centers that logically function as single, plug-and-play networks that will scale to the massive scale of modern data center networks. The software system—PortLand—is a fault-tolerant, layer 2 data center network fabric capable of scaling to 100,000 nodes and beyond.

PortLand is fully compatible with existing hardware and routing protocols and holds promise for supporting large-scale, data center networks by increasing inherent scalability, providing baseline support for virtual machines and migration, and dramatically reducing administrative overhead. Critically, it removes the reliance on a single spanning tree, natively leveraging multipath routing and improving fault tolerance. The computer scientists report this advance in data center networking on August 18, 2009 at SIGCOMM, the premier computer networking conference.

"With PortLand, we came up with a set of algorithms and protocols that combine the best of layer 2 and layer 3 network fabrics," said Amin Vahdat, the senior author on the SIGCOMM paper and a computer science professor at UC San Diego's Jacobs School of Engineering. "Today, the largest data centers contain over 100,000 servers. Ideally, we would like to have the flexibility to run any application on any server while minimizing the amount of required network configuration and state."

As mega data centers handle more and more of the world's computing and storage needs, data center networking is becoming increasingly important, the computer scientists say. Loading the front page of any active Facebook user, for example, typically involves over 1,000 servers in 300 milliseconds or less.

Looking for ways to improve data center networking, Vahdat and his team of graduate students from the Jacobs School of Engineering revisited the long-standing trade-offs between layer 2 or Ethernet networks—which route on MAC addresses—and layer 3 networks—which route on IP addresses.

Their result: PortLand, a system of algorithms and protocols that eliminates the scalability and routing-path limitations of existing layer 2 approaches and avoids the administrative and virtualization headaches caused by implementing layer 3 networks in data center environments.

Today's data centers are often run on layer 3 networks, but this demands huge numbers of person-hours to set up and maintain the networks. Layer 3 networks also prohibit straightforward implementation of virtual machine migration— limiting flexibility and efforts to reduce energy and cost in the data center.

"Our goal is to allow data center operators to manage their network as a single fabric," said Vahdat, who directs the Center for Network Systems at UC San Diego. "We are working toward a network that administrators can think of as one massive 100,000-port switch seamlessly serving over one million virtual endpoints."

Location Discovery

One of PortLand's key innovations is its location discovery protocol, which opens up the possibility of a scalable layer 2 network. Switches automatically learn their location within the data center topology without any human intervention. These switches, then, assign "Pseudo MAC" (PMAC) addresses to each of the servers they connect to. These PMAC addresses—rather than MAC addresses—are used internally in the network for packet forwarding.Server behavior remains the same in networks running PortLand. When a server wants to talk to a server on the other side of the data center, that first server still sends out an "ARP," which is a request for the MAC address of the computer with which it wants to communicate, based on its IP address.

But now, instead of broadcasting this request to the entire network, the switch that received the ARP talks to a directory service which returns a PMAC address, rather than the traditional MAC address.

"We have replaced broadcast with a server lookup. And we are forwarding based on PMAC addresses rather than MAC addresses. On the last hop, the egress hop, the switch rewrites the PMAC to be its actual MAC address," said Vahdat, the current Science Applications International Corporation (SAIC) Chair at the Jacobs School of Engineering. "We in effect transparently leverage the built-in hierarchy of data center networks."

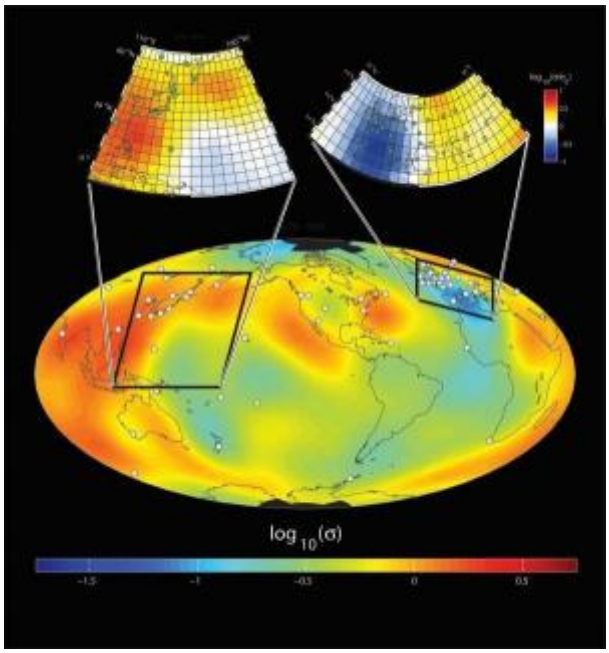
When new machines are added, or when virtual machines are moved, new PMAC addresses are automatically generated."An important thing here is that all the switches are off the shelf—unmodified 'merchant silicon'," said Vahdat."I think PortLand is something that will be useful in the real world. The goal is to create a network fabric that allows you to buy any server or switch, plug it in and have it just work," said Radhika Niranjan Mysore, a UC San Diego computer science graduate student and the first author on the SIGCOMM paper. Mysore presented this work at SIGCOMM 2009 in Barcelona, Spain on August 18, 2009.A full prototype of PortLand is currently running on a network in the Department of Computer Science and Engineering at UC San Diego's Jacobs School of Engineering.

"The students are getting good jobs and internships coming out of this project because they have data center networking skills. Companies are looking for this skill set," said Vahdat.The paper "PortLand: A Scalable Fault-Tolerant Layer 2 Data Center Network Fabric," by Radhika Niranjan Mysore, Andreas Pamboris, Nathan Farrington, Nelson Huang, Pardis Miri, Sivasankar Radhakrishnan, Vikram Subramanya, and Amin Vahdat from the Department of Computer Science and Engineering at the Jacobs School of Engineering at the University of California San Diego was presented at SIGCOMM'09, August 17–21, 2009 in Barcelona, Spain.

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

http://www.sciencedaily.com/releases/2009/08/090817190754.htm

Scientists Create First Three-dimensional Global Map Of Electrical Conductivity In Earth's Mantle



Scientists have mapped Earth's electrical conductivity on a global-scale in 3-D for the first time. (Credit: Anna Kelbert)

ScienceDaily (Aug. 20, 2009) — As tags on household appliances warn, water conducts electricity extremely well. Now, scientists have found that enhanced electrical conductivity in parts of Earth's mantle may signal the presence of water far below our planet's surface.

The researchers created the first global three-dimensional map of electrical conductivity in the mantle. Results of their study are published this week in the journal *Nature*.

The areas of high conductivity coincide with subduction zones--places where tectonic plates are being subducted beneath the Earth's crust, say the Oregon State University (OSU) scientists who performed the research. They used electromagnetic induction sounding of the Earth's mantle in the study. The method is very sensitive to interconnecting pockets of fluid in rocks and minerals.

"This work is important because it complements global 3-D seismic imaging of Earth's interior, which uses sound waves generated by earthquakes," said Robin Reichlin, program director in the National Science Foundation (NSF)'s Division of Earth Sciences, which funded the research. "Scientists may be able to combine these two methods to tease out a more detailed understanding of variations in Earth's inner composition, water content and temperature."

Subducting plates are comparatively colder than surrounding mantle materials and should be less conductive, geologists have believed. However, the OSU scientists suggest, conductivity in these areas may be enhanced by water drawn downward during the subduction process.

"Many earth scientists thought that tectonic plates are not likely to carry much, if any, water deep into the Earth's mantle," said Adam Schultz, a geologist at OSU and a co-author of the Nature paper. "Our model, however, clearly shows a close association between subduction zones and high conductivity. The simplest explanation is water."

The study provides new insights into the fundamental ways in which our planet works, Schultz says. Despite advances in technology, scientists are still unsure how much water lies beneath the ocean floor--and how much of it makes its way into the mantle.

The implications are myriad. Water interacts with minerals differently at different depths, and small amounts of water may change the physical properties of rocks, alter the viscosity of materials in the mantle, assist in the formation of rising plumes of melted rock, and ultimately affect what flows out on the surface.

"In fact, we don't really know how much water there is on Earth," said Gary Egbert, an oceanographer at OSU and co-author of the paper. "There is some evidence that there is many times more water below the ocean floor than there is in all the oceans of the world combined. Our results may shed some light on this question."

There may be different explanations for how the water--if indeed the conductivity is reflecting water--got there.

"If it isn't being subducted down with the plates," Schultz said, "is it primordial, down there for four billion years? Or did it come down as the plates slowly subduct, suggesting that the planet may have been much wetter a long time ago? These are fascinating questions for which we don't yet have answers."

Anna Kelbert, a post-doctoral researcher at OSU and lead author of the paper, says that the next step is to replicate the experiment with newly available data from both ground observatories and satellites, then conduct further research to better understand the water cycle and how its interaction with deep-Earth minerals works.

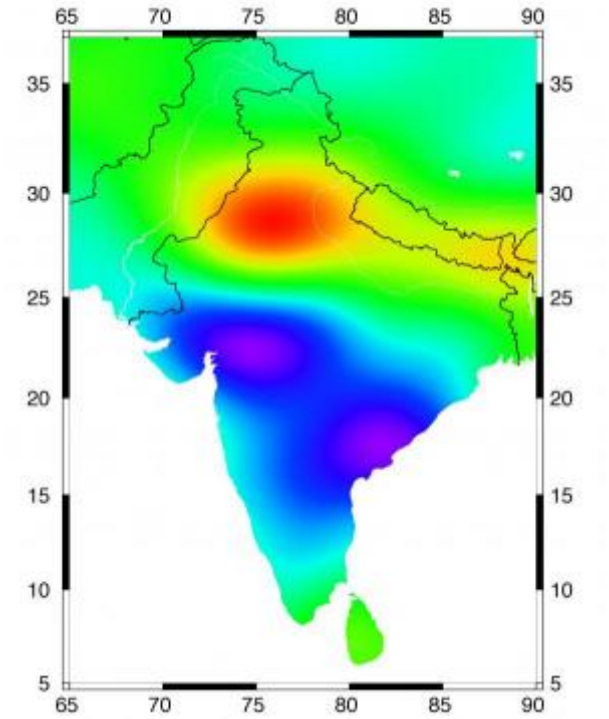
Ultimately, the scientists hope to produce a model quantifying how much water may be in the mantle, locked up in its rocks.

Their work is also supported by NASA.

Adapted from materials provided by National Science Foundation.

http://www.sciencedaily.com/releases/2009/08/090819153342.htm

Satellites Unlock Secret To Northern India's Vanishing Water



The map shows groundwater changes in India during 2002-08, with losses in red and gains in blue, based on GRACE satellite observations. The estimated rate of depletion of groundwater in northwestern India is 4.0 centimeters of water per year, equivalent to a water table decline of 33 centimeters per year. Increases in groundwater in southern India are due to recent above-average rainfall, whereas rain in northwestern India was close to normal during the study period. (Credit: I. Velicogna/UC Irvine)

ScienceDaily (Aug. 19, 2009) — Using satellite data, UC Irvine and NASA hydrologists have found that groundwater beneath northern India has been receding by as much as 1 foot per year over the past decade – and they believe human consumption is almost entirely to blame.

More than 109 cubic kilometers (26 cubic miles) of groundwater disappeared from the region's aquifers between 2002 and 2008 – double the capacity of India's largest surface-water reservoir, the Upper Wainganga, and triple that of Lake Mead, the largest manmade reservoir in the U.S.

People are pumping northern India's underground water, mostly to irrigate cropland, faster than natural processes can replenish it, said Jay Famiglietti and Isabella Velicogna, UCI Earth system scientists, and Matt Rodell of NASA's Goddard Space Flight Center.

"If measures are not soon taken to ensure sustainable groundwater usage, consequences for the 114 million residents of the region may include a collapse of agricultural output, severe shortages of potable water, conflict and suffering," said Rodell, lead author of the study and former doctoral student of Famiglietti's at the University of Texas at Austin.

Study results will be published online Aug. 12 in the journal *Nature*.

Groundwater comes from the percolation of precipitation and other surface waters down through Earth's soil and rock, accumulating in aquifers – cavities and layers of porous rock, gravel, sand or clay. In some subterranean reservoirs, the water may be thousands to millions of years old; in others, water levels decline and rise again naturally each year.

Groundwater levels do not respond to changes in weather as rapidly as lakes, streams and rivers do. So when groundwater is pumped for irrigation or other uses, restoration of original levels can take months or years.

"Groundwater mining – that is when withdrawals exceed replenishment rates – is a rapidly growing problem in many of the world's large aquifers," Famiglietti said. "Since groundwater provides nearly 80 percent of the water required for irrigated agriculture, diminishing groundwater reserves pose a serious threat to global food security."

Data provided by India's Ministry of Water Resources had suggested that groundwater use across the nation was exceeding natural replenishment, but the regional rate of depletion had been unknown.

In the new study, the hydrologists analyzed six years of monthly data for northern India from twin satellites called GRACE – NASA's Gravity Recovery and Climate Experiment – to produce a chronology of underground water storage changes.

GRACE detects differences in gravity brought about by fluctuations in water mass, including water below the Earth's surface. As the satellites orbit 300 miles above Earth, their positions change – relative to each other – in response to variations in the pull of gravity. They fly about 137 miles apart, and microwave ranging systems measure every microscopic variance in the distance between the two.

"With GRACE, we can monitor water storage changes everywhere in the world from our desk," said Velicogna, also with NASA's Jet Propulsion Laboratory. "The satellites allow us to observe how water storage evolves from one month to the next in critical areas of the world."

Groundwater loss in northern India is particularly alarming because there were no unusual trends in rainfall – in fact, it was slightly above normal during the study period. The researchers also examined data on soil moisture, lake and surface reservoir storage, vegetation and glaciers in the nearby Himalayas to confirm that the apparent groundwater trend was real. The only influence they couldn't rule out was human.

"For the first time, we can observe water use on land with no additional ground-based data collection," Famiglietti said. "This is critical because in many developing countries, where hydrological data are both sparse and hard to access, space-based methods provide perhaps the only opportunity to assess changes in freshwater availability across large regions."

About GRACE: The Gravity Recovery and Climate Experiment is a partnership between NASA and the German Aerospace Center. The University of Texas Center for Space Research, Austin, has overall mission responsibility. NASA's Jet Propulsion Laboratory developed the twin satellites. The German Aerospace Center provided the launch, and GeoForschungsZentrum Potsdam, Germany, operates GRACE.

Adapted from materials provided by University of California - Irvine.

http://www.sciencedaily.com/releases/2009/08/090812143938.htm

First Ever Use In Europe Of An Insect To Fight Invasive Plant Species

Dr John Bailey of the Department of Biology. (Credit: Image courtesy of University of Leicester)

ScienceDaily (Aug. 19, 2009) — Researchers at the University of Leicester have paved the way for the first ever use in Europe of an insect (biocontrol) to combat an invasive plant species in Britain.

University of Leicester biologists established that the Japanese Knotweed in Britain was one the biggest females in the world- a clone of cuttings brought into Britain in the 1850s. Costs of controlling it in Britain have been put at £1.5 billion.

Defra's Food and Environment Research Agency (Fera) has now launched a public consultation exercise into plans to control the Japanese Knotweed using a highly specialist sap-sucking insect –or psyllid- called *Aphalara itadori.*

This follows a rigorous testing regime undertaken by the not-for-profit research organisation CABI at their quarantine laboratories, the purpose of which is to be as sure as possible that potential biocontrol organisms are restricted to Japanese Knotweed and cannot be tempted to stray onto related British plants or economically important species.

Lead scientist Dick Shaw said: “Using information compiled by scientists at the University of Leicester, Biocontrol experts at CABI were able to focus their collecting efforts on the precise region of Japan where the European clone of Japanese Knotweed originated.

“A number of Japanese invertebrates and micro organisms have been subjected to a rigorous testing regime. The aim of biological control is not to eradicate the target organism, but to weaken it so as to restrict spread and increase the effectiveness of other control measures (i.e less herbicide use).”

The psyllid doesn't actually eat the plant, but sucks the sap like an aphid, and also produces vast numbers of offspring on Japanese Knotweed plants, which severely affect the morphology and vigour of the plant.

Dr Shaw added: "Since there has never been a release of a biocontrol agent for a plant species in Europe, extreme caution is being exercised by all concerned".The proposed organism has now satisfied the scientific community that the proposed release under licence would be both safe and beneficial to the environment. On July 23 2009 the government inaugurated a public consultation on the release, subject to the satisfactory conclusion of this process, approval should be granted for the first releases in April 2010.

"Early releases would be made only under licence, and would be closely monitored, with appropriate contingency plans in place. At the point that the organism is declared to be ordinarily resident, anybody may move it between knotweed sites. Given the fact that our Japanese knotweed is a single clone I feel we have excellent prospects for the specific and effective control of Japanese Knotweed in Britain. "

Adapted from materials provided by University of Leicester, via AlphaGalileo.

http://www.sciencedaily.com/releases/2009/07/090730073926.htm

Whole Grain Cereals, Popcorn Rich In Antioxidants, Not Just Fiber, New Research Concludes

Popcorn has the highest levels of healthy antioxidants among whole grain snack foods, researchers are reporting. (Credit: Wikimedia Commons)

ScienceDaily (Aug. 19, 2009) — In a first-of-its kind study, scientists reported today at the 238th National Meeting of the American Chemical Society (ACS) that snack foods like popcorn and many popular breakfast cereals contain "surprisingly large" amounts of healthful antioxidant substances called "polyphenols."

Polyphenols are a major reason why fruits and vegetables — and foods like chocolate, wine, coffee, and tea — have become renowned for their potential role in reducing the risk of heart disease, cancer, and other diseases.

Until now, however, no one knew that commercial hot and cold whole grain cereals — regarded as healthful for their fiber content — and snack foods also were a source of polyphenols.

"Early researchers thought the fiber was the active ingredient for these benefits in whole grains, the reason why they may reduce the risk of cancer and coronary heart disease," said Joe Vinson, Ph.D., who headed the new study. "But recently, polyphenols emerged as potentially more important. Breakfast cereals, pasta, crackers, and salty snacks constitute over 66 percent of whole grain intake in the U.S. diet."

Vinson, a chemist at the University of Scranton in Pennsylvania, said "We found that, in fact, whole grain products have comparable antioxidants per gram to fruits and vegetables. This is the first study to examine total phenol antioxidants in breakfast cereals and snacks, whereas previous studies have measured free antioxidants in the products."

Polyphenols are a group of chemicals found in many fruits, vegetables, and other plants, such as berries, walnuts, olives, tea leaves and grapes. Known as antioxidants, they remove free radicals from the body. Free radicals are chemicals that have the potential to cause damage to cells and tissues in the body.

The whole grain cereal with the most antioxidants are made with wheat, with corn, oats and rice cereals following in descending order, according to Vinson. He also noted that raisin bran has the highest amount of antioxidants per serving, primarily due to the raisins.

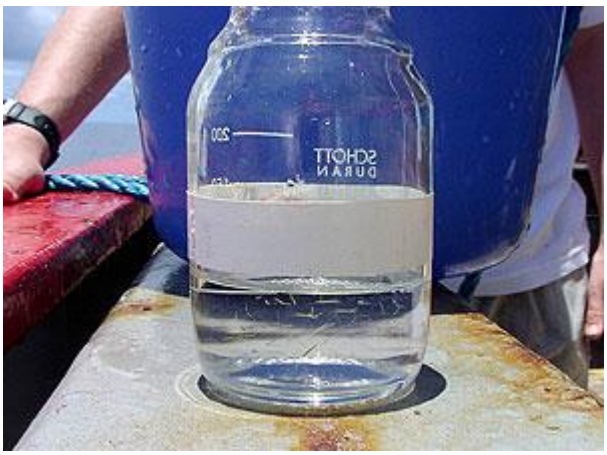
Bran cereals made from wheat overall do not have more antioxidants than wheat cereals, though they do have more fiber, he said. In other findings, he said that whole grain flours are very high in antioxidants; whole grain snacks have slightly lower levels of antioxidants than cereals; of snacks, popcorn has the highest level of antioxidants; and there is a wide variation in the amount of antioxidants in each class of cold cereal.

Internal Funding for the study was from the University of Scranton.

Adapted from materials provided by American Chemical Society.

http://www.sciencedaily.com/releases/2009/08/090818150011.htm

Nitrogen Fixation And Phytoplankton Blooms In The Southwest Indian Ocean



Researchers based at the National Oceanography Centre, Southampton report on a 2005 hydrographic survey south and east of Madagascar while aboard the royal research ship RRS Discovery (Credit: Image courtesy of National Oceanography Centre, Southampton)

ScienceDaily (Aug. 19, 2009) — Observations made by Southampton scientists help understand the massive blooms of microscopic marine algae – phytoplankton – in the seas around Madagascar and its effect on the biogeochemistry of the southwest Indian Ocean.

The observations were made by researchers based at the National Oceanography Centre, Southampton (NOCS) during a 2005 hydrographic survey south and east of Madagascar while aboard the royal research ship RRS Discovery. The fully analysed results are published in the journal *Geophysical Research Letters*.

Nitrogen-fixing bacteria convert atmospheric nitrogen into nitrogen compounds that organisms can then use as food. This process is thought to be important in areas of the ocean where nitrogen-based nutrients are otherwise in short supply, and the researchers confirm that this is indeed the case in the region south of Madagascar. But there were some surprises. Previously, it has been thought that the large-scale autumn bloom that develops in this region is driven by nitrogen-fixing blue-green algae, or cyanobacteria, called *Trichodesmium*, colonies of which the researchers found to be abundant. However, the 2005 bloom was dominated by a diatom – a type of phytoplankton – the cells of which play host to another nitrogen-fixing cyanobacterium called *Richella intracellularis*, with *Trichodesmium* apparently playing second fiddle.

Diatoms have relatively large cells, and when they die they sink down the water column, carrying with them carbon that is ultimately derived from carbon dioxide drawn from the atmosphere though the process of photosynthesis. "Carbon dioxide is a greenhouse gas, and enhanced export of carbon to the deep ocean in the bodies of diatoms is an important natural mechanism by which the ocean regulates atmospheric carbon dioxide and our climate," says team member Dr Alex Poulton of NOCS.

The researchers believe that their findings will have an impact on modelling and satellite studies of the Madagascar bloom. "Future research will also need to account for the magnitude of carbon export associated with diatoms and their nitrogen-fixing guests in the southwest Indian Ocean, and indeed other subtropical oceanic settings," says Dr Poulton.

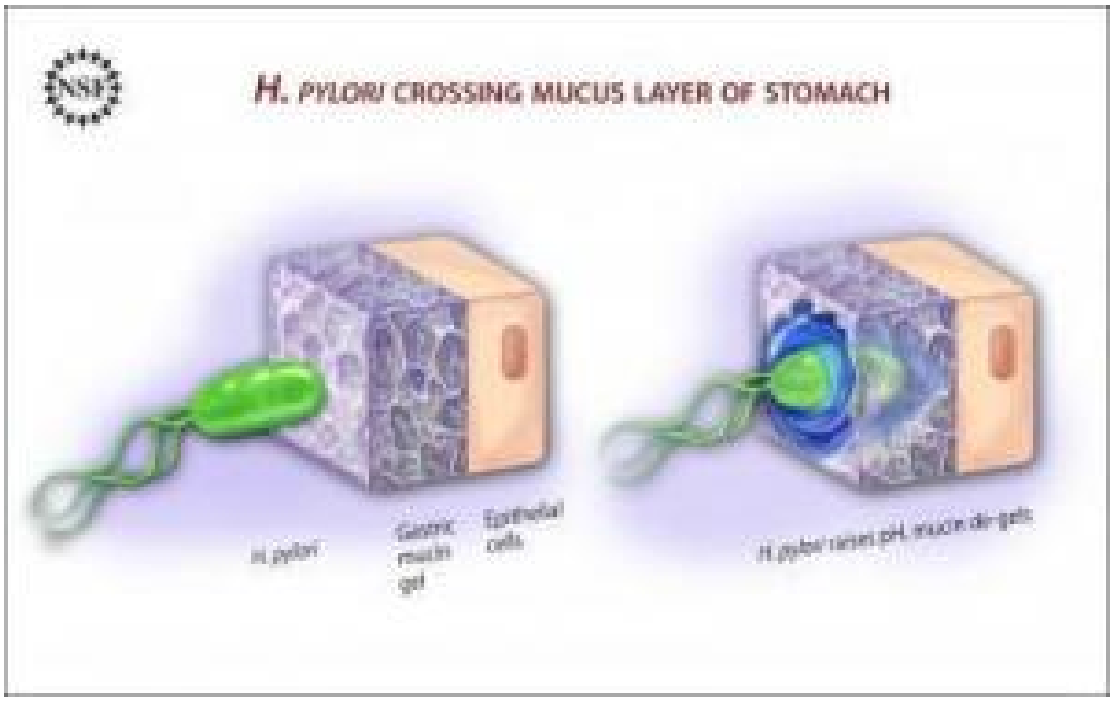
Journal reference:

1. Poulton, A.J., Stinchcombe, M.C. & Quartly, G.D. **High numbers of Trichodesmium and diazotrophic diatoms in the southwest Indian Ocean**. *Geophysical Research Letters*, 2009; 36 (15): L15610 DOI: 10.1029/2009GL039719

Adapted from materials provided by National Oceanography Centre, Southampton (UK).

http://www.sciencedaily.com/releases/2009/08/090814103233.htm

Secrets Of Ulcer-causing Bacteria: Clever Biochemical Strategy Enables Bacteria To Move Freely And Colonize Host



Contact with stomach acid keeps the mucin lining the epithelial cell layer in a spongy gel-like state. This consistency is impermeable to the bacterium Heliobacter pylori. However, the bacterium releases urease which neutralizes the stomach acid. This causes the mucin to liquefy, and the bacterium can swim right through it. (Credit: Zina Deretsky, National Science Foundation)

ScienceDaily (Aug. 19, 2009) — A team of researchers from Boston University, Harvard Medical School and Massachusetts Institute of Technology recently made a discovery that changes a long held paradigm about how bacteria move through soft gels. They showed that the bacterium that causes human stomach ulcers uses a clever biochemical strategy to alter the physical properties of its environment, allowing it to move and survive and further colonize its host.

The *Proceedings of the National Academy of Sciences* reports the findings in its most recent issue. *Helicobacter pylori* is a bacterium that inhabits various areas of the stomach where it causes chronic, low-level inflammation and is linked to gastric ulcers and stomach cancer. In order to colonize the stomach, *H. pylori* must cope with highly acidic conditions in which other bacteria are unable to survive. It is well known however, that the bacterium accomplishes this by producing ammonia to neutralize the acid in its surroundings. In addition, newly published research shows it does something else; it changes its environment to enable freer movement.

Acidic conditions within the stomach also work against the bacteria's ability to move freely. This is due to a protein called "mucin," a crucial component of the protective mucus layer in the stomach. In the presence of acid mucin forms a protective gel, which acts as a physical barrier that stops harmful bacteria from reaching the cell wall.

But, *H. pylori* increases the pH of its surroundings and changes this "mucin" gel to a liquid, allowing the bacterium to swim across the mucus barrier, establish colonies, attack surface cells and form ulcers.

"Bacteria 'swim' through watery fluids using their tails to propel them," said Boston University physicist Rama Bansil, who is currently on leave from BU, working as a Division of Materials Research program

manager at the National Science Foundation. "But it was not obvious how they move through a soft gel like mucus."

To answer the question Bansil, Shyam Erramilli and Jonathan Celli, also of Boston University, partnered with gastroenterologists Nezam Afdhal and Ciaran Kelly, and biochemists Sarah Keates, Bradley Turner and Ionita Ghiran at Harvard Medical School and mechanical and biomedical engineers Gareth McKinley, Peter So and Randy Ewoldt at MIT. The work began a few years ago as a feasibility study and was a part of Celli's Ph. D research.

Using video microscopes, the researchers found that when mucins extracted from mucus were in a liquid state, the bacteria could swim freely, but when mucins were in a gel state, the bacteria were stuck, even though their tails were rotating. More advanced imaging techniques revealed that pH changes directly correlated with the ability of the bacteria to move--the higher the pH, the greater the movement.

"This study indicates that the *H. pylori*, which is shaped very much like a screw, does not bore its way through the mucus gel like a screw through a cork as has previously been suggested," said Bansil. "Instead it achieves motility by using a clever biochemical strategy."

Researchers hope that the work will pave the way for future studies in native mucus and live animals to devise strategies for preventing *H. pylori* infection. Such studies could be important to the design of new therapeutic approaches that prevent the bacteria from colonizing in the first place, and also may be relevant to the broader question of bacterial infections in mucus linings in other organs.

Journal reference:

1. Jonathan P. Celli, Bradley S. Turner, Nezam H. Afdhal, Sarah Keates, Ionita Ghiran, Ciaran P. Kelly, Randy H. Ewoldt, Gareth H. McKinley, Peter So, Shyamsunder Erramilli, and Rama Bansil. **Helicobacter pylori moves through mucus by reducing mucin viscoelasticity**. *Proceedings of the National Academy of Sciences*, 2009; DOI: 10.1073/pnas.0903438106

Adapted from materials provided by National Science Foundation.

http://www.sciencedaily.com/releases/2009/08/090812163805.htm

How Mercury Becomes Toxic In The Environment

Amrika Deonarine of Duke University. (Credit: Duke University Photography)

ScienceDaily (Aug. 19, 2009) — Naturally occurring organic matter in water and sediment appears to play a key role in helping microbes convert tiny particles of mercury in the environment into a form that is dangerous to most living creatures.

This finding is important, say Duke University environmental engineers, because it could change the way mercury in the environment is measured and therefore regulated. This particularly harmful form of the element, known as methylmercury, is a potent toxin for nerve cells. When ingested by organisms, it is not excreted and builds up in tissues or organs.

In a series of laboratory experiments, Amrika Deonarine, a graduate student in civil and environmental engineering at Duke's Pratt School of Engineering, found that organic matter and chemical compounds containing sulfur – known as sulfides -- can readily bind to form mercury sulfide nanoparticles. Since they are more soluble than larger particles, these nanoparticles may be the precursors to a process known as methylation.

"When the organic material combines with the mercury, it prevents the particle from accumulating with other mercury particles and growing larger," said Deonarine, who presented the results of her analysis at the summer annual scientific sessions of the American Chemical Society (ACS) in Washington, D.C.

"Since the mercury remains in a nanoparticle size, it can easily collect on the surface of microbes where any mercury that dissolves can be taken in by the microbes," Deonarine said. "Without the organic matter, the mercury sulfide nanoparticles would grow too large and become insoluble, thus reducing the availability of mercury for microbial methylation."

It is while inside the microbe that the mercury is converted into the harmful methylmercury form, the researchers said.

These reactions can only take place in cold water environments with little to no oxygen, such as the zone of sediment just below the bottom of a body of water. Other such anaerobic environments can also be found in waste water and sewage treatment systems, the researchers said.

"The exposure rate of mercury in the U.S. is quite high," said Heileen Hsu-Kim, Duke assistant professor of civil and environmental engineering and senior member of the research team. "A recent epidemiological survey found that up 8 percent of women had mercury levels higher than national guidelines. Since humans are on top of the food chain, any mercury in our food accumulates in our body."

Because fish and shellfish have a natural tendency to store methylmercury in their organs, they are the leading source of mercury ingestion for humans. Mercury is extremely toxic and can lead to kidney dysfunctions, neurological disorders and even death. In particular, fetuses exposed to methylmercury can suffer from these same disorders as well as impaired learning abilities.

There are many ways mercury gets into the environment, with the primary sources being the combustion of coal, the refining of such metals as gold and other non-ferrous metals, and in the gases released during volcanic eruptions. The air-borne mercury from these sources eventually lands on lakes or ponds and can remain in the water or sediments.

"These initial laboratory findings could have far-reaching implications," Hsu-Kim said. "That these reactions can take places in anaerobic environments suggests that the old paradigm of testing for toxic metals in sediments may provide an incomplete picture of how much methylmercury is there."

The researchers plan to continue their studies with other types of organic matter and for longer periods of time.

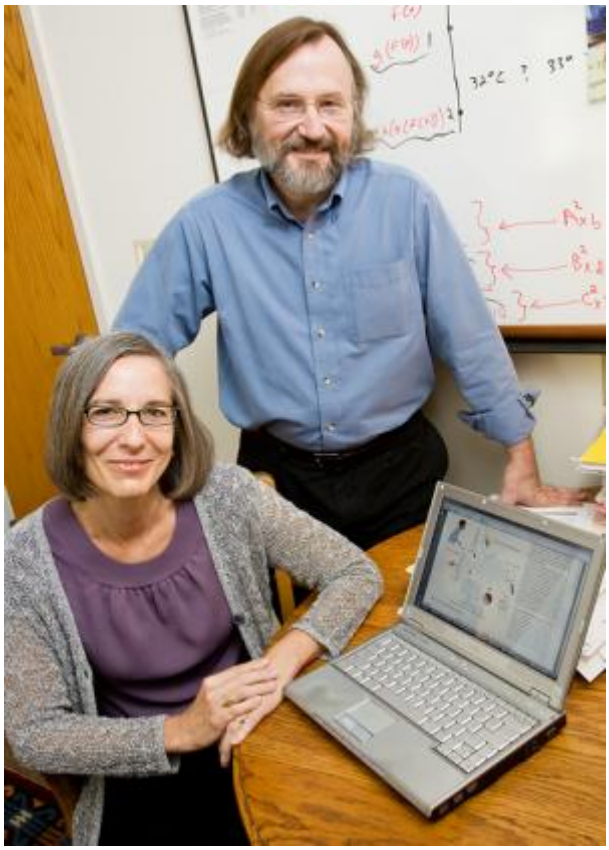
For her presentation and paper, Deonarime was one of six recipients of the C. Ellen Gonter Environmental Chemistry Award, given annually to graduate students.

The research was supported by the federally funded Center for the Environmental Implications of NanoTechnology (CEINT), which is based at Duke, and the ACS's Petroleum Research fund.

Adapted from materials provided by Duke University.

http://www.sciencedaily.com/releases/2009/08/090818150020.htm

Scientists' Strategic Reading Of Research Enhanced By Digital Tools



Allen H. Renear and Carole L. Palmer, professors of library and information science at Illinois, say that as techniques originally designed to organize and share scientific data are integrated into scientific publishing, scientists' long-standing practice of reading "strategically" will be dramatically enhanced. (Credit: Photo by L. Brian Stauffer)

ScienceDaily (Aug. 19, 2009) — The revolution in scientific publishing that has been promised since the 1980s is finally about to take place, according to two University of Illinois experts in information science.

Allen H. Renear and Carole L. Palmer, professors of library and information science at Illinois, say that as techniques originally designed to organize and share scientific data are integrated into scientific publishing, scientists' long-standing practice of reading "strategically" will be dramatically enhanced.

"Although it's natural to think that scientists search online to find individual articles to read, that isn't usually what's going on," Renear said. "Researchers actually try to avoid reading as much as possible, relying instead on indexing, citations and peer recommendations as indicators of scientific relevance."

"Scientists skim journal articles to discover valuable information. They scan for terminology, segments, diagrams and summaries of particular interest. But they don't read individual articles left-to-right, top-to-bottom."

As the quantity of information that must be covered grows rapidly, Renear says efficient strategic reading becomes increasingly critical in scientific work.

In today's electronic environment, powerful new tools are emerging that support strategic reading, allowing scientists to work with large numbers of articles simultaneously without having to read them in their entirety.

These tools are possible thanks to ontologies, which the authors describe as "structured terminologies for representing scientific data."

Originally designed to support the sharing and analysis of data, ontologies can provide information such as unambiguous identification of terms and relationships, and implicit background knowledge, the researchers say.

Scientists using these tools will be "speaking a language that can also be understood by computers, so computers can assist them as they make their way through text," Renear said.

The change in reading practices among scientists will also shape the future of scientific publishing.

"The way most journal articles are currently re-produced in electronic form is still as more or less non-functional versions of printed pages – basically, just a piece of paper lying dead on the screen," Renear said.

Instead of the electronic version simply imitating the print version of the article, integrating ontologies into the online versions of scientific literature will create many possibilities, including allowing text, diagrams and data in documents to be connected to databases of contemporary scientific knowledge.

The networked journal article will become a rich interactive representation of current scientific knowledge, available for automatic computer processing and optimized for the rapid and high-volume strategic reading scientists actually practice, Renear said.

Although automated information extraction and text mining of scientific literature, which are also supported by ontologies, will be increasingly important techniques for dealing with the information explosion, Palmer says they won't replace reading altogether.

"Narrative text will not disappear; the context it provides is too important," she said. "There will still be authors, and there will still be readers."

But within the sciences, the researchers say, reading will continue to be more and more strategic, and with the emergence of new reading tools, strategic reading will be more and more effective.

"Scientists want to read more, faster," Palmer said. "They want to read, relate and annotate research articles, strategically. Search and retrieval functions are important, as are automated information extraction and text mining. But tools for reading help scientists with the vital, everyday work of understanding and using the literature."

Renear and Palmer's findings were published in an article titled "Strategic Reading, Ontologies, and the Future of Scientific Publishing" in the Aug. 13 issue of *Science*.

Adapted from materials provided by University of Illinois at Urbana-Champaign.

http://www.sciencedaily.com/releases/2009/08/090818182058.htm

Successful Completion Of First Riser-drilling Operations In Earthquake Zone

The Japanese research vessel KAIREI shoots air-gun for vertical seismic profiling experiment conducted in the Kimano Basin. (Credit: JAMSTEC/IODP)

ScienceDaily (Aug. 19, 2009) — Researchers aboard drilling vessel *Chikyu* report successful completion of first riser-drilling operations in earthquake zone.

Kumano Basin off Kii Peninsula, approximately 58 km southeast of Japan— Despite harsh weather and ocean conditions, and complex geological characteristics of its drill site, the deep-sea drilling vessel CHIKYU, for the first time in the history of scientific ocean drilling, conducted riser-drilling operations to drill successfully down to a depth of 1,603.7 meters beneath the seafloor (at water depth of 2,054 meters). Engaged in the Integrated Ocean Drilling Program (IODP) Expedition 319, the CHIKYU is drilling deep into the upper portion of the great Nankai Trough earthquake zone to gain insights into geological formations and stress-strain characteristics. The CHIKYU is operated by the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) a partner in the IODP. The Kumano Basin drilling and sampling operations began on May 12; the science party, which includes Co-Chief Scientist Lisa McNeill of the National Oceanography Centre, Southampton (UK), is expected to complete the first drill site on or about August 1.

Riser-drilling technology was used from about 700 meters below the seafloor to the bottom of the hole. Riser-drilling involves the circulation of drilling fluid that helps maintain pressure balance within the borehole. Cuttings were recovered from the circulated drilling fluid and analyzed to gain a better overall picture of downhole changes in lithology and age. Core samples also were collected between depths of 1,510 and 1,593.3 meters below the seafloor.

Co-Chief Scientist Lisa McNeill, a member of the University of Southampton's School of Ocean and Earth Science based at the National Oceanography Centre, states: "This state-of-the-art technology

enables scientists to access an unknown area. It will provide a lot of important information about what has happened in the seismogenic zone in the past and its present condition." She adds, "I'm very pleased to be a member of the science party conducting the first riser-drilling operation in the Nankai Trough."

Following drilling operations that included 'measurement-while-drilling' to obtain real-time geophysical characteristics, wireline logging instruments were lowered into the borehole to measure formation temperature, resistivity, porosity, density, gamma ray, and borehole diameter. The riser-drilling technology enabled dynamic formation testing using the logging instrumentation for the first time during IODP scientific ocean drilling operations; this instrumentation is designed to measure stress, water pressure, and rock permeability.

Co-Chief Scientist Timothy Byrne of University of Connecticut emphasises the importance of the Nankai Trough experiment results. "These two parameters , stress magnitude and pore pressure," he says, "are both important to understanding earthquake processes."

In addition, vertical seismic profiling was conducted from July 24–25 to obtain accurate details of the geological structure of the plate boundary system. The activity involved an array of 16 seismographs vertically lowered into the borehole and eight ocean-bottom seismographs placed on the seafloor. An air-gun array on the JAMSTEC research vessel KAIREI generated elastic waves, which traveled through the formation to be recorded on the borehole and seafloor instruments.

"The seismic sensor array was installed in this hole below the thick sediment layer," says Co-Chief Scientist Eiichiro Araki of JAMSTEC: "It acts like a telescope exploring the structure of faults in detail, which are responsible for causing large earthquakes such as the one that occurred here in 1944."

Operations at this drill site are expected to conclude after casing the borehole to the bottom of the hole and capping it with a corrosion cap for future installation of a long-term borehole monitoring system (LTBMS).After completion of this task, the CHIKYU will move to its next drill site, where riserless drilling will be employed to penetrate the shallow portion of the megasplay fault branching from the seismogenic zone. Logging-while-drilling (LWD) will be conducted to measure rock properties, geological formation, and geophysical characteristics of the area. As a preliminary operation for LTBMS scheduled in the future, observatory instruments will be installed inside the hole to measure borehole temperature and pressure over the next few years.

Further analyses by scientists are expected to generate significant scientific knowledge of past earthquake activities and development processes of the Nankai Trough accretionary prism, as well as the mechanism of occurrence of large earthquakes and tsunamis.

Co-Chief Scientist Demian Saffer of The Pennsylvania State University notes, "With the efforts of the drillers and operations groups, we succeeded in conducting several very challenging experiments, many of which can only be achieved by riser drilling. The results provide important information about conditions within the rocks above zones where earthquakes occur. Ultimately, we plan to install long-term observatory systems in these boreholes that will allow us to continuously monitor the geologic formation during the earthquake cycle."

Adapted from materials provided by National Oceanography Centre, Southampton.

http://www.sciencedaily.com/releases/2009/07/090730073924.htm

Scientists Make First Discovery Using Revolutionary Long Wavelength Demonstrator Array

Standing next to a prototype of one of the anticipated 13,000 Long Wavelength Array dipole antennas are (left to right) Brian Hicks, Jake Hartman, and Paul Ray of the NRL engineering team who are installing the latest generation NRL-designed LWA antennas in New Mexico. One of the 27 25-m parabolic dish antennas comprising NRAO's Very Large Array radio telescope appears in the background. (Credit: Naval Research Laboratory)

ScienceDaily (Aug. 19, 2009) — Scientists from NRL's Space Science and Remote Sensing Divisions, in collaboration with researchers from the University of New Mexico (UNM) and the National Radio Astronomy Observatory (NRAO) located in Socorro, N.M., have generated the first scientific results from the Long Wavelength Demonstrator Array (LWDA). The measurements were obtained during field tests and calibration of two prototype antennas for the much larger Long Wavelength Array (LWA), which will eventually consist of nearly 13,000 similar antennas.

Utilizing radio emissions from the approximately 300 year-old Cassiopeia A (Cas A) supernova remnant (SNR)—one of the brightest astronomical radio sources in the sky—to establish baseline measurements, NRL scientist and National Research Council (NRC) postdoctoral fellow Dr. Jake Hartman utilized the LWDA to confirm and extend a study initiated by fellow NRL-NRC postdoc Dr. Joseph Helmboldt.

Using NRAO's Very Large Array (VLA) radio telescope, Dr. Helmboldt's research showed that the gradually weakening Cas A displays signs of a "softer" smooth, secular decrease and an apparent shorter term variability at frequencies below 100 MHz.

"Cas A has long been known to be fading, but the slower, seemingly irregular decrease at frequencies lower than 100 MHz has remained controversial," said Dr Namir Kassim, astronomer and LWA project scientist, NRL. "Dr. Hartman's discovery reaffirms this supposition and provides strong support that more frequent time sampling will be needed to determine whether the shorter term variations contain a non-random component."

Dr. Helmboldt's measurements were able to significantly improve constraints on the smooth secular decrease, confirming earlier indications that the decrease was slower than originally determined several

decades ago. He was also able to verify earlier indications of variations on shorter timescales, including the possibility that they might contain a sinusoidal component.

Scientifically, these new measurements taken by Dr. Hartman are significant because they must be explained by diffusive shock acceleration theory—which helps describe how the blast wave from a relatively recent supernova explosion like Cas A is able to accelerate relativistic particles and generate radio emission. The theory must account both for the relatively smooth, longer-term rate at which the emission is gradually fading, as well as the shorter-term variability that is likely related to the properties of the region into which the SNR is expanding.

"The result is exciting because it represents 'first science', and is increasingly intriguing as it is based on measurements from only two dipole antennas, as compared to the more than 13,000 that will eventually comprise the full LWA," said Dr. Paul Ray, astronomer, NRL. "For a project whose broader goals encompass engaging and training a next generation of young radio scientists we are proud that this first astronomical result emerged from the work of two postdocs, neither of whom were experts in this area of research."

Once completed, the LWA will provide an entirely novel view of the sky in the radio frequency range of 20-80 MHz, currently one of the most poorly explored regions of the electromagnetic spectrum in astronomy. The LWA will be able to make sensitive high-resolution images, scanning the sky rapidly for new and transient sources of radio waves that may represent the explosion of distant massive stars or detect emissions from planets outside of our own solar system and previously unknown objects or phenomena.

"We're now laying the infrastructure for the first LWA antenna station," said Joe Craig, LWA system engineer, UNM. "It's really an exciting period for everyone involved."

LWA will also provide an unparalleled measure of turbulence and waves in the Earth's ionosphere, together with unique diagnostics of phenomena manifested through the Sun-Earth connection also known as "Space Weather."

Dr. Hartman's work describing his LWDA-based measurements has been published as an LWA technical memorandum, while Dr. Helmboldt's paper on the secular decrease of Cas A, based on the combined VLA and LWDA data, will appear in the September 2009 issue of the Astronomical Journal.

The LWDA was funded by NRL and built by the Applied Research Laboratories of the University of Texas, Austin. Funding for the University of New Mexico-led LWA project is managed by the Office of Naval Research with research being co-sponsored by the Naval Research Laboratory, University of New Mexico, Los Alamos National Laboratory, Jet Propulsion Laboratory, Virginia Tech, and The University of Iowa with cooperation from the National Radio Astronomy Observatory. NRAO is a facility of the National Science Foundation operated under cooperative agreement by Associated Universities, Inc.

Adapted from materials provided by Naval Research Laboratory, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/08/090818150031.htm

Milk May Be Safe, Even Encouraged, For Some Children After Treatment For Milk Allergy

Some children with a history of severe milk allergy may be able to safely drink milk and consume other dairy products every day, according to new research. (Credit: iStockphoto)

ScienceDaily (Aug. 19, 2009) — Some children with a history of severe milk allergy may be able to safely drink milk and consume other dairy products every day, according to research led by the Johns Hopkins Children's Center and published in the Aug. 10 online edition of the *Journal of Allergy and Clinical Immunology*.

Investigators followed up with a subset of children who were part of an earlier Hopkins Children's-led study published in 2008 in which patients allergic to milk were given increasingly higher doses of milk over time. For many of them, continuous exposure to milk allergens – the proteins that trigger bad reactions – slowly and gradually retrained their immune systems to better tolerate the very food that once sent those systems into overdrive.

The follow-up of 18 children ages 6 to 16 whose severe milk allergies had eased or disappeared found that all children were able to safely consume milk at home, and that reactions, while common, were generally mild and grew milder and milder over time. The follow-up varied from three to 17 months, depending on how long it took patients to increase their milk intake.

These findings also suggest that regular use of milk and dairy foods may be needed for children to maintain their tolerance.

"We now have evidence from other studies that some children once successfully treated remain allergy-free even without daily exposure, while in others the allergies return once they stop regular daily exposure to milk," says Robert Wood, M.D., the study's senior investigator and director of Allergy & Immunology at Hopkins Children's. "This may mean that some patients are truly cured of their allergy, while in others the immune system adapts to regular daily exposure to milk and may, in fact, need the exposure to continue to tolerate it," he adds.

After up to 17 months of at-home consumption, 13 of the 18 children who could tolerate increasingly higher doses were asked to return to the clinic for milk-drinking tests. Of the 13, six showed no reaction after drinking 16,000 mg (16 ounces) of milk, twice the highest tolerated dose during the initial study. Seven children had reactions at doses ranging from 3,000 mg to 16,000 mg. The reactions ranged from oral itch to hives, to sneezing to mild abdominal pain, but none was serious. One child developed cough requiring medications.

Investigators also continued to follow three children who could not tolerate doses higher than 2,540 mg (2.5 ounces) – the cutoff set by the investigators at the beginning of the follow-up – which made them ineligible to continue the at-home part of the study. All three continued to drink milk daily with minimal reactions, and two of the children were eventually able to increase their consumption beyond 2,540 mg.

Sensitivity to milk was also measured with traditional skin prick testing, which showed gradual decreases in reactions over time. Seven children had no reactions at eight to 15 months of follow-up. Blood levels of milk IgE antibodies slowly decreased over time too, another sign of better tolerance to milk. At the same time, a different type of antibody, IgG4 – one that signals immunity to a particular allergen – went up over time, a maker of improved tolerance.

Children and their parents also kept daily logs of milk and dairy consumption and recorded symptoms, such as hives, abdominal pain, sneezing and cough. During the first three months, consumption of milk triggered reactions 49 percent of the time, with some children experiencing as few as two reactions for every 100 doses of milk consumed. The figure dropped to 23 percent in the subsequent three months, and some children had no reactions at all.

Milk allergy is the most common type of food allergy. Three million U.S. children have food allergies, according to the Centers for Disease Control and Prevention.

Co-investigators in the study include Satya Narisety, Robert Hamilton and Elizabeth Matsui, of Hopkins; Justin Skripak of the Mt. Sinai School of Medicine; and Pamela Steele and A. Wesley Burks of Duke University.

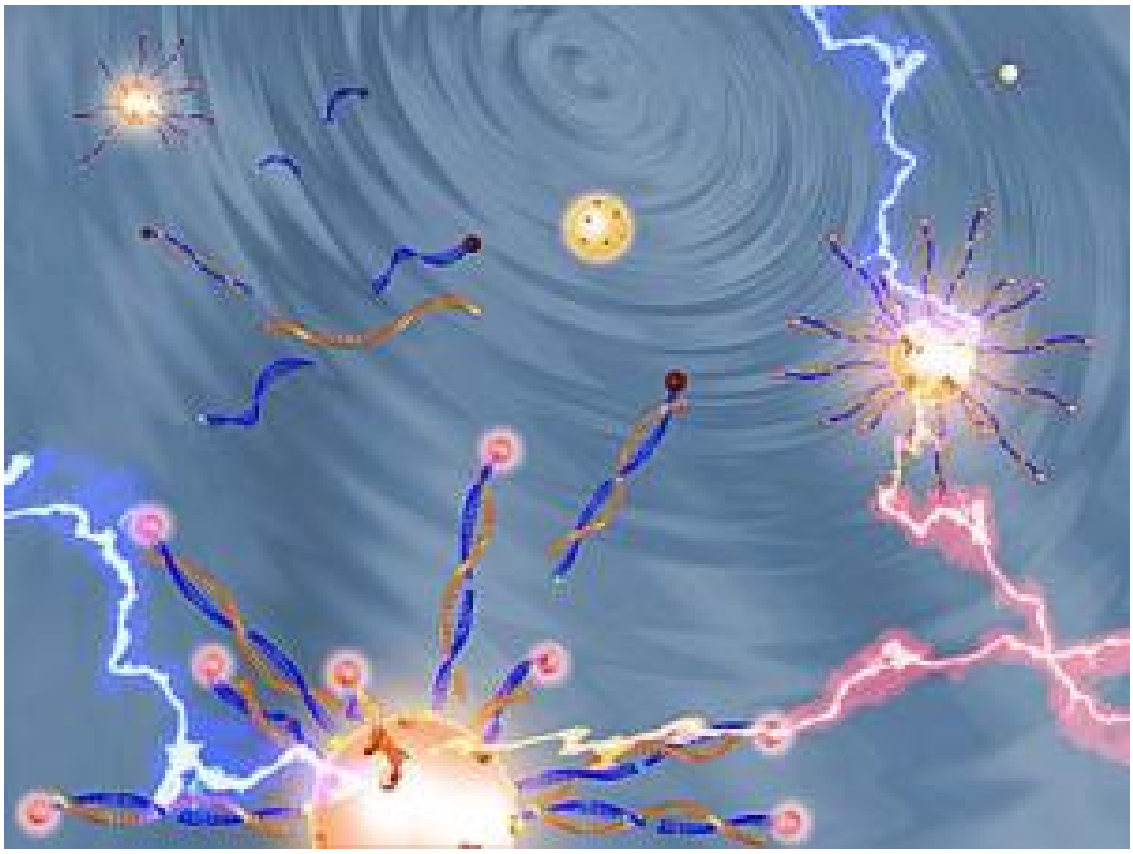
The research was funded by the National Institutes of Health.

Dr. Wood receives funding support from Genentech, manufacturer of Xolair, for the treatment of allergic asthma. He serves on the advisory board of the Food Allergy and Anaphylaxis Network.

Adapted from materials provided by Johns Hopkins Medical Institutions, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/08/090818182100.htm

New DNA Test Uses Nanotechnology To Find Early Signs Of Cancer



In this illustration by Yi Zhang, quantum dots are depicted as gold spheres that attract DNA strands linked to cancer risks. When the quantum dots are exposed to certain types of light, they transfer the energy to fluorescent molecules, shown as pink globes, that emit a glow. This enables researchers to detect and count the DNA strands linked to cancer. (Credit: Image courtesy of Johns Hopkins University)

ScienceDaily (Aug. 19, 2009) — Using tiny crystals called quantum dots, Johns Hopkins researchers have developed a highly sensitive test to look for DNA attachments that often are early warning signs of cancer. This test, which detects both the presence and the quantity of certain DNA changes, could alert people who are at risk of developing the disease and could tell doctors how well a particular cancer treatment is working.

The new test was reported in a paper called "MS-qFRET: a quantum dot-based method for analysis of DNA methylation," published in the August issue of the journal Genome Research. The work also was presented at a conference of the American Association of Cancer Research.

"If it leads to early detection of cancer, this test could have huge clinical implications," said Jeff Tza-Huei Wang, an associate professor of mechanical engineering whose lab team played a leading role in developing the technique. "Doctors usually have the greatest success in fighting cancer if they can treat it in its early stage."

Wang and his students developed the test over the past three years with colleagues at the Johns Hopkins Kimmel Cancer Center. Stephen B. Baylin, deputy director of the center and a co-author of the Genome Research study, said the test represents "a very promising platform" to help doctors detect cancer at an early stage and to predict which patients are most likely to benefit from a particular therapy.

The recent study, which included the detection of DNA markers in the sputum from lung cancer patients, was designed to show that the technology was sound. Compared to current methods, the test appeared to be more sensitive and delivered results more quickly, the researchers said. “The technique looks terrific, but it still needs to be tested in many real-world scenarios,” Baylin said. “Some of these studies are already under way here. If we continue to see exciting progress, this testing method could easily be in wide use within the next five years.”

The target of this test is a biochemical change called DNA methylation, which occurs when a chemical group called methyl attaches itself to cytosine, one of the four nucleotides or base building blocks of DNA. When methylation occurs at critical gene locations, it can halt the release of proteins that suppress tumors. When this occurs, it is easier for cancer cells to form and

multiply. As a result, a person whose DNA has this abnormal gene DNA methylation may have a higher risk of developing cancer. Furthermore, these methylation changes appear to be an early event that precedes the appearance of genetic mutations, another precursor to cancer.

To detect this DNA methylation, the Johns Hopkins team found a way to single out the troublesome DNA strands that have a methyl group attached to them. Through a chemical process called bisulfite conversion, all segments that lack a methyl group are transformed into another nucleotide.

Then, another lab process is used to make additional copies of the remaining target DNA strands that are linked to cancer. During this process, two molecules are attached to opposite ends of each DNA strand. One of these molecules is a protein called biotin. The other is a fluorescent dye. These partner molecules are attached to help researchers detect and count the DNA strands that are associated with cancer.

To do this, these customized DNA strands are mixed with quantum dots, which are crystals of semiconductor material whose sizes are in the range of only few nanometers across. (A nanometer is one-billionth of a meter, far too small to see with the naked eye.).These dots are usually employed in electronic circuitry, but they have recently proved to be helpful in biological applications as well. Quantum dots are useful because they possess an important property: They easily transfer energy. When light shines on a quantum dot, the dot quickly passes this energy along to a nearby molecule, which can use the energy to emit a fluorescent glow. This behavior makes the cancer-related DNA strands light up and identify themselves.

In the Johns Hopkins cancer test, the quantum dots have been coated with a chemical that is attracted to biotin–one of the two molecules that were attached to the DNA strands. As a result, up to 60 of the targeted DNA strands can stick themselves to a single quantum dot, like arms extending from an octopus. Then, an ultraviolet light or a blue laser is aimed at the sample. The quantum dots grab this energy and immediately transfer it to the fluorescent dyes that were attached earlier to the targeted DNA strands. These dye molecules use the energy to light up.

These signals, also called fluorescence, can be detected by a machine called a spectrophotometer. By analyzing these signals, the researchers can discover not only whether the sample contains the cancer-linked DNA but how much of the DNA methylation is present. Larger amounts can be associated with a higher cancer risk.

“This kind of information could allow a patient with positive methylation to undergo more frequent cancer screening tests. This method could replace the traditionally more invasive ways for obtaining patient samples with a simple blood test,” said Vasudev J. Bailey, a biomedical engineering doctoral student from Bangalore, India, who was one of the two lead authors on the Genome Research paper. “It’s also important because these test results could possibly help a doctor determine whether a particular cancer treatment is working. It could pave the way for personalized chemotherapy.”

In addition, because different types of cancer exhibit distinctive genetic markers, the researchers say the test should be able to identify which specific cancer a patient may be at risk of developing. Markers for lung cancer, for example, are different from markers for leukemia.

The other lead author of the Genome Research paper was Hariharan Easwaran, a cancer biology research fellow in the Johns Hopkins School of Medicine. Along with Wang and Baylin, the other co-authors were Yi Zhang, a biomedical engineering doctoral student at Johns Hopkins; Elizabeth Griffiths, an oncology clinical fellow in the School of Medicine; Steven A. Belinsky, of the Lovelace Respiratory Research Institute in Albuquerque, N.M.; James G. Herman, a professor of cancer biology in the School of Medicine; and Hetty E. Carraway, an assistant professor of oncology in the School of Medicine.

Johns Hopkins Technology Transfer staff members have applied for international patent protection covering the testing technique and are in talks with a biotechnology company that has expressed interest in licensing the application.

The research was supported by grants from the National Cancer Institute, the National Science Foundation, the Hodson Foundation and the Flight Attendant Medical Research Institute.

Adapted from materials provided by Johns Hopkins University.

http://www.sciencedaily.com/releases/2009/08/090817142847.htm

Stressed Crops Emit More Methane Than Thought

Mirwais Qaderi and David Reid say weeds like these pictured can thrive with climate change. (Credit: Image courtesy of University of Calgary)

ScienceDaily (Aug. 19, 2009) — Scientists at the University of Calgary have found that methane emission by plants could be a bigger problem in global warming than previously thought.

A U of C study says that when crops are exposed to environmental factors that are part of climate change -- increased temperature, drought and ultraviolet-B radiation -- some plants show enhanced methane emissions. Methane is a very potent greenhouse gas; 23 times more effective in trapping heat than carbon dioxide.

"Most studies just look at one factor. We wanted to mix a few of the environmental factors that are part of the climate change scenario to study a more true-to-life impact climate change has on plants," says David Reid, a professor in the Department of Biological Sciences who co-authored a paper with research associate Mirwais Qaderi in the advanced on-line edition of the journal *Physiologia Plantarum.*

Reid and Qaderi, who received funding from the University Research Grants Committee (URGC) and Natural Sciences and Engineering Research Council of Canada (NSERC), analyzed methane emissions from six important Canadian crops – faba bean, sunflower, pea, canola, barley and wheat – that were exposed to combinations of three components of global climate change: temperature, ultraviolet-B radiation and water stress (drought). What they found they say is troubling. These stresses caused plants to emit more methane. In a warmer, drier world methane might be a bigger contributor in global warming than previously thought.

When it comes to the greenhouse effect, methane could be considered the misunderstood and often overlooked orphan greenhouse gas. Much of the attention has been focused on carbon dioxide but more recently it has been realized that methane should also be considered as a very significant greenhouse gas. Its concentrations have more than doubled since pre-industrial times. While the growth rate of methane concentrations has slowed since the early 1990s, some scientists say this is only a temporary pause.

"Our results are of importance in the whole climate warming discussion because methane is such a potent greenhouse warming gas, says Qaderi. "It points to the possibility of yet another possible feedback phenomena which could add to global warming."

Since elevated levels of carbon dioxide has been observed to counteract the negative effects of some environmental stresses,

Qaderi and Reid are now studying the effect of increased carbon dioxide with factors such as drought, higher temperature and UVB on methane production in crops.

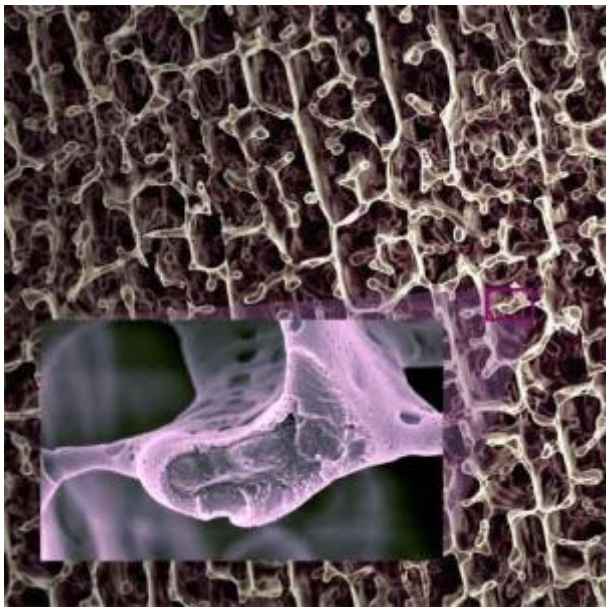
Journal reference:

1. David M. Reid and Mirwais M. Qaderi. **Methane emissions from six crop species exposed to three components of global climate change: temperature, ultraviolet-B radiation and water stress**. *Physiologica Plantarum*, July 14, 2009 DOI: 10.1111/j.1399-3054.2009.01268.x

Adapted from materials provided by University of Calgary.

http://www.sciencedaily.com/releases/2009/08/090817142851.htm

Icy Exposure Creates Armored Polymer High-Tech Foams



Chemists and engineers at the University of Warwick have found that exposing particular mixtures of polymer particles and other materials to sudden freeze-drying can create a high-tech armored foam that could be used for a number of purposes, including a new range of low power room temperature gas sensors. (Credit: Image courtesy of University of Warwick)

ScienceDaily (Aug. 19, 2009) — Chemists and engineers at the University of Warwick have found that exposing particular mixtures of polymer particles and other materials to sudden freeze-drying can create a high-tech armored foam that could be used for a number of purposes, including a new range of low power room temperature gas sensors.

Freeze-drying has been used to create structured foams before, the first such experiments being with rubber in the 1940s with the ice crystals formed throughout this process acting as templates to form the porous foam structure. However when trying to create particularly strong, stable polymer foam structures engineers and chemists today tend to rely on more complicated processes. The most straightforward of these methods is the so-called foaming or expanding process, which consists of introducing small discontinuities (for example by dispersing a compressed gas) into a soft polymer and then taking a further step to reinforce the cellular structure created upon polymerization or cooling.

The University of Warwick team's new approach to fabricate polymer foams by "ice-templating" differs from previous strategies in that they use a special range of colloids (mixtures of small particles dispersed in water), with crucial differences in their hardness and size, as key building blocks. In particular they employ a blend of larger ''soft'' polymer latexes (with diameters in range of 200–500 nm) in conjunction with a range of much smaller ''hard'' nanoparticles such as silica (with diameters in range of 25–35 nm).

When such a mixture is exposed to freeze-drying the difference in diameters induces a concentration enrichment of the smaller harder particles in the mix near the wall of each growing ice crystal. This creates a cellular structured foam in just one step in which each cell is effective given an armored layer of the smaller, harder nanoparticles.

The Warwick researchers also found that.by changing parameters, such as the nanoparticle/polymer latex ratios and concentrations, as well as the nanoparticle type, it was possible to fine-tune a certain the pore structure, and the overall porosity, of the polymer foams.The team were also able to employ various types of inorganic nanoparticles to create this instant freeze-dry foam armoring including: silica, Laponite clay, aluminium oxide, as well as small polystyrene latex particles.

The armored polymer foams have a range of applications but one of the most interesting could be a new range of room temperature low power gas sensors. The team increased the complexity of their mixture of colloids by the addition of a third colloidal component, carbon black particles with approximate diameters of 120 nm, which allowed them to produce an conductive foam 14% of the weight of which was carbon black particles.

Lead researcher Dr Stefan Bon from the University of Warwick's Department of Chemistry said: "This new process allows us to create interesting foam based nanocomposite materials which show promising results as gas sensors that can operate at room temperature and differ from traditional metal-oxide-based sensors. We know that existing chemical sensors formed from composites of carbon black particles and insulating polymers have been previously shown to form room-temperature (thus low-power) chemical sensors for detecting a range of volatile organic compounds. Now in one step we can place the same material in a high tech polymer foam to create a new range of gas-sensor devices. We believe these materials could become a new generation of sensing porous films."

Journal reference:

1. Catheline A. L. Colard, Richard A. Cave, Nadia Grossiord, James A. Covington, and Stefan A. F. Bon. **Conducting Nanocomposite Polymer Foams from Ice-Crystal-Templated Assembly of Mixtures of Colloids**. *Advanced Materials*, 21(28), 2894-2898.

Adapted from materials provided by University of Warwick.

http://www.sciencedaily.com/releases/2009/07/090728083712.htm

Immersion In Nature Makes Us Nicer

By: Tom Jacobs

Maintaining a connection to nature, either through the presence of indoor plants or artwork depicting the natural environment, has been shown to decrease stress levels and stimulate healing. Newly published research suggests it may also make us better people.

A series of studies suggests immersion in nature "brings individuals closer to others, whereas human-made environments orient goals toward more selfish or self-interested ends," according to a paper posted on the Web site of the *Personality and Social Psychology Bulletin*. This appears to be the first research to examine the impact of the natural world on people's values and aspirations, and its findings have intriguing implications for architects, designers and urban planners.

A team led by University of Rochester psychologist Netta Weinstein conducted three studies in which participants were shown a series of slides depicting either natural landscapes or urban settings. They looked at each slide for two minutes, while they were asked to notice the color and textures and imagine the sounds and smells of the environment pictured. They were then asked to what extent they felt involved in and engaged by the photos.

Those participating in the first study were then asked to rate the importance of four life goals, two of which were related to community and connectedness ("to have deep, enduring relationships" and "to work toward the betterment of society") and two of which were more egocentric ("to be financially successful" and "to be admired by many people").

The results: Those exposed to the nature scenes placed a higher value on community/connectedness values and a lower value on self-oriented values than those who saw the cityscapes. What's more, "as individuals were more immersed in the slides presenting natural settings, they experienced greater increases in intrinsic [community/connectedness] aspirations."

Another test confirmed these results by having participants engage in a "funds distribution" task. "As individuals were more immersed in nature slides, they were more likely to make generous decisions," the researchers write. "As they were more immersed in non-nature slides, they were less generous and greedier."

In a separate test that did not involve slides, "participants who were immersed in a lab setting with plants present reported higher valuing of intrinsic aspirations" than those in a setting devoid of living green growth.

So why would immersion in nature instill feelings of selflessness? Weinstein and her colleagues suggest the answer lies in an enhanced sense of personal autonomy. "Nature affords individuals the chance to follow their interests and reduces pressures, fears, introjects and social expectations," they write.

While conceding that more research will be necessary to confirm or refine these results, the researchers say their findings "highlight the importance of effective urban planning that incorporates green spaces and other representatives of nature."

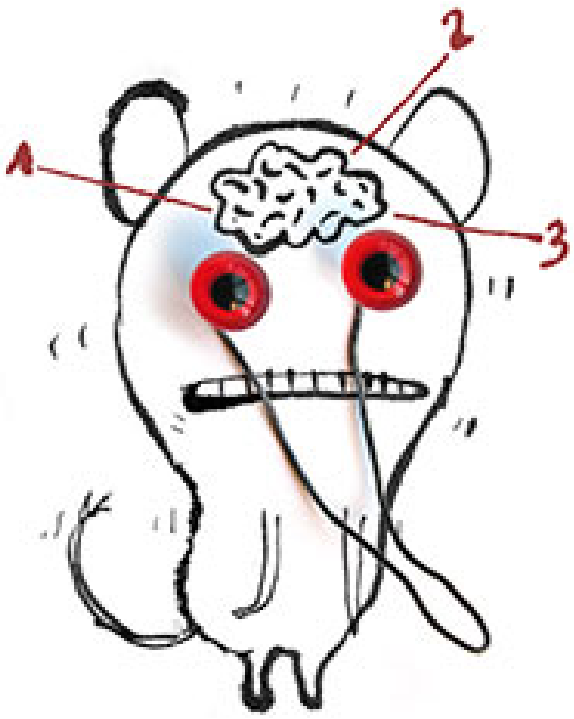
Their findings will also be of interest to architects and interior designers. Frank Lloyd Wright's concept of bringing the outside inside may not just be a prescription for aesthetic beauty, but also for peaceful coexistence.

"Together, these findings suggest that full contact with nature can have humanizing effects," the researchers conclude. "Our results suggest that, to the extent our links with nature are disrupted, we may also lose some connection with each other."

http://www.miller-mccune.com/news/immersion-in-nature-makes-us-nicer-1430

Brain Is a Co-Conspirator in a Vicious Stress Loop

By NATALIE ANGIER



If after a few months' exposure to our David Lynch economy, in which housing markets spontaneously combust, coworkers mysteriously disappear and the stifled moans of dying 401(k) plans can be heard through the floorboards, you have the awful sensation that your body's stress response has taken on a self-replicating and ultimately self-defeating life of its own, congratulations. You are very perceptive. It has.

As though it weren't bad enough that chronic stress has been shown to raise blood pressure, stiffen arteries, suppress the immune system, heighten the risk of diabetes, depression and Alzheimer's disease and make one a very undesirable dinner companion, now researchers have discovered that the sensation of being highly stressed can rewire the brain in ways that promote its sinister persistence.
Reporting earlier this summer in the journal Science, Nuno Sousa of the Life and Health Sciences Research Institute at the University of Minho in Portugal and his colleagues described experiments in which chronically stressed rats lost their elastic rat cunning and instead fell back on familiar routines and rote responses, like compulsively pressing a bar for food pellets they had no intention of eating.
Moreover, the rats' behavioral perturbations were reflected by a pair of complementary changes in their underlying neural circuitry. On the one hand, regions of the brain associated with executive decision-making and goal-directed behaviors had shriveled, while, conversely, brain sectors linked to habit formation had bloomed.
In other words, the rodents were now cognitively predisposed to keep doing the same things over and over, to run laps in the same dead-ended rat race rather than seek a pipeline to greener sewers. "Behaviors become habitual faster in stressed animals than in the controls, and worse, the stressed animals can't shift back to goal-directed behaviors when that would be the better approach," Dr. Sousa said. "I call this a vicious circle."
Robert Sapolsky, a neurobiologist who studies stress at Stanford University School of Medicine, said, "This is a great model for understanding why we end up in a rut, and then dig ourselves deeper and deeper into that rut."

The truth is, Dr. Sapolsky said, “we’re lousy at recognizing when our normal coping mechanisms aren’t working. Our response is usually to do it five times more, instead of thinking, maybe it’s time to try something new.”

And though perseverance can be an admirable trait and is essential for all success in life, when taken too far it becomes perseveration — uncontrollable repetition — or simple perversity. “If I were to try to break into the world of modern dance, after the first few rejections the logical response might be, practice even more,” said Dr. Sapolsky, the author of “Why Zebras Don’t Get Ulcers,” among other books. “But after the 12,000th rejection, maybe I should realize this isn’t a viable career option.”

Happily, the stress-induced changes in behavior and brain appear to be reversible. To rattle the rats to the point where their stress response remained demonstrably hyperactive, the researchers exposed the animals to four weeks of varying stressors: moderate electric shocks, being encaged with dominant rats, prolonged dunks in water. Those chronically stressed animals were then compared with nonstressed peers. The stressed rats had no trouble learning a task like pressing a bar to get a food pellet or a squirt of sugar water, but they had difficulty deciding when to stop pressing the bar, as normal rats easily did.

But with only four weeks’ vacation in a supportive setting free of bullies and Tasers, the formerly stressed rats looked just like the controls, able to innovate, discriminate and lay off the bar. Atrophied synaptic connections in the decisive regions of the prefrontal cortex resprouted, while the overgrown dendritic vines of the habit-prone sensorimotor striatum retreated.

According to Bruce S. McEwen, head of the neuroendocrinology laboratory at Rockefeller University, the new findings offer a particularly elegant demonstration of a principle that researchers have just begun to grasp. “The brain is a very resilient and plastic organ,” he said. “Dendrites and synapses retract and reform, and reversible remodeling can occur throughout life.”

Stress may be most readily associated with the attosecond pace of postindustrial society, but the body’s stress response is one of our oldest possessions. Its basic architecture, its linked network of neural and endocrine organs that spit out stimulatory and inhibitory hormones and other factors as needed, looks pretty much the same in a goldfish or a red-spotted newt as it does in us.

The stress response is essential for maneuvering through a dynamic world — for dodging a predator or chasing down prey, swinging through the trees or fighting off disease — and it is itself dynamic. As we go about our days, Dr. McEwen said, the biochemical mediators of the stress response rise and fall, flutter and flare. “Cortisol and adrenaline go up and down,” he said. “Our inflammatory cytokines go up and down.”

The target organs of stress hormones likewise dance to the beat: blood pressure climbs and drops, the heart races and slows, the intestines constrict and relax. This system of so-called allostasis, of maintaining control through constant change, stands in contrast to the mechanisms of homeostasis that keep the pH level and oxygen concentration in the blood within a narrow and invariant range.

Unfortunately, the dynamism of our stress response makes it vulnerable to disruption, especially when the system is treated too roughly and not according to instructions. In most animals, a serious threat provokes a serious activation of the stimulatory, sympathetic, “fight or flight” side of the stress response. But when the danger has passed, the calming parasympathetic circuitry tamps everything back down to baseline flickering.

In humans, though, the brain can think too much, extracting phantom threats from every staff meeting or high school dance, and over time the constant hyperactivation of the stress response can unbalance the entire feedback loop. Reactions that are desirable in limited, targeted quantities become hazardous in promiscuous excess. You need a spike in blood pressure if you’re going to run, to speedily deliver oxygen to your muscles. But chronically elevated blood pressure is a source of multiple medical miseries.

Why should the stressed brain be prone to habit formation? Perhaps to help shunt as many behaviors as possible over to automatic pilot, the better to focus on the crisis at hand. Yet habits can become ruts, and as the novelist Ellen Glasgow observed, “The only difference between a rut and a grave are the dimensions.”

It’s still August. Time to relax, rewind and remodel the brain.

http://www.nytimes.com/2009/08/18/science/18angier.html?_r=2&ref=science

Shooting the Freaks

By Jennifer Balderama

From "World of Wonders" Elton, a performer in the World of Wonders, says of the traveling sideshow's appeal to audiences, "For one moment those people are 9 years old again."
Fire-breathing bizarros are so hard to find these days. (No, Glenn Beck doesn't count.) And when's the last time you saw a girl change into a gorilla? A headless woman? The Human Blockhead? (Again, Glenn Beck doesn't count.) What used to be a mainstay of American circuses and county fairs — the sideshow grotesquerie — is on its last legs. As an impresario tells Jimmy and Dena Katz in their eye-popping book "World of Wonders": "In its heyday, around 1950, there were 104 traveling sideshows touring America. Today, the World of Wonders is the only one left."

Large-format camera in tow, the Katzes spent three seasons following the sword swallowers, snake handlers, illusionists and other performers of aberrational entertainment who make up the World of Wonders, capturing the glitter and kitsch, the liberty and hardship of the open road. The results are startling: dazzling portraits in lurid color, with an unflinching, high-definition intimacy. Also revealing are the excerpts from interviews — stark, prosaic, true — that lay bare the motivations and stoicism impelling this merry, if bone-tired, band of misfits.

From "World of Wonders" Chelsea (Click to Enlarge)
Some were practically born to the biz. Others tried the "real world" and found it didn't fit. "I went to school for about six weeks," says Ward Hall, who's known nothing but the sideshow life since 1946, "but they weren't teaching me what I wanted to learn, like how to tie a half-hitch on a guy-rope around a tent stake." (Hall — in jeweled cummerbund, bow tie and bowler hat — appears in the Book Review this weekend.)

Chelsea, a pierced and tattooed femme fatale in sequins and striped tights, worked at Starbucks once, but found she "had to suppress myself a lot." Chris Crist, 59, Hall's business partner, sees the sideshow as a calling. "Some kids want to be firemen," he says, but "I always knew this is what I wanted to do. I have no idea why.

Then there's Pete, a k a Poobah, one of the show's little people (you can see him in action here), who's been doing this so long that illusion has blurred into reality: "I tell people that Pete has appeared in 37 motion pictures and over 200 television shows, which is quite an exaggeration," Ward says, "but Pete has heard this so many times he now actually believes it."

And why shouldn't he believe? Countless people have, over the years. "I'm a professional liar," Ward told the Katzes. "I could take a Volkswagen and make you believe it is a Rolls-Royce. If I had another life I'd like to be a trial lawyer or perhaps an evangelical TV minister."

That's O.K., Ward. We've got plenty of lawyers and TV ministers. What I'm wondering after flipping through the Katzes' entrancing book is: Once the World of Wonders is gone, what's a freak to do?

http://papercuts.blogs.nytimes.com/2009/08/14/shooting-the-freaks/

Maestro Still Runs the Show, Grandly

By RACHEL DONADIO

ROME — Few Italians since Fellini have had such an impact in the United States as Franco Zeffirelli, from his flower-child-era film of "Romeo and Juliet" to his opulent productions at the Metropolitan Opera.

As he himself is the first to note: "I am very much loved," Mr. Zeffirelli said matter-of-factly in a recent conversation. "Eleven top productions at the Met."

Mr. Zeffirelli — or the maestro, as he is known — is 86 now, but his face looks decades younger, and his eyes still have a mischievous glint. On a sweltering recent afternoon, he held court on the veranda of his villa on the Appian Way, now an Elysian Field for the heroes of the dolce vita years. Several well-groomed dogs milled about, barking. Across the lush garden, guests lounged in the cabana by the pool.

For decades, his films — including "The Taming of the Shrew" (1967), with Elizabeth Taylor and Richard Burton, and "Hamlet" (1990), starring Mel Gibson — have helped make Shakespeare accessible, while his productions of "La Bohème," "La Traviata" and other Italian operas have kept audiences coming to the Met, which in 2008 honored him with a gala.

Critics, however, have routinely panned his work as "tawdry," "inflated" and "elephantine," saying his elaborate sets dwarf the singers. Donal Henahan of The New York Times once referred to Mr. Zeffirelli's career as "one of the great excess stories of our time." The Met has replaced some of his productions in recent years, including "Tosca." A new version directed by Luc Bondy will open the Met's season this fall.

Yet viewed from Italy — where less is never more — his style seems less over-the-top. At once conservative and campy, he is a central figure in the history of Italian postwar taste, an intriguing nexus between the glory years of Anna Magnani and Maria Callas, the Berlusconi era and the Vatican.

He is famously provocative about all three.

The sex scandal that Prime Minister Silvio Berlusconi has been embroiled in since May, when his wife announced she wanted a divorce and accused him of cavorting with very young women? "What is the scandal?" Mr. Zeffirelli said dismissively. "I think it's a joke. It's ridiculous." "I know that Berlusconi is a man that likes a lot women," he continued. "I met him when he was a very strong and efficient lady-chaser in the '70s. When he started he was a very cute boy who couldn't resist having sex behind doors."

The maestro and the prime minister share a gift for spectacle. When Mr. Berlusconi was first elected prime minister in 1994, he made Mr. Zeffirelli a senator and later bought him the villa where he now lives, Mr. Zeffirelli said.

Mr. Zeffirelli is exceedingly sniffy about more avant-garde productions and the critics who admire them. "They destroyed the tradition of musical culture," he said. "They said, 'Ah, we can't have Tosca done the same way,' but the audience loves it."

He blames critics for opera's shrinking audience. "It's like somebody decides that the Sistine Chapel is out of fashion. They go there and make something à la Warhol," he said. "You don't like it? O.K., fine, but let's have it for future generations."

For years he has tried to drum up interest in a foundation in Florence to house his own work and material he accumulated in his productions.

Mr. Zeffirelli's taste recalls the opulence of the Roman Catholic Church, and he has coordinated spectacles for the Vatican, including a production of Beethoven's "Missa Solemnis" in St. Peter's Basilica in 1970.

But the maestro is not completely enthusiastic about the current pope, Benedict XVI. "When they elected him, I felt the church was making an image error," he continued. "Catholic is another thing," he said. "It's open, it's theatrical, it's flashy." He waved his hands for effect. "When you have to deal with the Vatican — St. Peter's, 'The Last Judgment' of Michelangelo — you have to be larger than life, you can't be a professor from north Germany."

In fact, the pope, the former Cardinal Joseph Ratzinger, is a theologian from Bavaria, southern Germany. "Theologically," Mr. Zeffirelli added, he is "a wonderful man." The maestro, who in 1977 directed the television miniseries "Jesus of Nazareth," said he remained a devout Catholic. "There are some doubts about the Virgin Mary," he said ruminatively. "But not him."

As portrayed in his semi-fictional 1999 film, "Tea With Mussolini," starring Maggie Smith, Joan Plowright and Cher, Mr. Zeffirelli, born in 1923, was the product of an out-of-wedlock liaison. His mother, who owned a high-end dressmaking shop, was widowed when he was a boy. He knew his father only "in flashes," he said. "I remember this gentleman came, especially at night. I woke up and saw this shadowy man naked in bed with my mother."

Back then, children of "unknown" fathers were assigned surnames starting with a different letter each year. Because he born in the year of "Z," his mother named him after a Mozart aria with the word zeffiretti, or little zephyrs. A transcription error rendered it Zeffirelli.

He studied architecture at the University of Florence but loved theater. In the late 1940s, the director Luchino Visconti spotted the blond, blue-eyed Mr. Zeffirelli working as a stagehand in Florence. "I begged him, I showed to him my designs as a set designer, that was my dream," Mr. Zeffirelli said.

His first big break was in 1949, designing the set for the first Italian production of "A Streetcar Named Desire," directed by Mr. Visconti. "There were lots of stories of Visconti and myself and the relationship that developed," Mr. Zeffirelli said. "But the quality of my work did not authorize anybody to doubt my serious professional preparation."

He lived with Visconti for three years. In his 2006 autobiography Mr. Zeffirelli writes that he never liked to discuss his personal life, but that he considers himself "homosexual," not "gay," a term he considers less elegant.

Several years ago, Mr. Zeffirelli adopted two adult sons, men he has known and worked with for years who now live with him, dote on him and help manage his affairs. "I missed my father when I was a child, I craved becoming a father myself," he said. "But the facts of life prevented me from doing it."

The afternoon was turning to evening. His adopted son Luciano helped him walk through the garden to a bench more suitable for a photo shoot. Mr. Zeffirelli's cellphone rang. His productions are expensive, the conversation went, and who has money these days? "Only the arena of Verona seems able to do it," he said into the phone. The Roman amphitheater there is devoting its 2009-10 season to his works.

The maestro was still directing. "In the story," he said, turning to this reporter and rubbing his fingers together as if pinching salt, his face wincing in the evening glow, "make it alive, make it alive."

http://www.nytimes.com/2009/08/19/arts/music/19zeffirelli.html

Waiting at Heathrow, the Literary Experience

By ANDREW ADAM NEWMAN

TRAVELERS passing through London's Heathrow Airport this week may be surprised to encounter, in the middle of its bustling Terminal 5, the writer Alain de Botton, author of popular books including "How Proust Can Change Your Life" and "The Art of Travel," seated at a desk and tapping away at his laptop computer. His typing appears in real time on a screen behind him, and a placard explains — in what apparently is both a literary and aeronautic first — that Mr. de Botton is serving a one-week appointment as Heathrow's "writer in residence."

Mr. de Botton, who is bunking at the adjacent Sofitel London Heathrow, will stray from his desk to interview passengers, baggage handlers, airline executives and more. Afterward, he will return home to turn his airport reporting into a short book, "A Week at the Airport: A Heathrow Diary," to be published by the British publisher Profile Books in September.

On Sept. 21, the book, which will include photographs by Richard Baker, will be distributed free to 10,000 Heathrow travelers, and then be available for sale through Amazon's British Web site and traditional bookstores for £8.99 (about $15). The author retains the rights to the book and — on all but those 10,000 free copies — will earn royalties from it.

The stunt is the brainchild of Heathrow's public relations agency, Mischief of London, which might make creative-control purists wince. But Mr. de Botton said in a telephone interview that while Heathrow was paying him the equivalent of a book advance (he declined to reveal the amount) and paying for his hotel and meals, he was autonomous.

"Right from the start I said I can only do this if you don't even see the text before it goes to print," Mr. de Botton said of his negotiations with Heathrow. "I said, 'If I find a cockroach in the restaurant, if someone drops dead at the airport, I'm going to write about it and send it to the publisher.' They just took a big gulp and then to their credit they said, 'Fine, yes, you can say anything you want.' "

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For Heathrow, that may sound like Russian roulette, but Dan Glover, a creative director at Mischief, said in a telephone interview, "If we funded a brochure that said how wonderful the airport was, people would switch off because they'd think they're being marketed to."

Mr. Glover added in an e-mail message that the campaign sought to stimulate "branded conversations" among travelers "through the experience of seeing a top literary figure at the airport — and potentially being a character in the book — and by receiving an exclusive copy to read on your travels. The overarching objective is to make a passenger's time at Heathrow the best memory of the trip."

For Heathrow, any buzz will counter the drone of complaints about long lines, which reached a peak in March 2008, when the long-anticipated opening of Terminal 5 resulted in days of delays that The Guardian described as “chaos” and The Scotsman as “shambolic.”
“They’re not looking for someone to say the airport is brilliant,” Mr. de Botton said. “They’re looking for someone to say the airport is interesting — that the airport is more than, ‘There’s a long security queue.’ It’s almost as if their only goal is that something else is going to be said about the airport.”
As for how Mr. de Botton will deliver the manuscript to his publisher by the end of August, he said the book, which will feature many photographs and be only 112 pages, will run as short as 20,000 words (magazine articles often run over 10,000). He also said he made previous excursions to the airport and is “assembling bits now.”
One vignette provided to The New York Times describes divorced fathers waiting for children to arrive, with Mr. de Botton writing, “There were men pacing impatiently and blankly near Costa Coffee for an hour (just to be sure of not missing an unheralded early arrival), who had looked forward to this moment for half a year and could no longer restrain themselves at the sight of a small boy endowed with their own grey-green eyes and their mother’s cheeks, emerging from behind the stainless steel gate, holding the hand of an airport operative.”
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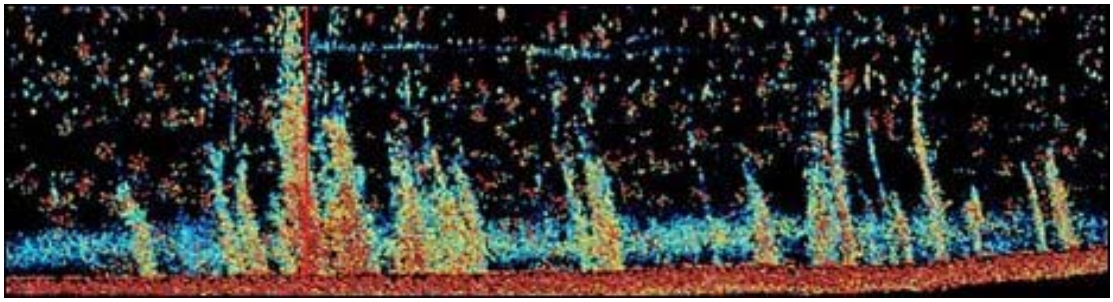
Other writers were considered, but “Alain bit our arms off to be involved in the project,” said Cat Jordan, a Heathrow spokeswoman, adding that he had a track record, having published “The Art of Travel,” on the subject.
Heathrow will review photos before publication for “security issues,” but will be hands off with the text, she said.
“No one expects everything all of the time to be perfect,” Ms. Jordan said. “If I wanted that, I might as well pay for a traditional marketing campaign, but what I wanted here was something with a little more emotion. Heathrow doesn’t have a lot to hide, and there’s a lot of emotion here every day with people saying hello and goodbye, and we hope he captures just a little bit of that.”
Mr. de Botton said the project recalled an era when patrons underwrote artists and writers.
“That one of the largest organizations in the U.K. should take an interest in a book is almost quaint, like sponsoring a poet,” Mr. de Botton said. “On behalf of my fellow beleaguered writers, it’s nice that writers seem to matter.”
Mr. de Botton, in fact, is already fantasizing about more posts. “I’d like to be a writer in residence at a nuclear power station,” he said.

http://www.nytimes.com/2009/08/19/business/global/19adco.html

Methane seeps from Arctic sea-bed

By Judith Burns
Science and environment reporter, BBC News

Scientists say they have evidence that the powerful greenhouse gas methane is escaping from the Arctic sea-bed.



Researchers say this could be evidence of a predicted positive feedback effect of climate change.

As temperatures rise, the sea-bed grows warmer and frozen water crystals in the sediment break down, allowing methane trapped inside them to escape.

The research team found that more than 250 plumes of methane bubbles are rising from the sea-bed off Norway.

The joint British and German research team detected the bubbles using a type of sonar normally used to search for shoals of fish. Once detected, the bubbles were sampled and tested for methane at a range of depths.

Writing in Geophysical Research Letters, the team says the methane was rising from an area of sea-bed off West Spitsbergen, from depths between 150m and 400m.

The gas is normally trapped as "methane hydrate" in sediment under the ocean floor.

METHANE HYDRATES
- Methane gas is trapped inside a crystal structure of water-ice
- The gas is released when the ice melts, normally at 0C
- At higher pressure, ie under the ocean, hydrates are stable at higher temperatures

"Methane hydrate" is an ice-like substance composed of water and methane which is stable under conditions of high pressure and low temperature.

As temperatures rise, the hydrate breaks down. So this new evidence shows that methane is stable at water depths greater than 400m off Spitsbergen.

However, data collected over 30 years shows it was then stable at water depths as shallow as 360m.

Ocean has warmed

Temperature records show that this area of the ocean has warmed by 1C during the same period.

The research was carried out as part of the International Polar Year Initiative, funded by Britain's Natural Environment Research Council (Nerc).

The team says this is the first time that this loss of stability associated with temperature rise has been observed during the current geological period.

Professor Tim Minshull of the National Oceanography Centre at Southampton told BBC News: "We already knew there was some methane hydrate in the ocean off Spitsbergen and that's an area where climate change is happening rather faster than just about anywhere else in the world."

Methane hydrate is stable below 400m
Nearer the surface the hydrate breaks down as temperatures rise and the methane is released
Gas rises from the sea-bed in plumes of bubbles - most of it dissolves before it reaches the surface
So far scientists haven't detected methane breaking the ocean surface - but they don't rule out the possibility

"There's been an idea for a long time that if the oceans warm, methane might be released from hydrate beneath the sea floor and generate a positive greenhouse effect.

"What we're trying to do is to use lots of different techniques to assess whether this was something that was likely to happen in a relatively short time scale off Spitsbergen."

However, methane is already released from ocean floor hydrates at higher temperatures and lower pressures - so the team also suggests that some methane release may have been going on in this area since the last ice age.

Significant discovery

Their most significant finding is that climate change means the gas is being released from more and deeper areas of the Arctic Ocean.

Professor Minshull said: "Our survey was designed to work out how much methane might be released by future ocean warming; we did not expect to discover such strong evidence that this process has already started."

"We were slightly surprised that if there was so much methane rising why no one had seen it before. But I think the reason is that you have to be rather dedicated to spot it because these plumes are only perhaps 50m to 100m across.

"The device we were using is only switched on during biological cruises. It's not normally used on geophysical or oceanographic cruises like ours. And of course you've got to monitor it 24 hours a day. In fact, we only spotted the phenomenon half way through our cruise. We decided to go back and take a closer look."

The team found that most of the methane is being dissolved into the seawater and did not detect evidence of the gas breaking the surface of the ocean and getting into the atmosphere.

The researchers stress that this does not mean that the gas does not enter the atmosphere. They point out that the methane seeps are unpredictable and erratic in quantity, size and duration.

It is possible that larger seeps at different times and locations might in fact be vigorous enough to break through the ocean surface.

Most of the methane reacts with the oxygen in the water to form carbon dioxide, another greenhouse gas. In sea water, this forms carbonic acid which adds to ocean acidification, with consequent problems for biodiversity.

Graham Westbrook, lead author and professor of geophysics at the University of Birmingham, said: "If this process becomes widespread along Arctic continental margins, tens of megatonnes of methane a year - equivalent to 5-10% of the total amount released globally by natural sources, could be released into the ocean."

The team is planning another expedition next year to observe the behaviour of the methane plumes over time. They are also engaged in ongoing research into the amount of methane hydrate under this area of the ocean floor.

Ultimately, they want to be able to predict how much might be vulnerable to temperature change and in what timescale.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8205864.stm

Published: 2009/08/18 12:47:31 GMT

Stone Tools, Rare Animal Bones: Clues To Caribbean's Earliest Inhabitants Discovered

Jessica Keller holds the primate skull found in the Padre Nuestro Cavern. (Credit: Courtesy of Indiana University)

ScienceDaily (Aug. 19, 2009) — A prehistoric water-filled cave in the Dominican Republic has become a "treasure trove" with the announcement by Indiana University archaeologists of the discovery of stone tools, a small primate skull in remarkable condition, and the claws, jawbone and other bones of several species of sloths.

The discoveries extend by thousands of years the scope of investigations led Charles Beeker, director of Academic Diving and Underwater Science Programs at IU Bloomington's School of Health, Physical Education and Recreation, and his interdisciplinary team of collaborators. The researchers' focus has been on the era a mere 500 years ago when the Old World and New World first met after Christopher Columbus stepped ashore in the Caribbean -- and on scintillating pirate lore. This rare find is expected to give insights into the earliest inhabitants of the Greater Antilles and the animals they encountered.

"To be honest, I couldn't believe my eyes as I viewed each of these astonishing discoveries underwater," Beeker said. "The virtually intact extinct faunal skeletons really amazed me, but what may prove to be a fire pit from the first human occupation of the island just seems too good to be true. But now that the lithics (stone tools) are authenticated, I can't wait to direct another underwater expedition into what may prove to become one of the most important prehistoric sites in all the Caribbean."

Beeker and researchers Jessica Keller and Harley McDonald found the tools and bones in fresh water 28- to 34-feet deep in a cave called Padre Nuestro. Nearby, and also underwater in the same cave, were found more recent Taino artifacts. The Taino were the first Native American peoples to encounter Europeans. Beeker and his colleagues have been diving in this particular cave, which sits beneath a limestone bluff and is only accessible after submerging into a small pool, since 1996 as they studied its use as a Taino water-gathering site.

Geoffrey Conrad, director of the Mathers Museum of World Culture at IU Bloomington and professor of anthropology, said the tools are estimated to be 4,000 to 6,500 years old. The bones might range in age

from 4,000 and 10,000 years old. While sloth bones are not uncommon, he knows of only a handful of other primate skulls found in the Caribbean.

"I know of no place that has sloths, primates and humanly made stone tools together in a nice, tight association around the same time," said Conrad, also associate vice provost for research at IU Bloomington. "Right now it looks like a potential treasure trove of data to help us sort out the relationship in time between humans and extinct animals in the Greater Antilles. This site definitely is worthy of a large-scale investigation."

The three stone tools and remnants, made of basalt and limestone, were examined by internationally known IU anthropologists Nicholas Toth and Kathy Schick, who told researchers the palm-sized stones showed unmistakable signs of human craftsmanship. Toth and Schick are co-directors of the Center for Research into the Anthropological Foundations of Technology (CRAFT) Stone Age Institute in Bloomington.

IU primate expert Kevin Hunt told researchers the primate could have been a howler monkey which is extinct in the Caribbean. Keller said the sloth bones came from six, and possibly seven, sloths and include several species, including one the size of a black bear and another the size of a large dog. She said the primate skull is significantly different than the other primate skulls found in the Caribbean.

"Very few primate skulls have been found in the Caribbean," she said. "The others, found in the late 1800s and early 1900s, are three times as large. We have received a permit to bring the skull to Indiana University for further study. It's all very exciting."

Conrad said the lithics and bones, which have arrived at Beeker's laboratory in the School of HPER, have not only expanded the research program to an earlier time but also to an issue of concern worldwide -- the extinction of native birds and animals upon the arrival of humans. Caribbean sloths are among the many species that became extinct soon after the presence of humans.

Researchers with the Office of Underwater Science in the School of HPER work closely with cultural, historical, and tourism agencies and organizations in the Dominican Republic to protect and explore the country's cultural heritage and natural history. Keller said local interest in the discoveries has been phenomenal. The cave where they were discovered, which is part of an aquifer and cave system that supplies water to nearby resorts, has been closed for research purposes.

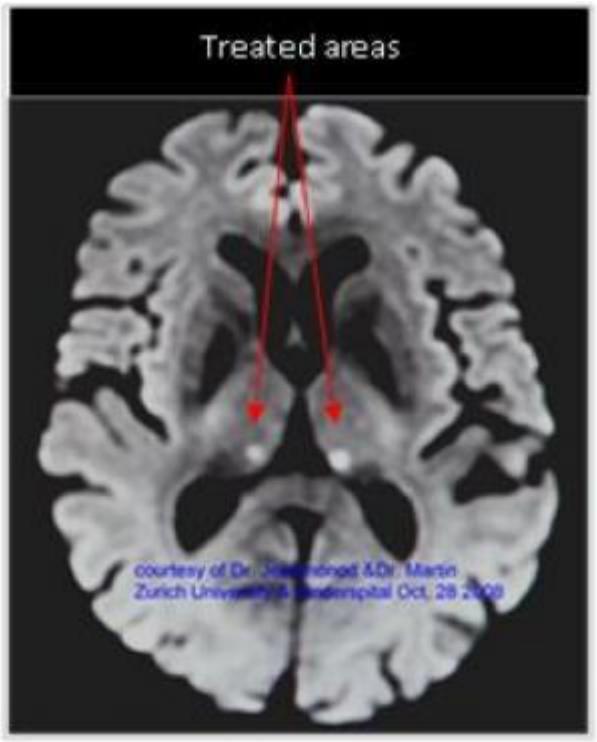
"There's a strong interest in protecting it, in having the research continue," Keller said. "Our partners were excited before we even found the primate."

The study is being conducted in cooperation with the Secretariat of State for Culture through the Office of Underwater Heritage and the Museum of Dominican Man, the Secretariat of State for Tourism, and the Secretariat of State for Environment and Natural Resources.

Adapted from materials provided by Indiana University.

http://www.sciencedaily.com/releases/2009/08/090818083228.htm

Non-invasive Brain Surgery Moves A Step Closer



MRI image of one of the patients in the study. Arrows show two small symmetrical lesions in the thalamus of the brain after the non-invasive procedure. (Credit: Courtesy of Dr. Jeanmonod and colleagues)

ScienceDaily (Aug. 19, 2009) — A team of researchers working at the MR-Center of the University Children's Hospital in Zürich has completed a pilot study using transcranial MR-guided focused ultrasound to treat 10 patients with neuropathic pain.The origin of chronic pain in these patients included post amputation phantom limb syndrome, nerve injury, stroke, trigeminal neuralgia and post herpetic neuralgia from shingles.

The findings will be published in a forthcoming issue of *Annals of Neurology*.“This study showed that we can perform successful operations in the depth of the brain without opening the cranium or physically penetrating the brain with medical tools, something that appeared to be unimaginable only a few years ago,” says Daniel Jeanmonod M.D., a neurosurgeon at the University of Zurich. “By eliminating any physical penetration into the brain, we hope to duplicate the therapeutic effects of invasive deep brain ablation without the side effects, and for a wider group of patients.”

The preliminary results in these patients are consistent with conventional therapy - radiofrequency ablation - which is an invasive procedure and involves making an incision in the scalp, drilling a hole in the skull, inserting an electrode through normal brain tissue into the thalamus, and using radiofrequency to create the lesion.“This research demonstrates that transcranial MR-guided focused ultrasound can be used non-invasively to produce small thermal ablations with extreme precision and accuracy deep in the brain,” comments Neal Kassell, M.D., a neurosurgeon at the University of Virginia, and Chairman of the Focused Ultrasound Surgery Foundation. “It paves the way for further research into the treatment of a variety of other brain disorders, including Parkinson's disease and essential tremor, epilepsy, brain tumors and stroke,”According to Dr Kassell, the key advantage of focused ultrasound is that it is non-invasive. This in principle makes it safer than conventional surgery because it avoids the associated risks of complications such as infection, hemorrhage, and collateral damage to normal brain structures.

The study was partially funded by the Focused Ultrasound Surgery Foundation. The Foundation funds translational and clinical research into new therapeutic applications of MR-guided focused ultrasound (MRgFUS).

Adapted from materials provided by Focused Ultrasound Surgery Foundation & Fibroid Relief, via Newswise.

http://www.sciencedaily.com/releases/2009/08/090807165836.htm

Personality Traits Associated With Stress And Worry Can Be Hazardous To Your Health

Personality traits associated with chronic worrying can lead to earlier death, at least in part because these people are more likely to engage in unhealthy behaviors, such as smoking, according to research from Purdue University. (Credit: iStockphoto/Mikael Damkier)

ScienceDaily (Aug. 19, 2009) — Personality traits associated with chronic worrying can lead to earlier death, at least in part because these people are more likely to engage in unhealthy behaviors, such as smoking, according to research from Purdue University.

"Research shows that higher levels of neuroticism can lead to earlier mortality, and we wanted to know why," said Daniel K. Mroczek, (pronounced Mro-ZAK) a professor of child development and family studies. "We found that having worrying tendencies or being the kind of person who stresses easily is likely to lead to bad behaviors like smoking and, therefore, raise the mortality rate.

"This work is a reminder that high levels of some personality traits can be hazardous to one's physical health."

Chronic worrying, anxiety and being prone to depression are key aspects of the personality trait of neuroticism. In this study, the researchers looked at how smoking and heavy drinking are associated with the trait. A person with high neuroticism is likely to experience anxiety or depression and may self-medicate with tobacco, alcohol or drugs as a coping mechanism.

They found that smoking accounted for about 25 percent to 40 percent of the association between high neuroticism and mortality. The other 60 percent is unexplained, but possibly attributed to biological factors or other environmental issues that neurotic individuals experience, Mroczek said.

The researchers analyzed data of 1,788 men and their smoking behavior and personality traits over a 30-year period from 1975 to 2005. The data was part of the VA Normative Aging Study, which is a long-term study of aging men based at the Boston VA Outpatient Clinic.

Mroczek and his co-authors, Avron Spiro III and Nicholas A. Turiano, published their findings in this month's Journal of Research in Personality.

A better understanding of the bridge between personality traits and physical health can perhaps help clinicians improve intervention and prevention programs, Mroczek said.

"For example, programs that target people high in neuroticism may get bigger bang for the buck than more widespread outreach efforts," he said. "It also may be possible to use personality traits to identify people who, because of their predispositions, are at risk for engaging in poor health behaviors such as smoking or excessive drinking."

The National Institute on Aging and the U.S. Department of Veterans Affairs supported this work.

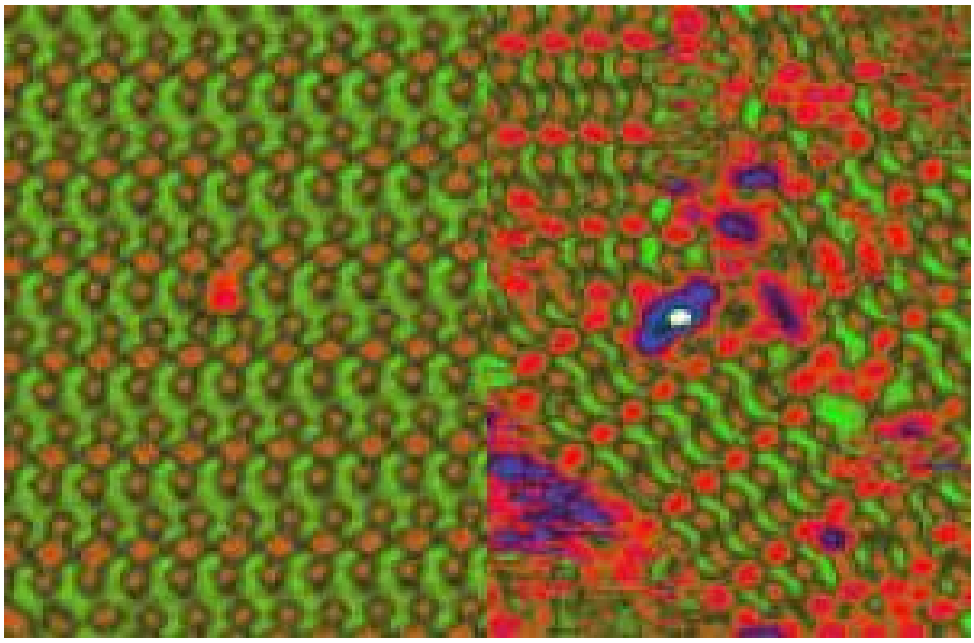
Journal reference:

1. Mroczek et al. **Do health behaviors explain the effect of neuroticism on mortality? Longitudinal findings from the VA Normative Aging Study**. *Journal of Research in Personality*, 2009; 43 (4): 653 DOI: 10.1016/j.jrp.2009.03.016

Adapted from materials provided by Purdue University.

http://www.sciencedaily.com/releases/2009/08/090818130552.htm

Molecules Wrestle For Supremacy In Creation Of Superstructures



The molecules in the majority form the superstructure while the minority remain disordered. (Credit: Image courtesy of University of Liverpool)

ScienceDaily (Aug. 19, 2009) — Research at the University of Liverpool has found how mirror-image molecules gain control over each other and dictate the physical state of superstructures.

The research team studied 'chiral' or 'different-handed' molecules which are distinguishable by their inability to be superimposed onto their mirror image. Such molecules are common – proteins use just one mirror form of amino acids and DNA, one form of sugars. Chirality leads to profound differences in the way a molecule functions – for example, drugs such as thalidomide can have positive effects on a patient but can prove harmful in their mirror image form.

Molecules can also assemble in large numbers and form 'superstructures' such as snowflakes which are created from large numbers of water molecules. When chiral molecules assemble they can create 'handed' superstructures; for example left-handed molecules can assemble together to make a left-handed superstructure. The Liverpool team studied this process in detail by assembling molecules at flat surfaces and using imaging techniques to map the formation of superstructures at nanoscale level.

Before now, scientists have not known whether, in systems containing both left-handed and right-handed molecules, one mirror-form of a molecule could take supremacy over its opposite number in the creation of superstructures, dictating their physical state and chemical and biological properties.

The research found that when equal numbers of mirror-molecules are present at the surface, they organise into separate left and right-handed superstructures, each with distinctly different properties. Crucially, a small imbalance in the population leads to a dramatic difference and only the molecules in the majority assemble into its superstructure, while the minority is left disordered at the surface and unable to create advanced molecular matter.

Professor Rasmita Raval from the University's Surface Science Research Centre said: "We were surprised at these results. All perceived wisdom was that the left and right-handed molecules would simply create their respective superstructures in quantities that reflected the molecular ratio – that is, we would observe proportional representation. Instead, what we obtained was a kind of 'molecular democracy' that worked

on a 'first-past-the-post' system where the majority population wrested chiral control of the superstructures and the minority was left disorganised."

Theoretical modelling carried out by the University of Eindhoven in the Netherlands found that this behaviour arises from the effects of entropy, or disorder, which leads the chiral molecules in the majority to preferentially organise into their superstructure.

The work has important implications in the pharmaceuticals industry and could lead to the development of surface processes to enable separation of drugs and products that are currently difficult to purify. The research also introduces the possibility that assembly processes at surfaces may naturally have led to the evolution of proteins and DNA – the molecules of life – containing just one mirror form of amino acids and sugars.

The research, in collaboration with the University of Eindhoven, is published in *Nature Chemistry*.

Journal reference:

1. Sam Haq, Ning Liu, Vincent Humblot, A. P. J. Jansen & Rasmita Raval. **Drastic symmetry breaking in supramolecular organization of enantiomerically unbalanced monolayers at surfaces**. *Nature Chemistry*, 2009; 1 (5): 409 DOI: 10.1038/nchem.295

Adapted from materials provided by University of Liverpool.

http://www.sciencedaily.com/releases/2009/08/090813142351.htm

'Killer Spices' Provide Eco-friendly Pesticides For Organic Fruits And Veggies

Natural pesticides made of spices show promise as an eco-friendly way to fight insects that destroy organic food crops. Shown is Murray Isman, Ph.D., of the University of British Columbia, who is developing these pesticides. (Credit: Martin Dee, University of British Columbia, Canada)

ScienceDaily (Aug. 18, 2009) — Mention rosemary, thyme, clove, and mint and most people think of a delicious meal. Think bigger…acres bigger. These well-known spices are now becoming organic agriculture's key weapons against insect pests as the industry tries to satisfy demands for fruits and veggies among the growing portion of consumers who want food produced in more natural ways.

In a study presented at the American Chemical Society's 238th National Meeting, scientists in Canada are reporting exciting new research on these so-called "essential oil pesticides" or "killer spices." These substances represent a relatively new class of natural insecticides that show promise as an environmentally-friendly alternative to conventional pesticides while also posing less risk to human and animal health, the researcher says.

"We are exploring the potential use of natural pesticides based on plant essential oils — commonly used in foods and beverages as flavorings," says study presenter Murray Isman, Ph.D., of the University of British Columbia. These new pesticides are generally a mixture of tiny amounts of two to four different spices diluted in water. Some kill insects outright, while others repel them.

Over the past decade, Isman and colleagues tested many plant essential oils and found that they have a broad range of insecticidal activity against agricultural pests. Some spiced-based commercial products now being used by farmers have already shown success in protecting organic strawberry, spinach, and tomato crops against destructive aphids and mites, the researcher says.

"These products expand the limited arsenal of organic growers to combat pests," explains Isman. "They're still only a small piece of the insecticide market, but they're growing and gaining momentum."

The natural pesticides have several advantages. Unlike conventional pesticides, these "killer spices" do not require extensive regulatory approval and are readily available. An additional advantage is that insects are less likely to evolve resistance — the ability to shrug off once-effective toxins — Isman says. They're also safer for farm workers, who are at high risk for pesticide exposure, he notes.

But the new pesticides also have shortcomings. Since essential oils tend to evaporate quickly and degrade rapidly in sunlight, farmers need to apply the spice-based pesticides to crops more frequently than conventional pesticides. Some last only a few hours, compared to days or even months for conventional pesticides. As these natural pesticides are generally less potent than conventional pesticides, they also must be applied in higher concentrations to achieve acceptable levels of pest control, Isman says. Researchers are now seeking ways of making the natural pesticides longer-lasting and more potent, he notes.

"They're not a panacea for pest control," cautions Isman. Conventional pesticides are still the most effective way to control caterpillars, grasshoppers, beetles and other large insects on commercial food crops, he says. "But at the end of the day, it comes down to what's good for the environment and what's good for human health."

The "killer spices" aren't just limited to agricultural use. Some show promise in the home as eco-friendly toxins and repellents against mosquitoes, flies, and roaches. Unlike conventional bug sprays, which have a harsh odor, these natural pesticides tend to have a pleasant, spicy aroma. Many contain the same oils that are used in aromatherapy products, including cinnamon and peppermint, Isman notes.

Manufacturers have already developed spice-based products that can repel ticks and fleas on dogs and cats without harming the animals. Researchers are now exploring the use of other spice-based products for use on fruits and vegetables to destroy microbes, such as E. coil and Salmonella, which cause food poisoning.

Other scientists are currently exploring the insect-fighting potential of lavender, basil, bergamot, patchouli oil, and at least a dozen other oils from exotic plant sources in China. Funding for this study was provided by EcoSMART®, a botanical pesticide company based in Alpharetta, Ga.

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

http://www.sciencedaily.com/releases/2009/08/090816170910.htm

Immersive Dome Replaces Flat Movie Screen: Don't Just Watch, Join The Action!

Developed in Europe, a new dome projection offers a compelling replacement for the flat movie screen. (Credit: Image courtesy of Fraunhofer-Gesellschaft)

ScienceDaily (Aug. 18, 2009) — A new dome projection developed in Europe offers a compelling replacement for the flat movie screen. The 'Immersive Dome' puts viewers at the heart of the action, and lets them actively participate. And instead of the conventional surround sound, a three-dimensional aural experience awaits visitors. At IBC, the trade show for the electronics media industry in Amsterdam, two institutes of the Fraunhofer-Gesellschaft debut the Immersive Dome technology.

Imagine that you are sitting in the middle of a lava lamp. You are surrounded by flowing, larger-than-life-sized sculptures, and you are in complete weightlessness. As befitting these amorphous forms, spherical sounds emanate that adapt to the movements of the fluid sculptures within the space. In the dome cinema of tomorrow, visitors will embrace entirely new visual and acoustic impressions.

This is why, at the IBC from September 11 to 15, 2009, digital dome projection from the Fraunhofer Institute for Computer Architecture and Software Technology FIRST is being combined with the 'Spatial Pan' sound system from the Fraunhofer Institute for Digital Media Technology IDMT. Another show-stopper: Visitors can actively participate in the creation of content. To do so, a camera films your face and projects it live onto a dome movie screen. Using a 3D-mouse, you can shift the projection on the screen, thereby interactively changing the image and the associated sound.

On behalf of both Fraunhofer institutes, the full-dome video 'Liquida' was produced by Ralph Heinsohn of Tilt animation studios and sound designer Sven Lütgen. The film shows how a high-resolution digital and interactive dome projection can be combined with three-dimensional sound. In the Immersive Dome, six projectors generate five partial images on the interior side, and one at the apex of the half-dome.

Screen Player software from FIRST controls the projector cluster and produces a uniformly colored full image. The software lets cluster projections be displayed in real time with a resolution of 4000 x 4000 pixels. To do so, the shape of the screen must be virtually replicated first. The image from the projectors is then aimed toward it and distorted to just the right fit. At the same time, three digital cameras capture

the projected images and layer them on top of one another by means of image recognition and color correction algorithms, creating pixel-perfect reproduction and color homogeneity. The Screen Player contains a preview function that displays the content ahead of time within the geometry of the screen. The adjustments of the original content to the screen geometry occurs directly when played in real time.

The Screen Player includes standard interfaces to other multimedia systems, so that additional devices can be easily integrated, including IDMT's Spatial Pan sound system. In contrast to other three-dimensional audio reproduction systems, which produce a natural and spatial sound impression with the aid of multiple loudspeakers, the Spatial Pan sound system works using fewer loudspeakers. For the Immersive Dome at the IBC, eight standard loudspeakers will be used to create a realistic and spatial sound experience for visitors. A third sound dimension is developed by the dome itself becoming a sound entity – without any other loudspeakers. In addition, special electro-acoustical transformers are attached to the dome, which emit pulses, trigger oscillations and thus shower the interior space with sound.

FIRST and Carl Zeiss cooperate closely in the planetarium sector. Beside planetariums and cinemas, the Immersive Dome can be used at theme parks, for simulators, in multi-media installations and in the high-end segment of home cinema.

Adapted from materials provided by Fraunhofer-Gesellschaft.

http://www.sciencedaily.com/releases/2009/08/090814101949.htm

Early Human Hunters Had Fewer Meat-sharing Rituals

This is UA anthropology professor Mary C. Stiner at Qesem Cave, Israel. Stiner analyzes faunal remains for the Qesem Cave Project. (Credit: Qesem Cave Project, Tel Aviv University)

ScienceDaily (Aug. 18, 2009) — A University of Arizona anthropologist has discovered that humans living at a Paleolithic cave site in central Israel between 400,000 and 250,000 years ago were as successful at big-game hunting as were later stone-age hunters at the site, but that the earlier humans shared meat differently.

"The Lower Paleolithic (earlier) hunters were skilled hunters of large game animals, as were Upper Paleolithic (later) humans at this site," UA anthropology professor Mary C. Stiner said.

"This might not seem like a big deal to the uninitiated, but there's a lot of speculation as to whether people of the late Lower Paleolithic were able to hunt at all, or whether they were reduced to just scavenging," Stiner said. "Evidence from Qesem Cave says that just like later Paleolithic humans, the earlier Paleolithic humans focused on harvesting large game. They were really at the top of the food chain."

The Qesem Cave people hunted cooperatively, then carried the highest quality body parts of their prey to the cave, where they cut the meat with stone blade cutting tools and cooked it with fire.

"Qesem" means "surprise." The cave was discovered in hilly limestone terrain about seven miles east of Tel-Aviv not quite nine years ago, during road construction. Stiner was invited by Ran Barkai and Avi Gopher of Tel Aviv University's Institute of Archaeology to participate in the Qesem Cave Project.

Stiner analyzed the pattern of cut marks on bones of deer, aurochs, horse and other big game left at Qesem Cave by hunters of 400,000 to 200,000 years ago. Her novel approach was to analyze the cut marks to understand meat-sharing behaviors between the earlier and later cooperative hunting societies.

And the patterns revealed a striking difference in meat-sharing behaviors: The earlier hunters were less efficient, less organized and less specialized when it came to carving flesh from their prey.

"This is somewhat expected, since the tools they made took considerable skill and locomotor precision to produce," Stiner said.

Random cut marks, and higher numbers of cut marks, made by the earlier hunters show they attached little social ritual or formal rules to sharing meat, Stiner said. Many hands, including unskilled hands, cut meat off the bone during feeding.

By contrast, by later times, by the Middle and Upper Paleolithic, "It's quite clear that meat distribution flowed through the hands of certain butchers," Stiner said. "The tool marks made on bones by the more recent hunters are very regular, very efficient and show much less variation in the postures of the individuals cutting meat from any one bone. Only certain hunters or other fairly skilled individuals cut meat that was to be shared among the group."

Stiner stresses that her new findings need to be more broadly replicated before the implications of her research can be widely accepted.

Meat is one of the highest quality foods that humans may eat, and it is among the most difficult resources to harvest from the environment.

Archaeologists know that the roots of carnivory stretch deep into the past. But the details of carnivory and meat sharing have been sketchy. And they are important details, because they reflect the evolutionary development in human economic and social behaviors.

"It's interesting that these earlier people were skilled predators and very social, but that their social rules are more basic, less derived than those of the Middle Paleolithic.

"What might surprise most archaeologists is that I'm seeing a big difference between Lower and Middle Paleolithic social behaviors, not between Middle and Upper Paleolithic social behaviors.

"Neanderthals lived in the Middle Paleolithic, and they were a lot more like us in their more formal redistributions of meat than were the earlier hominids."

Stiner, Barkai and Gopher reported on the research in their article, "Cooperative hunting and meat sharing 400-200 kya at Qesem Cave, Israel" in a recent issue of the *Proceedings of the National Academy of Sciences*.

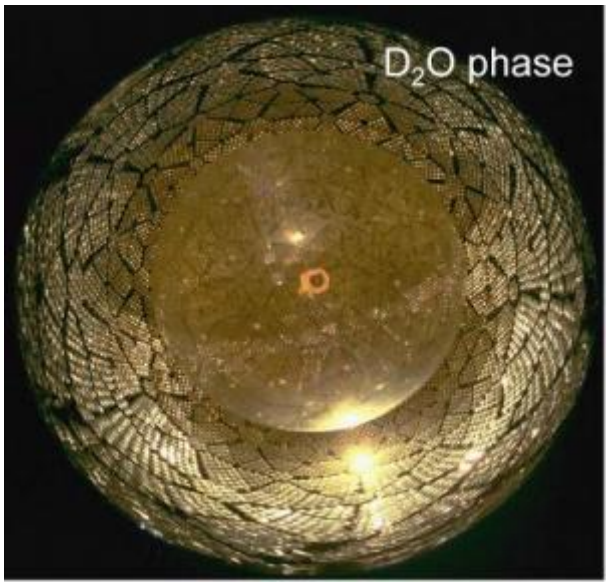
Journal reference:

1. Mary C. Stiner, Ran Barkai, and Avi Gopher. **Cooperative hunting and meat sharing 400-200 kya at Qesem Cave, Israel**. *Proceedings of the National Academy of Sciences*, 2009; 106 (32): 13207 DOI: 10.1073/pnas.0900564106

Adapted from materials provided by University of Arizona.

http://www.sciencedaily.com/releases/2009/08/090813142506.htm

To Understand The Universe, Science Calls On The Ultrasmall



Located two kilometers underground in a nickel mine in Ontario, the Sudbury Neutrino Observatory consists of a 12-meter-diameter acrylic vessel filled with 1,000 tons of ultrapure heavy water. It is surrounded by almost 10,000 light-sensitive photomultiplier tubes. (Credit: Minfang Yeh, Ph.D.)

ScienceDaily (Aug. 18, 2009) — Will the universe expand outward for all of eternity and end in a vast, dark, cold, sterile, diffuse nothingness? Or will the "Big Bang" — the gargantuan explosion that formed the universe 14 billion years ago — end in the "Big Crunch?" Planets, stars and galaxies all hurtle inward and collapse into an incredibly hot, dense mass a billion times smaller than the period at the end of this sentence. And then … KA-BOOOOM!!! Another Big Bang and another universe forms and hurtles outward, eventually leading to new iterations of the Sun, the Earth, and you?

A special three-day symposium focusing on the weird subatomic particles that could help answer those compelling questions takes place in Washington, D.C., August 16-18 at the 238th National Meeting of the American Chemical Society (ACS).

Titled "The Chemistry and Physics of Neutrino Experiments," it will include almost two dozen reports on experiments to understand what Nobel Laureate Frederick Reines once termed "the most tiny quantity of reality ever imagined by a human being." Neutrinos ("small neutral ones") are among the subatomic, or elementary, particles that make up all matter. They have no electric charge, virtually no mass, and pass through ordinary matter without causing any disruption. Most neutrinos traveling through Earth come from the Sun, and trillions of solar electron neutrinos pass through every person each second. Although those properties make neutrinos difficult to detect, detecting and understanding them are key scientific pursuits, partly because of the implications for cosmology.

"The neutrino has the smallest observed mass for any elementary particle, but they appear in such astonishing numbers in the universe that they are a large portion of its mass," said Steven Elliott, Ph.D. He is a physicist at Los Alamos National Laboratory in New Mexico. "At the moment, neutrinos may be massive enough to account for more mass in the universe than all stars combined."

Many of the ACS presentations focus on experiments to investigate these particles. Scientists are turning to huge devices — the MiniBooNE detector, the Super Kamiokande, the Sudbury Neutrino Observatory, the Borexino solar neutrino detector and the IceCube detector — that detect neutrinos using large volumes of liquids, like mineral oil, water or even the ice cap at the South Pole.

In the devices, scientists record the radiation of neutrinos generated from particle decay. The science and engineering laboratories must work deep underground to avoid cosmic rays and other ordinary background radiation, which would harm the experiments' results.

"Neutrino experiments are complicated undertakings that take years to design and construct and even longer to operate," says Richard Hahn, Ph.D., co-organizer of the ACS symposium and a scientist with Brookhaven National Laboratory (BNL) in Upton, N.Y. "The results tell us about fundamental physics, but developing the experiments is multidisciplinary, requiring expertise in physics but also other areas like organic, inorganic and nuclear chemistry."

Traveling near the speed of light, these tiny particles come in three varieties or "flavors," and they all routinely change from one type to another, a phenomenon known as oscillation. Because of their feeble interaction with all matter, understanding neutrinos and their effects on a universal scale has posed a challenge to nuclear chemists and physicists for decades.

Using these large detectors, scientists are looking to uncover some of the neutrino's basics. Elliott, for example, hopes to determine its mass using a technique called double beta decay. Previous research has determined a 'relative mass scale' of the neutrino, but a precise measurement is necessary to better understand the universe's development of structure, Elliott says.

Scientists are also trying to resolve the question of the universe's asymmetry — one of the greatest unsolved issues in physics, says Minfang Yeh, Ph.D., co-organizer of the ACS symposium and a scientist with Hahn at BNL. Almost everything observable from Earth seems to be made of matter, but based on experimental particle interactions, physicists believe that The Big Bang created equal amounts of matter and antimatter. Yeh imagines the apparent disappearance of antimatter could involve discrepancies in how neutrinos and anti-neutrino oscillate, or change flavors.

"Scientists think maybe the conversion mechanism could lead us to the understanding of the imbalance," Yeh said. "If there's a difference between a neutrino and an antineutrino, maybe theoretically that's one source of the asymmetry between matter and anti-matter in the universe." Yeh adds that neutrinos could be a solution to another mystery — dark matter, an energy that makes up almost one-quarter of the universe's mass. Like neutrinos, non-baryonic dark matter has virtually no interaction with ordinary matter. Unlike neutrinos, its existence hasn't been proven but is inferred by measuring the effects of its gravity.

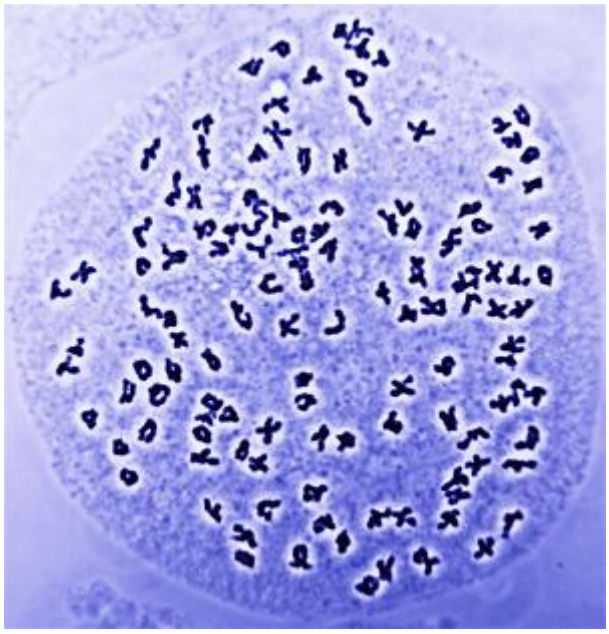
One device that could probe the mystery of asymmetry is a proposed 500 kT Water Cherenkov detector. The massive detector will investigate differences between neutrinos and antineutrinos from 4,850-feet underground in South Dakota. Weighing 500 kilotons, it will detect neutrinos from a beam of particles sent from Fermilab's proton accelerator in Illinois.

Another device, Fermilab's MiniBooNE detector, records neutrino oscillations and consists of a 40-foot diameter spherical tank holding 800 tons of mineral oil. It is covered on the inside by 1,520 8-inch phototubes.

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

http://www.sciencedaily.com/releases/2009/08/090816170917.htm

Speciation Through Genome Duplication More Common In Plant Evolution Than Previously Thought



Polyploidy is important in the origin of new plant species and has caused some species to have an astoundingly large number of chromosomes. This photograph is a "chromosome squash" of a hexaploid (six genome copies) fern species of the genus Cystopteris. This species has 126 pairs of chromosomes. (Credit: Photo by Michael Windham)

ScienceDaily (Aug. 18, 2009) — Extra genomes appear, on average, to offer no benefit or disadvantage to plants, but still play a key role in the origin of new species, say scientists from Indiana University Bloomington and three other institutions in this week's *Proceedings of the National Academy of Sciences*.

Plant biologists have long suspected polyploidy -- the heritable acquisition of extra chromosome sets -- was a gateway to speciation. But the consensus was that polyploidy is a minor force, a mere anomaly that accounts for 3 or 4 percent of the world's flowers and ferns.

The first direct, comprehensive survey of polyploid speciation in plant evolution severely challenges that notion.

"In the present paper, we make it clear that it is a common process," said evolutionary biologist and lead author Troy Wood, who began the research during graduate training at IU Bloomington. "Fifteen percent of flowering plant species and almost a third of fern species are directly derived from polyploidy."

Wood is now a research scientist at University of Muenster in Germany.

Could polyploidy provide plants with a powerful advantage over their chromosome-challenged peers? Not necessarily. The scientists' exhaustive survey of published phylogenetic and genomic data also shows that plant lineages starting with a polyploid ancestor appear to be no more successful at spawning species than diploid plants, which have two sets of chromosomes.

"The fact that polyploidy seems to have no effect on diversification rates should reduce the number of enthusiastic commentaries about the 'advantages of polyploidy,'" said IU Bloomington evolutionary biologist and paper coauthor Loren Rieseberg, who supervised the research. "However, our

diversification rate analyses only examined recent polyploids. A future area of research should be to ask whether more ancient polyploidy events have increased diversification rates."

Rieseberg holds joint appointments at the University of British Columbia and IU Bloomington.

"The present study developed out of an ongoing project to write a book about plant speciation," Rieseberg said. "I felt that recent estimates of the polyploid speciation rate were too conservative because they did not take genealogical history into account. Troy began compiling chromosome number data and phylogenetic trees so that we could generate a more accurate estimate of the frequency of polyploid speciation."

While the variation that leads to new species is usually a glorious accident, evolutionary biologists are beginning to identify the biological properties of organisms that make those accidents stick around long enough for new species to become established. If whatever separates the new breed from its original population is tenuous, it's possible the new and old populations will comingle, negating the possibility of a new species. Geographic separation or "reproductive isolation" is crucial.

Mechanisms of reproductive isolation are almost as vast and varied as the species they make possible.

In some animals, sudden, heritable changes in the size and shape of genitalia have the potential to prevent some individuals of a population from mating with most of the others. Even though sexually reproducing plants do not rely on this sort of "lock and key"-type of sex matching, they have equivalent, more subtle systems for preventing the wrong pollen from fertilizing their eggs.

Polyploidy can also result in speciation, as polyploid individuals often cannot produce viable offspring with their diploid (two sets of chromosomes) relatives. While the polyploid and diploid individuals may appear more-or-less identical to one another, their genetics make sexual reproduction unlikely or impossible.

Some animals can handle polyploidy, but for most vertebrate species, an extra chromosome set is a death sentence. Humans, for example, can barely tolerate the presence of even one extra chromosome out of the total set of 23. Most human "trisomies," as these are called, result in natural abortion, or miscarriage. Non-lethal human trisomies result in developmental disorders, such as Down Syndrome. Human zygotes with three full sets of chromosomes do not develop.

Plants are pretty special. Not only can many species tolerate extra chromosome sets, but polyploidy appears to be a recurring theme throughout plant evolution. The question is why.

"Recent data reveal evidence of polyploidy in an array of plants, like grapes, poplar trees, corn, and many others," Wood said. "In most of these cases the evidence points to ancient polyploid events. Some species of flowering plants have more than 400 chromosomes and some fern species more than 1,000 due to repeated instances of polyploidy during their evolution. While these examples might seem remarkable, given the high frequency of polyploidy speciation documented here, the bigger surprise would be if plant lineages were found in which polyploidy was absent."

One implication of the PNAS paper is that Wood, Rieseberg, and their coauthors may be getting close to solving the mystery. If extra genomes provide no special advantage over relatives, the ubiquity of polyploidy in plants could simply be because polyploid mutants are commonly produced. Evolutionary change that doesn't involve the plus-or-minus forces of natural selection is called "neutral" in evolutionary biology parlance.

"I really thought we would find evidence that polyploids have an advantage," Wood said. "The idea that the large number of polyploid species and the attending high chromosome numbers might be simply due to a neutral process is intriguing."

Also contributing to the PNAS paper were Naoki Takebayashi of the University of Alaska's Institute of Arctic Biology and Department of Biology and Wildilife, Michael Barker of the University of British Columbia and Indiana University Bloomington, and Itay Mayrose and Philip Greenspoon of the University of British Columbia. It was supported with grants from the Natural Sciences and Engineering Research Council of Canada, the National Science Foundation, and the National Institutes of Health.

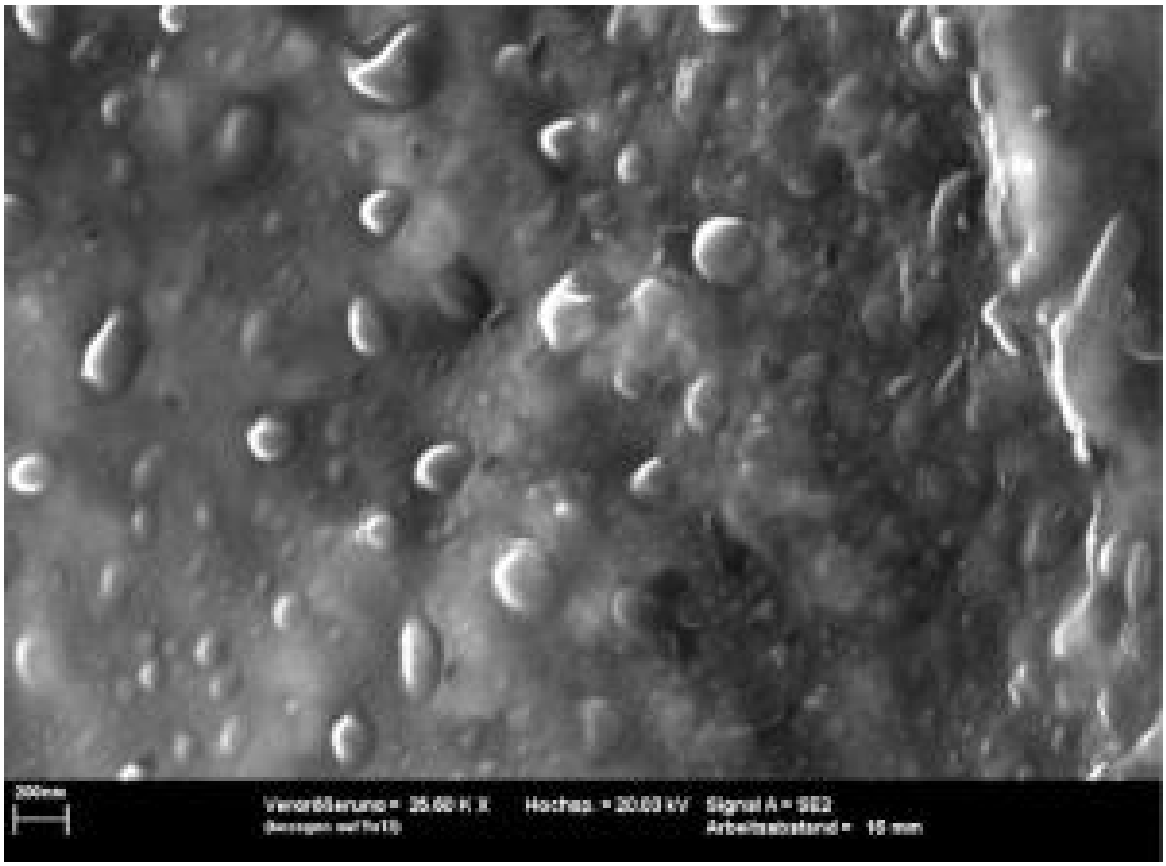
Journal reference:

1. Troy E. Wood, Naoki Takebayashi, Michael S. Barker, Itay Mayrose, Philip B. Greenspoon, and Loren H. Rieseberg. **The frequency of polyploid speciation in vascular plants**. *Proceedings of the National Academy of Sciences*, 2009; DOI: 10.1073/pnas.0811575106

Adapted from materials provided by Indiana University.

http://www.sciencedaily.com/releases/2009/08/090812145019.htm

Self-healing Surfaces



Self-healing surfaces. (Credit: Image courtesy of Fraunhofer-Gesellschaft)

ScienceDaily (Aug. 18, 2009) — The engineers‘ dream of self-healing surfaces has taken another step towards becoming reality – researchers have produced a electroplated layer that contains tiny nanometer-sized capsules. If the layer is damaged, the capsules release fluid and repair the scratch.^

Human skin is a phenomenon – small scratches and cuts heal quickly, leaving no trace of a scar after just a few days. It’s a different matter with materials, such as metals – if the electroplated layer protecting the metals from corrosion is scratched, rust protection is lost. Engineers are working on transferring the self-healing effect of skin to materials. The idea behind this is to introduce evenly distributed fluid-filled capsules into the electroplated layer – rather like raisins in a cake. If the layer is damaged, the pellets at the point of damage burst, the fluid runs out and ‘repairs’ the scratch.

Until now, these plans have failed due to the size of the capsules – at 10 to 15 micrometers they were too large for the electroplated layer, which is around 20 micrometers thick. The capsules altered the mechanical properties of the layer.

Researchers from the Fraunhofer Institute for Manufacturing Engineering and Automation IPA in Stuttgart, together with colleagues from Duisburg-Essen University, have developed a process for producing electroplated layers with nano-capsules, in a project being financed by the Volkswagen Foundation. At only a few hundred nanometers in diameter, the capsules are measured on another scale entirely, compared with previous results. “The challenge lies in not damaging the capsules when producing the electroplated layer”, says Dr. Martin Metzner, Head of Department at IPA. “The smaller the capsules, the thinner and more sensitive their casing. The electrolytes used for these electroplated-

technical processes are extremely aggressive chemically and can easily destroy the capsules". The researchers therefore had to find a compatible material for the capsule casing depending on the electrolytes used.

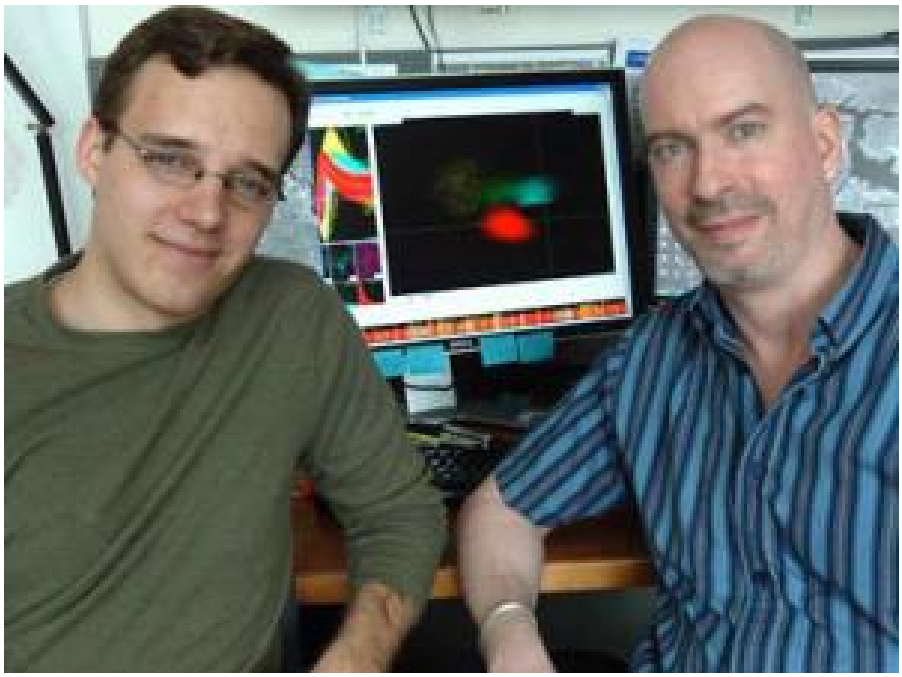
Mechanical bearings are one example of possible applications – the materials of the bearings usually have a electroplated coating, in which the capsules can be embedded. If there is a temporary shortage of lubricant, part of the bearing's coating is lost, the capsules at the top of the layer burst and release lubricant. The bearing is not therefore damaged if it temporarily runs dry.

The researchers have produced the first copper, nickel and zinc coatings with the new capsules, although surface coverage does not extend beyond the centimeter scale. Experts estimate that it will be another one and a half to two years before whole components can be coated. In a further step the team worked on more complex systems – involving differently filled capsules, for example, whose fluids react with one another like a two component adhesive.

Adapted from materials provided by Fraunhofer-Gesellschaft.

http://www.sciencedaily.com/releases/2009/08/090803084008.htm

The Mind's Eye Scans Like A Spotlight: New Role Discovered For Brain Waves



Picower Institute postdoctoral associate Timothy J. Buschman, left, and Picower Professor of Neuroscience Earl Miller (Credit: Photo by Donna Coveney)

ScienceDaily (Aug. 18, 2009) — You're meeting a friend in a crowded cafeteria. Do your eyes scan the room like a roving spotlight, moving from face to face, or do you take in the whole scene, hoping that your friend's face will pop out at you? And what, for that matter, determines how fast you can scan the room?

Researchers at MIT's Picower Institute for Learning and Memory say you are more likely to scan the room, jumping from face to face as you search for your friend. In addition, the timing of these jumps appears to be determined by waves of activity in the brain that act as a clock. The study, which appears in the Aug. 13 issue of the journal *Neuron*, sheds new light on a long-standing debate among neuroscientists over how the visual system picks out an object of interest in a complex scene.

In the study, monkeys were given the task of searching for one particular tilted, colored bar among a field of bars on a computer screen. By monitoring the activity of neurons in three of the animals' brain regions, researchers found that the monkeys spontaneously shifted their attention in a sequence, like a moving spotlight that jumped from location to location.

What's more, the study showed that brain waves act as a kind of built-in clock that provides a framework for shifting attention from one location to the next. The work could have implications for understanding or treating attention deficit disorder or even potentially speeding up the rate of cognition in the brain.

"For many years, neuroscientists have been debating competing theories on whether humans and animals spontaneously search elements of a visual scene in a serial or parallel manner," said lead author Earl K. Miller, the Picower Professor of Neuroscience. "Ours is the first study based on direct evidence of neurophysiological activity."

Like clockwork

Activity in the brain comes and goes in waves, cycling between high and low activity states. Researchers have been recording brain waves for more than 100 years and although they think they play roles in working memory, decision-making and communication among brain regions, no one is sure of their exact role in brain function. This work suggests a new role for brain waves — one in which they are directly involved in the brain's processing.

Picower Institute postdoctoral associate and co-author Timothy J. Buschman found that the spotlight of the mind's eye shifted focus at 25 times a second and that this process of switching was regulated by brain waves. "This is one of the first examples of how brain waves play a specific role in cognitive computations," Buschman said.

"Attention regulates the flood of sensory information pouring into the brain into a manageable stream. In particular, a lot of different areas of the brain are involved in vision. If they all competed at once, it would be chaos," Miller said. "Brain waves may provide the clock that tells the brain when to shift its attention from one stimulus to another. Oscillating brain waves may provide a way for several regions across the brain to be on the same page at the same time — very similar to the way computers use an internal clock to synchronize the many different components inside."

The researchers' next step is to expand their search for brain wave function beyond the visual. They hope to discover whether brain waves are specific to visual function or act as a "general clock" for the brain.

The researchers have found that in the experiment with the monkeys, the speed at which the animals searched was related to the speed of their brain waves. When the clock ticked faster, the animals "thought" faster. This implies that it may be possible to change the speed of cognition if researchers can learn to artificially manipulate brain waves. In separate studies outside MIT, researchers are looking at the correlation between the brain waves' "clock speed" in humans and the speed at which subjects shift attention from one task to another.

This work is supported by the National Science Foundation and the National Institute of Neurological Disorders and Stroke.

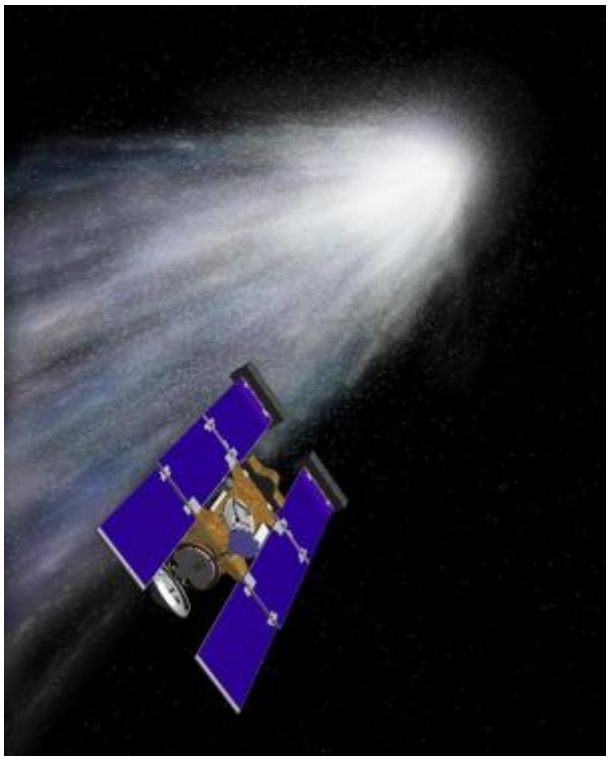
Journal reference:

1. Timothy J. Buschman, Earl K. Miller. **Serial, Covert Shifts of Attention during Visual Search Are Reflected by the Frontal Eye Fields and Correlated with Population Oscillations**. *Neuron*, 2009; DOI: 10.1016/j.neuron.2009.06.020

Adapted from materials provided by Massachusetts Institute of Technology.

http://www.sciencedaily.com/releases/2009/08/090812143928.htm

First Discovery Of Life's Building Block In Comet



Artist's concept of Stardust encountering comet Wild 2This is an artist's concept of the Stardust spacecraft beginning its flight through gas and dust around comet Wild 2. The white area represents the comet. The collection grid is the tennis-racket-shaped object extending out from the back of the spacecraft. (Credit: NASA/JPL)

ScienceDaily (Aug. 18, 2009) — NASA scientists have discovered glycine, a fundamental building block of life, in samples of comet Wild 2 returned by NASA's Stardust spacecraft.

"Glycine is an amino acid used by living organisms to make proteins, and this is the first time an amino acid has been found in a comet," said Dr. Jamie Elsila of NASA's Goddard Space Flight Center in Greenbelt, Md. "Our discovery supports the theory that some of life's ingredients formed in space and were delivered to Earth long ago by meteorite and comet impacts."

Elsila is the lead author of a paper on this research accepted for publication in the journal *Meteoritics and Planetary Science*. The research will be presented during the meeting of the American Chemical Society at the Marriott Metro Center in Washington, DC, August 16.

"The discovery of glycine in a comet supports the idea that the fundamental building blocks of life are prevalent in space, and strengthens the argument that life in the universe may be common rather than rare," said Dr. Carl Pilcher, Director of the NASA Astrobiology Institute which co-funded the research.

Proteins are the workhorse molecules of life, used in everything from structures like hair to enzymes, the catalysts that speed up or regulate chemical reactions. Just as the 26 letters of the alphabet are arranged in limitless combinations to make words, life uses 20 different amino acids in a huge variety of arrangements to build millions of different proteins.

Stardust passed through dense gas and dust surrounding the icy nucleus of Wild 2 (pronounced "Vilt-2") on January 2, 2004. As the spacecraft flew through this material, a special collection grid filled with

aerogel – a novel sponge-like material that's more than 99 percent empty space – gently captured samples of the comet's gas and dust. The grid was stowed in a capsule which detached from the spacecraft and parachuted to Earth on January 15, 2006. Since then, scientists around the world have been busy analyzing the samples to learn the secrets of comet formation and our solar system's history.

"We actually analyzed aluminum foil from the sides of tiny chambers that hold the aerogel in the collection grid," said Elsila. "As gas molecules passed through the aerogel, some stuck to the foil. We spent two years testing and developing our equipment to make it accurate and sensitive enough to analyze such incredibly tiny samples."

Earlier, preliminary analysis in the Goddard labs detected glycine in both the foil and a sample of the aerogel. However, since glycine is used by terrestrial life, at first the team was unable to rule out contamination from sources on Earth. "It was possible that the glycine we found originated from handling or manufacture of the Stardust spacecraft itself," said Elsila. The new research used isotopic analysis of the foil to rule out that possibility.

Isotopes are versions of an element with different weights or masses; for example, the most common carbon atom, Carbon 12, has six protons and six neutrons in its center (nucleus). However, the Carbon 13 isotope is heavier because it has an extra neutron in its nucleus. A glycine molecule from space will tend to have more of the heavier Carbon 13 atoms in it than glycine that's from Earth. That is what the team found. "We discovered that the Stardust-returned glycine has an extraterrestrial carbon isotope signature, indicating that it originated on the comet," said Elsila.

The team includes Dr. Daniel Glavin and Dr. Jason Dworkin of NASA Goddard. "Based on the foil and aerogel results it is highly probable that the entire comet-exposed side of the Stardust sample collection grid is coated with glycine that formed in space," adds Glavin.

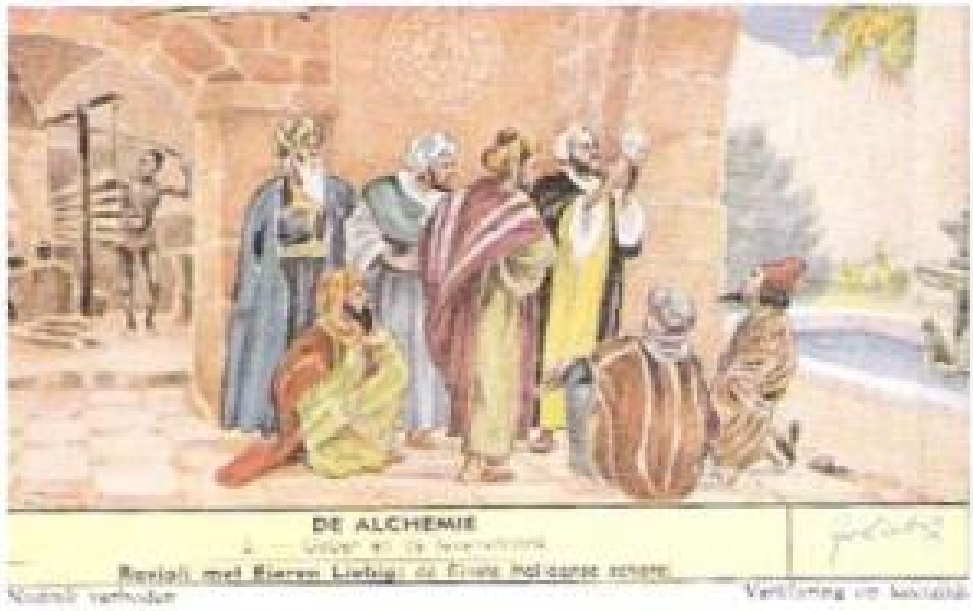
"The discovery of amino acids in the returned comet sample is very exciting and profound," said Stardust Principal Investigator Professor Donald E. Brownlee of the University of Washington, Seattle, Wash. "It is also a remarkable triumph that highlights the advancing capabilities of laboratory studies of primitive extraterrestrial materials."

The research was funded by the NASA Stardust Sample Analysis program and the NASA Astrobiology Institute. NASA's Jet Propulsion Laboratory, Pasadena, Calif., manages the Stardust mission for NASA's Science Mission Directorate, Washington. Lockheed Martin Space Systems, Denver, developed and operated the spacecraft.

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

http://www.sciencedaily.com/releases/2009/08/090817143602.htm

Arabic Chemists From The 'Golden Age' Given Long Overdue Credit



The Arabic chemist Geber is shown in his laboratory. (Credit: "From Alchemy to Chemistry," by Arthur Greenberg, 2007, Wiley-Interscience)

ScienceDaily (Aug. 18, 2009) — You've heard of Louis Pasteur and George Washington Carver, no doubt. And probably Joseph Priestley, one of the founders of modern chemistry. Names like Antoine Lavoisier, John Dalton, and Amadeo Avogadro may even bring a twinkle of recognition to the eye for their famous roles in establishing chemistry as a modern science.

But what about Muhammad ibn Zakariya al-Razi ("Rhazes")? Or Jabir ibn Hayyan ("Geber")? Or Abu Jusuf Yaqub ibn Ishaq al-Kindi. Huh?

"You should know them," Benjamin Huddle, Ph.D., declared in a report presented at the 238th National Meeting of the American Chemical Society. They're chemists from the Golden Age of Arabic-Islamic Science, which stretched from the 8th to the 13th centuries. During this era, science and medicine in Muslim countries — from southern Europe through North Africa to Central Asia and India — flourished and was unrivaled anywhere in the world. Muslim physicians and scientists made advancements that built the foundations for the emergence of modern science and medicine in Europe.

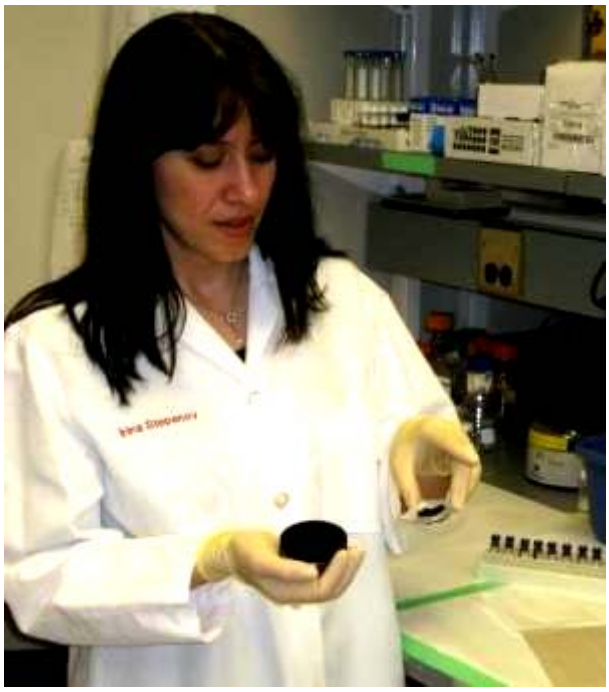
"Science in the early Muslim period is largely forgotten today in the Western world, or relegated to pseudo-science," Huddle said. "We are rediscovering the fact that from 750 to 1258 A.D. the best science in the world was being done by Arabic-speaking peoples. In chemistry we use language from the Arabs, apparatus and techniques, many chemicals (especially perfumes), and many materials."

Huddle did his research on the Golden Age, which produced a portrait of Arabic-Islamic love for learning and reverence for education and knowledge that defies popular modern stereotypes. His ACS abstract, non-technical summary, and contact information appear below.

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

http://www.sciencedaily.com/releases/2009/08/090816211841.htm

List Of Hazardous Chemicals In Smokeless Tobacco Is Expanded In New Study



Researcher Irina Stepanov, Ph.D., examines a can of smokeless tobacco. (Credit: Keith Lindsey)

ScienceDaily (Aug. 18, 2009) — Attention all smokeless tobacco users: It's time to banish the comforting notion that snuff and chewing tobacco are safe because they don't burn and produce inhalable smoke like cigarettes. A study that looked beyond the well-researched tobacco hazards, nitrosamines and nicotine, has discovered a single pinch — the amount in a portion — of smokeless tobacco exposes the user to the same amount of another group of dangerous chemicals as the smoke of five cigarettes.

The research on polycyclic aromatic hydrocarbons (PAH) in smokeless tobacco was reported at the 238th National Meeting of the American Chemical Society (ACS). It adds to existing evidence that smokeless contains two dozen other carcinogens that cause oral and pancreatic cancers, the scientists say.

"This study once again clearly shows us that smokeless tobacco is not safe," said Irina Stepanov, Ph.D., who led the research team. "Our finding places snuff on the same list of major sources of exposure to polycyclic aromatic hydrocarbons as smoking cigarettes." PAHs are widespread environmental contaminants formed as a result of incomplete burning of wood, coal, fat in meat, and organic matter. PAHs form, for instance, during the grilling of burgers, steaks and other meat.

The findings come in the midst of a rise in both marketing and consumption of smokeless tobacco, which many consumers regard as less dangerous than other forms of tobacco. Estimates suggest that sales of moist snuff in the United States have doubled since the 1980s.

"The feeling of safety among some smokeless users is wrong," said Stepanov, a chemist with Masonic Cancer Center, University of Minnesota, Minneapolis. "A total of 28 carcinogens were identified in smokeless tobacco even before our study. Continued exposure to these over a period of time can lead to cancer. Now we have found even more carcinogens in snuff." In addition to the heightened cancer risk, she noted that chronic use of snuff leads to nicotine addiction, just as it does with cigarette smoking.

Stepanov said that until recently, scientists believed that only trace amounts of PAH existed in snuff because the tobacco was not burned when used. This assumption proved to be wrong. "Even though smokeless tobacco use does not involve burning, moist snuff is getting contaminated with PAH during its

manufacturing," according to Stepanov. The most likely source of this contamination with PAH is the curing process that is used to turn tobacco leaves into snuff. This process is called 'fire-curing', and it puts tobacco into direct contact with the smoke generated by smoldering hardwoods — a rich source of various PAHs.

Looking to the next project, she said the team is working on a study that will examine a wide range of smokeless tobacco brands to compare PAH levels among them.

Funding for Stepanov's research came from the National Cancer Institute and the National Institute on Drug Abuse to the Transdisciplinary Tobacco Use Research Center at the University of Minnesota. The research team working on this project includes Dr. Dorothy Hatsukami and Dr. Stephen Hecht, renowned experts in tobacco carcinogenesis and tobacco harm reduction.

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

http://www.sciencedaily.com/releases/2009/08/090816170923.htm

Genetic Link Between Physical Pain And Social Rejection Found

Social rejection can hurt. UCLA psychologists have determined for the first time that a gene linked with physical pain sensitivity is associated with social pain sensitivity as well. (Credit: iStockphoto/Chris Price)

ScienceDaily (Aug. 21, 2009) — UCLA psychologists have determined for the first time that a gene linked with physical pain sensitivity is associated with social pain sensitivity as well.

Their study indicates that variation in the mu-opioid receptor gene (OPRM1), often associated with physical pain, is related to how much social pain a person feels in response to social rejection. People with a rare form of the gene are more sensitive to rejection and experience more brain evidence of distress in response to rejection than those with the more common form.

The research was published Aug. 14 in the early online edition of *Proceedings of the National Academy of Sciences* and will appear in the print version in the coming weeks.

The findings give weight to the common notion that rejection "hurts" by showing that a gene regulating the body's most potent painkillers — mu-opioids — is involved in socially painful experiences too, said study co-author Naomi Eisenberger, UCLA assistant professor of psychology and director of UCLA's Social and Affective Neuroscience Laboratory.

In the study, researchers collected saliva samples from 122 participants to assess which form of the OPRM1 gene they had and then measured sensitivity to rejection in two ways. First, participants completed a survey that measured their self-reported sensitivity to rejection. They were asked, for example, how much they agreed or disagreed with statements like "I am very sensitive to any signs that a person might not want to talk to me."

Next, a subset of this group, 31 participants, was studied using functional magnetic resonance imaging (fMRI) at UCLA's Ahmanson–Lovelace Brain Mapping Center during a virtual ball-tossing game in which participants were ultimately socially excluded. Subjects were told that they would be connected over the Internet with two other players who were also in fMRI scanners and that they would all be

playing the interactive ball-tossing game. In reality, however, participants were playing with a preset computer program, not other people.

Initially, participants were included in the activity but were then excluded when the two other "players" stopped throwing the ball to them.

"What we found is that individuals with the rare form of the OPRM1 gene, who were shown in previous work to be more sensitive to physical pain, also reported higher levels of rejection sensitivity and showed greater activity in social pain–related regions of the brain — the dorsal anterior cingulate cortex and anterior insula — in response to being excluded," Eisenberger said.

The dorsal anterior cingulate cortex and anterior insula are brain regions often associated with the distress of physical pain. Previous research by Eisenberger and her colleagues has shown that these brain regions are also involved in the pain of social rejection.

"Although it has long been suggested that mu-opioids play a role in social pain — and there are convincing animal models that show this — this is the first human study to link this mu-opioid receptor gene with social sensitivity in response to rejection," Eisenberger said.

"These findings suggest that the feeling of being given the cold shoulder by a romantic interest or not being picked for a schoolyard game of basketball may arise from the same circuits that are quieted by morphine," said Baldwin Way, a UCLA postdoctoral scholar and the lead author on the paper.

Eisenberger argues that this overlap in the neurobiology of physical and social pain makes good sense.

"Because social connection is so important, feeling literally hurt by not having social connections may be an adaptive way to make sure we keep them," she said. "Over the course of evolution, the social attachment system, which ensures social connection, may have actually borrowed some of the mechanisms of the pain system to maintain social connections."

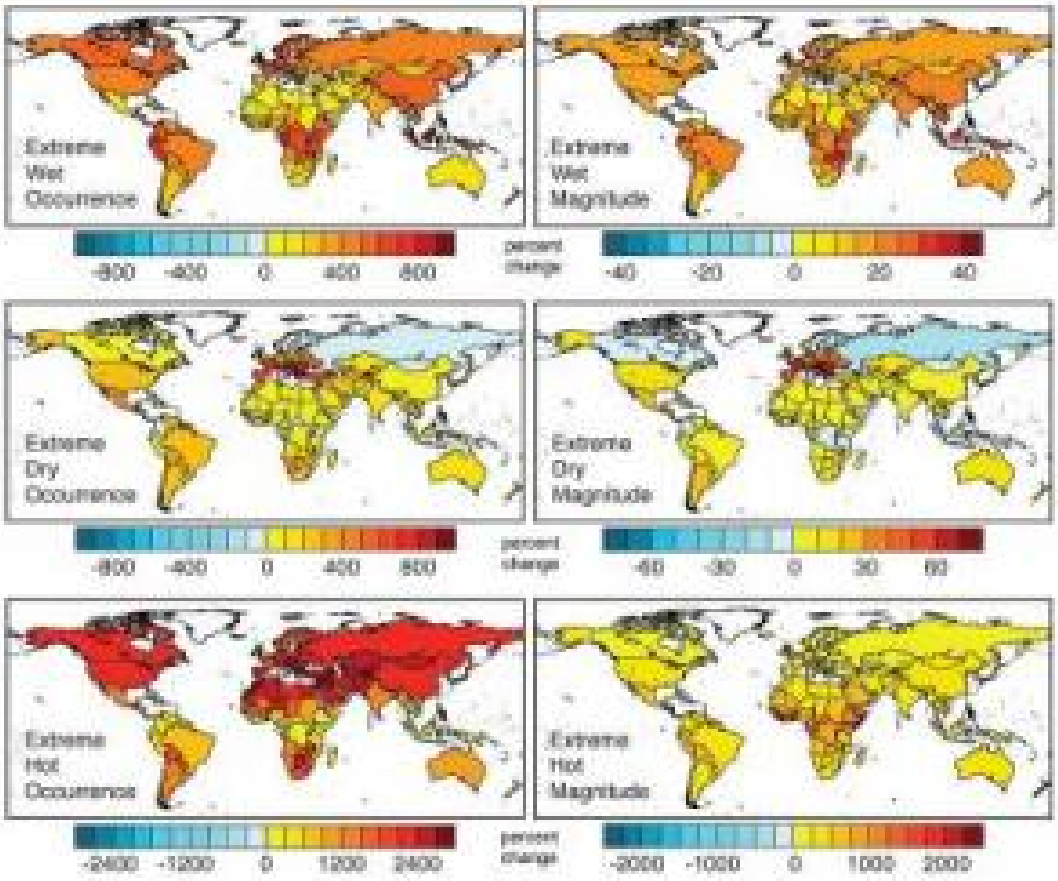
Shelley E. Taylor, UCLA distinguished professor of psychology, is also a co-author on the paper.

The research was funded by a National Institute of Mental Health (NIMH) postdoctoral fellowship, the National Institute on Aging, the NIMH and the Harry Frank Guggenheim Foundation.

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

http://www.sciencedaily.com/releases/2009/08/090817142859.htm

Climate Change Could Deepen Poverty In Developing Countries, Study Finds



These maps show projected changes in frequency and magnitude of climate extremes. A Purdue team found that the occurrence and magnitude of what are currently the 30-year-maximum values for wet, dry and hot extremes are projected to substantially increase for much of the world. (Credit: Diffenbaugh lab image)

ScienceDaily (Aug. 21, 2009) — Urban workers could suffer most from climate change as the cost of food drives them into poverty, according to a new study that quantifies the effects of climate on the world's poor populations.

A team led by Purdue University researchers examined the potential economic influence of adverse climate events, such as heat waves, drought and heavy rains, on those in 16 developing countries. Urban workers in Bangladesh, Mexico and Zambia were found to be the most at risk.

"Extreme weather affects agricultural productivity and can raise the price of staple foods, such as grains, that are important to poor households in developing countries," said Noah Diffenbaugh, the associate professor of earth and atmospheric sciences and interim director of Purdue's Climate Change Research Center who co-led the study. "Studies have shown global warming will likely increase the frequency and intensity of heat waves, drought and floods in many areas. It is important to understand which socioeconomic groups and countries could see changes in poverty rates in order to make informed policy decisions."

The team used data from the late 20th century and projections for the late 21st century to develop a framework that examined extreme climate events, comparable shocks to grain production and the impact on the number of impoverished people in each country.

Thomas Hertel, a distinguished professor of agricultural economics and co-leader of the study, said that although urban workers only contribute modestly to total poverty rates in the sample countries, they are the most vulnerable group to changes in grains production.

"Food is a major expenditure for the poor and, while those who work in agriculture would have some benefit from higher grains prices, the urban poor would only get the negative effects," said Hertel, who also is executive director of Purdue's Center for Global Trade Analysis. "This is an important finding given that the United Nations projects a continuing shift in population concentrations from rural to urban areas in virtually all of these developing countries."

With nearly 1 billion of the world's poor living on less than $1 a day, extreme events can have a devastating impact, he said.

"Bangladesh, Mexico and Zambia showed the greatest percentage of the population entering poverty in the wake of extreme drought, with an additional 1.4 percent, 1.8 percent and 4.6 percent of their populations being impoverished by future climate extremes, respectively," Hertel said. "This translates to an additional 1.8 million people impoverished per country for Bangladesh and Mexico and an additional half million people in Zambia."

A paper detailing the work will be published in Thursday's (Aug. 20) issue of *Environmental Research Letters*. In addition to Diffenbaugh and Hertel, Syud Amer Ahmed, a recent Purdue graduate and a member of the development research group for The World Bank, co-authored the paper. The World Bank's Trust Fund for Environmentally and Socially Sustainable Development funded the research.

The team identified the maximum rainfall, drought and heat wave for the 30-year periods of 1971-2000 and 2071-2100 and then compared the maximums for the two time periods.

The global climate model experiments developed by the Intergovernmental Panel on Climate Change, or IPCC, were used for the future projections of extreme events. The team used an IPCC scenario that has greenhouse gas emissions continuing to follow the current trend, Diffenbaugh said.

"The occurrence and magnitude of what are currently the 30-year-maximum values for wet, dry and hot extremes are projected to substantially increase for much of the world," he said. "Heat waves and drought in the Mediterranean showed a potential 2700 percent and 800 percent increase in occurrence, respectively, and extreme rainfall in Southeast Asia was projected to potentially increase by 900 percent."

In addition, Southeast Asia showed a projected 40 percent increase in the magnitude of the worst rainfall; central Africa showed a projected 1000 percent increase in the magnitude of the worst heat wave; and the Mediterranean showed a projected 60 percent increase in the worst drought.

A statistical analysis was used to determine grain productivity shocks that would correspond in magnitude to the climate extremes, and then the economic impact of the supply shock was determined. Future predicted extreme climate events were compared to historical agricultural productivity extremes in order to assess the likely impact on agricultural production, prices and wages. Because the projected changes in extreme rainfall and heat wave events were too large for the current model to accept, only the extreme drought events were incorporated into the economic projections, making the projected poverty impacts a conservative estimate, he said.

To assess the potential economic impact of a given change in wages and grains prices, the team used data from each country's household survey. The estimates of likely wage and price changes following an extreme climate event were obtained from a global trade model, called the Global Trade Analysis Project, or GTAP, which is maintained by Purdue's agricultural economics department.

Purdue's GTAP framework is supported by an international consortium of 27 national and international agencies and is used by a network of 6,500 researchers in 140 countries.

Large reductions in grains productivity due to extreme climate events are supported by historical data. In 1991 grains productivity in Malawi and Zambia declined by about 50 percent when southern Africa experienced a severe drought.

Diffenbaugh said this is an initial quantification of how poverty is tied to climate fluctuations, and the team is working to improve the modeling and analysis system in order to enable more comprehensive assessments of the link between climate volatility and poverty vulnerability.

Adapted from materials provided by Purdue University, via EurekAlert!, a service of AAAS. Original article written by Elizabeth K. Gardner

http://www.sciencedaily.com/releases/2009/08/090820082101.htm

With Nothing To Guide Their Way, People Really Do Walk In Circles

With nothing to guide their way, people attempting to walk a straight course through unfamiliar territory really do end up walking in circles. (Credit: iStockphoto/David Ciemny)

ScienceDaily (Aug. 21, 2009) — With nothing to guide their way, people attempting to walk a straight course through unfamiliar territory really do end up walking in circles, according to a report published online on August 20th in *Current Biology*, a Cell Press publication. Although that belief has pervaded popular culture, there has been no scientific evidence to back it up until now, according to the researchers.

"The stories about people who end up walking in circles when lost are actually true," said Jan Souman of the Max Planck Institute for Biological Cybernetics in Germany. "People cannot walk in a straight line if they do not have absolute references, such as a tower or a mountain in the distance or the sun or moon, and often end up walking in circles."

Those circular paths are rarely systematic, the researchers show. The same person may sometimes veer to the left, then again to the right, before ending up back where they started from, Souman said. That rules out one potential explanation for the phenomenon: that circle-walking stems from some systematic bias to turn in one direction, such as differences in leg length or strength. It seems that the circles rather emerge naturally through "random drift" in where an individual thinks straight ahead to be, Souman said.

The researchers tested the idea in both forest and desert environments. Participants were instructed to walk as straight as they could in one direction, and their trajectory was recorded via GPS. Six people walked for several hours in a large, flat forest—four on a cloudy day with the sun hidden. Those four all walked in circles, with three of them repeatedly crossing their own paths without noticing it. In contrast, when the sun was out, two other participants followed an almost perfectly straight course, except during the first 15 minutes, when the sun was still hidden behind some clouds.

Three other participants walked for several hours in the Sahara desert, in southern Tunisia. Two of them, who walked during the heat of the day, veered from the course they were instructed to follow but did not walk in circles. The third walked at night, at first by the light of a full moon. Only after the moon disappeared behind the clouds did he make several sharp turns, bringing him back in the direction he started from.

In other tests, blindfolded people walked in surprisingly small circles, though rarely showing a tendency to travel in any particular direction. That result led the researchers to suggest that the inability to stick to a straight course results from accumulating "noise" in the sensorimotor system. Without an external directional reference to recalibrate the subjective sense of straight ahead, that "noise" may cause people to walk in circles, the researchers said.

Souman's group plans to study this tendency under more controlled conditions by asking subjects to walk through a virtual-reality forest on a special treadmill they have built, which allows a person to travel in any direction they choose. These tests will make it possible for the researchers to isolate the various factors that might play a role, such as the availability of the sun or other landmarks, and to study their contributions to walking straight—or in circles.

The researchers include Jan L. Souman, Max Planck Institute for Biological Cybernetics, Tubingen, Germany; Ilja Frissen, Max Planck Institute for Biological Cybernetics, Tubingen, Germany, McGill University, Montreal, Canada; Manish N. Sreenivasa, Max Planck Institute for Biological Cybernetics, Tubingen, Germany, Laboratoire d'Analyse et d'Architecture des Systemes, Centre National de Recherche Scientifique, Toulouse, France; and Marc O. Ernst, Max Planck Institute for Biological Cybernetics, Tubingen, Germany.

Adapted from materials provided by Cell Press, via EurekAlert!, a service of AAAS

http://www.sciencedaily.com/releases/2009/08/090820123927.htm

Ocean-drilling Expedition Cites New Evidence Related To Origin And Evolution Of Seismogenic Faults

The Deep Sea Drilling Vessel Chikyu is the state-of-the-art scientific drill ship operated by the Japan Agency for Marine-Earth Science and Technology through the Center for Deep Earth Exploration for the Integrated Ocean Drilling Program. The NanTroSEIZE Stage 1 expeditions were implemented from September 2007 to February 2008. (Credit: Copyright: JAMSTEC/IODP)

ScienceDaily (Aug. 21, 2009) — New research about what triggers earthquakes, authored by Michael Strasser of Bremen University, Germany, with colleagues from the USA, Japan, China, France, and Germany, will appear in the Aug. 16 2009 issue of *Nature Geoscience* (online version). The research article, titled "Origin and evolution of a splay-fault in the Nankai accretionary wedge" is drawn from the scientists' participation in the Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE), a long-term scientific ocean-drilling project conducted by the Integrated Ocean Drilling Program (IODP).

Since September 2007, rotating teams of scientists have spent months aboard Japan's drilling vessel, CHIKYU, investigating the Nankai Trough, a seismogenic zone located beneath the ocean off the southwest coast of Japan. Drilling operations, managed by the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) through its Center for Deep Earth Exploration, have resulted in a collection of cored samples from the sea floor, which have provided scientists with deeper insights into the geologic past of the area.

Discussion in the above-noted article focuses on the Nankai Trough, in which the Philippine Sea plate slips below the Eurasian Plate with a velocity of 4 cm per year. This area is one of the most active earthquake zones on the planet. While being subducted, sediments are scraped off the oceanic plate and added to the overriding continental plate. Due to the movement of the plates these so-called accretionary wedges are exposed to enormous stress that form large faults. The landward wedge in the Nankai Trough is completely intersected by such a prominent fault which extends laterally over more than 120 km. Scientists refer to this structure as "the megasplay." Movements along such megasplay faults during large magnitude earthquakes generated at depth may rupture the ocean floor and generate tsunamis.

"Our knowledge of megasplay faults up till now has been based on seismic or modelling experiments accomplished over the last twenty years," says Michael Strasser of Post-Doc Fellow of the Center for Marine Environmental Sciences (MARUM) at University of Bremen. "For the first time, with cored samples brought onto the CHIKYU, it has become possible to reconstruct the geological history of a fault in great detail." With his associates, Dr. Strasser found that the fault in the Nankai Trough originated

about two million years ago. From the information recorded in the cores, the research team can draw conclusions on the mechanics of the accretionary wedge. They also can infer in which geological time periods the fault was most active.

"Our most significant conclusion is that splay fault activity varies through time," Dr. Strasser states. According to Strasser, after an initial period of high activity, the movement along the fault slowed down. Since about 1.55 million years ago, this fault has been reactivated, favoring ongoing megasplay slip along it.

"It is absolutely fascinating to be part of NanTroSEIZE," says Strasser, noting that the expedition series aims to sample and monitor activity at the point where earthquakes originate. "NanTroSEIZE is something completely new and innovative in scientific drilling," Strasser explains. "Ultimately, we hope to detect signals occurring just before an earthquake to get a better understanding of the processes leading to earthquakes and tsunamis."

The Nankai Trough is particularly suited for this experiment because historical records of earthquakes and tsunamis in this area date back into the seventh century. Additionally, the area where earthquakes are generated, the so-called seismogenic zone, is located at a relatively shallow depth of about six kilometers below the seafloor.

In 2007 and 2008, during the first stage of NanTroSEIZE, the deep sea drilling vessel CHIKYU carried out three expeditions. This drilling project consists of four stages in all, and ultimately focuses on "ultra-deep" drilling that can reach the seismogenic zone, where great earthquakes have occurred repeatedly.

During upcoming expeditions, the Nankai Trough boreholes will be equipped with instruments to establish an ocean observatory network. Currently, scientists are making preparations to install monitoring devices for continous measurements of the Nankai Trough. Prof. Gaku Kimura of University of Tokyo, who led an earlier NanTroSEIZE expedition 316 as Co-Chief Scientist says, "Not only do we have new insights about historic fault activities in Nankai Trough, but the data strongly suggests that the megasplay fault may be a key factor in the occurrence of large earthquakes in the future." He adds, "Greater understanding about the processes of earthquake and tsunami generation in the active subduction zone will be a great contribution to society."

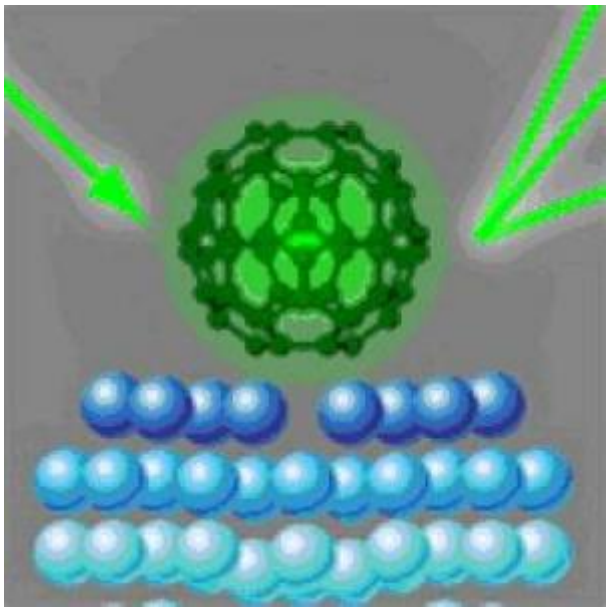
Journal reference:

1. Strasser et al. **Origin and evolution of a splay fault in the Nankai accretionary wedge**. *Nature Geoscience*, 2009; DOI: 10.1038/ngeo609

Adapted from materials provided by Integrated Ocean Drilling Program Management International, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/08/090817142743.htm

Nanophysics: Serving Up Buckyballs On A Silver Platter



Scientists have imaged the complete structure of C60 molecules on a silver surface with electron diffraction. (Credit: Image copyright American Physical Society [Illustration: Alan Stonebraker after H. I. Li et al.])

ScienceDaily (Aug. 21, 2009) — Scientists at Penn State University, in collaboration with institutes in the US, Finland, Germany and the UK, have figured out the long-sought structure of a layer of C60 – carbon buckyballs – on a silver surface. The results, which could help in the design of carbon nanostructure-based electronics are reported in *Physical Review Letters* and highlighted in the July 27th issue of APS's online journal *Physics*.

Ever since the 1985 discovery of C60, this molecule, with its perfect geodesic dome shape has fascinated scientists, physicists, and chemists alike. Like a soccer ball, the molecule consists of 20 carbon hexagons and 12 carbon pentagons. The electronic properties of C60 are very unusual, and there is a massive research effort toward integrating it into molecular scale electronic devices like transistors and logic gates.

To do this, researchers need to know how the molecule forms bonds with a metal substrate, such as silver, which is commonly used as an electrode in devices. Now, Hsin-I Li, Renee Diehl, and colleagues have determined the geometry of C60 on a silver surface using a technique called low-energy electron diffraction.

They find that the silver atoms rearrange in such a way – namely, by forming a 'hole' beneath each C60 molecule - that reinforces the bonding between the carbon structure and the silver surface.

The measurements push the limits of surface science because the molecules and the re-arrangement of the underlying silver atoms are quite complex. The measurements thus open the door to studies of a large number of technologically and biologically important molecules on surfaces.

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

http://www.sciencedaily.com/releases/2009/07/090727102133.htm

Plastics In Oceans Decompose, Release Hazardous Chemicals, Surprising New Study Says

A boy in Japan points out Styrofoam debris from the ocean. (Credit: Katsuhiko Saido)

ScienceDaily (Aug. 20, 2009) — In the first study to look at what happens over the years to the billions of pounds of plastic waste floating in the world's oceans, scientists are reporting that plastics — reputed to be virtually indestructible — decompose with surprising speed and release potentially toxic substances into the water.

Reporting at the 238th National Meeting of the American Chemical Society (ACS), the researchers termed the discovery "surprising." Scientists always believed that plastics in the oceans were unsightly, but a hazard mainly to marine animals that eat or become ensnared in plastic objects.

"Plastics in daily use are generally assumed to be quite stable," said study lead researcher Katsuhiko Saido, Ph.D. "We found that plastic in the ocean actually decomposes as it is exposed to the rain and sun and other environmental conditions, giving rise to yet another source of global contamination that will continue into the future."

He said that polystyrene begins to decompose within one year, releasing components that are detectable in the parts-per-million range. Those chemicals also decompose in the open water and inside marine life. However, the volume of plastics in the ocean is increasing, so that decomposition products remain a potential problem.

Each year as much as 150,000 tons of plastic debris, most notably Styrofoam, wash up on the shores of Japan alone, Saido said. Vast expanses of waste, consisting mainly of plastic, float elsewhere in the oceans. The so-called Great Pacific Garbage Patch between California and Hawaii was twice the size of Texas and mainly plastic waste.

Saido, a chemist with the College of Pharmacy, Nihon University, Chiba, Japan, said his team found that when plastic decomposes it releases potentially toxic bisphenol A (BPA) and PS oligomer into the water, causing additional pollution. Plastics usually do not break down in an animal's body after being eaten. However, the substances released from decomposing plastic are absorbed and could have adverse effects. BPA and PS oligomer are sources of concern because they can disrupt the functioning of hormones in animals and can seriously affect reproductive systems.

Some studies suggest that low-level exposure to BPA released from certain plastic containers and the linings of cans may have adverse health effects.

Saido described a new method to simulate the breakdown of plastic products at low temperatures, such as those found in the oceans. The process involves modeling plastic decomposition at room temperature, removing heat from the plastic and then using a liquid to extract the BPA and PS oligomer. Typically, he said, Styrofoam is crushed into pieces in the ocean and finding these is no problem. But when the study team was able to degrade the plastic, it discovered that three new compounds not found in nature formed. They are styrene monomer (SM), styrene dimer (SD) and styrene trimer (ST). SM is a known carcinogen and SD and ST are suspected in causing cancer. BPA ands PS oligomer are not found naturally and, therefore, must have been created through the decomposition of the plastic, he said. Trimer yields SM and SD when it decomposes from heat, so trimer also threatens living creatures.

Funding for Saido's research came from Nihon University.

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

http://www.sciencedaily.com/releases/2009/08/090819234651.htm

Dark Energy From The Ground Up: Make Way For BigBOSS

Ever since the big bang and the epoch of inflation, the universe has been expanding. Now it's expanding at an accelerating rate, because of a mysterious something called dark energy. (Credit: Image courtesy of DOE/Lawrence Berkeley National Laboratory)

ScienceDaily (Aug. 20, 2009) — Several ways have been proposed to examine dark energy, in hopes of finding out just what it is. One of them, "supernovae" for short, certainly works: it's how dark energy was discovered in the first place. Other independent techniques, such as weak gravitational lensing and baryon acoustic oscillation, also promise great power but are as yet unproven.These three techniques all have a share of the proposed Joint Dark Energy Mission (JDEM), a satellite design managed by NASA with the participation of the U.S. Department of Energy. DOE's JDEM Project Office is headquartered at Lawrence Berkeley National Laboratory and led by Michael Levi of the Physics Division.

During deliberations on JDEM's reference design in the fall and winter of 2008-2009, some members of the JDEM Science Coordination Group (SCG), which included Saul Perlmutter and David Schlegel of Berkeley Lab's Physics Division, questioned whether a satellite was really the best platform for all three of the proposed methods."Of the three main things JDEM is supposed to do, the NASA design focuses on baryon acoustic oscillation," says Schlegel. "It's good science, but I wondered whether it could be done just as well, or better, from the ground."

Space is the place – sometimes

The goal of all experiments that seek to determine the nature of dark energy is a detailed expansion history of the universe. For supernova studies, which depend on measuring the redshift and brightness of distant Type Ia supernovae, there's no question that space is the place.

Beginning in the 1980s, methods for finding Type Ia supernovae "on demand" were developed by the international Supernova Cosmology Project (SCP), based at Berkeley Lab and headed by Perlmutter, and adopted in 1994 by a rival team, the High-Z Supernova Search Team. In the fall of 1997 the SCP concluded that the universe is expanding at an accelerating rate, propelled by a mysterious something soon to be called dark energy. The unexpected acceleration was soon confirmed by the High-Z Team.

Most of the early studies were done from the ground but included a handful of supernova measurements made with the Hubble Space Telescope. To measure expansion rate with enough precision to choose among competing models of dark energy, however, exquisite spectrometry of thousands of distant Type Ia supernovae will be needed. This can only be done by flying a big telescope and an adequate spectrograph in space. That's why the SCP inaugurated a DOE satellite proposal in 1999 called the SuperNova/Acceleration Probe, SNAP, which eventually inspired JDEM.

Early on, SNAP included the capacity to measure weak gravitational lensing, which looks at subtle measures of the distortion of space by both ordinary and dark matter to reveal how the distribution of matter in the universe has changed over time. Weak lensing will also greatly benefit from a space-borne telescope.

Baryon acoustic oscillation (BAO) is distinct from both these methods. "Baryon" is cosmology-speak for ordinary matter, and "acoustic oscillation" is a fancy name for the way galaxies tend to bunch up at roughly 500 million light-year intervals. These density oscillations have their origin in the pressure waves (like sound waves, thus acoustic) that moved through the liquid-like plasma of the early, hot universe.

By the time the universe was 300,000 to 400,000 years old, it had expanded and cooled enough for atoms to form, releasing light to go on its way unimpeded – the era of decoupling. But the density oscillations left their mark as minute temperature differences in the cosmic microwave background (CMB). The denser regions, where matter was clumped more tightly, were the seeds of today's galaxies and groups of galaxies.

The cosmic microwave background provides the starting point for a natural ruler to measure how much, and how smoothly, the universe has expanded since the era of decoupling. The ruler is extended forward in time by measuring variations in the density of galaxies – especially old, bright, red galaxies and quasars – across billions of light-years. The expansion history of the universe emerges when the markings of the ruler, as seen in more recent cosmic structures, are calibrated against the scale frozen in when the universe was less than 400,000 years old.

Grounded cosmology

But does one need a telescope in space to measure baryon acoustic oscillations? David Schlegel didn't think so. In 2006 he and his colleague Nikhil Padmanabhan, both members of the Sloan Digital Sky Survey (SDSS), completed the largest three-dimensional map of the universe ever made until then, in which they first detected the 500-million-light-year scale of baryon oscillations. Now Schlegel leads the SDSS's Baryon Oscillation Spectroscopic Survey, BOSS, whose goal is to map one and a half million galaxies and quasars and measure the varying densities of hydrogen gas in the universe. It will be the first survey with a chance at using BAO to measure the universe's expansion history.

As a member of JDEM's Science Coordination Group, however, Schlegel was taken aback by NASA's emphasis on baryon acoustic oscillation. "I was surprised that JDEM, a $600-million mission, was going down what seemed a risky scientific pathway," he says.

"Last winter, I was scheduled to give a talk at an SCG meeting the next day in Washington with no idea what I was going to say," Schlegel recalls. "On my way down from New Haven on the train I just decided to work out the numbers to see if what JDEM wanted to do with BAO could be done from the ground. Remarkably, no one had done that. Instead of asking what kind of instrument we needed to do the science, the approach had been, 'here's the instrument we're giving you, what can you do with it?'"

Schlegel's back-of-the-envelope BAO calculations looked "encouraging," as he put it, and his presentation to the SCG raised a few eyebrows. But he realized existing programs were no threat to JDEM's "figure of merit" for BAO – a more or less abstract number based on the 2006 DOE-NASA-National Science Foundation Dark Energy Task Force's calculation of how useful a given experimental

result would be for measuring dark energy. JDEM's figure of merit is 313. The figure of merit for BOSS, the biggest ground-based BAO search underway so far, is 107.

Nevertheless, Schlegel couldn't shake the idea, and in February of 2009, once NASA had finalized their design ideas, he started thinking about it more seriously.

"To match what JDEM proposes to do, we would need a bigger telescope than the SDSS telescope in New Mexico we're using for BOSS. Optimum would be a 4-meter telescope that could accommodate a spectrograph with a wide field of view, covering three degrees of the sky," Schlegel says. (For comparison, the full moon is half a degree in diameter.) "There are only 14 4-meter telescopes in the world, seven of them U.S.-operated. And whether any of them had three-degree field-of-view imaging capability, I wasn't sure."

Two of the candidate telescopes are operated by the National Science Foundation's National Optical Astronomical Observatory (NOAO), which oversees the Kitt Peak National Observatory in Arizona with its 4-meter Mayall Telescope, and the Cerro Tololo Inter-American Observatory in Chile, which also has a 4-meter telescope. Schlegel's inquiries indicated that the NOAO astronomers would indeed be interested in exploring the possibility of BAO studies.

Says Schlegel, "So I asked Michael Sholl, the optical designer in the JDEM project office here, whether the 4-meter Mayall could be adapted for a spectrograph with a three-degree field of view. He said, 'I'll look into it and get back to you.'"

A string of luck

Schlegel fully expected Sholl to tell him it couldn't be done. And when Sholl knocked on his office door and said, "I'm really sorry, I can't get to three degrees." Schlegel thought that was the end of it – until Sholl added, "The best I can do is 2.94."

Says Schlegel, "I dropped everything. We were in business." It turned out that the telescope design which would allow a three-degree (oh all right, a 2.94-degree) spectrograph was common to only three of the world's 4-meter telescopes. NOAO's Kitt Peak and Cerro Tololo had two of them.

The spectroscopic instrument that would fit these telescopes had already been developed at Berkeley Lab using Laboratory Directed Research and Development funds, but wasn't completed in time to be installed on BOSS. BOSS's spectrograph uses optical fibers fitted into holes in metal "plug plate" masks, drilled in the precise position of galaxies mapped from previous photos. To obtain redshift and other spectral information, each fiber conducts the light of a single galaxy to a sensitive CCD. Each plate is limited to 1,000 fibers. BOSS will use some 1,500 virtually hand-made plates to gather the light of 1.5 million quasars and galaxies.

The new spectrograph does away with plug plates altogether. Target galaxy positions are stored in a computer, which directs the positioning of an array of thousands of optical fibers for each exposure. A single aluminum block machined to the curvature of the modified telescope's 1 meter focal plane is divided into 5,000 cells, each perforated by a cylindrical hole.

"In each hole live a couple of robots," says Schlegel, "actuators that can position the fibers to an accuracy of 15 microns" – 15 millionths of a meter. The robots put the tip of the fiber right where the light from the distant galaxy falls – even, if necessary, outside the hole – and positions the fibers in the focal plane with no dead space, gathering the light of some 4,000 galaxies at a time.

To accommodate the spectrograph, the existing telescopes would need to be modified with a 2-meter secondary mirror. It so happened that a glass blank for just such a mirror, intended for the SNAP satellite, had already been bought and paid for by DOE. DOE offered it to NASA for JDEM, but NASA wasn't

interested. It was available.Schlegel realized that he and his colleagues were looking at the possibility of mounting a three-degree spectrograph on existing telescopes that could gather millions of galaxies with extraordinary spectral resolution – precision that would allow the study not just of density variations of galaxies but in the hydrogen gas that fills the universe, something JDEM could not do, covering a much wider range of redshifts than JDEM, and looking much farther back in time.

Because the new approach had evolved from the existing BOSS, it was tagged BigBOSS.

Into the fray

"In a March 3 phone call to Kitt Peak we decided to go for broke," Schlegel says. "Every 10 years the National Academy of Science's Decadal Survey lays out a roadmap for future astronomy and astrophysics research. White papers describing proposals were due April 1. Most people work for years on these proposals; we did it in four weeks."

The joint DOE-NSF BigBOSS white paper was submitted to the Decadal Survey on time and has since gathered a string of approvals from government committees; the Decadal Survey report is due at year's end. "We made a Hail Mary pass and hit every committee," says Schlegel. "Our case is strong."BigBOSS proposes to advance in two stages, the first at Kitt Peak covering the northern sky, the second at Cerro Tololo. BigBOSS North would look at the distribution of 30 million galaxies and a million quasars. After this survey is complete the project would move to Chile, where BigBOSS South would add another 20 million galaxies and quasars. Both surveys would measure distortions in hydrogen gas.

The construction of the spectrograph and telescope modifications are estimated to take three years, beginning in 2011, at a cost of $71 million, with operations costing $2.5 million a year for 10 years.

Compared to JDEM's figure of merit, 313, BigBOSS North alone would achieve 240, and North and South together would achieve 338. At three years to build and 10 years to cover the whole sky, assuming five million targets a year, BigBOSS could take longer than JDEM, which might launch in 2016 at the earliest. The cost is less than a sixth JDEM's, however, and the risk of failure is minimal – BigBOSS uses existing facilities and proven technology.

"BOSS will be the first survey to produce a 3-D map of red galaxies and quasars and clouds of hydrogen gas in the universe, and BOSS is the first BAO survey from which it may be possible to measure the expansion history of the universe. BigBOSS's map will be far bigger and more detailed," says Schlegel.

"But BigBOSS offers more. One of the most interesting questions in cosmology is the relationship between dark energy and the early inflationary epoch of rapid expansion. Something was happening then, and we wonder if it's repeating in some way. BigBOSS will have the best sensitivity to the inflationary epoch. In some ways this could be the best argument for BigBOSS of them all."

"BigBOSS: The Ground-Based Stage IV Dark Energy Experiment," by David J. Schlegel, Chris Bebek, Henry Heetderks, Shirley Ho, Michael Lampton, Michael Levi, Nick Mostek, Nikhil Padmanabhan, Saul Perlmutter, Natalie Roe, Michael Sholl, George Smoot, and Martin White of Lawrence Berkeley National Laboratory, and Arjun Dey, Tony Abraham, Buell Jannuzi, Dick Joyce, Ming Liang, Mike Merrill, Knut Olsen, and Samir Salim of the National Optical Astronomy Observatory, is posted as arXiv:0904.0468v3.

Adapted from materials provided by DOE/Lawrence Berkeley National Laboratory.

http://www.sciencedaily.com/releases/2009/08/090807091028.htm

A Look Into The Hellish Cradles Of Suns And Solar Systems

The dense star cluster RCW 38 glistens about 5500 light years away in the direction of the constellation Vela (the Sails). RCW 38 is an "embedded" cluster, in that the nascent cloud of dust and gas still envelops its stars. (Credit: Image courtesy of ESO)

ScienceDaily (Aug. 20, 2009) — New images released today by ESO delve into the heart of a cosmic cloud, called RCW 38, crowded with budding stars and planetary systems. There, young stars bombard fledgling suns and planets with powerful winds and blazing light, helped in their task by short-lived, massive stars that explode as supernovae. In some cases, this onslaught cooks away the matter that may eventually form new solar systems. Scientists think that our own Solar System emerged from such an environment.

The dense star cluster RCW 38 glistens about 5500 light years away in the direction of the constellation Vela (the Sails). Like the Orion Nebula Cluster, RCW 38 is an “embedded cluster”, in that the nascent cloud of dust and gas still envelops its stars. Astronomers have determined that most stars, including the low mass, reddish ones that outnumber all others in the Universe, originate in these matter-rich locations. Accordingly, embedded clusters provide scientists with a living laboratory in which to explore the mechanisms of star and planetary formation.

“By looking at star clusters like RCW 38, we can learn a great deal about the origins of our Solar System and others, as well as those stars and planets that have yet to come”, says Kim DeRose, first author of the new study that appears in the *Astronomical Journal*. DeRose did her work on RCW 38 as an undergraduate student at the Harvard-Smithsonian Center for Astrophysics, USA.

Using the NACO adaptive optics instrument on ESO's Very Large Telescope, astronomers have obtained the sharpest image yet of RCW 38. They focused on a small area in the centre of the cluster that surrounds the massive star IRS2, which glows in the searing, white-blue range, the hottest surface colour and temperatures possible for stars. These dramatic observations revealed that IRS2 is actually not one, but two stars — a binary system consisting of twin scorching stars, separated by about 500 times the Earth–Sun distance.

In the NACO image, the astronomers found a handful of protostars — the faintly luminous precursors to fully realised stars — and dozens of other candidate stars that have eked out an existence here despite the powerful ultraviolet light radiated by IRS2. Some of these gestating stars may, however, not get past the protostar stage. IRS2's strong radiation energises and disperses the material that might otherwise collapse into new stars, or that has settled into so-called protoplanetary discs around developing stars. In the course of several million years, the surviving discs may give rise to the planets, moons and comets that make up planetary systems like our own.

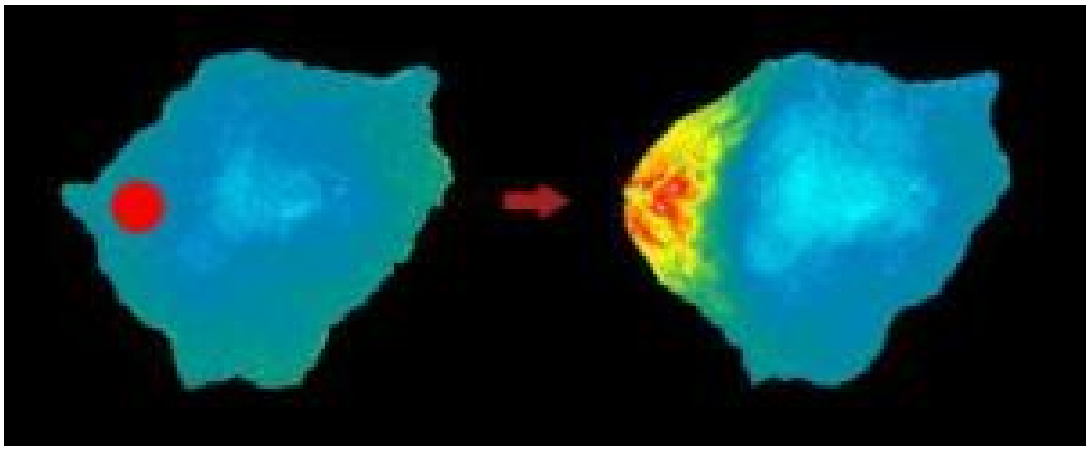
As if intense ultraviolet rays were not enough, crowded stellar nurseries like RCW 38 also subject their brood to frequent supernovae when giant stars explode at the ends of their lives. These explosions scatter material throughout nearby space, including rare isotopes — exotic forms of chemical elements that are created in these dying stars. This ejected material ends up in the next generation of stars that form nearby. Because these isotopes have been detected in our Sun, scientists have concluded that the Sun formed in a cluster like RCW 38, rather than in a more rural portion of the Milky Way.

"Overall, the details of astronomical objects that adaptive optics reveals are critical in understanding how new stars and planets form in complex, chaotic regions like RCW 38", says co-author Dieter Nürnberger.

Adapted from materials provided by ESO.

http://www.sciencedaily.com/releases/2009/08/090819110018.htm

Breakthrough Uses Light To Manipulate Cell Movement



A photoactivatable protein enables control of cell movement in living cells. Activation of Rac in the red circle led to localized cell protrusion and translocation of the kinase PAK to the cell edge (right hand image, Pak in red). (Credit: Yi Wu, UNC-Chapel Hill)

ScienceDaily (Aug. 20, 2009) — One of the biggest challenges in scientists' quest to develop new and better treatments for cancer is gaining a better understanding of how and why cancer spreads. Recent breakthroughs have uncovered how different cellular proteins are turned 'on' or 'off' at the molecular level, but much remains to be understood about how protein signaling influences cell behavior.

A new technique developed by Klaus Hahn, Ph.D. and his colleagues uses light to manipulate the activity of a protein at precise times and places within a living cell, providing a new tool for scientists who study the fundamentals of protein function.

In a paper published today in the journal *Nature*, Hahn, who is the Thurman Professor of Pharmacology at the University of North Carolina at Chapel Hill and a member of UNC Lineberger Comprehensive Cancer Center, described the technique, which uses light to control protein behavior in cells and animals simply by shining light on the cells where they want the protein to be active.

"The technology has exciting applications in basic research – in many cases the same protein can be either cancer-producing or beneficial, depending on where in a cell it is activated. Now researchers can control where that happens and study this heretofore inaccessible level of cellular control," said Hahn.

"Because we first tested this new technology on a protein that initiates cell movement, we can now use light to control where and how cells move. This is quite valuable in studies where cell movement is the focus of the research, including embryonic development, nerve regeneration and cancer metastasis," he added.The new technology is an advance over previous light-directed methods of cellular control that used toxic wavelengths of life, disrupted the cell membrane or could switch proteins 'on' but not 'off'.

The research in Hahn's lab was carried out by Yi Wu, PhD, research assistant professor of pharmacology, in collaboration with a team led by Brian Kuhlman, PhD, associate professor of biochemistry and biophysics at UNC and a team led by Ilme Schlichting, PhD at the Max Planck Institute for Medical Research in Heidelberg, Germany.This research was supported by the National Institutes of Health.

Adapted from materials provided by University of North Carolina School of Medicine, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/08/090819135434.htm

Toward Limitless Energy: National Ignition Facility Focus Of Symposium

The interior of the NIF target chamber. The service module carrying technicians can be seen on the left. The target positioner, which holds the target, is on the right. (Credit: Image courtesy of Lawrence Livermore National Laboratory)

ScienceDaily (Aug. 20, 2009) — Chemists are preparing to play an important but often unheralded role in determining the success of one of the largest and most important scientific experiments in history — next year's initial attempts at the National Ignition Facility (NIF) to produce the world's first controlled nuclear fusion reaction. If successful in taming the energy source of the sun, stars, and of the hydrogen bomb, scientists could develop a limitless new source of producing electricity for homes, factories, and businesses.The experiment could also lead to new insights into the origins of the universe. A special two-day symposium addressing this topic, "Nuclear Diagnostics in Fusion Energy Research," will be presented Aug. 19 and 20 during the 238th National Meeting of the American Chemical Society (ACS).

Scientists have been trying to achieve controlled nuclear fusion for almost 50 years. In 2010, researchers at the NIF at Lawrence Livermore National Laboratory in California will focus the energy of 192 giant laser beams onto a pea-sized target filled with hydrogen fuel. These lasers represent the world's highest-energy laser system. The scientists hope that their effort will ignite, or fuse, the hydrogen atoms' nuclei to trigger the high energy reaction."Chemists will definitely play a role in determining whether nuclear fusion reactions have occurred during this NIF experiment, which is key to determining whether the experiment is a success," says Dawn Shaughnessy, Ph.D., a scientist with Lawrence Livermore National Laboratory."The idea is that the lasers will fuse hydrogen particles together, producing neutrons," says Shaughnessy, one of many scientists who plan to analyze materials produced by the reaction. "We'll collect and measure the materials produced from the ignition and hopefully be able to determine how many neutrons were made. More neutrons mean that more fusion has occurred."

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

http://www.sciencedaily.com/releases/2009/08/090820083442.htm

Scramble for university places

By Angela Harrison
Education reporter, BBC News

Teenagers who failed to get their first choices for university are rushing to find courses amid a squeeze on places.

Some universities have already closed their "clearing" operations, whereby spare places are allocated, saying all courses are full.

More than 5,000 students have found a place through clearing but another 142,000 are eligible for the places available.

There is a shortage due to a surge in applications and a cap on places.

University admissions service Ucas said hits to its website were 50% up on last year after A-level results came out.

It was thought there were about 24,000 places available through clearing, so nearly a fifth of them have gone.

Students use clearing to apply for alternative courses or universities if they fail to get the grades they need to secure their first choices, if they have chosen not to take up an existing offer, or were not holding an offer.

Ucas says since 0600 on Thursday, more than 970,570 students have logged onto its website to see if they have a university place confirmed or to find alternatives.

Calls to its helpline were close to 15,000 by the end of the day.

'Disappointed'

Some universities have already closed their clearing systems, because courses are full.

Among the UK's Russell Group universities, Cambridge, Oxford, Imperial College London, Bristol and University College London either do not enter clearing, or have had no places available.

Nottingham, which usually has around 250 clearing places, has had around 100 this year.

Southampton had 25 vacancies, and just 10 are left. Birmingham had fewer than 50 clearing places, and all are now gone.

Gloucestershire University has closed its clearing operation. It only had about 20 full-time places available. Head of student recruitment, Brian Miller, says they were taken within hours.

"The government has capped student recruitment numbers for this academic year, so we were only able to take on the same number of students as in 2008, even though our applications were up by 19%," he said.

"This means that for the first time in 15 years, the university has filled its places in advance of the September registration date.

"Unfortunately this does mean that some students who missed their predicted A level grades may be disappointed, as competition for places this year has been exceptionally high."

" **This year's shortage of places, combined with an increased proportion of A grades going to private school students, will have a disproportionate impact on those from disadvantaged backgrounds** "
Wes Streeting, NUS President

A record 610,453 people have applied to UK universities this year - more than a 10% rise on last year.

The increase is thought to be due to a bulge in the population (there are more 18-year-olds this year), the drive to get more young people into higher education and the effects of the recession in encouraging both young and old to go to university.

The Westminster government earlier this year put a 10,000 cap on the expansion of places for this autumn, though later offered funding for 13,000 more places as numbers of applicants surged.

However, not all universities took up this offer because places were not fully funded.

The rising pass rate at A-level has also, over a longer term, made more young people eligible for university.

This year the overall pass rate for A-levels in England, Wales and Northern Ireland rose to the record level of 97.5%, adding to the clamour for places.

Students in Scotland, who received the results of their Highers earlier this month, had a head start on clearing. The pass rate for Highers also rose - by 0.8 percentage point to 74.2%.

Independent schools

There are fears that it will be state school pupils who lose out in the scramble for university places - and teenagers from disadvantaged homes - whom the government have been trying to encourage to go into higher education.

A breakdown of results by school type showed that half of the A-levels awarded to candidates from independent schools were at grade A.

This compared with about 40% of entries from selective state schools and about 22% of those from comprehensives.

Wes Streeting, President of the National Union of Students, said: "I have no doubt that this year's shortage of places, combined with an increased proportion of A grades going to private school students, will have a disproportionate impact on those from disadvantaged backgrounds.

"I have a real fear that when numbers are published later, the number of pupils from state schools will have fallen."

" **We have massively expanded post-16 education so there is a far wider group of state pupils doing A-levels who never would have even have considered it before** "
Iain Wright, Schools Minister

"We remain concerned that, despite passing their A-levels, many university applicants will still be disappointed.

"We understand the current pressures on public finances, but the government must also make the right long-term decisions. It is surely better to bear the cost of additional university places now than to shoulder the burden of long-term unemployment later."

Conservative education spokesman, Michael Gove, said: "The gulf between independent schools and state schools is truly shocking.

"The fortunate few are pulling ever further away from the rest and this phenomenon appears to be gathering pace rather than slowing down."

Schools Minister Iain Wright said the government had widened the pool of students doing A-levels and going to university.

"University and A-levels are no longer the preserve of the privileged and elite few - we have massively expanded post-16 education so there is a far wider group of state pupils doing A-levels who never would have even have considered it before.

"This means you can't just look at proportions of pupils getting As - the private sector has not seen the same changes in the type of students sitting exams as the maintained sector and is far smaller overall.

"The fact is that between 2002 and 2009 the number of A grades increased 44% in the independent sector, whilst over the same period there was a 60% increase in the maintained sector. This suggests the maintained sector is making real gains."

A selection of your comments may be published, displaying your name and location unless you state otherwise in the box below.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/uk_news/education/8213631.stm

Published: 2009/08/21 12:45:47 GMT

Homeopathy not a cure, says WHO

People with conditions such as HIV, TB and malaria should not rely on homeopathic treatments, the World Health Organization has warned.

It was responding to calls from young researchers who fear the promotion of homeopathy in the developing world could put people's lives at risk.

The group Voice of Young Science Network has written to health ministers to set out the WHO view.

However practitioners said there were areas where homeopathy could help.

" **There is no objective evidence that homeopathy has any effect on these infections** "
Dr Nick Beeching, Royal Liverpool University Hospital

In a letter to the WHO in June, the medics from the UK and Africa said: "We are calling on the WHO to condemn the promotion of homeopathy for treating TB, infant diarrhoea, influenza, malaria and HIV.

"Homeopathy does not protect people from, or treat, these diseases.

"Those of us working with the most rural and impoverished people of the world already struggle to deliver the medical help that is needed.

"When homeopathy stands in place of effective treatment, lives are lost."

Dr Robert Hagan is a researcher in biomolecular science at the University of St Andrews and a member of Voice of Young Science Network, which is part of the charity Sense About Science campaigning for "evidence-based" care.

He said: "We need governments around the world to recognise the dangers of promoting homeopathy for life-threatening illnesses.

"We hope that by raising awareness of the WHO's position on homeopathy we will be supporting those people who are taking a stand against these potentially disastrous practices."

'No evidence'

Dr Mario Raviglione, director of the Stop TB department at the WHO, said: "Our evidence-based WHO TB treatment/management guidelines, as well as the International Standards of Tuberculosis Care do not recommend use of homeopathy."

" **This is just another poorly wrapped attempt to discredit homeopathy** "
Paula Ross, Society of Homeopaths

The doctors had also complained that homeopathy was being promoted as a treatment for diarrhoea in children. But a spokesman for the WHO department of child and adolescent health and development said: "We have found no evidence to date that homeopathy would bring any benefit.

"Homeopathy does not focus on the treatment and prevention of dehydration - in total contradiction with the scientific basis and our recommendations for the management of diarrhoea."

Dr Nick Beeching, a specialist in infectious diseases at the Royal Liverpool University Hospital, said: "Infections such as malaria, HIV and tuberculosis all have a high mortality rate but can usually be controlled or cured by a variety of proven treatments, for which there is ample experience and scientific trial data.

"There is no objective evidence that homeopathy has any effect on these infections, and I think it is irresponsible for a healthcare worker to promote the use of homeopathy in place of proven treatment for any life-threatening illness."

Homework

However Paula Ross, chief executive of the Society of Homeopaths, said it was right to raise concerns about promotion of homeopathy as a cure for TB, malaria or HIV and Aids. But she added: "This is just another poorly wrapped attempt to discredit homeopathy by Sense About Science.

"The irony is that in their efforts to promote evidence in medicine, they have failed to do their own homework. "There is a strong and growing evidence base for homeopathy and most notably, this also includes childhood diarrhoea."

The UK's Faculty of Homeopathy added that there was also evidence homeopathy could help people with seasonal flu.

Dr Sara Eames, president of the faculty, said people should not be deprived of effective conventional medicines for serious disease.

But she added: "Millions die each year as those affected have no access to these drugs.

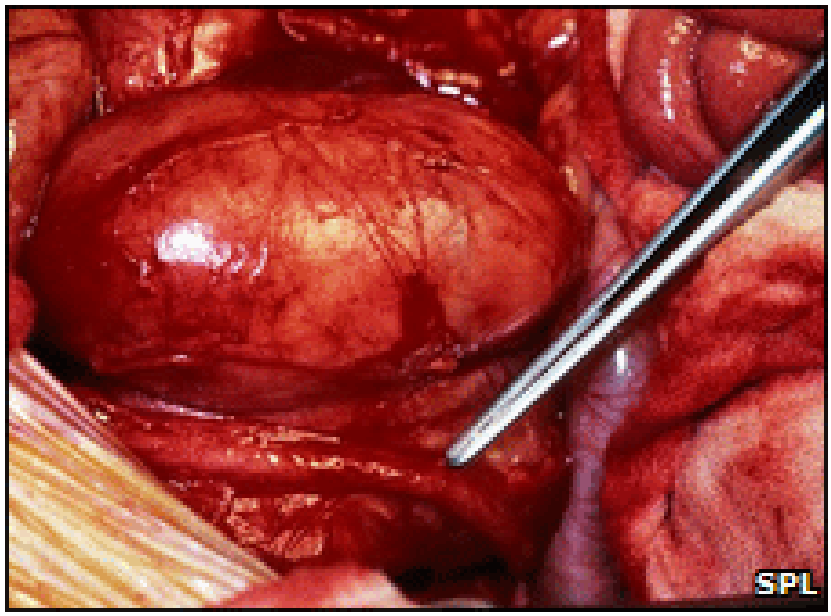
"It therefore seems reasonable to consider what beneficial role homeopathy could play. What is needed is further research and investment into homeopathy."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8211925.stm

Published: 2009/08/20 23:04:55 GMT

Primary liver cancers 'soaring'

Cases of primary liver cancer, an often preventable disease, have trebled in the last 30 years, figures suggest.



While it is not uncommon for cancer to spread to the liver, Cancer Research UK statistics show incidents where it starts in the organ have risen sharply.

Cases of cancer overall have increased over recent decades as people live longer and detection methods improve.

But experts say hepatitis C infections, as well as alcohol and obesity, have helped fuel the spike in liver cases.

Primary tumours frequently develop as a result of cirrhosis, itself associated with these risk factors.

Hepatitis C is a virus spread by blood-to-blood contact. Prior to 1991, transfusions were the most common source of infection, but since screening was introduced the disease is most commonly spread among intravenous drug users.

Matt Seymour, professor of gastronintestinal cancer at the University of Leeds, said: "We are seeing more patients with cirrhosis and, in turn, more patients with primary liver cancer.

"This is likely to continue. There is a long delay between exposure to the risk factors and the onset of cancer.

"It might take between 20 and 40 years for liver cancer to develop after infection with hepatitis C. So even if new cases of infection stopped, the number of cases would continue to rise for some years."

Screening call

Obesity is now thought to be one of the most common causes of liver disease, while cases of cirrhosis associated with excessive drinking are known to have soared in the UK in recent years.

Caught early enough, some of the damage caused by liver disease can be reversed and the risk of cancer developing reduced.

But many people with hepatitis C do not know they are carrying the virus: estimates suggest that while more than 250,000 people in the UK have been infected, eight out of 10 are unaware.

The five-year survival rate for primary liver cancer is low, and Cancer Research UK says it is currently supporting a number of trials to improve the treatment of the condition.

Imogen Shillito, of the British Liver Trust, said: "We know liver cancer is caused by years of liver damage, often from infection with hepatitis B or C, or regular excessive drinking.

"But there are many interventions that can prevent liver cancer. In particular, if people at risk are screened for hepatitis B or C and are offered effective treatment before liver damage has set in, their risk of liver cancer drops dramatically.

"We want to see the NHS diagnosing and treating liver disease at an early stage to prevent liver cancer developing and save lives."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8210208.stm

Published: 2009/08/19 23:24:12 GMT

Lung cancer genetics unravelled

The genetics underpinning a smoker's risk of developing lung cancer have been further unpicked by UK scientists.

Three areas of DNA were found to be linked with lung cancer risk in smokers, two of them influencing the type of cancer which develops.

It supports previous studies which have suggested a family link, even after taking smoking into account, a report in the Cancer Research journal says.

Smoking is responsible for nine out of 10 cases of lung cancer.

The Institute of Cancer Research team compared the DNA of 1,900 lung cancer patients and 1,400 healthy individuals.

" **The best thing a smoker can do to reduce their risk of lung cancer, and a range of other life-threatening conditions, is to quit** "
Dr Lesley Walker, Cancer Research UK

Information gathered on areas of genetic risk was then tested further in another 2,000 patients with lung cancer and a similar number of healthy volunteers.

Specific differences associated with lung cancer risk were found on chromosomes 5, 6 and 15.

Those with certain genetic changes on chromosome 5 were more likely to get a type of cancer called adenocarcinoma and the region highlighted on chromosome 6 seemed to influence whether a patient developed adenocarcinoma or another type called squamous cell carcinoma.

On chromosome 15, they pinpointed two independent sites that have a role in whether or not a smoker develops lung cancer.

These areas of the genome contain a family of genes that influence smoking behaviour but also cell growth and cell death.

Current or former smokers who carry one copy of each of these genetic variants increase their risk of lung cancer by 28%.

That increases to 80% in smokers who carry two copies.

Those who had the genetic changes but did not smoke had no increased risk of lung cancer.

Trigger

Study leader Professor Richard Houlston said the findings confirmed earlier research.

"The next step is to dig deeper to pinpoint which gene, or genes in these regions, cause the increased risk of developing lung cancer and how they actually trigger this increase."

Dr Lesley Walker, director of cancer information at Cancer Research UK who partly funded the research, said smoking was responsible for the vast majority of lung cancers.

"This research shows that inherited genetic variation accounts for some of this risk and the type of lung cancer that develops."

She added: "The best thing a smoker can do to reduce their risk of lung cancer, and a range of other life-threatening conditions, is to quit."

Dr Noemi Eiser, honorary medical director of the British Lung Foundation, said: "This research is very interesting as it provides further clues as to why some smokers are more prone to developing certain types of lung cancer.

"We now hope that with more research this discovery will lead to the development of early screening techniques and treatments for lung cancer, which is currently the UK's biggest cancer killer."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8212658.stm

Published: 2009/08/20 23:05:09 GMT

Bizarre newt uses ribs as weapons

Matt Walker
Editor, Earth News

One amphibian has evolved a bizarre and gruesome defence mechanism to protect itself against predators.

When attacked, the Spanish ribbed newt pushes out its ribs until they pierce through its body, exposing a row of bones that act like poisonous barbs.

The newt has to force its bones through its skin every time it is attacked, say scientists who have described the form and function of the barbs in detail.

Yet this bizarre behaviour appears not to cause the newt any ill effects.

The ability of the Spanish ribbed newt to expose its rib bones was first noticed by a natural historian in 1879.

But scientists have now used modern photographic and X-ray imaging techniques to reveal just how the animal does it.

And what they discovered is even more gruesome than they imagined.

When the newt becomes agitated or perceives a threat, it swings its ribs forward, increasing their angle to the spine by up to 50 degrees.

As it does this, the newt keeps the rest of its body still.

"The forward movement of the ribs increases the body size and stretches the skin to the point of piercing it," says zoologist Egon Heiss of the University of Vienna in Austria.

The tips of the newt's ribs then stick outside its body, like exposed spines.

But there is more to the newt's defence, Heiss and his Vienna-based colleagues report in the Journal of Zoology.

"When teased or attacked by a predator, [the newt] secretes a poisonous milky substance onto the body surface. The combination of the poisonous secretion and the ribs as 'stinging' tools is highly effective," says Heiss.

The impact on any predator can be striking, particularly if they try to bite the newt or pick it up using their mouth.

Then the poison in almost injected into the thin skin within the mouth, causing severe pain or possibly death to the attacker.

As well as elucidating the spear-like shape of the ribs, and exactly how the ribs swing forward and protrude, the scientists have demonstrated that the bones must break through the newt's body wall every time the amphibian evokes the defence response.

Initially, it was thought that the ribs may passively emerge through pores, rather than be actively driven through the body wall.

Surprisingly, the newt, which is related to other newts and salamanders, appears to suffer no major ill effects, despite repeatedly puncturing its own body and exposing its rib bones.

"Newts, and amphibians in general, are known to have an extraordinary ability to repair their skin," says Heiss.

"Anyway, if this newt can avoid being eaten in some cases, this surely has a positive influence."

It also seems that the newt is immune to its own poison, which is normally confined to glands in the newt's body.

When the newt wounds itself by exposing its ribs, the poison can seep into its body tissue, again apparently with no ill effects.

Heiss now hopes to investigate which compounds are in the poison.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/earth/hi/earth_news/newsid_8212000/8212623.stm

Published: 2009/08/21 09:11:50 GMT

Glowing 'bomber worms' discovered

By Victoria Gill
Science reporter, BBC News

A group of glowing worms has been found dwelling in the deep ocean, some of which release body parts as tiny "bombs" to ward off predators.

Researchers describe the bizarre "Swima worms" in Science journal.

The creatures, which the scientists say could be widespread in the deep sea, indicate the extent of biodiversity yet to be discovered in the oceans.

The team found them whilst exploring the waters just above the sea-bed off the west coast of the US.

Lead author Karen Osborn, from the University of California San Diego, told BBC News that she and her colleagues found the worms accidentally, whilst exploring the deep oceans with remotely operated submersible vehicles.

"We came across them and thought they were very interesting, firstly because of their bioluminescence," she said.

"When we brought them up and realised they were different from anything that had been described before, we became even more interested."

Dr Osborn and her colleagues were exploring depths of up to 3,700m when they spotted the creatures.

As they continued to bring more of the worms back to their lab, they realised they had found a group of previously unknown animals.

Each of the seven species found so far is transparent apart its gut, and all of the worms produce colourful bioluminescence.

The researchers are now investigating what chemicals the animals produce to give rise to their striking glow.

The animals are also excellent swimmers - using fans of long bristles that form swimming paddles.

Five of the species release the glowing bombs, which probably serve to distract predators while the worm escapes. The team has named the first of these species *Swima bombiviridis* .

"They usually have about eight of the bombs, and they drop one or two at a time," explained Dr Osborn.

Because of the tiny size of the bombs - approximately 1-2mm in diameter - and the bright lights used by the submersible vehicles, the team was unable to capture this bombing on film in the deep ocean.

"So we bring the animals up to study them," Dr Osborn said. "If you transfer the animal into a small tank, and harass it a little bit with forceps - kind of bump it anywhere on the body - it will release one of these bombs.

"As soon as [the bomb] is released it starts glowing green and the animal swims away."

Greg Rouse, another member of the research team, explained that a common ancestor of the species had gills that appeared to be "in exactly the same places as the bombs", from which the bombs could have evolved.

"The gills (of their relatives) can fall off very easily so there's a similarity of being detachable, but for some reason the gills have transformed to become these glowing little detachable spheres."

Dr Osborn concluded: "This group of really fantastic animals emphasises just how much we have to learn about deep sea organisms and deep sea biodiversity."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8210645.stm

Published: 2009/08/21 10:07:00 GMT

Brighter idea for bendy displays

The technology behind giant video billboards can now be made into flexible and even transparent displays.

These could be used to create brakelights that fit the curves of a car or medical diagnostics that envelop a patient like a blanket.

It has been made possible by a new technique, outlined in Science, for manufacturing so-called inorganic LEDs.

The new method allows these tiny light-emitting diodes (LEDs) to be attached to materials such as glass or rubber.

"[This] enables new kinds of 'form factors' that would allow you to put lighting sources on curved surfaces or in corners, places where you can't put light sources nowadays," Professor John Rogers of the University of Illinois at Urbana-Champaign told BBC News.

Stamp of approval

There are two types of light-emitting diode (LED) technology, inorganic and organic.

The vast majority of consumer electronics use the inorganic version.

For a square centimetre of the material these are 400 times brighter than their organic cousins.

"If you look at the billboard displays that exist already, they're inorganic LED based," said Professor Rogers.

"You can see them on a bright sunny day; it would be impossible to generate that kind of brightness out of an organic LED."

When arrays of inorganic LED's are used - such as those in billboard displays - they are made in a large wafer which is sawn into bits.

Each bit is then placed individually by a robot arm, making the production of large or dense arrays complex.

Organic LEDs (OLEDs) on the other hand have been introduced into some consumer electronics such as televisions.

They are in theory easier to manufacture because they can be made individually smaller, processed in high quantities and spread out in thin films that are easy to manipulate and connect electrically.

However, they are not as robust as inorganic LEDs, and must be encapsulated because they are sensitive to oxygen and moisture.

Professor Rogers and his colleagues have now devised a method that in theory comprises the best of both worlds - bright, robust inorganic LEDs that can be processed en masse.

The approach is able to make thin inorganic LEDs in high quantities in such a way that they can be cut up by bathing them in a strong acid.

The separated elements can then be picked up with a "stamp", with holes cut precisely to size for the elements, and then placed on a wide array of surfaces, from glass to plastic to rubber.

The devices can be placed sparsely enough that a bright layer of them is practically transparent.

"Because you can get away with very low coverage by area, it opens up the possibility of making something that's see-through," Professor Rogers explained.

He said that the nearer-term applications for the approach will be in general lighting or in the illumination of instrument panels, but the group is working toward perfecting the application.

"Displays remain the ultimate goal - we don't need a new law of physics to enable it, it's just more of an engineering question," he said.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/8214363.stm

Published: 2009/08/21 17:45:43 GMT

Theory and Morality in the New Economy

By DAVID LEONHARDT

The indispensable economist of the moment is clearly John Maynard Keynes. Keynes's prescription for financial crises — aggressive government action and, by definition, big budget deficits — has been Washington's basic approach since Lehman Brothers collapsed last September. Eleven months later, the economy remains deeply troubled, and it probably will be for some time. But our Great Recession seems unlikely to turn into another Great Depression.

It is impossible to know just how much credit the Keynesian approach deserves, because we can't rerun the past year with a Hooverite economic strategy and see what would happen. Still, history seems to have vindicated Keynes. Likewise, it has indicted the laissez-faire philosophy that had been ascendant for most of the last three decades.

The indispensable economist of that philosophy, of course, is Adam Smith. Smith's invisible hand — which, in his description, guides an individual to promote the interests of society more effectually than he intends — has not looked so effectual lately. In Obama's Washington, understandably enough, Keynes seems to be in and Smith out.

Yet here is where the story becomes a little complicated. Six years ago, Bantam Classic published a mass-market volume of Smith's 1776 masterwork, "The Wealth of Nations," with an introduction by Alan B. Krueger, an economics professor at Princeton. Krueger argued that Smith's modern image had become unhinged from his actual writings. "Smith was a nuanced thinker. He was not nearly as doctrinaire a defender of unfettered free enterprise as many of his late-20th-century followers have made him out to be," Krueger wrote. "He recognized that human judgment was not infallible."

Smith was indeed a champion of individual liberty and worried about how governments might muck up an economy. But he also wrote that the goal of employers, "always and everywhere," was to keep wages as low as possible. "When the regulation, therefore, is in favor of the workmen, it is always just and equitable; but it is sometimes otherwise when in favor of the masters," he concluded. He supported a tax on luxury carriages and taxes on alcohol, sugar and tobacco. He said that "negligence and profusion" inevitably occur when corporate managers control shareholders' money. And as the historian Emma Rothschild has noted, "The Wealth of Nations" uses the phrase "invisible hand" precisely once. In the 1,231-page Bantam edition, it appears on Page 572.

I stumbled on that edition earlier this year in my local bookstore and was struck by Krueger's name on the cover. These days, he is the chief economist in the Obama Treasury Department, the lead agency in the administration's efforts to halt the economic crisis. The ideas of Keynes, surely, are central to those efforts. But the ideas of Smith are not anathema to the administration. In fact, Smith turns out to be a useful guide to the ways Obama is and is not trying to reshape the American economy. Smith also lurks, often unnamed, in some of the most thoughtful early books to have been published on the Great Recession.

Beyond the immediate crisis, today's overarching economic challenge is figuring out how the country can reap the benefits of Smith's market-based system without experiencing the worst of its downsides. In the decades after World War II, the Keynesians who descended on Washington thought they had solved this problem. With the right mix of spending, regulation and interest rates, they believed, the business cycle could be tamed and unemployment largely eliminated. "This was hubris," Paul Krugman, the Nobel laureate and liberal Times Op-Ed columnist, writes in "The Return of Depression Economics and the Crisis of 2008." Technocrats overestimated how many jobs they could create without aggravating inflation, and aggravate inflation they did.

Their failures, combined with the greater failure of socialist economies, set the stage for the ascendancy of laissez-faire economics. Much of Asia moved to a market-based system and experienced stunning improvements in living conditions. As Krugman writes, "capitalism could with considerable justification claim the credit." These successes, however, created their own excesses. The principles of laissez-faire capitalism were elevated to the status of religious scripture, with Alan Greenspan as high priest. In "The Cost of Capitalism," Robert J. Barbera, a longtime Wall Street economist, notes that Greenspan and others confused the fact that market capitalism was thebest economic system with the misguided notion that it was the perfect system.

Barbera calls instead for “an enlightened synthesis.” Such a synthesis — one that takes Smith at his word rather than his caricature — is at the core of almost every serious vision of a postcrisis American economy. For Barbera, it means the Federal Reserve should recognize that bubbles are the norm and that preventing them is its job. For the conservative appellate judge and law professor Richard A. Posner, it means seeing the crisis as “A Failure of Capitalism,” as he titled his latest book. Among other things, Posner suggests a modern-day version of Smith’s tax on luxury carriages: “increasing the marginal income tax rate of persons who have very high incomes, in order to reduce their appetite for risk-taking.” And in “Animal Spirits,” George A. Akerlof (another Nobel laureate) and Robert J. Shiller (who issued early warnings about the dot-com and housing bubbles) say the synthesis must take into account the many ways in which people are not the coldly rational, utility-maximizing beings that laissez-faire economic models imagine.

Smith, as it happens, would have been quite comfortable with this notion. At the University of Glasgow he held the chair of moral philosophy, and his second most famous book was titled “The Theory of Moral Sentiments.” In “The Wealth of Nations,” he wrote of the ways that pride, envy, respect and other emotions influenced decisions. Intriguingly, this is the version of Smith that Obama likes to recall.

Last summer, during an interview shortly before the Democratic National Convention, I was asking Obama about the benefits and limits of a market economy, when he brought up Smith. “Adam Smith, at the same time as he was writing about the invisible hand, he was also writing about that moral sense — that human ecology — that allows a market to work: the sense that if I bring my goods into the market, someone is not going to hit me over the head; the sense that because I am trading with this guy often enough, that I know that the scales aren’t tampered with,” Obama said. “That compact that we make is not just legalistic. It has to do also with our politics and our culture, and when that starts eroding it inhibits economic growth as well.”

You can make a good case that, for all the talk-show chatter about whether Obama is a socialist, his agenda is in fact tinged with Smith. The administration’s various attempts to reduce inequality are meant, at their core, to make Americans feel as if the economic system is fair — that the scales haven’t been tampered with. In responding to the financial crisis, Obama eschewed the left’s calls for nationalizing the banks and instead kept them in private hands, albeit with public assistance. To reduce health care costs, he favors moving away from a fee-for-service system, which has the same perverse incentives Smith liked to denounce.

Economic historians could doubtless have a spirited debate about whether Smith would have supported or disdained the White House’s agenda. But it’s reasonable to think that, either way, he would have had something trenchant to say about its chances of success. Among his more radical observations was that legislators tended to defer to those “masters” of industry, even when their aims would hurt the citizenry. To put it another way, economic theory can do only so much for a president. The rest falls to politics.

David Leonhardt writes a weekly economics column for The Times.

http://www.nytimes.com/2009/08/23/books/review/Leonhardt-t.html?8bu&emc=bub1

The Daily Show
By HAROLD EVANS

LOSING THE NEWS

The Future of the News That Feeds Democracy

By Alex S. Jones

234 pp. Oxford University Press. $24.95. By Harold Evans

There's Alex Jones and there's Jason Jones. The two unrelated Joneses offer competing commentaries on journalism in our times. Amid the hubbub about how we will get the news if newspapers keep drowning in the wrong color of ink, Alex offers a passionate but lucid analysis of where we are and where we might be going. Jason tells jokes on "The Daily Show."

Not to get too familiar or confuse people, let's initially call them A.J. and J.J.

A.J. comes from a small-town newspaper family in Tennessee; he covered the press for The New York Times from 1983 to 1992, won a Pulitzer for his reporting, wrote a couple of newspaper histories and for the last eight years has been director of the Shorenstein Center on the Press, Politics and Public Policy at Harvard. J.J.'s connection with The New York Times is that, for reasons now obscure to the higher management that made the decision, he was invited into the newspaper's offices to torture the editorial staff. Pointing to a copy of the paper, he asks a baffled executive, for the benefit of "Daily Show" cameras and a giggling studio audience, to show him "one thing in there that happened today." J.J.'s shtick is that The Times is a "creaky old rag," a doomed dinosaur because it publishes "aged news" on paper. He confronts the executive editor, Bill Keller, with the allegation that The Huffington Post makes more money; when Keller gamely mentions that he hasn't seen a bureau for The Huffington Post, Google News or The Drudge Report in Baghdad (or any of the world's nasty places), J.J. ripostes that The Times's reports are not as much fun to read.

Contemplating J.J.'s thoughts on journalism, one has to bear in mind Stephen Colbert's advice: "Remember kids! In order to maintain an untenable position, you have to be actively ignorant." In fact, J.J., in his assumed or genetic goofiness — it's hard to tell — does a public service. He affords a glimpse of the void we'll inhabit if what newspapers really do withers away with the paper they are printed on. This is the "barbarians at the gate" prospect that has moved Alex Jones to write his thoughtful book "Losing the News."

He swiftly demolishes the notion that news is defined only by the hour of the day. Obviously we don't want to be told what we know already, but significance may not be governed by the clock. The most valuable element in journalism is often enough not an episode that occurred today, yesterday or, horrors, the day before. It's the creation of a new awareness provided by either months of investigation or relentlessly regular coverage. As it happens, The Times itself provided vivid testimony to Jones's thesis just as I was reading his book. On July 12, an important front-page article wasn't about anything that took place during the so-called news cycle; it was a convincingly detailed (and readable) revelation of how

young men in Minneapolis had been recruited for jihad in Somalia. One thinks of the disasters when this kind of embryonic news doesn't get enough attention: the insufficiently monitored housing bubble, leading to the financial meltdown; the neglect in New Orleans, leading to the devastation after Katrina; or the formation of Al Qaeda in Afghanistan, leading to 9/11.

This is the scope of the news Jones fears we are in danger of losing, and the news he says the Internet generation has already abandoned. It's the flow of significant reported information, "the iron core of information that is at the center of a functioning democracy." He asks us to imagine it as forming a large iron cannonball, representing the total mass of serious reporting from all news organizations. It's a pity that this is such an unappealing metaphor, suggestive not of organic continuity, liveliness and relevance but of heaviness and death, because Jones is a bringer of light in the encircling gloom. He sees the printed newspaper continuing as a life force, "the beating heart of a community"; "a warm and comfortable medium . . . able to command a sustainable audience, just as books have done"; and altogether the product of a much-underappreciated "evolved technology" that is a "portable, recyclable" organizer of news values, easy to read and scan, and "a phenomenal bargain."

Jones's defense of the newspaper is not simply nostalgic. Many people may think they get their news from television and the Web, but even today, he estimates, 85 percent of fact-based news currently originates in a newspaper attempting to record, explain and investigate. Television — network, local, cable — he dismisses as derivative media, doing less and less original reporting (though most people would say the televised debates were the most revealing element in the presidential election). As for talking heads, newspaper columnists, radio commentators, feature and op-ed writers, political bloggers and joke-meisters, "their point of departure is almost always information gleaned from . . . reporting." I bet Jay Leno is unaware how much he was dependent on an iron ball: it's enchanting to learn that during Leno's first 10 years on "The Tonight Show" he relied on the press's accuracy for more than 18,000 political jokes, "almost 4,000 of them about Bill Clinton."

Jones may be something of a romantic, but he is not a Luddite. He acknowledges that the future will center on digital technology and the Web, "dazzling in its breadth and innovation" and the vehicle of choice for younger audiences. But he does not believe Web sites will ever become Atlas, shouldering the iron ball to sustain foreign bureaus, science and cultural staffs, and investigative teams. Even if enough money were there, which at the moment it is not, he contends that the culture of Web journalism does not support in-depth news or investigative journalism: "An article on the Web of more than 150 words is generally considered too long and unlikely to be read." Another odd presence at The New York Times, he tells us, was a futurist who advised visiting journalism school deans that they should train the next generation to write articles no longer than 50 words.

Since the author has to concede that the bottom may not yet have been reached for newspaper circulation and advertising, how can we expect to stay informed if we ever have to make do with all the news that will fit on a cellphone screen? He doubts that nonprofit news organizations can fill the breach. He questions the idea that newspapers can get enough revenue by assigning reporters and salesmen to their Web sites. A successful hybrid, he argues, cannot be created from two such different cultures: it's "like asking Sinatra to sing 'Blue Suede Shoes.' "

In the end, Jones pins his hopes on newspapers' developing separate online businesses, with the owners of quality papers settling for lower than historic profit margins and renouncing slash-and-burn strategies. He's surely right about that. Destroying the editorial value of an editorial product could be commended only in an asylum.

What I most question is his verdict on the reality and the potential of the Web. It can handle more than 150 words perfectly well, and hyperlinks can open a panorama of global multimedia sources (disclosure: my wife is a co-founder of The Daily Beast). I love newspapers, too, but in the end what really matters will not be saving newspapers. It will be, as Jones himself says, "saving the news."

Sir Harold Evans was the editor of The Sunday Times of London from 1967 to 1981 and of The Times of London in 1981-82.

http://www.nytimes.com/2009/08/23/books/review/Evans-t.html?ref=books

Untamed Creature

By FERNANDA EBERSTADT

WHY THIS WORLD

A Biography of Clarice Lispector

By Benjamin Moser

Illustrated. 479 pp. Oxford University Press. $29.95

Here's a riddle for literary sleuths. Which 20th-century writer was described by the eminent French critic Hélène Cixous as being what Rilke might have been, if he were a "Jewish Brazilian born in the Ukraine"? By the poet Elizabeth Bishop as "better than J. L. Borges"? And by the Brazilian musician Caetano Veloso as one of the chief revelations of his adolescence, along with sex and love and bossa nova? The answer is Clarice Lispector, a Portuguese-language novelist who died in Rio de Janeiro in 1977, and who, despite a cult following of artists and scholars, has yet to gain her rightful place in the literary canon.

Benjamin Moser's lively, ardent and intellectually rigorous biography promises to redress this wrong. During her lifetime, Lispector, a catlike blond beauty with movie-star magnetism and an indefinably foreign accent, enjoyed an enormous succès d'estime in Brazil. Her fiction, which combines jewel-like language, deadpan humor, philosophical profundity and an almost psychotically lucid understanding of the human condition, was lauded for having introduced European modernism to a national literature felt to be pretty parochial.

Yet such was the mystery surrounding this reclusive author, Moser writes, that few people knew her true origins.

Moser, a regular contributor to The New York Review of Books and Harper's, describes a family story that is harrowing even by the standards of 20th-century European Jewry.

Lispector was born in 1920 in Podolia, the same fertile crescent in present-day Ukraine that produced a number of mystical movements, both Christian and Jewish. Her original first name was not Clarice, but Chaya. Her father, Pinkhas, barred from a career in mathematics by his Jewishness, came from a family of religious scholars; her mother, Mania, from prosperous merchants.

The trauma that scarred Lispector's life occurred before her birth. During the civil war that followed the Bolshevik Revolution, Podolia was beset by a truly genocidal succession of pogroms. In 1918, Lispector's grandfather was murdered, her family home destroyed, and shortly after, her mother, Mania, already the mother of two small children, was gang-raped by Russian soldiers — an assault that infected the young woman with syphilis. The Lispector family joined the hordes of starving refugees crisscrossing present-day Moldova and Ukraine seeking escape to the New World. Without access to medical treatment, Mania and her husband resorted to folk remedies. Clarice, Mania's third and last daughter, was conceived in accordance with a folk belief that pregnancy could cure a woman of venereal disease.

Clarice's inability to save her mother's life was a source of lacerating remorse: "They made me for a specific mission, and I let them down. As if they were counting on me in the trenches of a war and I had deserted."

Eventually, the family won passage to Maceió, a port town in northeastern Brazil. Chaya, renamed Clarice, was barely a year old when they arrived. Although for the rest of her life fellow Brazilians

regarded Lispector as unassimilably alien, she herself was adamant in claiming Brazil as her soul's true home, the only place on earth where she could breathe free.

For her parents, however, fortunes did not improve. Mania, long mute and paralyzed, died when Clarice was 9; Pinkhas, now Pedro, struggled in vain to make a living as a peddler and died at age 55, leaving his children with the "unbearable" memory of a gifted mathematician and immensely moral man who was at every step thwarted by human evil and indifference.

Yet despite such beginnings, the Lispector daughters managed to forge valiant careers. Clarice's eldest sister also became a novelist, the middle sister a civil servant. Clarice graduated from law school — a rare accomplishment for her time, not to mention her background — and went to work as a newspaper journalist.

Nineteen forty-three — the year after Stefan Zweig, another Jewish writer who hoped Brazil could offer redemption from Europe's genocidal impulses, committed suicide in a mountain resort not far from Rio — saw the publication of the 23-year-old Lispector's first novel. It was called "Near to the Wild Heart," and it was an overnight sensation. The story is simple — a man torn between a homebody mistress and a wild-animal wife — and chillingly amoral, but Lispector uses it to address with brutal lucidity what will prove the central question of her work: What is the nature of God's presence in the world?

Moser is persuasive in reading the novel both as an extended riff on Spinoza and as an allegory of Lispector's own dueling personalities. For, as Moser reveals, if she was a writer almost cabalistically bent on piercing the veil between "word" and "being," and not much convinced of the validity of such human categories as good and evil, she was also an orphan who longed to be a perfect wife and mother, and who wrote Miss Manners-type columns advising women not to draw attention to themselves with garish clothing or loud laughter.

Lispector soon married a fellow law student who became a diplomat. The untamed creature, whom one poet-friend described as "a she-wolf," was to spend much of her life serving tea sandwiches at embassy functions in Bern and Chevy Chase.

In a story that seems to symbolize her own perpetual sense of involuntary alienation, Lispector writes of encountering at a bus stop a man with a coati (a kind of raccoon) on a leash. "I imagine: if the man took him to play in the square, at some point the coati would grow uncomfortable: 'But, good God, why are the dogs looking at me like that?' I also imagine that, after a perfect day of being a dog, the coati would feel melancholic, looking at the stars: 'What's wrong with me, after all? . . . What is this anxiety, as if I only loved something I didn't know?' "

In 1959, a desperately homesick Lispector finally left her husband and Washington and brought her two young sons back to Brazil.

Her last two decades make a sad story: an addiction to sleeping pills, her son's schizophrenia and the no less painful quandary of a beauty who doesn't know how to survive the loss of her sexual allure. And although Lispector's fiction was continually being rediscovered, not least by the '60s generation of young Brazilians who found in it freedom from political dictatorship, she herself had become a near recluse. The coati, increasingly incapable of playing perfect dog, no longer wanted to live. The conflagration in which Lispector, falling asleep with a cigarette, set fire to her apartment and severely burned much of her body, including her writing hand, seems almost preordained.

Yet even as Lispector's physical existence became intolerable, her fiction soared. "The Hour of the Star," her last and perhaps finest novel, published in 1977, is a mystical treatise on the nature of love, the commonplace book of a martyr possessed of an earthy sense of the absurd.

Two months after its publication, on the day before her 57th birthday, Lispector died of ovarian cancer. Her devotees ("claricianos," Moser tells us they are called) have found many ways to approach this uncompromisingly complex writer. Moser, despite Lispector's avoidance of overt references to Jewishness, places her firmly in the tradition of Jewish mystics who were driven by historical cataclysm and personal trauma to create their own theology from God's absence. His energetically researched, finely argued biography will surely win Lispector the English-language readership she deserves.

Fernanda Eberstadt's fifth novel, "Rat," will be published in the winter of 2010.

http://www.nytimes.com/2009/08/23/books/review/Eberstadt-t.html?ref=books

Fox Hunter, Party Animal, Leftist Warrior

By DWIGHT GARNER

MARX'S GENERAL

The Revolutionary Life of Friedrich Engels

By Tristram Hunt

Illustrated. 430 pages. Metropolitan Books. $32.

Thanks to globalism's discontents and the financial crisis that has spread across the planet, Karl Marx and his analysis of capitalism's dark, wormy side are back in vogue. But what of Friedrich Engels, Marx's best friend and closest ally, the co-author of "The Communist Manifesto" and the man who selflessly supported Marx while he wrote "Das Kapital"?

In his new book, "Marx's General: The Revolutionary Life of Friedrich Engels," Tristram Hunt argues that Engels has become a convenient scapegoat, too easily blamed for the state crimes of the Soviet Union and Communist Southeast Asia and China. "Engels is left holding the bag of 20th-century ideological extremism," Mr. Hunt writes, "while Marx is rebranded as the acceptable, postpolitical seer of global capitalism." Mr. Hunt, a young British academic and a columnist for The Guardian, embarks on a two-part rescue mission in "Marx's General." He wants first to show us the human Engel, portraying him as gregarious and bighearted. He also works mightily to defend Engels against most of the calumnies later committed in his and Marx's names.

Mr. Hunt is so successful at the first goal that the big takeaway of "Marx's General" may be that Engels, best known as a ruthless party tactician, comes across as the Mario Batali of international communism: a jovial man of outsize appetites who was referred to by his son-in-law as "the great beheader of Champagne bottles."

A few of this book's piquant details: Engels was proud of his lobster salad and liked to fox hunt. He hosted regular Sunday parties for London's left-wing intelligentsia and, as one regular put it, "no one left before 2 or 3 in the morning." On a personality quiz, three of Engels answers were: "Favorite virtue: jollity"; "Idea of happiness: Château Margaux 1848"; "Motto: take it easy."

Friedrich Engels's motto was take it easy? Clearly there is some cognitive static in our sense of this man, and it is one of the achievements of Mr. Hunt's book that he pulls the multiple strands of Engels's personality into a nearly coherent whole.

Engels seemed to lead a kind of double existence almost from the start. Born in 1820, the son of a wealthy German textile manufacturer, he led a life of privilege and was expected to go into the family business. He was more interested, however, in poetry and later in journalism. He felt his way toward his leftist politics through a passionate interest in Hegel's dialectical philosophical method. When Engels was in his early 20s, his father sent him to work in the family business in Manchester, England. In the horrors he saw there (child labor, the despoiled environment and overworked and impoverished laborers) he spied the grim future of capitalism and the industrial age. His time in Manchester led him to write "The Condition of the Working Class in England" (1845), a book Mr. Hunt correctly calls "a tour de force of urban industrial horror."

Engels's writing caught the attention of Marx, and the two bonded in Paris during what Mr. Hunt describes as "10 beer-soaked days." They would remain friends for the next four decades, as they together wrote "The Communist Manifesto," witnessed the failed Continental revolutions of 1848 and fanned the flames of international communism. Engels would return to Manchester to work for 19 more years in his family business, at a job he loathed, in order to support Marx while he wrote "Das Kapital."

There is a good deal of gentle comedy in "Marx's General." Marx loved to tweak Engels for the ease with which he mingled with upper-middle-class Victorian society in Manchester: the fox hunting, the clubs, the meals. "So now you're a member of the Exchange, and altogether respectable," Marx wrote him. "My congratulations. Some time I should like to hear you howling amidst that pack of wolves."

Marx cashed the checks Engels sent, however, and loved how Engels doted on Marx's daughters. To spare Marx embarrassment, Engels even accepted the paternity of Marx's illegitimate son. Engels had no children of his own. He rejected marriage as an institution, and lived with his great love, Mary Burns, an uneducated Irish girl, like husband and wife. When Mary died in 1863, Engels lived with her sister Lizzy, and married her on her deathbed. In 1870, his time in Manchester over, Engels and Lizzy Burns moved to London, where they lived a short walk from the Marx household. After Marx died in 1883, Engels edited the second and third volumes of "Das Kapital," and his newspaper-filled house became a mecca for socialists from around the world.

In later books like "Socialism: Utopian and Scientific," Engels delivered comprehensible guides to Marxism, although critics accused him of both simplifying and deviating from Marx's ideas. Engels died of throat cancer in 1895 at 74.

As artfully as Mr. Hunt flushes out Engels's human side, he can't — and to be fair, doesn't try to — hide the brutal ideologue that also existed inside his cranium. Engels was an advocate, on at least one occasion, of ethnic cleansing; his writing about science helped lead to the abominations of Soviet-style scientific inquiry, which dismissed results that might be seen as bourgeois. He was a master tactician whose purging of rivals in political organizations foreshadowed later purges.

Ultimately, however, Mr. Hunt largely exonerates him. "In no intelligible sense can Engels or Marx bear culpability for the crimes of historical actors carried out generations later," he writes, "even if the policies were offered up in their honor." Engels was skeptical of top-down revolutions, Mr. Hunt notes, and later in life advocated a peaceful, democratic road to socialism. He connects Engels the man to Engels the thinker. "This great lover of the good life, passionate advocate of individuality, and enthusiastic believer in literature, culture, art and music as an open forum could never have acceded to the Soviet Communism of the 20th century, all the Stalinist claims of his paternity notwithstanding," he writes. Engels almost certainly was, in other words, the kind of man Stalin would have had shot.

At the end of this vivid and thoughtful biography, you are quite persuaded that Friedrich Engels would have been a fine man to drink a Margaux with. And it is surely true, as Mr. Hunt puts it, that Engels's larger critique of capitalism — and his hope for a more dignified kind of humanity — "resonates down the ages." But what exactly was it about Engels's thinking and writing, as well as Marx's, of course, that made it so toxic in the hands of almost everyone else? A more penetrating examination of that question might have made "Marx's General" an excellent book instead of merely a good one.

http://www.nytimes.com/2009/08/19/books/19garner.html?ref=books

On American Shores, a Wave of Immigrants Smuggled in From China
By JANET MASLIN

THE SNAKEHEAD

An Epic Tale of the Chinatown Underworld and the American Dream

By Patrick Radden Keefe

414 pages. Doubleday. $27.50.

On Jan. 8, 1993, in an electronics store on Allen Street in Lower Manhattan, two factions of the Fuk Ching gang squared off in a showdown that resulted in a double homicide. The shootout took place in broad daylight in a busy neighborhood. And yet, according to Patrick Radden Keefe, author of "The Snakehead," none of New York's major English-language newspapers even mentioned this violent crime. Although Mr. Keefe does not invoke the relevant movie dialogue, a "Forget it, Jake — it's Chinatown" attitude might have helped keep the press away.

But the Chinatown described in "The Snakehead" is such an impenetrable place that attitudes of resignation are understandable. Mr. Keefe's book focuses on a ghetto within a ghetto, the New York community of émigrés from Fujian Province of China who began arriving in the United States in large numbers in the 1980s.

In a formidably well-researched book that is as much a paean to its author's industriousness as it is a chronicle of crime, Mr. Keefe outlines the way in which the Fujianese were forced out of China, driven to take desperately roundabout and dangerous travel routes and eventually arrived in America courtesy of the lucrative human smuggling business. Snakehead is the term for an entrepreneurial leader of that trade.

The stories told in "The Snakehead" are so long and convoluted that Mr. Keefe has had to go to astonishing lengths to follow them. He has contended with formidable language barriers, convoluted global trade routes, foreign governments that take an anything-goes approach to issuing passports, corruption in the Immigration and Naturalization Service, rivalry between that agency and the F.B.I., and rogue developments like the incarceration of a large group of illegal Chinese immigrants in York, Pa.

He has also tackled a major player, a snakehead known as Sister Ping, who seems determined to stay out of public view. When Mr. Keefe, who wound up interviewing with her in writing, initially approached her about his reporting, she gave an answer that validated everything his book would go on to say about her: "What's in it for me?"

That seems to have been Sister Ping's attitude from the start. She emigrated to America, as her father had before her, and quickly established herself as a hard-working businesswoman operating a mom-and-pop variety store in New York's Chinatown with her husband, Cheung Yick Tak, a man who shares little of his wife's remarkable ability to shrug off the law. On one of the first occasions Sister Ping was interrogated by an American official, she flatly told the I.N.S. investigator Joe Occhipinti: "You don't have the time to get me. Or the resources." Mr. Keefe says what impressed Mr. Occhipinti about this exchange was that she was right.

Mr. Keefe has the wisdom to realize that Sister Ping, for all her flouting of American law enforcement, is not a sufficiently vivid or galvanizing figure on whom to center a book. So she becomes one of many, to the point that "The Snakehead" struggles to balance the many twisting story lines that fill its pages. Part of the book describes the conditions in Fujian Province that prompted such a strong wave of chain migration (the kind in which one villager or family member follows another to the same overseas destination). It addresses the paradoxical way in which new prosperity in China drove away some of that country's most skilled — and most motivated — workers.

And Mr. Keefe outlines the way in which close-knit Fujianese enclaves in the United States could drift into crime in general and human smuggling in particular. In the process, he makes crucial distinctions between human smuggling (voluntary on both sides) and human trafficking (akin to slavery) while also demonstrating how American law has made the people-smuggling business so lucrative.

Crackdowns at borders, Mr. Keefe says, are only more apt to drive immigrants into the hands of skilled snakeheads. And when the Chinese are willing to pay $30,000 each to enter the United States illegally, it becomes both practical and profitable for smugglers to hire low-paid local decoys to distract border patrols. Snakeheads also put themselves at relatively low legal risk compared to drug smugglers who face stiff sentences if arrested and convicted.

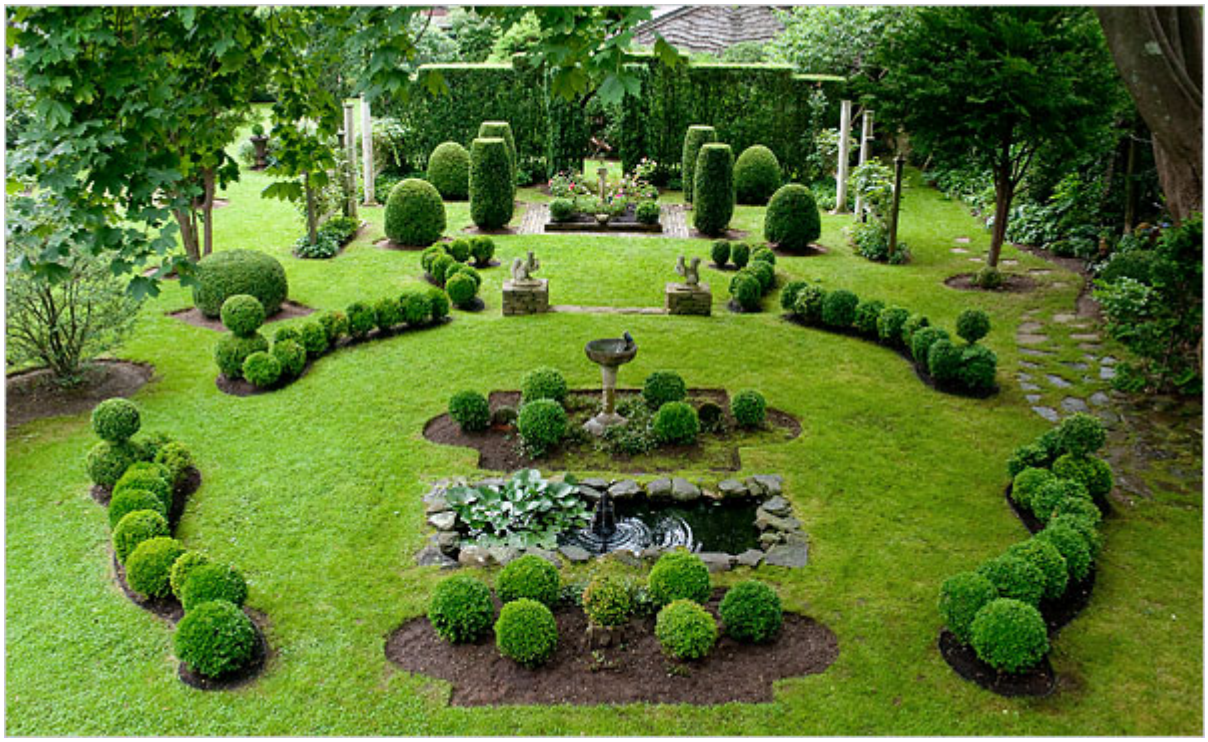
Although Mr. Keefe does an admirable job of navigating the minutiae of his story, the larger-scale events and historical currents are what stand out. "The Snakehead" begins with the shipwreck of the Golden Venture, a vessel filled with illegal immigrants, near a New York City beach in 1993. It describes what a ticklish matter this became for the brand-new Clinton administration, which faced the challenge of reconciling sympathy for Chinese refugees after Tiananmen Square with resistance to illegal immigration. And it illustrates beautifully how oddly politics can evolve. The story takes an unexpected turn once China's one-child policy — and propaganda-ready stories of forced abortions and sterilizations conducted there — made the immigrants' cause unexpectedly attractive to America's religious right. The way political opponents converged in York, Pa., to form the immigrants-rights group called the People of the Golden Vision and usher Golden Venture survivors into their new American lives is inspiring, but it makes sense only in the full context of Mr. Keefe's many interconnected tales.

An all-American footnote: One Chinese-born immigrant emerged from prison, was hired by a Pennsylvania weaving company, went to live rent-free in a room at the mill's facilities and increased the company's output by 50 percent over his first three years. He became American enough to make fabric used in costumes for re-enactors of Civil War battles.

http://www.nytimes.com/2009/08/17/books/17maslin.html?ref=books

Land as Canvas, Plants as Paint

By DOROTHY SPEARS



MANY contemporary artists move among a variety of mediums, and for those lucky enough to have outdoor space, landscape often becomes one of them. On Aug. 29 Guild Hall, the performing and visual arts center in East Hampton, N.Y., will conduct a tour of several artists' gardens on the East End of Long Island. Although tickets are priced at Hamptons rates — $100 for nonmembers; $500 for those who also want a lecture, lunch and a cocktail party — the event is a reminder even to have-nots of the aesthetic potential of earth and plant life. Here, three artists' gardens in the area (two of which will be on the tour) offer evidence of what can happen when a distinct artistic vision connects with natural, growing forms.

Dianne Blell, Photographer
LIKE her highly stylized photographs of models against painted backdrops, Dianne Blell's Bridgehampton garden, above, has the inherent yet somehow suppressed drama of a theatrical stage set. In this fairyland of English dwarf boxwoods, Irish yews and old tangled bittersweet vine fashioned into garden arches, nature's caprices are tamed by obsessive clipping, shaping and rearranging. As in pieces like "Courting the Beloved," above right, classical symmetry and architectural columns combine with whimsical personal flourishes like the garden's animal statues. And everything but the grass appears trained to perfection. "I don't try to keep a perfect lawn," said Ms. Blell, who welcomes the intrusions of clover and moss. "It's my great medievalist gesture: Just let it be."
In this year of persistent rains Ms. Blell's exacting standards have led to a full-scale battle in her rose bed. The crisis began when, after considerable fertilizing and cutting back, her first blossoms didn't open. Upon close inspection she discovered little spiders and insects eating the insides of the buds. "I said, 'All right you win, but I'm going to get you,' " she said. "I resorted to lethal methods."
During a recent visit there were fresh buds on her roses. Her "Intellectual Ladies Grid Garden," with its cement-and-grass checkerboard pattern, appeared lush and green. And her "Melancholy Garden," where, she said, "every tree and plant is weeping," was also thriving.
Ms. Blell bought the property in 1993. After excavating 6,000 square feet of concrete from her back yard, she began gardening from scratch. Now green ivy grows up the cedar shingles of her house to an

octagonal sleeping porch, where she confessed, “I have this fantasy of letting my hair down, like Rapunzel.”

Keith Sonnier, Sculptor

WHEN the sculptor Keith Sonnier first laid eyes on what was then a 150-foot tulip tree in the front yard of a farmhouse in Sagaponack 21 ago, he said recently, “it was so majestic, so huge,” that he immediately made an offer on the property. And when he landscaped the “exceedingly overgrown” two-acre grounds, Mr. Sonnier, who grew up near his grandmother’s sugar cane and cotton farm in Louisiana, opted for a somewhat wild, even baroque, aesthetic.

Now his garden (which is not on the Guild Hall tour) retains elements of its own past — a venerable Japanese maple, an unruly lilac grove and an orchard of ficus trees all but consumed by ivy — while also serving as a record of Mr. Sonnier’s evolving interests. After travels to India and Japan in the early 1980s, for example, he began incorporating bamboo and a variety of Asian woods into his sculptures, and he has cultivated several varieties of bamboo and a grove of miniature Japanese maples in his garden. And the interest in hybrids evident in the garden also shows up in many of his sculptures like his 1981 “Sarasvati,” left, in which he endowed bamboo, a type of grass, with treelike qualities like branching systems. Conversely, his maple and cedar sculptures typically rely on multiple supports, which resemble the spreading root systems of bamboo.

His vegetable garden combines Asian herbs like lemongrass and shiso with Southern staples like collard and turnip greens.

“My garden was built around that big tulip tree,” he said. “When it blooms, it has this wonderful orange flower. And the leaf looks — curiously — very much like a maple.”

Bryan Hunt, Sculptor

THE sculptor Bryan Hunt thinks of his lush waterfront property, in Wainscott, “more as a landscape than a garden.” On further reflection, referring to a grove of his cast-metal works, some of which, like the one above, rise 10 feet among distinguished oaks and elms, Mr. Hunt said recently, “I guess I grow sculptures.”

In a small garden, nestled between his house and studio, Mr. Hunt also grows perennials, vegetables and a mix of leafy annuals, which he plants each May. Nearby a raised wooden gazebo with outdoor seating is shaded by a tangle of concord grapes and roses.

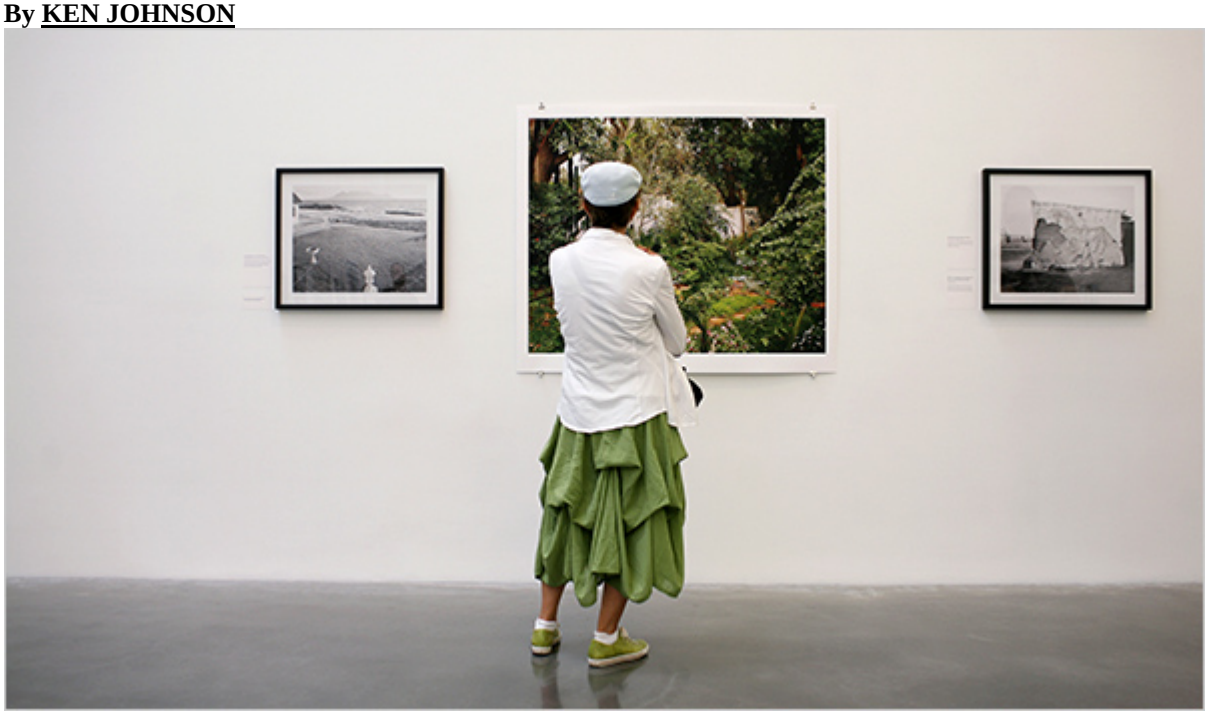
Although he keeps an apartment in TriBeCa, Mr. Hunt spends seven months a year here, making pieces like “Flume I,” above, in a converted-barn studio with expansive views of Georgica Pond. The sculptures, with their crinkled surfaces, blur the line between abstraction and figuration, solid mass and liquid. Like amalgams of the natural features around them, they simultaneously evoke knobby tree bark, fungus and rippling water.

The nearby water is a particularly important influence in Mr. Hunt’s work, he said. Having lived in Florida and Los Angeles, he said, “water has been near and dear to me most of my life.”

http://www.nytimes.com/2009/08/23/arts/design/23spea.html?ref=design

DAVID GOLDBLATT
Silent Cries From a Beloved Country

By KEN JOHNSON



Looking at the series of large color photographs called “In the Time of AIDS” by the South African David Goldblatt, you may wonder why they are so titled. They depict rural, suburban and semi-industrial landscapes, some with people, but no one in them appears to be sick.

Some of the prints, which date from 2003 to 2007, include a looped and crossed red ribbon, the universal sign of the fight against AIDS. In an image of a man watering his lawn, it is painted on the side of a small white building down the street. Elsewhere a sculptural version is erected on a high pole at a truck stop. On close inspection, in fact, every picture yields a ribbon, one of them almost undetectable on the letterhead of a memo taped to the window of a municipal office cashier. Studying the series is like a game of Where’s Waldo?

Unlike many of the works in “Intersections Intersected: The Photography of David Goldblatt,” a slow-burning, two-floor exhibition at the New Museum, for which Mr. Goldblatt wrote informative labels, the AIDS series has no written explanation. But in an interview available as a podcast at the museum as well as on its Web site, newmuseum.org, he explains that the ubiquitous red ribbon symbolizes for him what a horribly banal fact of life AIDS has become in his country, where, he says, 1,000 people die from the disease every day.

Mr. Goldblatt’s oblique approach to AIDS is typical. Born in 1930 to Lithuanian Jews who had moved to South Africa to escape religious persecution, he is internationally celebrated for the socially engaged photography he has been producing since the early ’60s. But none of his works picture the kinds of horrific scenes you might expect of witness-bearing photography in the land of apartheid and its violent aftermath. If you didn’t read his labels and didn’t know anything about South Africa, you’d have no idea how troubled its history has been. The 114 pictures here give the impression of a dry, dusty, underdeveloped but basically peaceful place.

In the podcast Mr. Goldblatt explains that many other photographers have done fine jobs of showing terrible events and conditions in South Africa, so it is not an approach he feels compelled to pursue. He also declares that he is not interested in making conventionally artistic photographs, and that he intends his flatly reportorial words to be integral to the experience of his work.

His strategy is effective and often quite moving, though it can leave you with more questions than answers. A black-and-white photograph from 1984 shows a black woman and her child lying on a bed surrounded by their possessions.

The lengthy label describes how a team of five black men, supervised by an armed white man, all working for the Western Cape Development Board, have just dismantled and destroyed her makeshift house and moved on to do the same to another group of shelters. The text concludes, “For a while the woman lay with the child. Then she got up and began to cut and strip branches of Port Jackson bush to make a new framework for her house. The child slept.”

This is heartbreaking, but also puzzling. Presumably the woman was in violation of some ordinance — this was before apartheid ended in 1994 — but we don’t know what the law was or what it was intended to do.

A color photograph from 2003 shows a black woman sitting proudly by her vegetable garden, a cake marking her 53rd birthday in her lap. The text reads, in full: “Anna Boois was one of 14 people — all women — who had been given land in this area under a government scheme. About a year after this photograph was taken her source of water dried up, and she abandoned her farm and went to live in Garies, the nearest village.” Again, a sad state of affairs, but what are we to conclude? That even benign government programs are often misconceived and incompetently carried out is not news.

Yet something else happens because of this vagueness. Just as particular characters and details in a novel can evoke whole worlds, Mr. Goldblatt’s words and pictures suggest more than they explicitly show or tell. Much of the power of his work comes from the feeling of being in the mind of a thoughtful narrator who chooses his words with an almost painful economy.

A 2006 landscape shows an abandoned housing development. In the distance row after row of small, roofless, concrete-block buildings spread out on an arid plain. In the foreground there is an irregular arrangement of stones on the dirt, remains of a children’s game called onopopi.

“The houses were part of an effort by the municipality to accommodate people living in shacks,” the label reads. “Eight years after approval the scheme had stalled.” Despite his avowed lack of interest in aesthetics, Mr. Goldblatt’s picture of the resulting ghost town has the intensity of a haunting dream.

In a number of cases Mr. Goldblatt has paired old and new images. In a black-and-white photograph from 1985, a boy of 5 or 6 holding his fist aloft in a revolutionary salute stands before fresh grave mounds where antiapartheid activists known as the Cradock Four have just been buried. Next to it a color picture from 2004 shows the same site with stone columns and tombstones marking the graves, surrounded by an iron fence. A cheap painted sign in front proclaims the memorial as the work of the South African Resources Agency. Together the photographs exude a sense of waste, futility and bureaucratic stupidity.

In another pairing a black-and-white picture from 1989 shows a rural shack with laundry hanging on a curved clothesline out front. It was the home of a man who worked for yet another failed government program. In the color picture next to it, from 2006, the tiny figure of a bungee jumper falls from a sleek modern bridge whose supporting arch inversely mirrors the clothesline. Mr. Goldblatt’s laconic note reads, “This jump — 710 feet (216 meters) — is said to be the highest in the world.” The leap from the rough house to the multimillion-dollar bridge and its recreational diver is even greater.

The effect of Mr. Goldblatt’s understated, antisensational photographs and the spare words that accompany them is cumulative. They build into an infectiously mournful beauty. Even in pictures that seem almost nondescript — like his recent large triptychs depicting dirt streets, old cars, low buildings and a few people here and there — Mr. Goldblatt’s compositions have a classical elegance and a reticence that speaks volumes.

“Intersections Intersected: The Photography of David Goldblatt” continues through Oct. 11 at the New Museum, 235 Bowery, at Prince Street, Lower East Side; (212) 219-1222, newmuseum.org.

This article has been revised to reflect the following correction:

Correction: August 22, 2009

Schedule information on Friday with an art review of “Intersections Intersected: The Photography of David Goldblatt,” at the New Museum on the Lower East Side, misstated the museum’s telephone number. It is (212) 219-1222.

http://www.nytimes.com/2009/08/21/arts/design/21goldblatt.html?ref=design

Grand, Wasn't It?
By CONSTANCE ROSENBLUM

THE Grand Concourse, the four-and-a-half-mile boulevard that for much of its life was described as the Champs-Élysées of the Bronx, has often sat for its portrait, as have many of the handsome buildings along its flanks. But there is one image that captures in poignant fashion exactly what the street represented in the mid-20th century.

It is a grainy black-and-white snapshot of a boy named Sam Goodman, a third-generation boulevard resident, wearing a dressy coat and hat and standing in front of the Lorelei fountain in Joyce Kilmer Park. Anyone who knew the area would recognize the luscious white-marble concoction of mermaids and riverfront siren, which had been created in Germany in 1893 and brought to the Bronx with much fanfare six years later.
Lorelei was not the boulevard's only charmer. This broad, tree-lined street, the ultimate prestige address for vast numbers of the city's upwardly mobile Jews, was also home to a movie palace where stars twinkled in a midnight-blue ceiling, a grand hotel where political intrigue played out amid marble columns and crimson carpets, and a stellar collection of Art Deco apartment houses.
That world has evaporated. The stars in the movie palace (now home to sports events and concerts with a Latin beat) are gone, along with the political intrigue in the hotel (now a residence for the elderly) and most of the trees. The 182-foot-wide roadway has been sliced and diced over the years. But Sam Goodman, the little boy in the snapshot, who now works as an urban planner in the Bronx borough president's office, is hardly the only survivor of that era whose voice softens at the mention of the thoroughfare that even today, nearly a century after it was built, is considered one of the city's legendary streets.
Some years ago, when I began writing a book on the history and onetime allure of the Grand Concourse, people invariably asked if I had grown up in the area. I wish. (I was born and raised in Orange County, north of New York City.) But while the street has undergone profound changes since the time Sam Goodman and Lorelei sat for their picture, when I walk along the Grand Concourse these days, I can see a great deal that stands as a reminder of its early years.
You have to exercise your imagination to conjure the past; this part of the Bronx is in many respects a diamond in the rough. Many of the lustrous structures that defined life in these precincts have been irrevocably transformed, and even those that haven't are Potemkin villages, their fine facades masking troubled lives: the Bronx, after all, is still a borough in which one of every three families lives below the poverty line.
But a trip down this particular memory lane has much to recommend it beyond pure nostalgia. As the boulevard nears its centennial in November, a journey offers a vision of its past, present and future — a chewy slice of urban history festooned with murals, mosaics and other Art Deco touches.
The boulevard starts at 138th Street and runs north to Mosholu Parkway, but you don't have to walk every blessed block to appreciate its charms. And no offense to the upper Concourse, but north of Fordham Road, where the attractions thin out, you might want to take the bus.
If you're game for a long trek, start near the boulevard's southern tip at 149th Street for a glimpse of a celebrated work of art that dates from the Depression, 13 murals by Ben Shahn and his wife, Bernarda Bryson Shahn, in the lobby of the Bronx General Post Office that depict the American worker in all his nobility. Though faded now, and largely ignored by the people streaming past, these images are

unexpectedly stirring, a reminder of an era in which artists were not ashamed to make grand political statements.

Then head north to 161st Street, long the official gateway to the boulevard and an intersection with showstoppers on every corner, along with a view of both old and new Yankee Stadiums off to the west. On the southwest corner stands the massive Bronx County Building, once the borough's judicial heart. (Remember the courthouse scenes in "The Bonfire of the Vanities"?) It is still an important civic center, even though many of its functions have been moved to the dazzling new glass and aluminum courthouse a few blocks to the east, designed by Rafael Viñoly, one of a number of star architects to put their imprint on the neighborhood.

Mayor Fiorello La Guardia called the old county building a "golden fortress," an apt description, especially given the eight monumental sculptures — rosy marble in their day, less rosy now — presiding over the 125,000-square-foot terrace. From that terrace you can see Joyce Kilmer Park, named after the poet who died in World War I, and if you poke your head into the lobby of the apartment house at 910 Grand Concourse, you can see a surreal mural bearing a fragment of Kilmer's poem "Roofs": "But I'm glad to turn from the open road and the starlight on my face, and to leave the splendor of out-of-doors for a human dwelling place."

At the park's southern end, stop a moment to contemplate the restored Lorelei fountain, the backdrop of the snapshot of young Sam Goodman, to reflect on the long journey this part of the borough has traveled. In the 1970s the fountain fell victim to urban disarray sweeping through the West Bronx, the mermaids' noses and fins were broken and their bodies clothed with graffiti. Only through the efforts of the local community was the statue restored and rededicated in 1999, a century after its triumphal arrival in the Bronx. Like so much along this street, this work embodies both the best of times and the worst.

The West Bronx houses one of the nation's two richest troves of Art Deco residential buildings (the other is in Miami Beach), and dozens of streamlined apartment houses dating from the 1930s and early '40s march up and down the boulevard. The one by Emery Roth on the southeast corner of this intersection, at 888 Grand Concourse, is a particular stunner, a medley of curves, scallops and concave spaces executed in black granite, bronze, stainless steel, marble mosaic and gold stripes. Stand in the doorway to admire the circular floor, then peer into the lobby to marvel at how much of the décor has survived.

The once celebrated Concourse Plaza Hotel, across the street, was from the moment of its opening in 1923 one of the borough's jewels. Few were the Bronx parents who didn't dream of celebrating a daughter's wedding or a son's bar mitzvah in one of the lavish ballrooms, adorned with flocked crimson wallpaper and crystal chandeliers. Year after year the powerhouse Yankees held their victory dinners at the hotel, and aspiring officeholders and even sitting presidents, at least of the Democratic persuasion, deemed a stop at the hotel an essential part of a campaign swing through the borough.

By the early 1970s the hotel was on the ropes, having slid fast from declining hostelry to welfare hotel to abandoned ruin, its only occupants sleepy drug addicts and stray cats. Now the building houses the needy elderly, but except for the brick and limestone facade, where you can still see wreaths, urns and other classical details, few reminders survive of the hotel's glory days.

Heading north, on your left you'll see at 166th Street what looks like a dead ringer for the Palazzo Farnese in Rome, a pale limestone palace atop a little hill. Its creator, Andrew Freedman, was a wealthy turn-of-the-century New Yorker who helped jump-start the city's first subway system and was also a world-class snob. He fretted about the plight of the city's formerly affluent and used his great wealth to build and endow what The New York Times described as "an ex-rich man's poorhouse" when it opened in 1924.

Except for some social service programs in the basement, the Andrew Freedman Home, as it is known, is largely empty these days. But picture in your mind's eye features like the 75-foot-long grand salon, where aging businessmen dozed in velvet armchairs and overstuffed Georgian sofas, smoking cigars and dreaming of deals brought off in headier years. Imagine men in black tie and women in flowing dresses being attended by obsequious white-gloved waiters as they dined at tables set with crystal goblets and silver forks.

Across the street, at 1150 Grand Concourse, is probably the borough's most celebrated Art Deco apartment house, the so-called Fish building, named in honor of the gaudy mosaics of marine life on the facade. The circular lobby is outfitted with a marble fireplace and a starburst terrazzo floor of golds, reds and greens, and on facing murals, weirdly elongated maidens who strike languorous poses in a landscape populated by frogs and swans.

While the Fish building has aged surprising well, many Art Deco buildings along the Grand Concourse have not been so lucky. Decorative details have been stripped away, and garden courtyards have turned to dustbowls. But don't despair. Look past the gaudy commercial signs and window bars for signature details like wraparound casement windows and geometric accents of brass, steel and colored brick. Don't hesitate to poke your head into unlocked lobbies; doormen tend to be surprisingly welcoming.

To make sure you don't miss some of the best examples of this style, consult the AIA Guide to New York City, hands down the best Baedeker to the boulevard's Art Deco legacy. And as you stroll, take a moment to contemplate the largely unknown architects who created these onetime beauties, many of them local immigrant boys who made good, chief among them Horace Ginsbern, mastermind behind the Fish building and much else in the West Bronx.

The vast number of occupants of these buildings were Jewish, and the elite among them worshipped at Temple Adath Israel, which occupied a white limestone neo-Classical building on the southwest corner of 169th Street. Like so many onetime synagogues in the West Bronx this one has been repurposed (as has Young Israel of the Concourse at 165th Street, now home to the Bronx Museum of the Arts, sheathed in a pleated aluminum facade by the Miami design firm Arquitectonica).

For decades the Adath Israel building has been occupied by Seventh-Day Adventists. But anyone walking by can admire the austere exterior, and if you attend a service, you can marvel at the well-preserved interior, where Old Testament images are pricked in gleaming stained glass.

Not every survivor of the boulevard's earlier days looks this good.

Roosevelt Gardens, at 171st Street, acclaimed as the world's largest apartment house when it opened in 1922 as the Theodore Roosevelt, became a ruin in the 1970s. The complex was packed with welfare recipients, and fires were commonplace. Because water had been turned off due to flooding, residents filled pails with water from the fire hydrant out front and brought them up to their apartments so they could bathe and use the toilets. Though the complex is in better shape now, the eye-catching décor that included an Italian garden courtyard complete with a 15-foot statue honoring the project's namesake has long disappeared into memory.

Things are not much better at the once-famed Lewis Morris south of 175th Street at No. 1749, at 11 stories the tallest apartment house on the boulevard and home to future luminaries like the journalist and author David Halberstam, who lived there as a child, along with seemingly every doctor in the Bronx. With its shabby lobby dominated by a security cage encased in bulletproof glass, the Lewis Morris looks sadly threadbare inside and out.

But the past has made a comeback with a vengeance at Loew's Paradise, just south of Fordham Road. This landmark re-creation of an enclosed Italian Baroque garden, which opened in 1929, was an indelible part of the mythic Bronx childhood. Goldfish swam in a marble fountain near the candy counter, and a statue of St. George slew a fire-breathing dragon every hour on the facade.

The stars, the goldfish and the dragon are long gone. But the theater's interior has been gorgeously restored to its opening-day glory, complete with cherubs, caryatids and chandeliers, and under the name Utopia's Paradise Theater the space plays host to boxing matches and other events.

If you hop a northbound bus at this point and look to your right just before you hit Kingsbridge Road, you'll see Poe Park and the little cottage where the poet lived, wrote and drank in the 1840s.

Finally, at the northern tip of the boulevard, opposite the castlelike apartment house where two Hollywood directors, Garry Marshall and his sister, Penny Marshall, grew up, linger for a moment on the tiny strip named in honor of Louis Risse. This is the only memorial to the visionary French engineer who conceived of the boulevard in 1890.

Risse once described his grandest creation as "a drive of extraordinary delightfulness." Were he with us today, he might be gratified to know that glimpses of its heyday are still visible despite the passing of the years.

Constance Rosenblum writes the Habitats column for The New York Times. This article is adapted from "Boulevard of Dreams: Heady Times, Heartbreak and Hope Along the Grand Concourse in the Bronx" published by NYU Press.

http://www.nytimes.com/2009/08/21/arts/design/21concourse.html?ref=design

'MANDALA'
To Stimulate Souls, Cosmic Mansions With Many Rooms
By HOLLAND COTTER

I don't understand why the Rubin Museum of Art in Chelsea isn't swarming with visitors. But I'm thrilled that it isn't, because I plan to move in for the rest of the summer.

The museum has to be one of the coolest, calmest spots in town. Its wide-open design, with a big spiral staircase and tiers of circular galleries topped by a skylight — sort of Guggenheim meets 1980s Barneys New York (which is what the place once was) — is perfect for looking at art. And the art on view? Tibetan gods and Nepalese goddesses peering down from ex-retail heaven. Divine.
There's also a good cafe, a shop stocked with Buddhist books and a weekly film program. If I can just manage to stash a bedroll somewhere inside, I'm home, and you can look for me at Hotel Nirvana till at least September.
The point is, go. The museum may be small, but there's tons to see, starting with "Mandala: The Perfect Circle," a new show installed way up in the topmost ring under the clouds.
Mandalas, often defined as cosmic diagrams and used as aids in mediation, are complicated objects: they're art, but more. Whether paintings or sculptures they are basically geometric, patterns of nested circles and squares, with the geometry softened and vivified by additional elements, usually crowds of tiny figures — lamas, dancing deities, souls in torment — clustered around a major Buddha.
In cases where that Buddha is really big, we see the whole scene straight on, like a Western-style painting or sculpture in a niche. More often, though, we seem to be looking down from an aerial view — as if we were hovering, say, above the Rubin Museum's skylight — at a mansion of many rooms, with the figures dispersed throughout and the largest one at the very center.
The real complication comes in trying to understand what all of this means, spiritually speaking. Mandalas aren't made to sit there looking pretty. They're for stimulating your brain and saving your soul. Entering them is serious business, and will take you places you would rather not go: through graveyards and fires, to encounters with multi-armed monsters that look as if they'll eat you alive. (They're actually friendly, meant to scare away evil, not you.)
To survive, you had better be ready to travel light, leaving anger, greed, envy and all the depressive junk we lug around every day at the door. Even then you'll be hit by emotions and memories, impulses toward self-wreckage, that you never knew you had. They can totally floor you. Salvation isn't for sissies.
But if you can get a foot inside the mandala's precincts, you've gone a distance. You're already different. For one thing, there's suddenly less of you, maybe just by a hair, but when it comes to ego, a little less is a lot. So you're lighter, possibly light enough to think unusual, un-you thoughts, like "I'm tired of hating so-and-so, so I'll stop." Or "I thought I needed such-and-such to feel good, but I don't." Or "I'll do

whatever it takes to help that particular person in that particular situation," which may turn into "I'm here to help anyone in need, anytime."
With the help of a teacher or guide, you continue slowly on, the goal being to reach the mandala's center. What do you find when you get there? I wouldn't know, but those who do agree that whatever you call it — the Buddha, nirvana, pure love, clear light, sweet nothing — it's worth the trip.
As it happens, there are two mandala shows in this city right now, the second being "Japanese Mandalas: Emanations and Avatars" at the Metropolitan Museum. Visually they're very different. Where the Japanese objects exist in a kind of tonal mist of white, black and brown, with scintillations of silver and gold, their Tibetan equivalents are sharp and bold: the paintings jump with spicy colors, the gilded sculptures are sheer Himalayan bling.
The oldest painting in the Rubin show is of particular interest. Compositionally, it's relatively simple: the white-skinned Bodhisattva of Compassion sits on a lotus surrounded by eight lesser deities with auras as round as Christmas bulbs. But in it, many historical threads tie together.
The scroll is from Dunhuang in far-western China, an ancient Silk Road oasis town and Buddhist pilgrimage site notable for its carved and decorated monastic caves. Tibetan rulers controlled the area in the eighth and ninth centuries, when this mandala was probably painted. And judging by what the figures wear — floral-print pants, bangles galore and no tops — the stylistic source, for fashion at least, was India.
Some scholars say the earliest surviving painted mandalas come from Dunhuang, where they were sealed up in a single cave and preserved for centuries, as this one was. There's no question that the later paintings at the Rubin are also cultural hybrids, with designs that grew more intricately miniaturist as time went on.
It takes sharp eyes to make out the troops of teensy deities staging floor shows in a 15th-century piece on loan from the Kimbell Art Museum in Texas. And you'll need a magnifying glass — there are some in the gallery — to see the profusion of pinpoint-fine flowers, musical instruments and liturgical objects that adorn the Buddha's palace in a 16th-century Nepalese painting from the Rubin's collection.
Where things get truly wild, though, is in the sculpture. An 18th-century bronze and gold mandala from China, big as a birthday cake, shows the entire Buddhist cosmos in 3-D relief, with sun, moon, continents and the sacred mountains all accounted for. A gilt copper Mongolian mandala in the shape of a lotus bud opens to reveal two deities making passionate love as court attendants, perched on surrounding petals, patiently watch.
And from Cornell University comes a 21st-century computer-generated digital mandala. Presented on a monitor in the gallery, it emerges from a stellar cloud as a flat diagram, gains architectural volume to become a walk-in palace shrine, then dissolves back into a cloud, though not before you've had a chance to zoom around inside, passing through transparent walls right to the center.
Nor is this virtual image of the cosmos the museum's last word on the subject. The current exhibition, organized by the Rubin's chief curator, Martin Brauen, is the first of three addressing the ways various cultures envision the universe.
The second show, called "The Red Book of C. G. Jung: Creation of a New Cosmology," opening Oct. 7, will be built around the first public display of a leather-bound notebook filled with the mandala-style drawings that Jung made as he developed his theory of archetypes and spiritual wholeness. (The show coincides with the publication by W. W. Norton of a facsimile of the book.)
Then, on Dec. 11, comes "Visions of the Cosmos: From Milky Ocean to Black Hole," which will tackle the subject of cosmology from comparative Western and non-Western perspectives, taking in Hinduism, Renaissance humanism and contemporary astrophysics.
With all three shows running concurrently as of early December, I suspect the word will get out and crowds will make their way to the Rubin. I sure would, for the Dunhuang mandala and Jung book alone. Who knows, maybe I'll still be in residence then. In the meantime, visit while it's still quiet, soak up the ambient bliss and pretend you see nothing when I sneak my bedroll in.
"Mandala: The Perfect Circle" continues through Jan. 11 at the Rubin Museum of Art, 150 West 17th Street, Chelsea; 212 620-5000, rmanyc.org.

http://www.nytimes.com/2009/08/21/arts/design/21mandala.html?ref=design

An Aide for the Disabled, a Companion, and Nice and Furry

By WALECIA KONRAD

BECAUSE she suffers from a rare genetic disorder, 17-year-old Siobhan O'Connor walks with braces and cannot speak. Her assistance dog, Gaynor, helps Siobhan keep her balance and navigate crowds when she leaves her Santa Monica, Calif., home. The dog can also pick up dropped items or open and close doors.

"Gaynor has been a tremendous help for my daughter physically, and a great bridge socially," said Siobhan's mother, Linda Karr O'Connor.

That is why Ms. O'Connor was so surprised when the company that administers her employer's flexible spending health account rejected her claim for hundreds of dollars of veterinary bills and other maintenance costs for Gaynor. (A flexible spending health care account lets employees use pretax dollars to pay for qualified medical expenses.)

Service dog expenses are medical costs approved by the Internal Revenue Service, and Ms. O'Connor had filed similar expenses under her flexible spending plan in the past without problem.

But her employer had recently switched plan administrators, and the new company balked at paying the claims. Only now, after dozens of letters and phone calls, is the check supposedly in the mail.

"It took an amazing amount of effort, but I wouldn't give up," Ms. O'Connor said. "I felt like it was almost a form of harassment or even discrimination against my disabled daughter."

The O'Connors' situation illustrates the financial burden that people with assistance dogs may face. Wonderful as the animals are, it can be costly to buy, feed and care for them. No health insurance policies cover these costs.

More people are likely to enter this thicket in coming years. Although few firm numbers are available, people in the profession say the number of assistance dogs in use in this country has continually grown, as experts have been able to train dogs for more types of tasks. Besides traditional activities, like guiding the blind and acting as hearing dogs for the deaf, the animals are increasingly being used to help people in wheelchairs and children with autism. Some dogs can even warn people with diabetes that they have low blood sugar or people with epilepsy that they are about to have a seizure. Still others help patients who are suffering from brain trauma and other cognitive disorders function better in the everyday world.

Service dogs have proved so successful for wounded Iraqi war veterans that legislation has been introduced in both the House and the Senate to start a comprehensive government-sponsored assistance dog program for vets.

There are dozens of established nonprofit organizations, including Canine Companions for Independence and the Guide Dog Foundation for the Blind, that provide service dogs free of charge to those who need them. But the wait can be long.

Plenty of other programs, especially those specializing in the newer uses of assistance dogs, will charge you part or all the cost of raising and training the dog — which can range from $15,000 to $50,000.

And whether the dog is donated or purchased, once the animal is home, it becomes the owner's responsibility to feed and groom it and keep it healthy. Food and routine veterinarian bills on average add up to about $1,500 a year, said Jeanine Konopelski, director of marketing for Canine Companions for Independence. And "if a dog becomes ill or is hurt, vet bills can go much, much higher," she said.

Ed Eames, president of the International Association of Assistance Dog Partners, a nonprofit advocacy organization, said, "We hate to see people missing out on this incredible aide because they can't afford to take care of an assistance dog." Mr. Eames and his wife, Toni, are both blind and both use guide dogs.

"And remember," Mr. Eames said. "This is not a wealthy group. Seventy percent of disabled people are unemployed."

Fortunately, there are programs aimed at helping to defray the costs of caring for an assistance dog. The following advice can help people take advantage of the resources available and get the most for their money.

CHOOSE CAREFULLY. "There are some phony programs out there, so you have to be careful," Mr. Eames warned. "You'll pay a lot and end up with a poorly trained dog."

Look for established programs with a history of successful fund-raising and large budgets. The Guide Dog Foundation for the Blind, for example, spends about $55,000 to breed and train each of the 130 guide and service dogs it places each year, and has an annual budget of $8 million.

Assistance Dogs International and the International Association of Assistance Dog Partners list various organizations that train all types of service dogs throughout the country.

Check to make sure the program you pick provides dogs and equipment like special leashes free and also covers the costs of training the human partner.

CREDENTIALS COUNT. You want your dog to come from a program accredited by Assistance Dogs International, especially when participating in a program where you are paying some or all of the costs. This credential ensures that the program is adhering to industry training standards.

Dogs from accredited programs are also more likely to behave well in public, making it easier for people to go to places that are often dog-unfriendly, like restaurants. Being denied such access is a common problem for people using assistance dogs.

PICK THE RIGHT TRAINER. Recently, it has become more common for human partners to train their own assistance dogs, usually with the help of a professional trainer. This can be expensive, however, with no guarantee of results, warns Mr. Eames.

Trainers charge anywhere from $5,000 to $15,000 for each dog. If you go with a private trainer, look for one who has previously worked for one of the main assistance-dog training programs.

GET HELP WITH VET BILLS. Many veterinarian chains, animal hospitals, teaching hospitals and local vets offer discounts on services for assistance dogs. Ms. O'Connor, for instance, receives a 10 percent discount on vaccinations and other services for Gaynor from her veterinarian.

For large vet bills, say for a surgery or major illness, check back with the organization where you got the dog. Many programs have emergency vet money available. In addition, the International Association of Assistance Dog Partners lists many veterinarian hospitals that offer free critical care for ill or injured assistance dogs and also runs a fund for people in financial need who face large vet bills.

CHECK FOR TAX BREAKS. If your medical expenses equal more than 7.5 percent of your adjusted gross income, you can write off those expenses on your income taxes, including the cost of maintaining a service dog.

And many companies do allow this expense on their flexible spending accounts — without the impediments Ms. O'Connor faced. Check with your employer's benefits department.

http://www.nytimes.com/2009/08/22/health/22patient.html?ref=health

Niche Differences In Biodiversity: Species' Differences Are Responsible For Their Coexistence

Jonathan Levine conducting his biodiversity research. (Credit: George Foulsham, Office of Public Affairs, UCSB)

ScienceDaily (Aug. 22, 2009) — Scientists at UC Santa Barbara have found strong evidence that niche differences are critical to biodiversity. Their findings are published online in this week's issue of the journal *Nature*.

"Ecologists have long assumed that species differences in how they use the environment are key to explaining the large number of species we see all around us, but the importance of such niches have never been field tested," said first author Jonathan M. Levine, associate professor in UCSB's Department of Ecology, Evolution, and Marine Biology.

Levine and his co-author Janneke HilleRisLambers, a former postdoctoral fellow at UCSB, who is now an assistant professor at the University of Washington, did field testing of small plants. These plants were found in northern Santa Barbara County on rocky outcrops, where diversity is very high. They used a combination of mathematical techniques, as well as experimental approaches, to remove niche differences from these experimental communities.

"Our work is important because it resolves a century-old biodiversity puzzle," said Levine. "Why doesn't the single best competitor exclude all others in the community?"

Ecological theory has posed two possible answers to the coexistence conundrum. "The classic argument is that niche differences allow species to divide up the environment, much like different products cater to consumers of different tastes or incomes," he said. "The alternative is that competitors are so evenly matched that no single species can win — as occurs when different airlines offer the same route for the same price."

Conflict between these hypotheses has formed the single greatest controversy in ecology over the last decade. The new study provides the first strong evidence that species' differences are responsible for their coexistence.

Although the study's primary importance is in advancing pure ecological science, understanding how biodiversity works is critical. It is in those communities in which niche differences maintain diversity that species loss has the greatest impact on plant production, and other ecosystem services to mankind — from economic to aesthetic.

Journal reference:

1. Jonathan M. Levine & Janneke HilleRisLambers. **The importance of niches for the maintenance of species diversity**. *Nature*, 2009; DOI: 10.1038/nature08251

Adapted from materials provided by University of California - Santa Barbara.

http://www.sciencedaily.com/releases/2009/08/090812163802.htm

Energy-Efficient Sewage Plants

Sewage plant in Schwerzen. This 10,000-strong municipality has already opted for high-rate digestion. (Credit: Copyright Fraunhofer IGB)

ScienceDaily (Aug. 22, 2009) — High-rate digestion with microfiltration is state-of-the-art in large sewage plants. It effectively removes accumulated sludge and produces biogas to generate energy. A study now reveals that even small plants can benefit from this process.

Sewage plants remove organic matter from wastewater. If the accumulating sludge decays, biogas is generated as a by-product. However, only 1156 of the 10,200 sewage plants in Germany have a digestion tank. Smaller operations, especially, baulk at the costs of a new digestion tank. Instead, they enrich the sludge with oxygen in the existing activation basin, and stabilize it.

“Activation basins require a lot of electricity. At the same time, enormous energy potential is lost, since no biogas is produced,” says Dr. Brigitte Kempter-Regel of the Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB in Stuttgart. “A sewage plant eats up more electricity in the municipalities than their hospitals do.”

In a cost-benefit-study Dr. Kempter-Regel has shown that it also pays small sewage plants to transfer to more energy-efficient processes – even if they have to invest in a sludge digestion unit. “Based on a sewage plant for 28,000 inhabitants, we calculate that the plant can reduce its annual waste management costs from 225,000 euros by as much as 170,000 euros if sludge is decayed in a high-rate digestion unit with microfiltration, as opposed to treating it aerobically,” she says.

This process was developed at IGB and is much more effective than conventional digestion. Instead of the usual 30 to 50 days, sludge only remains in the tower for five to seven days. Around 60 percent of the organic matter is converted into biogas – the spoil is approximately a third more than in the traditional

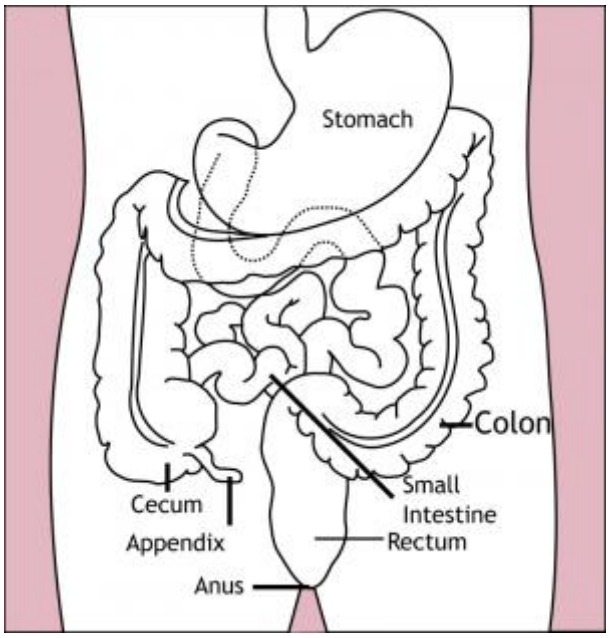
digestion process. The biogas obtained can be used to operate the plant, which, in the case study, would cut energy costs by at least 70,000 euros each year. High-rate digestion has the added advantage of producing less residual sludge needing disposal.

"This saves the operator another 100,000 euros," says Kempter-Regel. In addition to high energy prices, budgets are also being hit hard by increasing waste management costs. The use of residual sludge in agriculture is controversial, and slurry can no longer be disposed of on landfills; burning the sludge is a very expensive alternative. So an effective reduction of sludge through digestion pays off. Even small sewage plants have already followed the recommendation of the Stuttgart Institute and converted to the high-rate digestion process.

Adapted from materials provided by Fraunhofer-Gesellschaft.

http://www.sciencedaily.com/releases/2009/08/090813142345.htm

Evolution Of The Human Appendix: A Biological 'Remnant' No More



Normal location of the appendix relative to other organs of the digestive system (frontal view). (Credit: Wikimedia Commons)

ScienceDaily (Aug. 21, 2009) — The lowly appendix, long-regarded as a useless evolutionary artifact, won newfound respect two years ago when researchers at Duke University Medical Center proposed that it actually serves a critical function. The appendix, they said, is a safe haven where good bacteria could hang out until they were needed to repopulate the gut after a nasty case of diarrhea, for example.

Now, some of those same researchers are back, reporting on the first-ever study of the appendix through the ages. Writing in the *Journal of Evolutionary Biology*, Duke scientists and collaborators from the University of Arizona and Arizona State University conclude that Charles Darwin was wrong: The appendix is a whole lot more than an evolutionary remnant. Not only does it appear in nature much more frequently than previously acknowledged, but it has been around much longer than anyone had suspected.

"Maybe it's time to correct the textbooks," says William Parker, Ph.D., assistant professor of surgical sciences at Duke and the senior author of the study. "Many biology texts today still refer to the appendix as a 'vestigial organ.'"

Using a modern approach to evolutionary biology called cladistics, which utilizes genetic information in combination with a variety of other data to evaluate biological relationships that emerge over the ages, Parker and colleagues found that the appendix has evolved at least twice, once among Australian marsupials and another time among rats, lemmings and other rodents, selected primates and humans. "We also figure that the appendix has been around for at least 80 million years, much longer than we would estimate if Darwin's ideas about the appendix were correct."

Darwin theorized that the appendix in humans and other primates was the evolutionary remains of a larger structure, called a cecum, which was used by now- extinct ancestors for digesting food. The latest study demonstrates two major problems with that idea. First, several living species, including certain lemurs, several rodents and a type of flying squirrel, still have an appendix attached to a large cecum which is used in digestion. Second, Parker says the appendix is actually quite widespread in nature. "For example, when species are divided into groups called 'families', we find that more than 70 percent of all primate and rodent groups contain species with an appendix." Darwin had thought that appendices appeared in only a small handful of animals.

"Darwin simply didn't have access to the information we have," explains Parker. "If Darwin had been aware of the species that have an appendix attached to a large cecum, and if he had known about the widespread nature of the appendix, he probably would not have thought of the appendix as a vestige of evolution."

He also was not aware that appendicitis, or inflammation of the appendix, is not due to a faulty appendix, but rather due to cultural changes associated with industrialized society and improved sanitation. "Those changes left our immune systems with too little work and too much time their hands – a recipe for trouble," says Parker.

That notion wasn't proposed until the early 1900's, and "we didn't really have a good understanding of that principle until the mid 1980's," Parker said. "Even more importantly, Darwin had no way of knowing that the function of the appendix could be rendered obsolete by cultural changes that included widespread use of sewer systems and clean drinking water."

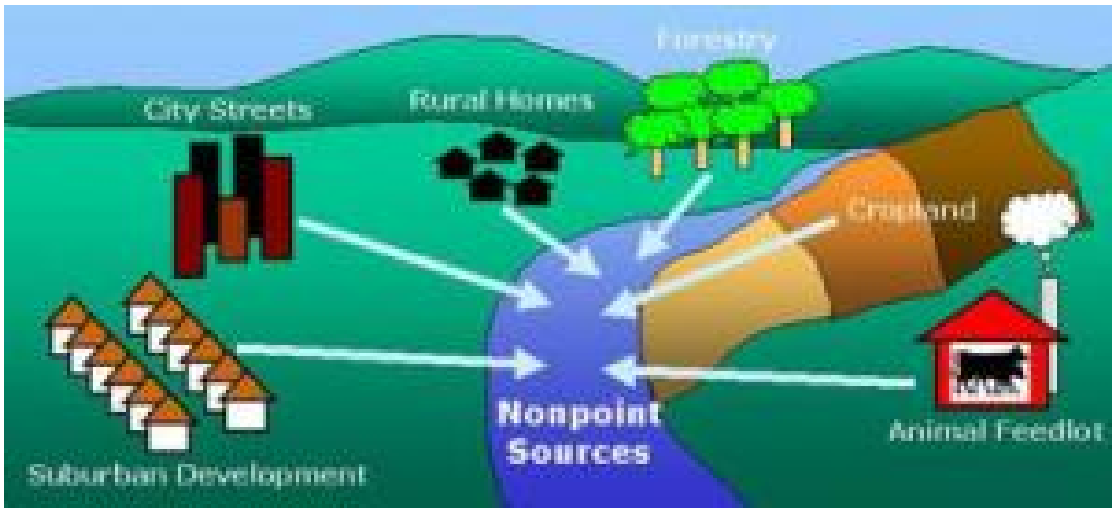
Parker says now that we understand the normal function of the appendix, a critical question to ask is whether we can do anything to prevent appendicitis. He thinks the answer may lie in devising ways to challenge our immune systems today in much the same manner that they were challenged back in the Stone Age. "If modern medicine could figure out a way to do that, we would see far fewer cases of allergies, autoimmune disease, and appendicitis."

Colleagues who contributed to the study include lead author Heather Smith, of the Arizona College of Osteopathic Medicine; Rebecca Fisher, of Arizona State University; and Mary Lou Everett, Anitra Thomas and R. Randal Bollinger from the Department of Surgery at Duke.

Adapted from materials provided by Duke University Medical Center.

http://www.sciencedaily.com/releases/2009/08/090820175901.htm

Homes Pollute: Linked To 50 Percent More Water Pollution Than Previously Believed



Polluted runoff originates from several sources, and has been linked to fish kills and a loss of aquatic species diversity. A new study suggests current runoff models may underestimate pollution contributed by homes by up to 50 percent. (Credit: National Oceanic and Atmospheric Administration)

ScienceDaily (Aug. 21, 2009) — They say there's no place like home. But scientists are reporting some unsettling news about homes in the residential areas of California. The typical house there — and probably elsewhere in the country — is an alarming and probably underestimated source of water pollution, according to a new study reported at the 238th National Meeting of the American Chemical Society.

In the study, Lorence Oki, Darren Haver and colleagues explain that runoff results from rainfall and watering of lawns and gardens, which winds up in municipal storm drains. The runoff washes fertilizers, pesticides and other contaminants into storm drains, and they eventually appear in rivers, lakes and other bodies of water.

"Results from our sampling and monitoring study revealed high detection frequencies of pollutants such as pesticides and pathogen indicators at all sites," Oki says of their study of eight residential areas in Sacramento and Orange Counties in California.

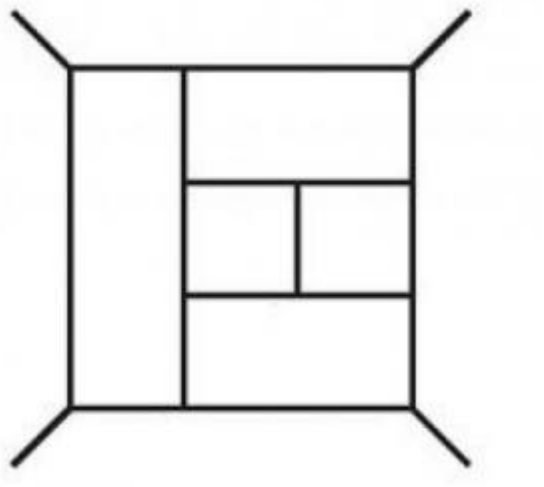
Preliminary results of the study suggest that current models may underestimate the amount of pollution contributed by homes by up to 50 percent. That's because past estimates focused on rain-based runoff during the wet season. "Use of pesticides, however, increases noticeably during the dry season due to gardening, and our data contains greater resolution than previous studies," Oki says.

Pollutants detected in outdoor runoff included ant-control pesticide products. Previous surveys have shown that the majority of pesticides purchased by homeowners are used to control ants. To encourage pollutant reduction, the researchers initiated community outreach programs centered on improving both irrigation control and pest management.

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

http://www.sciencedaily.com/releases/2009/08/090819110008.htm

Vanquishing Infinity: Old Methods Lead To New Approach To Finding Quantum Theory Of Gravity



In the 1940s, Richard Feynman devised a graphical method for carrying out calculations. Bern et al. use different kinds of diagrams that permit large calculations. Owing to their resemblance to the work of artist Piet Mondrian, these graphical computational devices are sometimes referred to as Mondrian diagrams. (Credit: Adapted from Bern et al., Phys. Rev. D 76, 125020 (2007)])

ScienceDaily (Aug. 21, 2009) — Quantum mechanics and Einstein's theory of general relativity are both extremely accurate theories of how the universe works, but all attempts to combine the two into a unified theory have ended in failure. When physicists try to calculate the properties of a quantum theory of gravity, they find quantities that become infinite -- infinities that are so bad they can't be removed by mathematical gambits that work in other areas of physics.

Now, Zvi Bern, John Carrasco, and Henrik Johanssen at UCLA, Lance Dixon at the Stanford Linear Accelerator Center, and Radu Roiban at Pennsylvania State University have found a way to carry out a new set of gravity calculations with the help of an older theory that has been known since the 1980s to be finite.

Their new results are reported in *Physical Review Letters* and highlighted in a commentary by Hermann Nicolai at the Max Planck Institute for Gravitational Physics in Potsdam, Germany, in *Physics.*

Previous attempts at removing the fatal infinities in quantum gravity calculations collapsed when researchers discovered that you would need an infinite number of parameters. The problem stems from the point-like and thus infinitesimally small fundamental particles in the theories, so some physicists have developed string theory as a possible approach: instead of point particles, the fundamental entities are vibrating loops of string. But string theory is beset with its own difficulties, as it lays out a "landscape" of possibilities with an astronomical number of scenarios.

The new paper by Bern et al. shows that by combining desirable aspects of string theory and point-like particles, they can use cancellations in the calculations - done with the help of graphical computational methods called Feynman diagrams (and later elaborations) - to escape the problem of infinities. While not a solution to the problem of quantum gravity, nor a result that knocks string theory aside, the findings of Bern et al. show that theories thought to be dead ends may still show the way forward.

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

http://www.sciencedaily.com/releases/2009/08/090817143556.htm

Echoes Of The Birth Of The Universe: New Limits On Big Bang's Gravitational Waves

Aerial view of LIGO facility in Livingston, Louisiana. (Credit: LIGO, California Institute of Technology.)

ScienceDaily (Aug. 20, 2009) — An investigation by the LIGO (Laser Interferometer Gravitational-Wave Observatory) Scientific Collaboration and the Virgo Collaboration has significantly advanced our understanding the early evolution of the universe.

Analysis of data taken over a two-year period, from 2005 to 2007, has set the most stringent limits yet on the amount of gravitational waves that could have come from the Big Bang in the gravitational wave frequency band where LIGO can observe. In doing so, the gravitational-wave scientists have put new constraints on the details of how the universe looked in its earliest moments.

Much like it produced the cosmic microwave background, the Big Bang is believed to have created a flood of gravitational waves—ripples in the fabric of space and time—that still fill the universe and carry information about the universe as it was immediately after the Big Bang. These waves would be observed as the "stochastic background," analogous to a superposition of many waves of different sizes and directions on the surface of a pond. The amplitude of this background is directly related to the parameters that govern the behavior of the universe during the first minute after the Big Bang.

Earlier measurements of the cosmic microwave background have placed the most stringent upper limits of the stochastic gravitational wave background at very large distance scales and low frequencies. The new measurements by LIGO directly probe the gravitational wave background in the first minute of its existence, at time scales much shorter than accessible by the cosmic microwave background.

The research, which appears in the August 20 issue of the journal *Nature*, also constrains models of cosmic strings, objects that are proposed to have been left over from the beginning of the universe and subsequently stretched to enormous lengths by the universe's expansion; the strings, some cosmologists say, can form loops that produce gravitational waves as they oscillate, decay, and eventually disappear.

Gravitational waves carry with them information about their violent origins and about the nature of gravity that cannot be obtained by conventional astronomical tools. The existence of the waves was predicted by Albert Einstein in 1916 in his general theory of relativity. The LIGO and GEO instruments have been actively searching for the waves since 2002; the Virgo interferometer joined the search in 2007.

The authors of the new paper report that the stochastic background of gravitational waves has not yet been discovered. But the nondiscovery of the background described in the Nature paper already offers its own brand of insight into the universe's earliest history.

The analysis used data collected from the LIGO interferometers, a 2 km and a 4 km detector in Hanford, Washington, and a 4 km instrument in Livingston, Louisiana. Each of the L-shaped interferometers uses a laser split into two beams that travel back and forth down long interferometer arms. The two beams are used to monitor the difference between the two interferometer arm lengths.

According to the general theory of relativity, one interferometer arm is slightly stretched while the other is slightly compressed when a gravitational wave passes by.

The interferometer is constructed in such a way that it can detect a change of less than a thousandth the diameter of an atomic nucleus in the lengths of the arms relative to each other.

Because of this extraordinary sensitivity, the instruments can now test some models of the evolution of the early universe that are expected to produce the stochastic background.

"Since we have not observed the stochastic background, some of these early-universe models that predict a relatively large stochastic background have been ruled out," says Vuk Mandic, assistant professor at the University of Minnesota.

"We now know a bit more about parameters that describe the evolution of the universe when it was less than one minute old," Mandic adds. "We also know that if cosmic strings or superstrings exist, their properties must conform with the measurements we made—that is, their properties, such as string tension, are more constrained than before."

This is interesting, he says, "because such strings could also be so-called fundamental strings, appearing in string-theory models. So our measurement also offers a way of probing string-theory models, which is very rare today."

"This result was one of the long-lasting milestones that LIGO was designed to achieve," Mandic says. Once it goes online in 2014, Advanced LIGO, which will utilize the infrastructure of the LIGO observatories and be 10 times more sensitive than the current instrument, will allow scientists to detect cataclysmic events such as black-hole and neutron-star collisions at 10-times-greater distances.

"Advanced LIGO will go a long way in probing early universe models, cosmic-string models, and other models of the stochastic background. We can think of the current result as a hint of what is to come," he adds.

"With Advanced LIGO, a major upgrade to our instruments, we will be sensitive to sources of extragalactic gravitational waves in a volume of the universe 1,000 times larger than we can see at the present time. This will mean that our sensitivity to gravitational waves from the Big Bang will be improved by orders of magnitude," says Jay Marx of the California Institute of Technology, LIGO's executive director.

"Gravitational waves are the only way to directly probe the universe at the moment of its birth; they're absolutely unique in that regard. We simply can't get this information from any other type of astronomy.

This is what makes this result in particular, and gravitational-wave astronomy in general, so exciting," says David Reitze, a professor of physics at the University of Florida and spokesperson for the LIGO Scientific Collaboration.

"The scientists of the LIGO Scientific Collaboration and the Virgo Collaboration have joined their efforts to make the best use of their instruments. Combining simultaneous data from the LIGO and Virgo interferometers gives information on gravitational-wave sources not accessible by other means. It is very suggestive that the first result of this alliance makes use of the unique feature of gravitational waves being able to probe the very early universe. This is very promising for the future," says Francesco Fidecaro, a professor of physics with the University of Pisa and the Istituto Nazionale di Fisica Nucleare, and spokesperson for the Virgo Collaboration.

Maria Alessandra Papa, senior scientist at the Max Planck Institute for Gravitational Physics and the head of the LSC overall data analysis effort adds, "Hundreds of scientists work very hard to produce fundamental results like this one: the instrument scientists who design, commission and operate the detectors, the teams who prepare the data for the astrophysical searches and the data analysts who develop and implement sensitive techniques to look for these very weak and elusive signals in the data."

The LIGO project, which is funded by the National Science Foundation (NSF), was designed and is operated by Caltech and the Massachusetts Institute of Technology for the purpose of detecting gravitational waves, and for the development of gravitational-wave observations as an astronomical tool.

Research is carried out by the LIGO Scientific Collaboration, a group of 700 scientists at universities around the United States and in 11 foreign countries. The LIGO Scientific Collaboration interferometer network includes the LIGO interferometers and the GEO600 interferometer, which is located near Hannover, Germany, and designed and operated by scientists from the Max Planck Institute for Gravitational Physics, along with partners in the United Kingdom funded by the Science and Technology Facilities Council (STFC).

The Virgo Collaboration designed and constructed the 3 km long Virgo interferometer located in Cascina, Italy, funded by the Centre National de la Recherche Scientifique (France) and by the Istituto Nazionale di Fisica Nucleare (Italy). The Virgo Collaboration consists of 200 scientists from five Europe countries and operates the Virgo detector. Support for the operation comes from the Dutch–French–Italian European Gravitational Observatory Consortium. The LIGO Scientific Collaboration and Virgo work together to jointly analyze data from the LIGO, Virgo, and GEO interferometers.

The next major milestone for LIGO is the Advanced LIGO Project, slated to begin operation in 2014. Advanced LIGO will incorporate advanced designs and technologies that have been developed by the LIGO Scientific Collaboration. It is supported by the NSF, with additional contributions from the U.K.'s STFC and Germany's Max Planck Society.

The paper is entitled "An Upper Limit on the Amplitude of Stochastic Gravitational-Wave Background of Cosmological Origin."

Adapted from materials provided by California Institute of Technology.

http://www.sciencedaily.com/releases/2009/08/090819135426.htm

Ultimate Long Distance Communication: Talking To Lunar Reconnaissance Orbiter

This image shows cratered regions near the moon's Mare Nubium region, as photographed by the Lunar Reconnaissance Orbiter. (Credit: NASA)

ScienceDaily (Aug. 20, 2009) — Anyone who's vacationed in the mountains or lived on a farm knows that it's hard to get good internet access or a strong cell phone signal in a remote area. Communicating across great distances has always been a challenge. So when NASA engineers designed the Lunar Reconnaissance Orbiter (LRO), they knew it would need an extraordinary communications system.

Over the next year, the LRO, NASA's diligent robotic scout, will collect more information about the moon's surface and environment than any previous mission. It takes a powerful system to send all of this information more than 238,800 miles back to Earth.

A 13-inch-long tube, called a Traveling Wave Tube Amplifier, is making it possible for scientists to receive massive amounts of images and data from the orbiter at an unusually fast rate. It is the first high data rate K-band transmitter to fly on a NASA spacecraft.

With this new amplifier, LRO can transmit 461 gigabytes of data per day. That's more information than you can find in a four-story library. And it transmits this information at a rate of up to 100 megabytes per second. By comparison, typical high-speed internet service provides about 1 to 3 megabytes per second.

L-3 Communications Electron Technologies built the amplifier under the supervision of NASA's Glenn Research Center in Cleveland. The device uses electrodes in a vacuum tube to amplify microwave signals to high power. It's ideal for sending large amounts of data over a long distance because it provides more power and more efficiency than its alternative, the transistor amplifier.

As the orbiter collects information about the moon's geography, climate and environment, the communication system transmits this information to a receiver at a Ka band antenna network at White Sands Test Facility in New Mexico. Scientists are using the data to compile high-resolution, 3D maps of the lunar surface.

"We're sending back more data than ever, faster and it's nearly real time," said Glenn project manager Todd Peterson.

Traveling Wave Tube Amplifiers have been used for other planetary missions, such as Kepler and Cassini, but previous designs were less powerful. According to Rainee Simons, chief of Glenn's Electron and Optoelectronic Device Branch, engineers had to redesign the internal circuitry of the amplifier.

"In order to provide the power and frequency needed to send communications from the vicinity of the moon, it had to be custom designed and handmade," he said.

The orbiter's Traveling Wave Tube Amplifier is also more efficient than previous amplifiers. When it comes to launching satellites, weight means money. The heavier the spacecraft, the more fuel it needs to reach orbit. Because the new amplifier packs more power into a lighter design than previous microwave amplifiers, it's cheaper to fly.

The amplifier underwent vigorous spaceflight testing -- including vibration, thermal vacuum, radiation and electromagnetic interference tests -- to ensure that it could withstand the intense conditions of launch and lunar orbit.

Simons, Peterson and other members of the Glenn team were on standby when LRO entered its final orbit and began transmitting data. They were thrilled to hear that it's working properly, not only because LRO is a vital step toward returning humans to the moon, but also because they believe the new amplifier can improve life on Earth in countless ways.

If used on communication satellites, it could allow for much better tracking, monitoring and control of transoceanic flights and ships traveling beyond the reach of radar.

It also could enable real-time data transfer from future Earth-orbiting satellites. Such satellites are used to track migratory animals, endangered species, icebergs, volcanic eruptions and forest fires, and to aid in search and rescue operations. They're used to study climate change and meteorology as well.

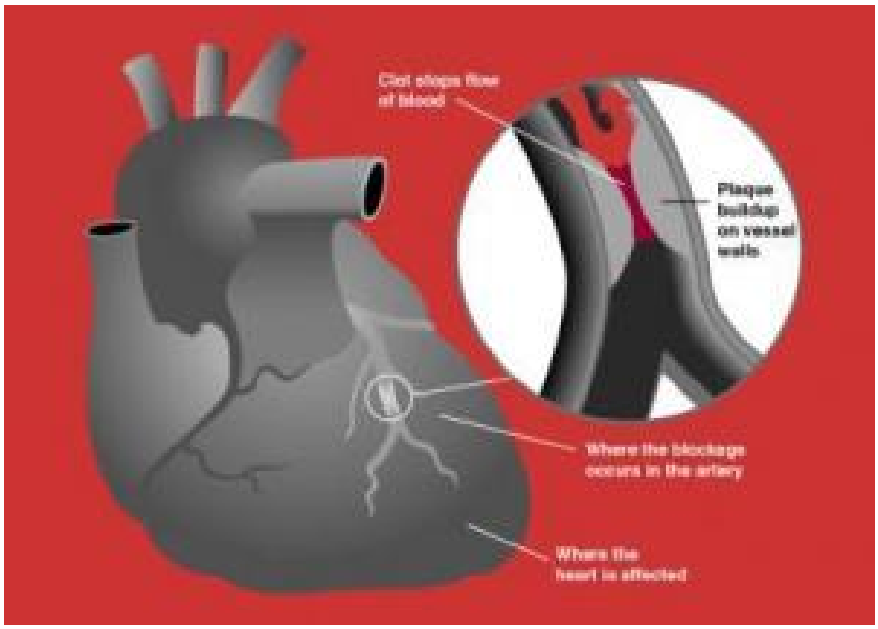
According to Simons, by collecting more timely data about the interaction of our atmosphere, ocean and land, we could save lives and property during severe weather.

"This technology has the potential to create a better world," he said.

Adapted from materials provided by NASA.

http://www.sciencedaily.com/releases/2009/08/090819150521.htm

Little Known Type Of Cholesterol -- Oxycholesterol -- May Pose The Greatest Heart Disease Risk



A little known type of cholesterol, oxycholesterol, may pose the greatest heart disease risk, researchers say. Shown is a diagram of a heart attack. (Credit: Wikimedia Commons)

ScienceDaily (Aug. 23, 2009) — Health-conscious people know that high levels of total cholesterol and LDL cholesterol (the so-called "bad" cholesterol) can increase the risk of heart attacks. Now scientists are reporting that another form of cholesterol called oxycholesterol — virtually unknown to the public — may be the most serious cardiovascular health threat of all.

Scientists from China presented one of the first studies on the cholesterol-boosting effects of oxycholesterol at the 238th National Meeting of the American Chemical Society. The researchers hope their findings raise public awareness about oxycholesterol, including foods with the highest levels of the substance and other foods that can combat oxycholesterol's effects.

"Total cholesterol, low-density lipoprotein cholesterol (LDL), and the heart-healthy high-density lipoprotein cholesterol (HDL) are still important health issues," says study leader Zhen-Yu Chen, Ph.D., of Chinese University of Hong Kong. "But the public should recognize that oxycholesterol is also important and cannot be ignored. Our work demonstrated that oxycholesterol boosts total cholesterol levels and promotes atherosclerosis ["hardening of the arteries"] more than non-oxidized cholesterol."

Fried and processed food, particularly fast-food, contains high amounts of oxycholesterol. Avoiding these foods and eating a diet that is rich in antioxidants, such as fresh fruits and vegetables, may help reduce its levels in the body, the researchers note.

Scientists have known for years that a reaction between fats and oxygen, a process termed oxidation, produces oxycholesterol in the body. Oxidation occurs, for instance, when fat-containing foods are heated, as in frying chicken or grilling burgers or steaks. Food manufacturers produce oxycholesterol intentionally in the form of oxidized oils such as trans-fatty acids and partially-hydrogenated vegetable oils. When added to processed foods, those substances improve texture, taste and stability. Until now, however, much of the research focused on oxycholesterol's effects in damaging cells, DNA, and its biochemical effects in contributing to atherosclerosis. Chen believes this is one of the first studies on oxycholesterol's effects in raising blood cholesterol levels compared to non-oxidized cholesterol.

In the new study, Chen's group measured the effects of a diet high in oxycholesterol on hamsters, often used as surrogates for humans in such research. Blood cholesterol in hamsters fed oxycholesterol rose up to 22 percent more than hamsters eating non-oxidized cholesterol. The oxycholesterol group showed greater deposition of cholesterol in the lining of their arteries and a tendency to develop larger deposits of cholesterol. These fatty deposits, called atherosclerotic plaques, increase the risk for heart attack and stroke.

Most importantly, according to Chen, oxycholesterol had undesirable effects on "artery function." Oxycholesterol reduced the elasticity of arteries, impairing their ability to expand and carry more blood. That expansion can allow more blood to flow through arteries that are partially blocked by plaques, potentially reducing the risk that a clot will form and cause a heart attack or stroke.

But a healthy diet rich in antioxidants can counter these effects, Chen said, noting that these substances may block the oxidation process that forms oxycholesterol. Good sources of antioxidants include fruits, veggies, beans, and certain herbs and spices. Healthy alternatives to fast-food, which also boosts oxycholesterol, include whole grains, fresh fruits and vegetables, seeds, and nuts.

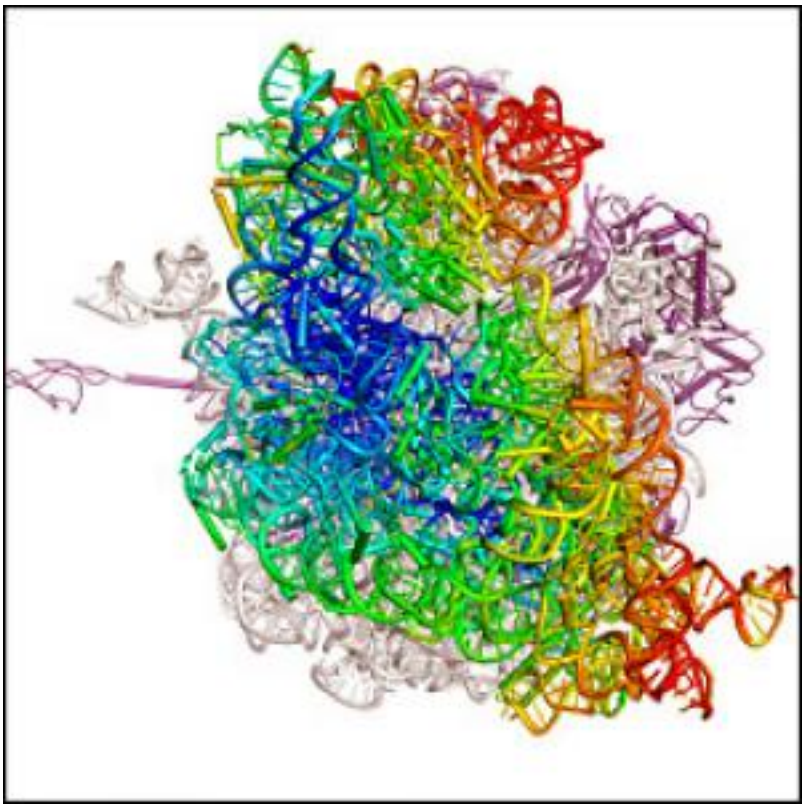
Scientists do not know whether the popular anti-cholesterol drugs called statins lower oxycholesterol, Chen said.

Hong Kong Grant Research Council provided funding for this study. An advisory body of the Hong Kong Special Administration Region of the People's Republic of China, the Council is responsible for funding government-sponsored academic research projects.

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

http://www.sciencedaily.com/releases/2009/08/090820123923.htm

New Images Capture Cell's Ribosomes At Work



Above is an entire ribosome with its changes in position color-coded — ranging from blue, indicating no movement, to red, indicating large movements. (Credit: Cate research group, UC Berkeley image)

ScienceDaily (Aug. 23, 2009) — Researchers at the University of California, Berkeley, have for the first time captured elusive nanoscale movements of ribosomes at work, shedding light on how these cellular factories take in genetic instructions and amino acids to churn out proteins.

Ribosomes, which number in the millions in a single human cell, have long been considered the "black boxes" in molecular biology. "We know what goes in and what comes out of ribosomes, but we're only beginning to learn about what is going on in between," said the study's principal investigator, Jamie Cate, UC Berkeley associate professor in chemistry and molecular and cell biology, and a faculty scientist at Lawrence Berkeley National Laboratory.

The achievement, described in the Aug. 21 issue of the journal *Science*, could eventually lead to significant advances in the fight against human disease, the researchers said.

They point out that many infectious diseases involve ribosomal warfare between humans and our bacterial or viral invaders. Important antibiotic drugs, like spectinomycin, capreomycin and aminoglycosides, exploit the structural differences between human and bacterial ribosomes to selectively attack the bacteria. Some viruses, like polio and hepatitis C, hijack human ribosomes, forcing them to pump out proteins that are beneficial for the viruses.

"Inside the ribosome, antibiotics and viruses are using chemistry to either fight or promote disease," said Cate, who conducted the work with research specialist Wen Zhang and graduate student Jack Dunkle, both co-lead authors of the study, in his lab at UC Berkeley. "But what sort of chemistry? The short answer is that we have a lot still to learn. Once we find out, that knowledge could lead to more effective antibiotics, or new treatments against devastating diseases like hepatitis C."

In the protein manufacturing process, the genetic code - or instruction manual - for making proteins lies inside a cell's double-stranded DNA. When the cell needs to produce more proteins, the DNA unzips into two separate strands, exposing the protein code so it can be duplicated by single-stranded messenger RNA (mRNA). The mRNA dutifully delivers that code to the ribosome, which somehow reads the instructions, or "data tape," as each amino acid is added to a growing protein chain.

At the same time, other RNA molecules, called transfer RNA (tRNA), bring to the ribosome amino acids, the raw building blocks needed for protein construction.

To help elucidate the ribosome's movements as it interacts with mRNA and tRNA, the researchers used X-ray crystallography to obtain a highly detailed picture of the ribosome - a mere 21 nanometers wide - from an Escherichia coli bacterium. In addition to revealing atomic level detail, the technique allowed the researchers to capture the ribosome mid-action, a challenge because it acts fast, adding 20 new amino acids to a protein chain every second.

"Scientists used to think that the ribosome made a simple two-stage ratcheting motion by rotating back and forth as it interacts with mRNA and tRNA," said Cate, who is also a member of the California Institute for Quantitative Biomedical Research (QB3) at UC Berkeley. "What we captured were images of the ribosome in intermediate stages between the rotations, showing that there are at least four steps in this ratcheting mechanism."

"We suspect that the ribosome changes its conformation in so many steps to allow it to interact with relatively big tRNAs while keeping the two segments of the ribosome from flying apart," said Cate. "It's much more complicated than the simple ratcheting mechanism in a socket wrench."

Cate said that while this study marked a major accomplishment in cracking open the "black box" of ribosomal function, there are far more details yet to be revealed. Advances in imaging techniques over the next decade should allow researchers to go beyond the snapshots taken in this study to high-resolution movies of a ribosome's movements, he said.

"I'm looking forward to producing a movie of a ribosome with enough resolution and enough frames per millisecond that we can see what is happening at a molecular level," said Cate. "It would be great to watch and really understand how the ribosome makes a protein, how antibiotics interfere with a bacterial ribosome, or why a strand of genetic code in a hepatitis C virus is so effective at hijacking a human ribosome. We still have a long way to go, but we're working hard."

This research was supported by the National Institutes of Health and the U.S. Department of Energy.

Adapted from materials provided by University of California - Berkeley.

http://www.sciencedaily.com/releases/2009/08/090821135106.htm

Water Desalination Using Novel Method Of Reverse Osmosis Promises High Recovery Levels

ScienceDaily (Aug. 23, 2009) — Researchers at Ben-Gurion University of the Negev are developing technology to scale up a novel method for achieving very high recoveries in desalination by reverse osmosis to be used in a Jordanian desalinization plant.

The team, lead by Dr. Jack Gilron of the Zuckerberg Institute for Water Research (ZIWR) and Prof. Eli Korin of the Department of Chemical Engineering, has developed a method of exploiting the finite kinetics of membrane fouling processes by periodically changing the conditions leading to membrane fouling before it can occur. The team was recently awarded grants from the NATO Science for Peace program and the Middle East Desalination Research Center (MEDRC).

Working in collaboration with colleagues from University of Colorado and the Hashemite University of Jordan, the group will be developing technology and setting up pilot facilities to produce ~120 m^3/day (31,000 gallons) at desalination sites in Israel and in Jordan. Dr. Gilron explains that "the process will be tuned to reduce brine volumes to 33-50 percent of those generated in conventional reverse osmosis. This greatly reduces the environmental burden and improves the economics of the inland desalination process."

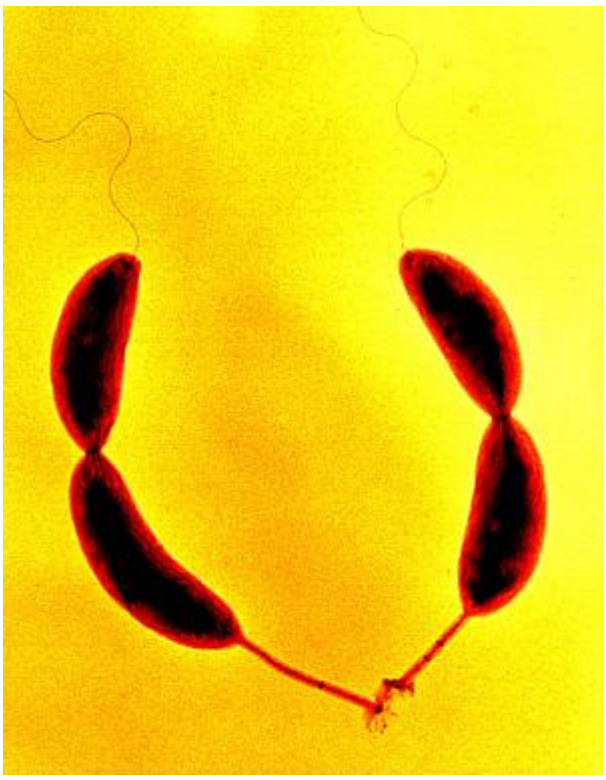
Gilron continues, "Water scarcity and the need to develop new water resources for populations not on the seacoasts are driving efforts to desalinate brackish water and municipal wastewater with ever-increasing efficiencies."

Related to the above development, BGN Technologies – the University's technology transfer company and the ATI (Ashkelon Technology Incubator) Cleantech Group have established a new company, ROTEC (Reverse Osmosis Technologies) to commercialize the technology. Israel's national water company, Mekorot, selected ROTEC as one of a handful of promising companies in which it invests R&D funding to help promote novel water treatment technologies worldwide and in Israel.

Adapted from materials provided by American Associates, Ben-Gurion University of the Negev, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/08/090819135931.htm

Math Model Accurately Mimics Cell Division In Carbon-cycling Bacterium



Two cells of the aquatic bacterium Caulobacter crescentus attach to a surface, and each other, by their glue-secreting holdfasts. The holdfast is the structure at the tip of the stalk, a thin extension of the cell. The two cells in the picture are about to divide. (Credit: Yves V. Brun, Indiana University)

ScienceDaily (Aug. 22, 2009) — Scientists from the Department of Biological Sciences and the Virginia Bioinformatics Institute (VBI) at Virginia Tech have developed a quantitative, mathematical model of DNA replication and cell division for the bacterium *Caulobacter crescentus*. *C. crescentus*, an alpha-proteobacterium that inhabits freshwater, seawater and soils, is an ideal organism for genetic and computational biology studies due to the wealth of molecular information that has been accumulated by researchers. It also plays a key role in global carbon cycling in its natural environment.

The researchers work will appear in the August 14 edition of *PLoS Computational Biology*. The article is by Genetics, Bioinformatics, and Computational Biology graduate student Shenghua Li, research scientist Paul Brazhnik, Professor and Director of VBI's Cyberinfrastructure Group Bruno Sobral, and University Distinguished Professor of Biological Sciences John Tyson.

The mathematical model described in the paper allows researchers to study and analyze the systems-level dynamics of the Caulobacter cell cycle, test hypotheses and suggest crucial new experiments. "By careful examination of the large amount of experimental information available about the genes, proteins and biochemical reactions involved in regulating the cell division of *C. crescentus*, we have developed a good understanding of the mechanism of cell division in this organism and a realistic, quantitative mathematical model of the molecular machinery that oversees Caulobacter's cell division cycle," said John Tyson.

Caulobacter normally undergoes a cell cycle that produces two different types of offspring: a motile "swarmer cell" with a flagellum, a slender thread-like structure that allows the bacterium to swim, and an immobile "sessile stalked cell" that lacks a flagellum. The two cell types undergo different development programs but share the same core molecular regulatory system that controls whether the cell commits to a new round of DNA synthesis and to the cell division process. This regulatory core comprises three key proteins – DnaA, GcrA, and CtrA – that act as control points or master switches for DNA replication and cell division. The new math model allows scientists to investigate how these proteins vary with time and their link to physiological events in both stalked and swarmer cells.

"Cells have some similarities to computers in the sense that they engage in information processing", said Tyson. "However, prokaryotic cells like Caulobacter have been somewhat neglected as information systems in studies by scientists. While computers are precise, digital processors, cells are analog systems that operate for the most part in sloppy, watery environments. Conveying instructions for DNA replication and cell division has profound consequences for a cell and needs to be done with considerable accuracy and precision and that's one of the reasons why we want to be able to model the process." Tyson

added: "We have been able to establish a wiring diagram that maps the essential regulatory steps for DNA replication and cell division in Caulobacter in a way that is similar to how you would define a computer process. The model provides a rigorous account of the consequences of our hypotheses, which can be compared to experimental observations to test the model."

With the model in place, the researchers confirmed that it correctly represents the sequence of physiological events that take place during cell division. They were able to show in simulations that the model accurately describes how the different proteins change in quantity during the cell division cycle. Taking this one step further, they were also able to simulate the impact of specific known mutations on cell function.

Mutant cells provide valuable information about how individual components of the cell cycle control system affect the features (phenotype) of cells. Commented Tyson: "Our model allows you to perform quantitative predictions for novel mutants. We have performed simulations of some novel mutants that to our knowledge have not been described in the scientific literature. For example, the math model predicts that if the master regulator CtrA cannot be properly phosphorylated, which is a key step in the activation of CtrA, then the cell replicates its DNA but cannot divide. It will grow very long and eventually die. Specific predictions like this can test the reliability of the model. A validated model can then be used to design new experiments by in silico simulations."

The researchers have built a math model that allows for the study of how the protein components change with time. Future versions of the model will also take into account the spatial localization of the proteins. Said Bruno Sobral: "Caulobacter crescentus is a member of the alpha-proteobacteria, a group of diverse organisms whose members have successfully adopted different lifestyle and energy-yielding strategies over the course of evolution. Caulobacter was also recently detected as a human pathogen, which makes its study directly relevant to human health. Since many genes and mechanisms discovered in Caulobacter are evolutionarily conserved among the alpha-proteobacteria our computational model of cell replication may be applicable to other family members, in particular the causative agents of brucellosis in cattle and Rocky Mountain spotted fever in humans."

Journal reference:

1. Shenghua Li, Paul Brazhnik, Bruno Sobral, John J. Tyson. **Temporal controls of the asymmetric cell division cycle in Caulobacter crescentus**. *PLoS Computational Biology*, 2009; 5(8): e1000463 DOI: 10.1371/journal.pcbi.1000463

Adapted from materials provided by Virginia Tech, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/08/090813202124.htm

Orchids And Fungi -- Partners For Life

This is an Aphyllorchis montana orchid. (Credit: Roy et al., BMC Biology)

ScienceDaily (Aug. 22, 2009) — Three Thai orchids have been found to rely on a wide range of fungi to help them take carbon out of the soil instead of producing their own organic carbon. A detailed study of the relationship, published in the open access journal *BMC Biology*, also features stunning pictures of the plants.

Marc-André Selosse and Mélanie Roy, from the Centre d'Ecologie Fonctionnelle et Evolutive, Montpellier, France, studied Aphyllorchis montana, A. caudata and Cephalanthera exigua orchids with Suyanee Vessabutr and Santi Watthana from the Queen Sirikit Botanic Garden, Thailand. These orchids have no chlorophyll and rely on fungi colonizing their roots for their carbon supply.

The plants, which grow on the ground in mountain forests, were collected from 10 different sampling sites in diverse parts of Thailand. The two Aphyllorchis orchids studied were found to associate with a wide range of fungi, while the Cephalanthera was much more specific.

Selosse said: "We show for the first time that certain tropical orchids associate with highly diverse soil fungi colonizing their roots; using stable isotopes, we show that they are likely to use these fungi as a carbon source." Most importantly for conservation concerns, all these fungi associate in turn with the roots of nearby green trees, where they collect carbon for the orchids.

Speaking about the results of the study, Selosse said: "Plants really interact with fungi in an unexpectedly diverse way - the impression one gains is that there is a great need for more research on biological interactions in the tropics to unravel this diversity."

Journal reference:

1. Mélanie Roy, Santi Watthana, Anna Stier, Franck Richard, Suyanee Vessabutr and Marc-André Selosse. **Two mycoheterotrophic orchids from Thailand tropical dipterocarpacean forests associate with a broad diversity of ectomycorrhizal fungi**. *BMC Biology*, 2009; (in press) [link]

Adapted from materials provided by BioMed Central, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/08/090813190936.htm

Happiness: A buyer's guide

Money can improve your life, but not in the ways you think

By Drake Bennett | August 23, 2009

Can money buy happiness? Since the invention of money, or nearly enough, people have been telling one another that it can't. Philosophers and gurus, holy books and self-help manuals have all warned of the futility of equating material gain with true well-being.

Modern research generally backs them up. Psychologists and economists have found that while money does matter to your sense of happiness, it doesn't matter that much. Beyond the point at which people have enough to comfortably feed, clothe, and house themselves, having more money - even a lot more money - makes them only a little bit happier. So there's quantitative proof for the preachings of St. Francis and the wisdom of the Buddha. Bad news for hard-charging bankers; good news for struggling musicians.

But starting to emerge now is a different answer to that age-old question. A few researchers are looking again at whether happiness can be bought, and they are discovering that quite possibly it can - it's just that some strategies are a lot better than others. Taking a friend to lunch, it turns out, makes us happier than buying a new outfit. Splurging on a vacation makes us happy in a way that splurging on a car may not.

"Just because money doesn't buy happiness doesn't mean money cannot buy happiness," says Elizabeth Dunn, a social psychologist and assistant professor at the University of British Columbia. "People just might be using it wrong."

Dunn and others are beginning to offer an intriguing explanation for the poor wealth-to-happiness exchange rate: The problem isn't money, it's us. For deep-seated psychological reasons, when it comes to spending money, we tend to value goods over experiences, ourselves over others, things over people. When it comes to happiness, none of these decisions are right: The spending that make us happy, it turns out, is often spending where the money vanishes and leaves something ineffable in its place.

Any attempt to put these findings into practice, however, has to contend with the subtle but powerful ways money itself channels our thinking, and the ways it plays on human attitudes about sharing and

scarcity. Recent studies have suggested that merely thinking about money makes us more solitary and selfish, and steers us away from the spending that promises to make us happiest.

Figuring out how to clear this hurdle has implications for our daily budget decisions and our investments, and for how organizations from resorts to charities do business. Money is inseparable from our existence in society - we work for money, live on money, and hoard it and spend it for a tangled mix of reasons. As psychologists unpack these insights, their work offers a powerful new way to think about this complex and poorly understood relationship. And it gives us a chance to use our spending money, however much it may be, as a vehicle to a more fulfilling life rather than just a better accessorized one.

Despite millennia of folk wisdom on the topic, it wasn't until a decade ago that researchers started to take a hard look at whether money really does have anything to do with happiness. In the late 1990s, a psychologist named Martin Seligman founded the field of positive psychology, driven by the idea that psychologists had as much of a duty to figure out what made people happy as to study their problems. At the same time, a few economists were starting to borrow the tools of psychology to challenge some of the assumptions that their field had long held about human behavior - that people were rational calculators of cost and benefit, for example, and that looking at how people spent money could be a reliable indicator of their deeper desires.

Positive psychologists and so-called behavioral economists both turned their attention to the money-happiness nexus. Mapping financial statistics against people's self-reported happiness, the researchers sifted data from rich nations and poor nations, from people up and down the economic ladder, and from individuals as their economic fortunes improved or deteriorated. The connection between wealth and happiness, they found, was pretty weak.

"It's not a zero correlation, even at higher income levels, but it's not a very big correlation," says Sonja Lyubomirsky, a psychology professor at the University of California at Riverside and a leading happiness researcher. Money, she says, "matters less than we think it would."

But what if that wasn't the whole story? Dunn, of the University of British Columbia, remembers wondering a couple years ago whether money and happiness were necessarily so disconnected. Partly, she was inspired by a change in her own circumstances: She had just gotten hired as an assistant professor, her salary suddenly jumping from a post-doctoral researcher's $20,000 stipend to about four times that much. She found it hard to believe that there was nothing she could do with some of that new money to make herself happier.

What if, for example, she spent it not on a new flat-screen television or sectional sofa, but on other people? One of the most consistent findings of the happiness literature is that having a strong social network is an excellent predictor of happiness, and it seemed plausible that you could use money to buy happiness that way. She teamed up with Michael Norton, a psychologist and assistant professor at Harvard Business School, and the two embarked on a series of experiments to test whether spending money on others actually makes us happier than spending it on ourselves.

First, they surveyed 632 Americans on their general happiness, along with what they spent their money on, and found that higher "prosocial spending" - gifts for others and donations to charity - was indeed correlated with higher self-reported happiness. They followed this up with a more detailed look at 16 workers before and after they received a profit-sharing bonus from their company. They found that the only factor that reliably predicted which workers would be happy six to eight weeks after the bonus was their prosocial spending - the more money people spent on charity and gifts for others, the happier they were.

But was the happiness caused by giving money away, or were charitable people simply happier to start with? To show a causative link, they then performed an experiment in which volunteer test subjects were given a small windfall of $5 to $20. Some of the subjects, chosen at random, were told to spend it on a

bill, an expense, or a gift for themselves. The others were told to buy a gift for someone else or make a charitable donation. Afterwards, the second group - the ones who had given the money away - reported being significantly happier than those who had spent the money on their own needs.

Dunn and Norton published their results in the journal Science in March 2008. The lesson of their study, says Dunn, is clear. Money makes you most happy if you don't spend it on yourself.

"By that I do not mean give all your money away and live in a shack," she says. "I just mean think about increasing it slightly. Just reallocating as little as $5 on a given day can make a difference in happiness."

Another theme that has emerged in similar research is that money spent on experiences - vacations or theater tickets or meals out - makes you happier than money spent on material goods. Leaf Van Boven, an associate psychology professor at the University of Colorado, and Thomas Gilovich, chair of the psychology department at Cornell University, have run surveys asking people about past purchases and how happy they made them.

"We generally found very consistent evidence that experiences made people happier than material possessions they had invested in," says Van Boven.

Why? For one thing, Van Boven and Gilovich argue, experiences are inherently more social - when we vacation or eat out or go to the movies it's usually with other people, and we're liable also to relive the experience when we see those people again. And past experiences can work as a sort of social adhesive even with people who didn't participate with us, providing stories and conversational fodder in a way that a new watch or speedboat rarely can.

In addition, other work by Van Boven suggests that experiences don't usually trigger the same sort of pernicious comparisons that material possessions do. We like our car less whenever we catch a glimpse of our neighbor's newer, nicer car, but we don't like our honeymoon any less because our neighbor went on a fancier one.

And while we quickly grow accustomed to a new suit or a bigger house, no matter how much we originally loved it, experiences instead tend to get burnished in our memory - a year after a vacation, we look back not on the stress of dealing with lost luggage or the fights over which way the hotel was, but the beauty of the scenery or the exotic flavors of the food.

Why, then, don't we already spend more of our money this way? Of course, people do give to charity and go on vacations and treat their friends to the occasional dinner. But if the goal is to buy happiness, we still spend more on stuff and on ourselves than we should.

Part of the problem is that happiness isn't necessarily what's motivating us when we reach for our wallets. Much of the impetus for discretionary spending - even for seeming essentials like cars, houses, and clothes - comes from a desire to send certain signals about our buying power and our tastes. We might mistake that motivation for happiness, or for having a better life, but it's driven by something else, a human need to compete or to fit in. And $5,000 worth of new stuff, or even $500,000 worth, is unlikely to permanently quell that need.

Even if we learn to recognize that impulse for what it is, however, money has a psychological power of its own. It seems that simply thinking about money makes us less likely to do prosocial things. Kathleen Vohs, a psychologist and associate professor at the University of Minnesota Carlson School of Management, has done studies in which people were primed to think of money - by either reading text that subtly evoked it or by being surreptitiously shown images of dollar bills - while doing various tasks. Having money on one's mind, Vohs found, made people harder-working, even more resistant to pain, but it also made them more solitary. They were less likely to offer help to others or to donate money. They even chose to put more physical distance between themselves and other people when talking to them.

Paradoxically, then, money itself blinds us to the ways we might spend it to make ourselves happiest.

"People may know that being nice to other people makes them happy, but money, in and of itself, turns us around and makes us think about buying more stuff," says Norton of Harvard Business School.

The research, however, does suggest a few ways to spring ourselves from this bind. One intriguing possibility is that workplaces could change to encourage more prosocial spending in their workers. Dunn and Norton have argued, for example, that companies can improve their employees' emotional well-being by shifting some of their budget for charitable giving so that individual employees are given sums to donate, leaving them happier even as the charities of their choice benefit.

And on a more personal, everyday level, when we're drawn to a new pair of designer sunglasses, we could try to factor in the psychological return that we might get from a similar sum spent on a night out with friends.

Thinkers are trying to figure out how to incorporate these sorts of findings into a new model of consumption. Norton, along with Dan Ariely, a behavioral economist and professor at Duke University's Fuqua School of Business, has coined the term "conceptual consumption" to describe our willingness to spend real money on abstract goods. Among other things, they argue, it helps explain the sort of long-term payoff we get from a memorable dinner with a loved one. It's a testament to the power of such conceptual goods, they argue, that in certain settings we privilege the concept over actual physical consumption - such as when we decide not to go back to the restaurant where we had the special dinner because we're afraid it would dilute the memory. The more we learn about consumer behavior, Ariely and Norton argue, the more we will realize that nearly every decision we make as consumers is primarily conceptual.

Whether or not that turns out to be true, an important change is afoot in work like Dunn and Norton's and Van Boven and Gilovich's. Talking about money and happiness in the same breath, it turns out, isn't necessarily a surrender to crass materialism - it can also be a route to a new and more humane way to think about vitally important things like consumption, satisfaction, investment, and value.

It can also turn the familiar logic of money, prudence, and charity almost on its head. Seen this way, blowing money on a bar crawl with friends isn't necessarily a waste of your hard-earned paycheck - it's something of an investment. And a generous philanthropic donation is also an act of hedonism even more gratifying than a new Lexus or a handmade watch. Making money vanish can have a payoff every bit as real, and possibly more beneficial, than putting it somewhere to make it grow. You just have to do it the right way.

"It's funny, everyone keeps saying money doesn't make you happy, but money can change the world," says Lyubomirsky. "It can support political candidates, it can drive change. And it can't buy me love, but it can certainly get you to meet people and have dates."

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http://www.boston.com/bostonglobe/ideas/articles/2009/08/23/happiness_a_buyers_guide/

Physicists investigate the grand artistic vision of one of the most influential artists of the last two centuries.

When physicist John Smith spent the night in his garden with the score to *Götterdämmerung*, the final opera in Richard Wagner's four-part, 15-hour epic, *Der Ring des Nibelungen*, he wasn't interested in its account of the apocalyptic struggle of Norse gods for control of the world. Smith was concerned with a struggle of a different sort—one between the opera's words and music that might elucidate the controversial German composer's peculiar vision for the future of art.

On Smith's mind was an age-old difficulty all soprano singers face: They mispronounce lyrics when singing powerfully in the top half of their range. This "soprano problem" was formally recognized at least as far back as 1843, when French composer Hector Berlioz wrote in his *Treatise on Instrumentation* that "[sopranos] should not be required to sing many words on high phrases, since this makes the pronunciation of syllables very difficult if not impossible." It does not appear, however, that Berlioz—or anyone else—ever understood why this problem occurred.

In 2004, Smith and his colleagues Joe Wolfe and Elodie Joliveau at the University of New South Wales published a study in the *Journal of the Acoustical Society of America* that revealed the physiological cause of the soprano problem for the first time. They sent an acoustic signal through the vocal tracts of nine sopranos and used a microphone to measure how the signal changed when the sopranos sang vowel sounds at various pitches. They found that when a soprano sings at high pitches, she adjusts her vocal tract to make her voice resonate. In effect, she "tunes" the resonance frequency of her vocal tract to match the frequency of the pitch at which she is singing. This vocal-tract tuning, which gives a soprano's voice enough power to fill an opera house, is what makes certain words at high pitches difficult for the audience to understand. (It is joked by singers that Wagner's character of Siegfried in *Der Ring des Nibelungen* ought to have been called S*ah*gfried, as his name is sometimes pronounced that way by sopranos looking to get the most volume out of their voices.) Jane Eaglen, a critically acclaimed soprano who has performed Wagner's works in opera houses worldwide, explains that sopranos must try to find a balance between power and clarity. "It's really about how you modify the vowels at the top of the voice so that the words are still understandable but so that you are also making the best sound that you can make," she says.

Composers generally cope with this problem by writing lyrics for sopranos that are not essential to their operas' plots. But Smith and Wolfe began to wonder whether some hadn't found a better solution. They realized that composers could actually avoid the problem completely by pairing words with notes at which the vowel sounds resonated naturally in a singer's mouth. Smith saw Wagner—a perfectionist notorious for writing long and demanding soprano roles—as an obvious candidate on which he and Wolfe could test their theory.

Wagner was a ruthless opportunist and an outspoken anti-Semite with an ego on par with the grandiosity of his operas. His narcissism and stubbornness plagued his personal life, but shaped him into an idealistic and dedicated artist who was utterly uncompromising in his work. It took him almost 30 years to complete his *Der Ring des Nibelungen* cycle. He was methodical in his research, engrossing himself in Hellenic dramas and Norse mythology. He worked and reworked each opera without regard for the growing horde of creditors that was never far behind him. When need be, he even created new instruments and edifices—he invented the Wagner tuba, and, in the 1870s, built his own opera house, the Bayreuth Festspielhaus, just to get the sounds he wanted.

Smith felt that through this obsession with perfection, Wagner might have come to understand the relationship between vowel sounds and pitch necessary to overcome the soprano problem. “He was a man of huge experience who had a lot of time to polish his operas,” Smith explains. “Others had to do it for a living, but Wagner sponged off other people.”

Perhaps most importantly, Smith’s decision to focus on Wagner was also influenced by the sheer scope and demand of Wagner’s ultimate vision: to synthesize all forms of artistic expression into what he called “total artwork.” He wrote passionately about this theory in his 150-page essay, *The Art-Work of the Future*, referring to dance, tone, and poetry as the “three primeval sisters” without which no work of art is complete.

“Wagner always said that he wanted to be Shakespeare and Beethoven in one. He wanted to write great plays and set those plays to great music,” says Michael Saffle, a musicologist at Virginia Tech. In pursuit of “total artwork,” Wagner allowed no artistic component of his operas to take precedence over any other; the plot was as important as the score and the design of the set as important as the poetry of the libretto. (He considered his librettos literature in their own right, even going so far as to publish them as independent works.) His operas contained subtle plot twists that required his audience to pay careful attention to the lyrics being sung. Wagner couldn’t—and wouldn’t—compromise the intelligibility of his lyrics during high soprano parts. “You weren’t supposed to go just to tap your toe to the tunes,” Saffle says. “He didn’t want that. He wanted you to take in everything, and everything had to play a crucial part.”

So one evening in his garden while he was recovering from surgery, Smith took up a pen and paper and went through *Götterdämmerung* note-by-note, lyric-by-lyric, recording which notes were paired with which vowel sounds. In the early hours of the next morning he wrote a computer program to determine with statistical certainty whether Wagner had in fact used a vowel-pitch matching technique. Looking at the program’s first results, he was amazed. There was a clear relationship.

After Smith’s discovery, he and Wolfe began analyzing more of Wagner’s work. “It’s quite a tedious job, but sitting in the garden reading Wagner is not a bad way to spend your time,” Smith says. In all, Smith and Wolfe looked at four of the composer’s works, including *Tristan und Isolde* and three operas from Wagner’s magnum opus, *Der Ring des Nibelungen*. In each case they found a statistically significant correlation between the music and lyrics. For comparison they also looked at operas by Mozart, Rossini, and Strauss and determined that, in these compositions, no such correlation existed. This didn’t surprise Eaglen. “Some composers had a better idea of how voices worked than others. For example, Beethoven did not really understand how the voice works. But Wagner clearly did,” she says. Smith and Wolfe first published their findings in the *Journal of the Acoustical Society of America* this July, and since then they have continued to test the works of more modern composers. “Wagner’s operas have certainly the strongest effect we have seen by a long way,” Smith says.

The researchers found that as Wagner’s career progressed he continued to improve his vowel-pitch matching technique, suggesting that over time he had developed an intuitive sense of the interplay between words and music in his operas. Though he couldn’t express this concept in scientific terms, on some level he certainly grasped it. Eaglen’s experience performing the character of Brünnhilde throughout the *Der Ring des Nibelungen* cycle also corroborates what Smith and Wolfe discovered. “The progression of that character is just fascinating. What Wagner writes for her at the end of

Götterdämmerung isn't the same music that he could have written in *Die Walküre* [the second opera in the cycle, written 18 years before *Götterdämmerung*]. His music develops along with her character," she says.

The impact of Wagner's "total artwork" is hard to pin down exactly, but the man himself is without question one of the most influential artists of the last 200 years. "Wagner influenced—positively or negatively—almost every subsequent musician," Saffle says. Some say composers like Richard Strauss and John Williams (the latter of whom is perhaps most well known for scoring films like *Star Wars* and *Jurassic Park*) both bear the mark of Wagner. And according to Saffle, you can find him outside of music as well. He is often considered to have anticipated film with his operas. "Terry Gilliam's *Fear and Loathing in Las Vegas* is a Wagnerian movie," he says. "It's all-encompassing, like Wagner's total artwork. It takes the individual and hurls him up into the air or throws him down into the ground. That sense of emotional space, that is Wagner."

Just as Jackson Pollock incorporated fractals into his splatter paintings, Wagner seems to have used vowel-pitch matching in his operas—a concept that scientists wouldn't formally explain for well over a century. And though it would certainly be going too far to suggest that vowel-pitch matching alone was responsible for Wagner's grand compositions, without a strong intuitive sense of the human voice and its limitations, it is unlikely that he would have been able to take his unified theory of art so far. If understanding of concepts like vowel-pitch matching can emerge from the vastly different frameworks of art and science, then surely there is merit to considering Wagner's thoughts on the eventual intersection of the two fields: In *The Art-Work of the Future*, he writes, "The end of Science is the justifying of the Unconscious, the giving of self-consciousness to Life…. As Science melts away into the recognition of the ultimate and self-determinate reality, of actual Life itself: so does this avowal win its frankest, most direct expression in Art."

http://seedmagazine.com/content/print/the_wagnerian_method

Malignant sadness

James Boswell, Charlotte Brontë, Charles Darwin, Florence Nightingale, Marcel Proust, and Andy Warhol - what do they all have in common? They were all hypochondriacs. Brian Dillon examines the relationship between creativity, illness and the imagination

Brian Dillon

- The Guardian, Saturday 22 August 2009

'Seeing the parallels between sickbed sensitivities and the delicate rigour of aesthetic feeling' ... Marcel Proust. Photograph: Hulton Archive

On Saturday 6 August 1763 James Boswell, then aged 22, boarded the Prince of Wales packet boat at Harwich, on the coast of Essex. The ship was bound for the Dutch port of Helvoetsluys; from there, Boswell travelled to the university town of Utrecht where, at the insistence of his father, he was to study law. He was being punished for his scandalous life in London - he'd lately converted to Catholicism and fathered an illegitimate son whom he would never see - but none of this quite explains his dismal mood in the days before he left for Holland. His friend and mentor Samuel Johnson found him agitated, gloomy and dejected as they shared the journey to Harwich. The elder man was moved to remark of a moth that burned itself to death in a candle flame: "That creature was its own tormenter, and I believe its name was Boswell."

Tormented Hope

: Nine Hypochondriac Lives

by Brian Dillon

Pneguin,

£18.99

The reluctant scholar's spirits had sunk even lower by the time he reached Utrecht. He was not cheered by his lodgings, next door to the town's half-ruined cathedral, and "groaned with the idea of living all winter in so shocking a place". He woke the next day in profound despair and ran out into the streets, convinced he was going mad. He groaned aloud as he turned from the cathedral square, cried out as he crossed the city's turbid canals and wept openly in the faces of passing strangers. In the weeks that followed, Boswell's letters traced a pitiful decline; to his friend William Temple, he described a wretchedness that, he insisted, nobody who had not suffered it could fully comprehend. "I have been melancholy," he wrote, "to the most shocking and tormenting degree."

Boswell struggled to effect a cure for his Dutch malaise. He was certain at first that the trouble arose from his native laziness; his body seemed to revolt against the rigours of the diurnal round. He and Johnson had once imagined a machine for raising a sluggard body from its bed; now he determined on a vigorous regime of early-morning exercise and prompt voiding of the bowels after breakfast. At times, he thought his problem was a sexual one, but could not decide if the remedy lay in pious abstinence or "debauching a Dutch girl". But the most striking thing about Boswell's grim sojourn in Utrecht is the mania for planning, and for writing, that overcame him as his mood darkened. He filled journals and memoranda with desperate injunctions to better himself morally, socially and intellectually. He tried to parse his days in advance like sentences or equations, but his nights were filled with regret as his therapeutic schedule unravelled time and again.

What exactly was the nature of Boswell's illness? By the end of his first term in Utrecht, he had self-identified as "splenetic", "nervous" and "melancholy". But 25 years later, in the pages of the London Magazine, he cut through his youthful confusion to what seemed a definitive diagnosis: throughout his life, he averred, he had suffered frequent bouts of "hypochondria". The term would surprise us if Boswell were not already writing, in the essay in question, in the persona of the Hypochondriack: his sickly successor to Johnson's Rambler and Joseph Addison's Spectator. Quite what Boswell and his century meant by "hypochondria" is a vexed question. It was considered both a physical and a psychological distemper, an ailment at once of the imagination and the viscera, an extremely common disease that seemed also to set its sufferers apart from the ordinary throng of crocks and invalids. Hypochondria was a real sickness with all-too-actual symptoms - flatulence, constipation, headaches, vertigo, insomnia and palpitations among them - but it was also a painful amalgam of fear, delusion and a strange sort of insight into what it meant to be an embodied being.

In the two and a half centuries since Boswell's collapse, medical lore and ordinary usage have narrowed our definition of hypochondria to a finer point of anxiety and deception. The idea that the hypochondriac suffered unwarranted apprehensions and false beliefs about his or (less frequently) her body had always been present; Nicholas Robinson, in 1729, writes of the patient's "impertinent or groundless fears". But today "hypochondria" usually means little more than this: a simple case of misplaced terror or mistaken conviction about one's body. The contemporary hypochondriac is well known, anecdotally, to all of us. As a character type, he or she is pretty disreputable, a malingering drain on our capacity for patience and empathy, at worst a parasite on scarce healthcare resources.

Accordingly, hypochondriacs are almost always other people; few of us care to admit to the levels of delusion and self-regard that we deprecate in the personalities of the "worried well". I tend to tell myself, for example, that my own case of chronic health anxiety is a thing of the past. In my teens and 20s, in the aftermath of my parents' early deaths, I became convinced that I would be next to die, and began to interpret every stray discomfort as a sign of the dread disease that would take me away. It took a complete breakdown in my late 20s to convince me that the problem was not with my body at all, and my "symptoms" started to recede. And yet, I have to admit that even now, more than a decade later, fatigue or stress or a long period of unproductive work can bring on the old fears, and I slip too easily into former habits of thought, apprehension and assurance-seeking. At such moments, one conveniently forgets the rich history - from Molière's Le Malade Imaginaire to the films and public persona of Woody Allen - of the hypochondriac as comic dupe of medical quackery or anxious existential somatiser.

The narrative of the refinement of "hypochondria" from luridly real disease to the name we give to an overactive medical imagination - and the parallel story of what we might still learn from our fears - begins with the Greeks, for whom the hypochondrium was the area just below the rib cage. That meaning survives in Robert Burton's prodigious and vagrant Anatomy of Melancholy, published in 1621. In his chapter on the "Symptoms of Windy Hypochondriacal Melancholy", Burton mentions "sharp belchings, fulsome crudities, heat in the bowels, wind and rumbling in the guts, vehement gripings, pain in the belly and stomach". At the same time, the hypochondriac may suffer from terror and grief, or imagine himself invaded by some implausible parasite, such as a serpent or a frog. A century later, this combination of physical and psychological symptoms was well established among medical writers; George Cheyne, writing in 1733, goes so far as to suggest that together they comprise a specific "English malady": a new type of oversensitivity brought on by modern luxury and ease.

When the Victorians spoke of "hypochondria", they still intended an actual illness, and not merely the tenacious fear of such. Its symptoms, however, now more closely resembled what we might today call anxiety or depression, tended to shade off into the adjacent ailments of melancholy, hysteria and neurasthenia. More than anything, the hypochondriac was a creature of exaggerated sensibility. Take the figure at the dilapidated heart of Edgar Allan Poe's The Fall of the House of Usher. Roderick Usher, the tale's narrator tells us, is a chronic hypochondriac, painfully susceptible to the slightest sensations, sounds, tastes and smells; even the air about his rotting mansion seems to him horribly alive and malignant. Later in the century, it is the super-sensitive dandy who is diagnosed as hypochondriacal; in Joris-Karl Huysmans's feverishly decadent 1884 novel Against Nature, the "hypochondria" of the aesthete protagonist, Des Esseintes, is another name for his morbid allergy to ordinary life.

What these haggard figures share is a sickly sense of their own exceptional nature, and a desperate desire for solitude. Victorian hypochondria seems to have been intimately connected to the need for creative reclusion, nowhere more so than in the lives and writings of certain notable female hypochondriacs. Charlotte Brontë, for example, claimed to have suffered her first hypochondriacal fit while teaching at Roe Head at 19. The illness, she wrote, "made life a continual waking nightmare". Brontë put her crisis down to the drudgery of teaching, which left her little time to write; she felt, she said, "the heavy gloom of many long hours". Readers of Jane Eyre may recall that on the night before they are meant to be married, Rochester dismisses Jane's fear as a "hypochondria" born of excitement and fatigue. But the fullest expression of Brontë's own malady comes in Villette, when the novel's narrator, Lucy Snowe, her privacy invaded and her covert desires exposed, succumbs to "that strangest spectre, Hypochondria".

Brontë seems to have meant by the word a debilitating perplex of panic and despair: something close to a "breakdown" in the modern sense. She was not alone in explaining her crisis in terms of a young woman's total lack of social or intellectual autonomy. Florence Nightingale, in her anguished polemic Cassandra, deplored the domestic tyranny that constrained her early life: "To be absent from dinner is the equivalent of being ill. Nothing else will excuse us from it. Bodily incapacity is the only apology valid." Nightingale did not describe herself as hypochondriacal, but her physical and emotional collapse on returning from the Crimean war in 1856 - as Mark Bostridge points out in his recent biography, she may have been suffering from chronic brucellosis - has something about it of Brontë's "silent suffering", though she deployed her enfeeblement more energetically. Illness allowed Nightingale to retreat from public life, all the better to campaign tirelessly for medical reform from the sanctuary of her sickbed at the Burlington Hotel. As Lytton Strachey wrote of her "She found the machinery of illness scarcely less effective as a barrier against the eyes of men than the ceremonial of a great palace."

A similar sense of agonised but industrious seclusion surrounds Alice James. The younger sister of Henry and William was a lifelong invalid of such ambiguous symptomatology and temperament that she seems to languish apart, in a hypochondriacal category all her own: that of the ironic and cheerful malingerer. In her youth, she was diagnosed as hysterical, and submitted to the fashionable treatments of the day, but neither the rest cure advocated by the neurologist Silas Weir Mitchell, nor the exercise regime she endured at the New York clinic of Charles Fayette Taylor, could rid her of the desire to die, nor of her worsening physical symptoms. By her 30s, she was a confirmed incurable, plagued with disorders of the stomach and the spine, scarcely able to walk but still expressing her sarcastic and scurrilous worldview in

her diaries and her letters, especially to William, who seemed best able to grasp the strangeness of her case.

What sets James apart from the ordinary female hypochondriacs of her era is her curious and affecting response to the news, at the age of 42, that she was really dying. On 27 May 1891, she was examined at her house in London by the renowned physician Sir Andrew Clark, who noted his patient's long-standing "nervous hyperaesthesia", her "spinal neurosis" and "rheumatic gout", but now added to the litany a tumour of the breast that was sure to kill her. Four days later, James wrote to her diary: "To him who waits, all things come! My aspirations may have been eccentric, but I cannot complain now, that they have not been brilliantly fulfilled." It was as if, after decades of obscure symptoms and vague prognoses, bound up no doubt with her peripheral status at the edge of a brilliant family, James truly began to live at the moment she knew she was dying. Her illnesses had been works in progress, and she was ready at last to deliver, in the form of her own death, a masterpiece to rival those of her brothers.

James's insight into her own case, and her apparent presence of mind as the end approached - "Where does the fun come in?" she asked of death in her last days - are almost enough to disqualify her from a diagnosis of hypochondria; the patient is usually denied such a clear sense of his or her own valetudinarian tendencies. Charles Darwin, for example, seems to have evinced no grasp whatever of his hypochondriacal character, except to say, in an autobiographical fragment, that "ill-health ... has saved me from the distractions of society and amusement". Like Florence Nightingale, Darwin appears to have been afflicted with some authentic organic disease, though none of the suggested disorders he might have contracted on his travels have yet completely convinced. His actual illness is perhaps beside the point. The more intriguing aspect of Darwin's ill health is to be found in his giving himself up to two high-Victorian enthusiasms: dyspepsia and the hydrotherapy that was meant to cure it. Darwin sedulously recorded his bouts of flatulence and dutifully travelled to Malvern, where he was sluiced inside and out with cold water.

Such attention to his own ailments puts Darwin in the select company of his century's most creative hypochondriacs. Tennyson, Dickens, Wilkie Collins and Thomas and Jane Carlyle were all adepts of the water cure and keen watchers over their symptoms, real and imaginary. (Tennyson, for instance, became obsessed by the floaters that hovered before his eyes: "These 'animals' ... are very distressing", he wrote.) But they were trumped a few decades later, in terms of debility and detailed self-anatomising, by the recumbent figure of Proust, air-locked in his apartment on the Boulevard Haussmann, muffled in sweaters and choking on medicinal powders, surviving on little but coffee and cold beer as he struggled to finish his novel.

The details of Proust's asthma-induced decline - the cork-lined room and nocturnal habits, his allergy to everything from household dust to a rough handkerchief - are so well known that it is easy to forget that A La Recherche du Temps Perdu is itself a sort of treatise on hypochondria and its artistic uses. Proust, it seems, was well aware of the contemporary explanation for hypochondria - it was thought at the turn of the century to be a disorder of the "common sense" or "coenaesthetic" faculty, by which we apprehend the evidence of our senses - and the book is full of instances of physiological as well as aesthetic oversensitivity. The Proustian hypochondriac feels the world press too keenly on him; he mistakes perfectly ordinary sensations for deep afflictions. (In Proust's own case, the touch of a damp towel could send him into hypochondriacal paroxysms.) Proust's genius consists partly in seeing the parallels between sickbed sensitivities and the delicate rigour of aesthetic feeling. What was a vague cliché for the Romantics - the artist's pallor and susceptibility - becomes for Proust a matter of neurology.

In light of the importance of diseases of the "common sense" to psychiatrists of the late 19th century, it comes as a surprise that Freud wrote so little - and that somewhat confusing, if not confused - on the subject of hypochondria. He seems to have wavered both in trying to describe the condition and to suggest a possible explanation. In 1887, in a letter to Wilhelm Fliess, Freud claimed, rather vaguely, that hypochondria was just an adjunct symptom of neurasthenia. To Fliess again, in 1895, he suggested a sexual origin; but once more, that tells us little about how hypochondria might differ from other neuroses. A decade and a half later, Freud was proffering a neatly aphoristic definition - hypochondria was "the

state of being in love with one's own illness" - but also admitting that the whole subject was "suspended in darkness" and subject to "nothing but suppositions".

The text of Freud's in which we can grasp something of the full horror of a florid hypochondria, and learn a startling lesson about just how far an individual may stray from a realistic conception of himself, is his 1911 essay on the delusions of Daniel Paul Schreber, a German judge who suffered 35 years of almost constant mental illness, most of it expressed through bizarre beliefs about his body. "Psychoanalytic Remarks On an Autobiographically Described Case of Paranoia (Dementia Paranoides)" is based on Schreber's own Memoirs of My Nervous Illness, in which the scarcely recovered jurist recounts his extraordinary symptoms. Diagnosed in middle age with a case of hypochondria, Schreber quickly declined: among countless fantastical notions, he thought he was turning into a woman, that he was destined to be impregnated by God, that his head had been colonised by "little men" and his stomach been removed so that food consequently accumulated in his legs.

Schreber's agony is one extreme outcome of the hypochondriac affliction: a generalised and catastrophic misreading of the state of one's physical being. For centuries, physicians had recorded cases that were hardly less weird. The "glass delusion" that flourished from the late middle ages onwards is perhaps the most striking. The patient imagined that he was made of glass, entirely or in part; Thomas Walkington, in 1607, wrote of a Venetian "fool" who was afraid to sit down for fear of shattering his "crackling hinderparts".

By the middle of the 20th century, "hypochondria" had come to denote little more than the exaggerated fear of illness or the erroneous belief in its actual presence. (Freud's ambivalence is partly to blame for this etymological shrinkage; it seemed that "hypochondriasis" was always explicable in terms of another, more comprehensively theorised neurosis.) The condition had meanwhile lost its frequent, and even fashionable, association with the artistic temperament. But that is not to say that hypochondria cannot still teach us something about the relationship between creativity and embodiment, illness and imagination. Consider the case of Glenn Gould, whose numerous eccentricities at the piano and in his daily life - Gould wrapped himself in scarf and gloves in the hottest weather, shrank from physical contact with others and kept voluminous records of his mostly imaginary symptoms - point to a physical retreat from the world that mirrors his retirement from the concert hall in 1964. Just as the recording studio then became Gould's musical prosthesis, so his hypochondria allowed him to engage with the world at a comforting distance.

The visual artist of the late 20th century who knew most about the dangers and pleasures of physical proximity and aesthetic distance was Andy Warhol, and it is no surprise to discover that throughout his life he was a hypochondriac with a fretful and fertile imagination. The sources of Warhol's bodily unease are well known - his hair loss, his bad skin, the physical and emotional scars from his shooting in 1968 - but his diaries record a much wider variety of fears: cancer, brain tumours, Aids ("the magic disease") and the medical profession itself. (In the end, this last fear hastened his death: had he attended earlier to his inflamed gall bladder, he might have survived the rigours of the hospital; instead, he died of a heart attack in 1987, just hours after surgery.)

Warhol is also our hypochondriac precursor: his life and art appear to predict precisely the obsessions - weight, complexion, age, aesthetics, the virulence of new diseases and the efficacy of the cures for the old ones - of a society whose medical imagination is better informed than before, but just as susceptible to grisly images of illness and anxious prophylaxis against decay. Though we live at a time when hypochondria is routinely described as merely another anxiety disorder, to be treated with drugs and cognitive-behavioural therapy, we do well to recall the fundamental questions it invites us to ask about disease and well-being, and about the proper attitude to our mortality. Every historical period has felt itself to be an era of heightened hypochondriacal anxieties; the disorder remains current, but its manifestations shift and alter and overlap from one century, or one decade, to another. The history of hypochondria is an X-ray of the more solid and familiar history of medicine; it reveals the underlying structure of our hopes and fears about our bodies.

The young Boswell's hypochondria lingered on, in fits and starts, for several months. He tried to distract himself by learning French and falling in love with two women at once; one of them also declared herself a chronic hypochondriac. He consulted notable physicians in The Hague and Leyden, who prescribed either total rest or constant activity. At length, he paid a visit to Jean-Jacques Rousseau, who concluded of his agitated admirer: "He is a convalescent whom the last relapse will infallibly destroy." Years later, in the London Magazine, Boswell wrote, he said, solely to distract himself and others from their hypochondria: "I myself have been frequently terrified, and dismally afflicted in this way; nor can I yet secure my mind against it at gloomy seasons of dejection."

Brian Dillon's Tormented Hope: is published by Penguin on 3 September. He will chair a public symposium, 'Culture and Hypochondria', at Tate Britain on 18 September.

http://www.guardian.co.uk/books/2009/aug/22/creativity-hypochondria-brian-dillon

A city dedicated to books and print

By Edwin Heathcote
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Publishing company Dulnyouk (above and below, right) by Foreign Office Architects in Paju Book City, South Korea

The idea of a city of books evokes a fantastical vision: towers of tottering volumes, narrow alleys formed by canyons and stacks of dusty hardbacks, formal avenues between loaded shelves. Like something imagined by Calvino or Borges, it conjures up a city of wisdom and surprise, of endless narratives, meaning, knowledge and languages. What it does not evoke is an industrial estate bounded by a motorway and the heavily guarded edge of a demilitarised zone. Yet somehow, South Korea's Paju Book City begins to reconcile these two extremes into one of the most unexpected and remarkable architectural endeavours.

Built on marshland, former flood plains and paddyfields 30km north-west of Seoul, Paju Book City is an attempt to create an ambitious new town based exclusively around publishing. We may be reading obituaries of the book and the printed word almost daily, but the news has not reached Paju. Plans for the Book City were first proposed in 1989, as the country was emerging from a period of political repression. Publishing had gathered momentum and status after years of underground activity and censorship, and it re-emerged after the liberalisation of the regime in 1987 in an explosion of small, often family-run publishers. Their beautifully crafted books attempted to re-engage the nation with the history and culture that had been distorted, manipulated and lost over a period which included colonial rule from Japan, brutal civil war and military dictatorship. The project was also, at least in part, a reaction to the rapacious redevelopment of Seoul, the loss of the city's historic fabric and its rapid embrace of the culture of bigness and congestion. That it was christened a "City to Recover Lost Humanity" tells us much about its creators' intentions.

The project was initiated by publisher Yi Ki-Ung, whose ambition extended to creating a city of books that would also become a kind of museum of architecture: Paju features buildings by some of the finest architects working in the world today. The 1.5m sq m masterplan and the most sophisticated buildings on the site were carried out by the remarkable London-based Architectural Research Unit, run by Florian Beigel and Philip Christou. They wanted to create what they called, delightfully, an "urban wetland" – a paradoxical idea that allows them to root the new city in the landscape, to create something tied to its context rather than a suburban non-place. That context is beautiful, even epic, in its own way – the Han River, the mountain backdrop – but all that is cut off by the elevated motorway which also acts as a dyke. So the city is constructed on two levels: a dense street level, which accommodates the activity of the city

itself, and a sparser upper level Beigel poetically refers to as “the strata belonging to the horizon”. Here a series of rooftop pavilions, elevated public spaces and buildings crowning bigger buildings below look over the road and out to the landscape beyond.

The city plan follows the contours and lines of the landscape, one main road snaking through it like a river and a series of tighter roads creating a denser network of small publishing houses, printers, distributers and so on. There are some extraordinarily ambitious buildings here. Just finishing construction is the Mimesis Museum, one of the Portuguese architect Alvaro Siza’s most arresting recent structures – its sheer concrete walls curve like the pages of a book in the wind, wrapping around a sculptural courtyard at its heart. SANAA, the Japanese architects of this year’s Serpentine Pavilion in London, have designed a stripped-down box, a publisher’s building of stark, striking elegance. London-based Foreign Office Architects have built a wonderfully theatrical publishing house which appears on the street as a modernist sliver, a delicately folded façade of glass which reveals sides with an almost nautical quality, clad in timber where they face a garden. There are exotically ambitious buildings under construction by Yung Ho Chang, Xaveer de Geyter, Stan Allen and some structures by Korean architects which would astound in any capital, let alone on a suburban Seoul industrial complex – notably those of Moogyu Choi and a bravado piece of concrete expressionism from Kim Jun-sung and Hallim Suh.

At the centre of the city stands a huge cultural complex, designed by Kim Byung-yoon, a combination of hotel (in which, it was pointed out to me, there are no TVs), restaurants, auditoriums and, on the roof, an urbane, elevated realm of seating, shops, libraries and galleries overlooking the sparkling waters of the river and the Simhak Mountain.The finest buildings on the site, though, are by the ARU themselves (together with local partner Choi Jong Hoon). The first was for Yi Ki-Ung’s own Youl Hwa Dang publishing house, an enigmatic U-shaped building around a small courtyard. It looks like a bold pictogram, with a dark street façade, but to the courtyard there are “walls of light”, translucent membranes that recall the paper walls of traditional houses. An extension which contains a bookshop and café presents an intriguing contrast to the original buildings, retaining the subtlest memories of classical European urban architecture in moulding details, a portico and so on. This conservatism was conceived as a gentle provocation to the radical modernism all around and it works, with a startling clarity.

The ARU’s other structure, equally compelling, is for the Positive Thinking Publishing House. Designed as offices on a domestic scale and split into two units that create an intimate public plaza between them, they are built of traditional dark grey Korean brick set into a steel frame. The result is a hybrid of deeply embedded oriental and European archetypes. There is something here of Wittgenstein’s house, something of Beijing’s courtyard houses, a kind of Eurasian architectonic language which also, amazingly, manages to be conservative and deeply in thrall to the radical modernism of Mies van der Rohe. Inside, the surprises continue. The ceilings become an inverted urban landscape as a series of blocky paper lanterns break up the space from above. The domestic scale is wonderful: these feel like publishing offices, no plate glass, no open plan, rather a series of humane rooms, terraces and natural light.

If there is a problem at Paju it is that, as in all new cities, there is a kind of stillness, a lack of real density. This is compounded by zoning issues: as this is designated an industrial zone, the building of dwellings is difficult, and without places for people actually to live an area can never become a real city. Nevertheless, housing is slowly being built, and there are stirrings of the urban and commercial activity that constitute the beginnings of a real place.

It is not hyperbole to claim that this is one of the most extraordinary and most unsung cultural and architectural developments in the world. The idea that a city, right now, be dedicated solely to print and that an industrial estate could be a place of architectural pilgrimage could not be more heartening, more encouraging to anyone who delights in those very old information technologies – books and buildings

http://www.ft.com/cms/s/2/26852872-8de2-11de-93df-00144feabdc0.html

British Design: Not What It Used to Be
By ALICE RAWSTHORN

LONDON — Strikes. Disappearing letters. Shuttered post offices. Irritatingly long queues and suspicious smells in the survivors. There are (sadly) lots of reasons for the British to indulge in the popular national pastime of grumbling about the Royal Mail this summer.

The appearance last week of a new series of Royal Mail stamps to celebrate the 200th anniversary of the postbox should have struck a cheerier tone. Even the grouchiest grumblers agree that old-fashioned mailboxes are among the most popular symbols of Britain, and share many characteristics of the country's other design icons.

One is that they come in a rousing shade of red, like the K2 telephone kiosk and Routemaster double-decker bus. Another is that they have the gutsy, no-nonsense engineering aesthetic of the K2, Routemaster and other national design gems, including the Concorde and Spitfire fighter jet. (The French tend to favor elegant icons, like the delicate Art Nouveau ironwork of the Paris subway and those dainty blue and white enamel street signs, but the pretension-phobic British prefer theirs to look pragmatic.) And like so many other jewels of Britain's design heritage, the postbox is not what it used to be.

In fairness to the Royal Mail (not that I feel like doing it any favors in light of its other recent offenses), the design standards of mailboxes have not plunged quite as precipitously as those of phone booths and buses. The latest designs are unforgivably mediocre, but are neither as ugly as the shabby vandal-magnets that now pass for telephone kiosks, nor as dysfunctional as the lethally long "bendy buses," which were imported to Britain from Germany to become objects of national hatred, alongside tax inspectors, bonus-

grabbing bankers and expense-fiddling politicians. Why have so many British design treasures been so badly neglected?

There are some boringly obvious logistical reasons. The “change for change’s sake” syndrome among ambitious executives in an era of ever-decreasing corporate life expectancy makes them feel compelled to meddle with perfectly good designs to make an impact or, better still (in their eyes, at least), to replace them with something new. They then bungle the process of making modifications or choosing replacements by dint of any or all of the following: cowardice, laziness, lack of imagination, delegating decision-making to committees or focus groups (even though the result is bound to be compromised) and plain ineptitude.

None of these problems are limited to public design projects. They are routine corporate crimes that bedevil every area of design, and explain why we end up with other disasters, like inoperable cellphones, illegible instruction manuals, neurotically overstyled espresso machines and landfill sites bloated with indestructible, non-biodegradable rubbish. But their impact is greater when applied to public commissions, because mailboxes, phone booths and the like are so much more visible. Not only are there lots of them, they tend to be big and to be used by many people, not just individuals. If you analyze the design deficiencies of the average cellphone, they are depressingly similar to those of a Royal Mail postbox, but the latter will be seen by millions of people, regardless of whether or not they actually use it, while the phone will seem conspicuous only to its luckless owner.

All of this could, of course, be avoided, if the designers, and the people who commission them, were better equipped to do their jobs. Throughout design history, almost every national design coup was initiated by a stellar patron, not just in Britain, but other countries, too. Take Frank Pick, who made London Transport a model of modern design management in the early 1900s. Many of his innovations, like Harry Beck’s 1933 diagrammatic London Underground map and Edward Johnston’s 1916 roundel symbol, are still in use today. Pick oversaw everything, traveling around the network on rare “nights off” to check that it was perfect. Even the Routemaster, which was commissioned after his retirement, owes much to his legacy.

None of the people currently running London Transport come close to matching Pick’s dynamism, nor do their peers at the Royal Mail or British Telecom, and they tend to choose designers of their own mettle (or lack of it).

There is another problem, which is specific to public projects. An essential quality of a national design gem is that it reflects the country’s culture. The neo-classical dome of the K2 telephone kiosk symbolized Britain’s attachment to tradition and ambivalence toward modernity in the 1920s, just as the Routemaster’s can-do style captured the determination of the postwar era.

It was easier for designers to accomplish this then than it is today, when Britain’s national identity seems so much more complex, diverse and contradictory than it did in the 1920s and 1940s. Those eras had their complexities, too, but there was less inclination to recognize them, and it is simpler for designers to articulate a clearly defined message, than ambiguity.

This goes some way to explaining why so few new design jewels have emerged, although the shortcomings of the current postboxes, phone booths and most other flops are down to bad design, rather than doomed attempts to reflect the confusion of modern life. The achingly embarrassing London 2012 Olympics logo succeeds in doing that, but is also ugly and inappropriate.

And success is possible, as Matthew Dent proved with his designs for Britain’s new coins, which were introduced last year by the Royal Mint. The backs of the 50-, 20-, 10-, 5- and 2-pence and 1-penny coins bear fragments of the 14th-century Shield of the Royal arms. When those coins are placed together the shield appears intact, as it does on the back of the £1 coin. By fracturing an emblem of British history and reunifying it, Mr. Dent created a sensitive and appealing symbol of contemporary Britain, which has proved so popular that the Royal Mint has run short of coins, because people are keeping, rather than spending, them.

http://www.nytimes.com/2009/08/24/fashion/24iht-design24.html?_r=1&partner=rss&emc=rss

As Heroes Disappear, the City Needs More
By NICOLAI OUROUSSOFF

The death of Charles Gwathmey early this month has provoked a lot of nostalgic reminiscence in the New York architecture world: not just about Mr. Gwathmey himself, but also about the New York Five, a group of influential architects of which he was part.

This nostalgia has much to do with what's been lost in the years since the group's prominence in the 1970s. The early years of that decade was a time when this city was beginning to close itself off to innovative architecture. But it was also a time when New York could still claim to be the country's center of architectural thought, and Mr. Gwathmey and his colleagues had a great deal to do with maintaining that pre-eminence in the public imagination. The New York Five came to represent the idea that architecture could still express and advance our values as a culture. To some, the group embodies the last heroic period in New York architecture.

That the five came together at all seems almost an accident of fate. They had no real manifesto, no common aesthetic. Several young, promising New York architects were invited by Arthur Drexler, the director of the Museum of Modern Art's legendary architecture department, to meet informally in the museum board room one day in the late '60s to talk about their work. More meetings followed, a few attendees dropped out, others joined in. When the book "Five Architects," which inspired the group's name, was published in 1972, its success was a shock to everyone.

What the five architects did share, however, was a desire to reassert the importance of architecture as art form during a crisis in the profession. By the mid-1960s much of the Modernist dream was in ruins, and one of its central tenets — that architecture could act as an agent of positive social change — lay buried beneath decades of failed urban housing projects, soulless government buildings and sterile concrete plazas.

At the same time activists like Jane Jacobs were portraying modern architecture as the product of smug, pointy-headed academics out of touch with the way real people live. Her vision of the ideal city — a historical community of brownstones, front stoops and corner stores — was modeled on the North End in Boston and Greenwich Village. It left little room for new architectural ideas.

Faced with such a hostile climate, some of the New York Five began looking to other creative disciplines for a way out of this malaise. John Hejduk, for example, often cited Fernand Léger and Juan Gris as an inspiration. The carefully assembled forms of Michael Graves's early projects drew inspiration from the still-life paintings of Giorgio Morandi. (Even Richard Meier's refined glass-and-steel aesthetic, which owed its most obvious debt to orthodox Modernism, turned the classical Modernist house into a fetishized art object.)

The group's greatest contribution, in retrospect, was its assertion that architecture had not reached a dead end. The architects saw themselves as artists and thinkers — not activists — and this was particularly true

of Peter Eisenman, sometimes to a fault. The distorted grids of his early houses, with their references to Renaissance precedents and Structuralist theory, were not only a way to thumb a nose gleefully at Jacobs-style populism; they also elevated conceptual ideas above material and structure, the life of the mind over the life of the body.

To many in the profession this aesthetic approach represented a way forward. Philip Johnson, who seemed to rule the American architectural scene from his perch as a trustee at the Museum of Modern Art, began to fete the five over lunches at the Four Seasons and black-tie dinners at the Century club. He introduced them to powerful figures in the art establishment.

Yet to those who were paying attention, the party's end was evident almost as soon as it had started. By the mid-1980s the effort to suburbanize the city's core and make it safe for tourists — a process that many associate with Rudolph W. Giuliani and his mayoral quality-of-life campaigns a decade later — was well under way, and the group's members had splintered off in different directions.

Mr. Graves, once a dogmatic Modernist, retreated into an ersatz historicism. Mr. Hejduk, who died in 2000, beat a similar retreat into academia. Although Mr. Meier continues to create works of remarkable refinement, his vision has not significantly changed in decades. Only Mr. Eisenman has kept up a theoretical practice, one in which the work is continually evolving, but he has built little — and nothing in New York.

The country's creative energy shifted westward, to Los Angeles, whose vibrant mix of urban grit and nature, abundance of relatively cheap land and lack of confining historical traditions allowed architects to experiment with a freedom that had become virtually impossible in New York.

Frank Gehry, Thom Mayne, Eric Owen Moss, Robert Mangurian, Craig Hodgetts — these architects were not only the creative equals of their New York counterparts, they were making architecture that was rooted in popular culture and as rich in ideas as anything that has come out of New York in decades. They have been joined by a younger generation, including Greg Lynn, Michael Maltzan, Neil Denari and the team of Kevin Daly and Chris Genik, that has no real equivalent in New York.

A similar energy could be found in Europe and Japan, where the crisis of Modernism had not been felt as deeply and architects had never stopped experimenting.

Given that reality, it should not be surprising to anyone that the most important works of contemporary architecture to rise in New York over the past decade — Mr. Gehry's IAC headquarters on the West Side Highway, Mr. Mayne's Cooper Union building, the Tokyo firm Sanaa's New Museum of Contemporary Art on the Bowery and Jean Nouvel's tower under construction in Chelsea — were designed not by New Yorkers but by Angelenos, a Japanese woman and a Frenchman.

It is hard to know how the current financial crisis will affect this trend. More than once I've heard it suggested that the downturn will be good for architecture. The argument goes something like this: The economic tailspin will put an end to the boom in gaudy residential towers that are distorting the city's skyline. Cheap rents will attract young, hungry creative types. This will spawn a cultural flowering similar to that of the 1970s, when the Bronx was burning, graffiti artists were the norm and Gordon Matta-Clark was carving up empty warehouses on the Hudson River piers with a power saw.

But cheap rents alone won't do it. On the contrary, the construction slowdown, if it lasts long enough, will likely drive many young talents out of the profession for good. It also looks less and less likely that a government-sponsored, Works Progress Administration-style civic project will revive the profession — another favorite fantasy of the ever-optimistic architecture scene.

Real change will first demand a radical shift in our cultural priorities. Politicians will have to embrace the cosmopolitanism that was once the city's core identity. New York's cultural institutions will need to shake off the complacency that comes with age and respectability. Architects will need to see blind obedience once again as a vice, not a virtue. And New Yorkers will have to remember why they came to the city in the first place: to find a refuge from suburbia, not to replicate it. That's a tall order.

http://www.nytimes.com/2009/08/24/arts/design/24five.html?ref=design

Painting With Hands and Feet
By BENJAMIN GENOCCHIO

The Gutai group of postwar Japanese conceptual artists not only made radical abstract paintings with their hands and feet; they also sought to network with similar-minded artists in other parts of the world. One of their efforts to forge these connections is the basis for a curious little show at the Pollock-Krasner House and Study Center exploring a link between Gutai and the artist Jackson Pollock.

Multiple copies of Issues 2 and 3 of the Gutai magazine, published by the group to illustrate and promote its activities, were found in Pollock's library after his death in 1956 by a close friend, B. H. Friedman. But until recently nobody had any idea how they got there.
The answer to the mystery is contained in a recently discovered letter written by Shozo Shimamoto on behalf of the Gutai group to Pollock on Feb. 6, 1956, informing the American artist of Gutai's existence and requesting his views on some enclosed copies of its magazines.
Pollock never responded to the letter, as far as anyone knows, but kept the magazines. He died later that year.
Tetsuya Oshima, a Japanese curator, discovered the letter in 2006 while doing research on Pollock's work in Lee Krasner's papers at the Smithsonian Archives of American Art in Washington. His essay about the discovery in the catalog accompanying the present show is great reading. He also speculates that members of Gutai first saw Pollock's work in a 1951 exhibition in Japan.
The current show contains the original letter, along with Mr. Friedman's reply to the Gutai group informing them of Pollock's death.
Mr. Friedman, a writer, was greatly interested in Gutai and continued to correspond with Jiro Yoshihara, the group's charismatic leader; a selection of these letters from 1956 to 1958 is on display.
They are interesting as personal memorabilia, but not much more. Fortunately the show also contains a small but delightful selection of Gutai paintings, most of them on loan from the New York-based abstract painter Paul Jenkins, who visited the group's headquarters in Osaka in 1964.
Mr. Jenkins's Gutai paintings, acquired through exchanges and gifts, include pieces by some of the core members of the group. The rhapsodic, visually dynamic untitled oil on canvas from 1964 by Kazuo Shiraga, for example, is a prime example of his characteristic technique: using his head, hands or feet to make swirls, arcs and slashes of color.

Hanging nearby, Toshio Yoshida's untitled 1964 mixed media work recalls drip paintings by Pollock. A vibrant splatter painting, it consists of myriad flecks of paint circling a dense central shape on a black ground. It looks like an exploding star in space, or even a section of the paint-splattered floor of Pollock's studio. It is one of the best works in the show.

What Pollock thought of the paintings of this Japanese conceptual art group remains a mystery, but one imagines he would have approved of their enthusiasm for visual dynamism and the randomness of the final designs. He was at least intrigued enough by their activities to keep the copies of their journal that had been sent to him.

The exhibition curator, Ming Tiampo, has usefully included paintings and prints from the period by Pollock, Krasner and other American artists such as Mr. Jenkins and Alfonso Ossorio, giving viewers a chance to see how Gutai's experiments in painting corresponded with developments in international abstraction.

There is an obvious affinity between some of these American pieces and works by the Japanese artists, which often make use of similar techniques. For "Untitled" (1963), Sadamasa Motonaga combined broad, liquid swathes of color in much the same way that Mr. Jenkins seems to have made a work like "Phenomena Nightwood" (1962).

This is a small but immensely interesting and ambitious show that will travel to New Jersey City University, in Jersey City, in the fall. Gutai's paintings project a dynamism and playfulness that is little known or appreciated in this country.

" 'Under Each Other's Spell': Gutai and New York," Pollock-Krasner House and Study Center, 830 Springs-Fireplace Road, East Hampton, through Oct. 17. (631) 324-4929 or pkhouse.org.

http://www.nytimes.com/2009/08/23/nyregion/23artsli.html?ref=design

'Better' test for asbestos cancer

Scientists claim they have developed a more sensitive test for the asbestos-related cancer mesothelioma.

The cancer develops long after exposure to asbestos but patients usually have a limited life expectancy.

The test developed by a team at Oxford University looks at levels of a protein closely linked to the cancer in fluid around the lungs.

A UK lung expert welcomed the American Journal of Respiratory and Critical Care Medicine study.

" **A simple test which can exclude the diagnosis without resort to more invasive methods would be welcomed** "
Dr Paul Beckett, British Thoracic Society

Mesothelioma is an invariably fatal tumour found in the surface of the lung. While relatively rare, it is very difficult to treat because of its location and because it does not seem to respond well to chemotherapy.

The disease has been found in people with no history of exposure to asbestos, but inhaling the dust released by the mineral when it is broken up is known to be a key risk factor.

It has particularly affected tradesmen such as joiners, plumbers and electricians.

Because it can take many decades for the disease to develop, experts expect the number of cases in the UK to peak at around 2,200 by 2013.

Laws preventing occupational exposure to asbestos are in place in the developed world. There are no such restrictions in developing countries, however.

High levels

The researchers focused on ways of distinguishing mesothelioma as a cause of pleural effusion, the build-up of fluid in the pleural cavity surrounding the lungs.

There are many causes of this symptom, many of which are benign or linked to other types of cancer but over 90% of people with mesothelioma have the symptom. At the moment, doctors carry out pleural fluid cytology - a lab test which looks for cancerous cells.

However the Oxford team say this is not a very sensitive test.

Team members used pleural fluid samples from over 200 patients who had been referred to a specialist respiratory clinic. They then looked at levels of the protein meothelin - which is released in high quantities in the pleural fluid of most patients with mesothelioma.

It was found that levels of the protein were almost six times higher in patients with the cancer than in those with secondary lung cancers, and 10 times greater than those with benign conditions.

Rapid diagnosis

Dr Helen Davies, who worked on the research, said: "This study suggests a way for clinicians to more readily identify cases of mesothelioma from the start."

She added: "Because mesothelioma has a median survival time of 12 months, minimising the number of invasive procedures and tests patients require is crucial to reduce morbidity and the time they need to spend in hospital.

"An earlier diagnosis also allows speedier interventions to relieve symptoms as well as initiation of other treatments such as chemotherapy or radiotherapy if appropriate.

"Claims for worker's compensation may also be instigated once the diagnosis is confirmed."

Dr Paul Beckett of the British Thoracic Society said: "A simple test which can exclude the diagnosis without resort to more invasive methods would be welcomed, allowing a more streamlined diagnostic pathway both for those with and without the disease.

"Such a pathway would be expected to lead to more rapid diagnosis and therefore treatment and perhaps improve the outlook for this disease, as well as avoiding unnecessary tests in those who don't have mesothelioma."

Professor Stephen Spiro, of the British Lung Foundation, said: "This study is an important step forward, as it could lead to earlier diagnosis and better treatment of mesothelioma which is vital as currently most patients diagnosed with this disease live less than 12 months."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8214847.stm

Published: 2009/08/24 04:00:02 GMT

Upwards lightning caught on film

By Judith Burns
Science and environment reporter, BBC News

Scientists have photographed "upwards lightning", a rarely-seen phenomenon where electricity from storms flows into the upper atmosphere.

During last year's Tropical Storm Cristobal, lightning reached more than 60km (40 miles) up.

Also known as "gigantic jets", these events are just as powerful as cloud-to-ground lightning bolts.

The US team of researchers also took radio measurements of the electrical charge.

The phenomenon was photographed from a field site near Duke University in Durham, North Carolina.

Their work, published in Nature Geoscience, gives scientists a better understanding of this form of lightning.

Gigantic jets do not occur during every storm and scientists do not yet know what types of storm are conducive to their formation.

Substantial charge

Lead author Professor Steven Cummer, from Duke, told BBC News: "What we were able to conclusively show is that these are not just sparks that come out of the thunderstorm and travel upward and tickle the upper atmosphere.

"They actually deliver to the upper atmosphere as much electric charge as the very strong lightning strokes to ground."

The jets discharge a comparable amount of electricity to conventional lightning but the charge travels further and faster because the thinner air between the clouds and the ionosphere provides less resistance.

Gigantic jets are rarely photographed because they happen so quickly that cameras have to be trained on them exactly when they occur.

Professor Cummer caught the images of the event by chance. He had trained his camera on the sky above the storm, hoping to photograph another phenomenon known as "sprites". These are blue or red electrical discharges above storm clouds.

He is planning to install a low-light, high speed camera to capture colour images of gigantic jets, which could provide information about chemical processes and temperatures.

He said: "In fact, this one that we reported came from a tropical storm - not quite a hurricane.

"There is another hurricane bearing down on us that is about to hit the eastern seaboard of the US. You can be sure that we will be training our cameras on that, just in case we are lucky."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8214290.stm

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New Microchip Technology Performs 1,000 Chemical Reactions At Once

A microfluidic device held in the palm of the hand. (Credit: Image courtesy of University of California - Los Angeles)

ScienceDaily (Aug. 24, 2009) — Flasks, beakers and hot plates may soon be a thing of the past in chemistry labs. Instead of handling a few experiments on a bench top, scientists may simply pop a microchip into a computer and instantly run thousands of chemical reactions, with results — literally shrinking the lab down to the size of a thumbnail.

Toward that end, UCLA researchers have developed technology to perform more than a thousand chemical reactions at once on a stamp-size, PC-controlled microchip, which could accelerate the identification of potential drug candidates for treating diseases like cancer.

Their study appears in the Aug. 21 edition of the journal *Lab on a Chip* and is currently available online.

A team of UCLA chemists, biologists and engineers collaborated on the technology, which is based on microfluidics — the utilization of miniaturized devices to automatically handle and channel tiny amounts of liquids and chemicals invisible to the eye. The chemical reactions were performed using in situ click chemistry, a technique often used to identify potential drug molecules that bind tightly to protein enzymes to either activate or inhibit an effect in a cell, and were analyzed using mass spectrometry.

While traditionally only a few chemical reactions could be produced on a chip, the research team pioneered a way to instigate multiple reactions, thus offering a new method to quickly screen which drug molecules may work most effectively with a targeted protein enzyme. In this study, scientists produced a chip capable of conducting 1,024 reactions simultaneously, which, in a test system, ably identified potent inhibitors to the enzyme bovine carbonic anhydrase.

A thousand cycles of complex processes, including controlled sampling and mixing of a library of reagents and sequential microchannel rinsing, all took place on the microchip device and were completed in just a few hours. At the moment, the UCLA team is restricted to analyzing the reaction results off-line, but in the future, they intend to automate this aspect of the work as well.

"The precious enzyme molecules required for a single in situ click reaction in a traditional lab now can be split into hundreds of duplicates for performing hundreds of reactions in parallel, thus revolutionizing the laboratory process, reducing reagent consumption and accelerating the process for identifying potential drug candidates," said study author Hsian-Rong Tseng, a researcher at UCLA's Crump Institute for Molecular Imaging, an associate professor molecular and medical pharmacology at the David Geffen School of Medicine at UCLA, and a member of the California NanoSystems Institute at UCLA.

Kym F. Faull, director of the Pasarow Mass Spectrometry Lab at UCLA, helped the team with several challenges, including reducing the amount of chemicals needed for reactions on the chip, enhancing test sensitivity and speeding up reaction analysis.

"The system allows researchers to not only test compounds quicker but uses only tiny amounts of materials, which greatly reduces lab time and costs," said Faull, a professor of psychiatry and biobehavioral sciences at the Geffen School of Medicine.

Next steps for the team include exploring the use of this microchip technology for other screening reactions in which chemicals and material samples are in limited supply — for example, with a class of protein enzymes called kinases, which play critical roles in the malignant transformation of cancer.

According to the researchers, the technology may open up many areas for biological and medicinal study.

The study team relied on work in the UCLA labs of Michael E. Phelps, Norton Simon Professor and chair of molecular and medical pharmacology, and Clifton K.F. Shen, assistant professor of molecular and medical pharmacology. Key research contributors included Yanju Wang, Wei-Yu Lin and Kan Liu, who work in Tseng's lab and intend to continue this line of research in independent careers after completing their training with Tseng.

The study was funded by the U.S. Department of Energy and the National Institutes of Health.

Other authors include: Rachel J. Lin of UCLA's Crump Institute for Molecular Imaging; Matthias Selke of the department of chemistry and biochemistry at California State University, Los Angeles; Hartmuth C. Kolb of Siemens Medical Solutions; Nangang Zhang of UCLA's Crump Institute for Molecular Imaging and the department of physics and Center of Nanoscience and Nanotechnology at China's Wuhan University; and Xing-Zhong Zhao of the department of physics and Center of Nanoscience and Nanotechnology at China's Wuhan University.

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

http://www.sciencedaily.com/releases/2009/08/090803122730.htm

Babies With Mild Facial Paralysis From Forceps Typically Do Not Need Treatment

ScienceDaily (Aug. 24, 2009) — Mild facial nerve paralysis caused by the use of forceps during birth generally resolves on its own and does not require treatment, according to a report in the July issue of *Archives of Otolaryngology–Head & Neck Surgery*, one of the JAMA/Archives journals.

Facial nerve palsy (inability to move some facial muscles) occurs in approximately 0.8 to 7.5 of 1,000 births overall and 8.8 of every 1,000 births in which forceps are used, according to background information in the article. "Previous observations indicate that while most cases of facial nerve palsy caused by birth trauma implicate the use of forceps, up to 33 percent occur in spontaneous vaginal delivery without instrumentation," the authors write. The injury is caused when the forceps blade or a bone in the mothers' pelvis puts pressure on the baby's head in the area of the facial nerve.

Melanie Duval, M.D., of McGill University, Montreal, Quebec, Canada, and Sam J. Daniel, M.D., M.Sc., F.R.C.S.C., of McGill University and Montreal Children's Hospital, reviewed the medical records of 28 babies with facial nerve palsy caused by forceps use between 1989 and 2005.

In all 28 cases, the palsy was classified as mild to moderate. "Except in one neonate, no treatment was initiated in any of the patients," the authors write; one child received a 14-day course of oral prednisone, a corticosteroid. "All 21 neonates with adequate long-term follow-up recovered fully after an average period of 24 days."

"There is discrepancy in the literature on the investigations and/or treatment options to be undertaken in facial palsy owing to birth trauma," the authors conclude. Some authors recommend surgery to explore the nerve, whereas most consider observation to be sufficient in uncomplicated cases. The current results add to evidence that the recovery rate is high without treatment. "This confirms that corticosteroid treatment or surgery should be withheld in neonates presenting with uncomplicated facial nerve palsy resulting from forceps trauma."

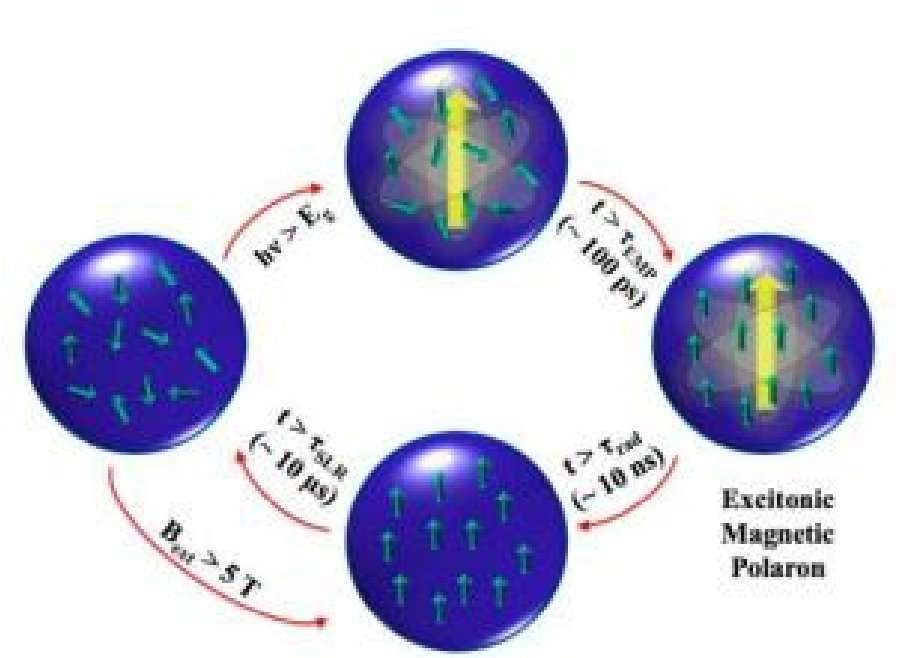
Journal reference:

1. Melanie Duval; Sam J. Daniel. **Facial Nerve Palsy in Neonates Secondary to Forceps Use**. *Archives of Otolaryngology%u2013Head & Neck Surgery*, 2009; [link]

Adapted from materials provided by JAMA and Archives Journals.

http://www.sciencedaily.com/releases/2009/07/090720163548.htm

Let There Be Light: Teaching Magnets To Do More Than Just Stick Around



Strong dopant-exciton magnetic exchange coupling in doped QDs can allow formation of magnetic polarons, where the spins of the dopants spontaneously align with the exciton spin. Key: Small green arrows: Mn2+ spins. Big yellow arrow: exciton spin. h½ = photoexcitation. EMP = excitonic magnetic polaron. rad = radiative decay. SLR = magnetic relaxation. Bext = external magnetic field. (Credit: Image courtesy of Daniel Gamelin/University of Washington)

ScienceDaily (Aug. 24, 2009) — That palm tree magnet commemorating your last vacation is programmed for a simple function – to stick to your refrigerator. Similarly, semiconductors are programmed to convey bits of information small and large, processing information on your computer or cell phone.

Scientists are working to coax those semiconductors to be more than conveyers, to actually perform some functions like magnets, such as data recording and electronic control. So far most of those effects could only be achieved at very cold temperatures: minus 260 degrees Celsius or more than 400 below zero Fahrenheit, likely too cold for most computer users.

However, researchers led by a University of Washington chemist report on Aug. 21 in *Science* that they have been able to train tiny semiconductor crystals, called nanocrystals or quantum dots, to display new magnetic functions at room temperature using light as a trigger.

Silicon-based semiconductor chips incorporate tiny transistors that manipulate electrons based on their charges. Scientists also are working on ways to use electricity to manipulate the electrons' magnetism, referred to as "spin," but are still searching for the breakthrough that will allow "spintronics" to function at room temperature without losing large amounts of the capability they have at frigid temperatures.

The team led by Daniel Gamelin, a UW chemistry professor, has found a way to use photons – tiny light particles – to manipulate the magnetism of semiconductor nanocrystals efficiently, even up to room temperature.

"This provides a completely new approach to microelectronics, if you can use spin instead of charge to process information and use photons to manipulate that process," Gamelin said. "It opens the door to

materials that store information and perform logic functions at the same time without the need for super cooling."

The team used nanocrystals of a cadmium-selenium semiconductor called cadmium selenide, but replaced some nonmagnetic cadmium ions with magnetic manganese ions. The crystals, smaller than 10 nanometers across (a nanometer is one-billionth of an inch), were then suspended in a colloid solution, like droplets of cream suspended in milk.

Beams of photons were used to align all of the manganese ions' spins, creating magnetic fields as much as 500 times more powerful than in the same semiconductor material without manganese. The magnetic effects were strongest at low temperatures, but remained remarkably strong up to room temperature, Gamelin said.

Besides Gamelin, authors of the Science paper are Rémi Beaulac and Paul Archer of the UW and Lars Schneider and Gerd Bacher of the University of Duisburg-Essen in Germany.

In a second paper published Sunday (Aug. 16) in the online edition of Nature Nanotechnology, Gamelin's group reported related effects in semiconductor nanocrystals made of zinc oxide but also containing small amounts of manganese impurities.

With zinc oxide, photons acted more as an on-off switch – once photons altered the zinc oxide's magnetism, the photon stream could be removed and the effect remained in place until another stimulus was applied to turn the effect off again.

Besides Gamelin, authors of the Nature Nanotechnology paper are Stefan Ochsenbein, Yong Feng, Kelly Whitaker, Ekaterina Badaeva, William Liu and Xiaosong Li, all of the UW.

Some behaviors described in the papers have been seen previously at very low temperatures, but in those cases the active materials were embedded in other crystals and so could not be isolated or processed. Suspending the nanocrystals in a colloid solution brings the magnetic effects into a new functional form that could be useful for integration with unconventional materials, Gamelin said. For example, the solution containing the crystals could be applied to a film using a device like an ink jet printer, or interfaced with carbon-based materials using techniques not typically practical for magnetic semiconductors.

"We've brought these spin effects into a processable form," he said. "I think both of these papers are converging on the same applications. We're exploring how to manipulate spins in these nanostructures and perhaps opening the door for some exciting new technologies."

Funding for the work in the two papers came from the U.S. National Science Foundation, the Dreyfus Foundation, the Sloan Foundation, the Natural Sciences and Engineering Research Council of Canada, the German Research Foundation, Gaussian Inc., the Research Corp., the Swiss National Science Foundation and the University of Washington.

Adapted from materials provided by University of Washington.

http://www.sciencedaily.com/releases/2009/08/090820161127.htm

Why Sleep? Snoozing May Be Strategy To Increase Efficiency, Minimize Risk

New research concludes that sleep's primary function is to increase animals' efficiency and minimize their risk by regulating the duration and timing of their behavior. (Credit: iStockphoto/Justin Horrocks)

ScienceDaily (Aug. 23, 2009) — Bats, birds, box turtles, humans and many other animals share at least one thing in common: They sleep. Humans, in fact, spend roughly one-third of their lives asleep, but sleep researchers still don't know why.

According to the journal *Science*, the function of sleep is one of the 125 greatest unsolved mysteries in science. Theories range from brain "maintenance" — including memory consolidation and pruning — to reversing damage from oxidative stress suffered while awake, to promoting longevity. None of these theories are well established, and many are mutually exclusive.

Now, a new analysis by Jerome Siegel, UCLA professor of psychiatry and director of the Center for Sleep Research at the Semel Institute for Neuroscience and Human Behavior at UCLA and the Sepulveda Veterans Affairs Medical Center, has concluded that sleep's primary function is to increase animals' efficiency and minimize their risk by regulating the duration and timing of their behavior.

The research appears in the current online edition of the journal *Nature Reviews Neuroscience*.

"Sleep has normally been viewed as something negative for survival because sleeping animals may be vulnerable to predation and they can't perform the behaviors that ensure survival," Siegel said. These behaviors include eating, procreating, caring for family members, monitoring the environment for danger and scouting for prey.

"So it's been thought that sleep must serve some as-yet unidentified physiological or neural function that can't be accomplished when animals are awake," he said.

Siegel's lab conducted a new survey of the sleep times of a broad range of animals, examining everything from the platypus and the walrus to the echidna, a small, burrowing, egg-laying mammal covered in spines. The researchers concluded that sleep itself is highly adaptive, much like the inactive states seen in a wide range of species, starting with plants and simple microorganisms; these species have dormant states — as opposed to sleep — even though in many cases they do not have nervous systems. That challenges the idea that sleep is for the brain, said Siegel.

"We see sleep as lying on a continuum that ranges from these dormant states like torpor and hibernation, on to periods of continuous activity without any sleep, such as during migration, where birds can fly for days on end without stopping," he said.

Hibernation is one example of an activity that regulates behavior for survival. A small animal, Siegel noted, can't migrate to a warmer climate in winter. So it hibernates, effectively cutting its energy consumption and thus its need for food, remaining secure from predators by burrowing underground.

Sleep duration, then, is determined in each species by the time requirements of eating, the cost-benefit relations between activity and risk, migration needs, care of young, and other factors. However, unlike hibernation and torpor, Siegel said, sleep is rapidly reversible — that is, animals can wake up quickly, a unique mammalian adaptation that allows for a relatively quick response to sensory signals.

Humans fit into this analysis as well. What is most remarkable about sleep, according to Siegel, is not the unresponsiveness or vulnerability it creates but rather that ability to reduce body and brain metabolism while still allowing that high level of responsiveness to the environment.

"The often cited example is that of a parent arousing at a baby's whimper but sleeping through a thunderstorm," he said. "That dramatizes the ability of the sleeping human brain to continuously process sensory signals and trigger complete awakening to significant stimuli within a few hundred milliseconds."

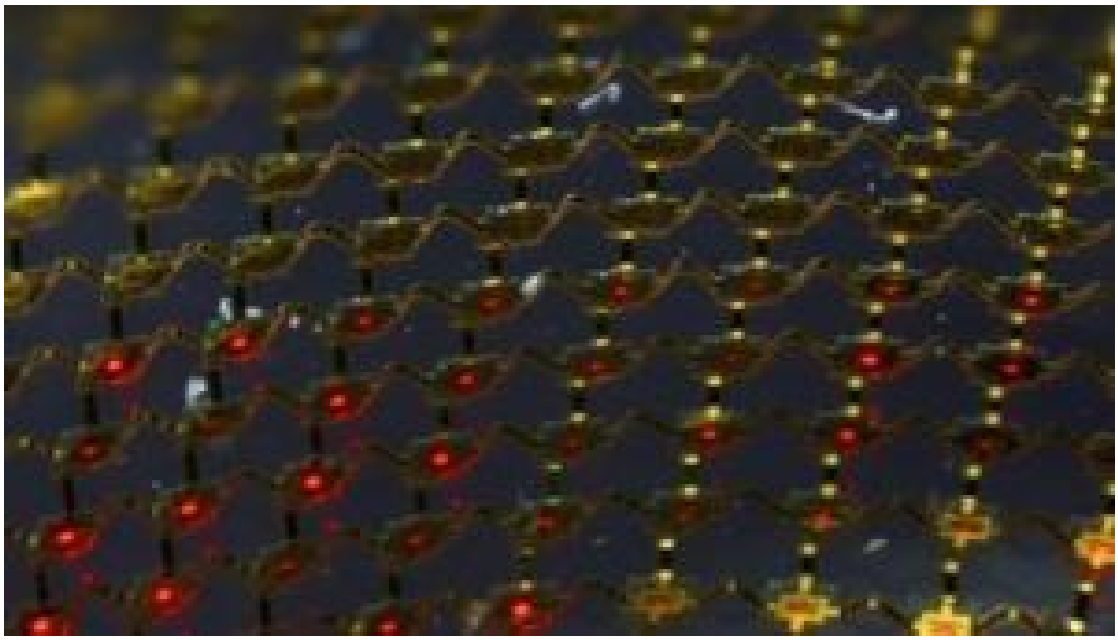
In humans, the brain constitutes, on average, just 2 percent of total body weight but consumes 20 percent of the energy used during quiet waking, so these savings have considerable adaptive significance. Besides conserving energy, sleep invokes survival benefits for humans too — "for example," said Siegel, "a reduced risk of injury, reduced resource consumption and, from an evolutionary standpoint, reduced risk of detection by predators."

"This Darwinian perspective can explain age-related changes in human sleep patterns as well," he said. "We sleep more deeply when we are young, because we have a high metabolic rate that is greatly reduced during sleep, but also because there are people to protect us. Our sleep patterns change when we are older, though, because that metabolic rate reduces and we are now the ones doing the alerting and protecting from dangers."

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

http://www.sciencedaily.com/releases/2009/08/090820161333.htm

Ultrathin LEDs Create New Classes Of Lighting And Display Systems



Stretchable micro-LED display, consisting of an interconnected mesh of printed micro LEDs bonded to a rubber substrate. (Credit: Photo by D. Stevenson and C. Conway, Beckman Institute, University of Illinois)

ScienceDaily (Aug. 23, 2009) — A new process for creating ultrathin, ultrasmall inorganic light-emitting diodes (LEDs) and assembling them into large arrays offers new classes of lighting and display systems with interesting properties, such as see-through construction and mechanical flexibility, that would be impossible to achieve with existing technologies.

Applications for the arrays, which can be printed onto flat or flexible substrates ranging from glass to plastic and rubber, include general illumination, high-resolution home theater displays, wearable health monitors, and biomedical imaging devices.

"Our goal is to marry some of the advantages of inorganic LED technology with the scalability, ease of processing and resolution of organic LEDs," said John Rogers, the

Flory-Founder Chair Professor of Materials Science and Engineering at the University of Illinois.

Rogers and collaborators at the U. of I., Northwestern University, the Institute of High Performance Computing in Singapore, and Tsinghua University in Beijing describe their work in the Aug. 21 issue of the journal Science.

Compared to organic LEDs, inorganic LEDs are brighter, more robust and longer-lived. Organic LEDs, however, are attractive because they can be formed on flexible substrates, in dense, interconnected arrays. The researchers' new technology combines features of both.

"By printing large arrays of ultrathin, ultrasmall inorganic LEDs and interconnecting them using thin-film processing, we can create general lighting and high-resolution display systems that otherwise could not be built with the conventional ways that inorganic LEDs are made, manipulated and assembled," Rogers said.

To overcome requirements on device size and thickness associated with conventional wafer dicing, packaging and wire bonding methods, the researchers developed epitaxial growth techniques for creating LEDs with sizes up to 100 times smaller than usual. They also developed printing processes for assembling these devices into arrays on stiff, flexible and stretchable substrates.

As part of the growth process, a sacrificial layer of material is embedded beneath the LEDs. When fabrication is complete, a wet chemical etchent removes this layer, leaving the LEDs undercut from the wafer, but still tethered at anchor points.

To create an array, a rubber stamp contacts the wafer surface at selected points, lifts off the LEDs at those points, and transfers them to the desired substrate.

"The stamping process provides a much faster alternative to the standard robotic 'pick and place' process that manipulates inorganic LEDs one at a time," Rogers said. "The new approach can lift large numbers of small, thin LEDs from the wafer in one step, and then print them onto a substrate in another step."

By shifting position and repeating the stamping process, LEDs can be transferred to other locations on the same substrate. In this fashion, large light panels and displays can be crafted from small LEDs made in dense arrays on a single, comparatively small wafer. And, because the LEDs can be placed far apart and still provide sufficient light output, the panels and displays can be nearly transparent. The thin device geometries allow the use of thin-film processing methods, rather than wire bonding, for interconnects.

In addition to solid-state lighting, instrument panels and display systems, flexible and even stretchable sheets of printed LEDs can be achieved, with potential use in the health-care industry.

"Wrapping a stretchable sheet of tiny LEDs around the human body offers interesting opportunities in biomedicine and biotechnology," Rogers said, "including applications in health monitoring, diagnostics and imaging."

Ford Motor Co., the National Science Foundation and the U. S. Department of Energy funded the work.

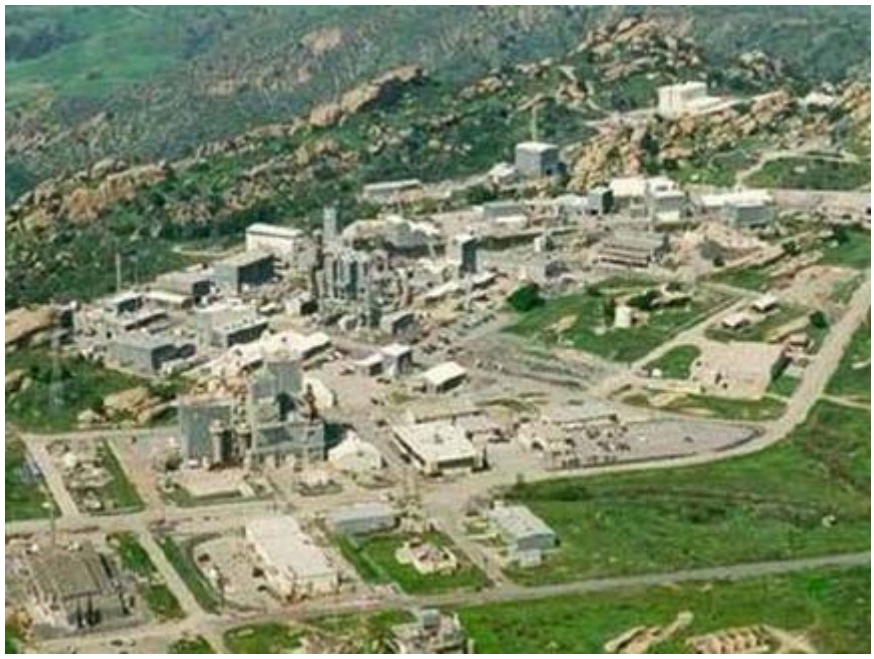
Adapted from materials provided by University of Illinois at Urbana-Champaign.

http://www.sciencedaily.com/releases/2009/08/090820161129.htm

50 Years After America's Worst Nuclear Meltdown

Human error helped worsen a nuclear meltdown just outside Los Angeles, and now human inertia has stymied the radioactive cleanup for half a century.

By: Joan Trossman Bien and Michael Collins | August 24, 2009 |



The Santa Susana Field Laboratorywikipedia.org

For Release Saturday A.M., August 29, 1959
CANOGA PARK, CA

"During an inspection of fuel elements on July 26 at the Sodium Reactor Experiment, operated for the Atomic Energy Commission at Santa Susana, California by Atomics International, a division of North American Aviation, Inc., a parted fuel element was observed.

The fuel element damage is not an indication of unsafe reactor conditions. No release of radioactive materials to the plant or its environs occurred and operating personnel were not exposed to harmful conditions...

In each case, all seven tubes of the fuel element remained in the core. This fuel loading, nearing the end of its useful life, was scheduled to be removed in the near future."

This press release — issued five weeks after the end of the United States' worst nuclear reactor meltdown — was the public's first notification that something unusual had happened up on "The Hill." For the next 20 years, it remained the only public notification about the accident at the Santa Susana Field Laboratory on a mountaintop in California's eastern Ventura County, on the border with the San Fernando Valley.

In fact, from July 12 through July 26, 1959, an unknown amount of radioactive gases were intentionally vented to prevent the Sodium Reactor Experiment from overheating and exploding.

Unlike most conventional reactors that circulate water to be heated by the fuel rods in the core in order to turn steam turbines, the SRE used sodium because it could operate under lower pressure. Pure sodium — not to be confused with table salt, or sodium chloride — was a risky metal to use since it catches fire when exposed to air and explodes when mixed with water.

Due to the experimental nature of the SRE, it was built without a containment structure — the distinctive large dome associated with nuclear power plants — so any radiation vented hot out over the San Fernando Valley, which the city of Los Angeles was busily annexing. What exactly vented remains in contention.

"We know there was a fuel meltdown," said William Taylor, the current spokesman for the U.S. Department of Energy. "We don't know how much [radiation] or if any was released."

According to an analysis of a five-year study by a panel of independent scientists convened years after the incident, the SRE accident spit out up to 459 times the amount of radiation released during the 1979 meltdown at Three Mile Island.

Fifty years later, the contaminated site has yet to be cleaned up, although this month two federal agencies promised to plow ahead without the site's current owner, Boeing. And in March, the Department of Energy provided $38.3 million in funds to complete the radiologic survey of "Area IV" as part of the American Recovery and Reinvestment Act. Unlike the then-remote hilltop it once was, now more than a half million people live within 10 miles of The Hill, and downtown Los Angeles is 30 miles away.

The Race to Conquer the Atom

The Santa Susana Field Laboratory was built on 2,850 acres in the mid-1940s. A portion of the facility was dedicated to nuclear research, while other portions were marked to develop powerful rocket engines such as the Delta II. The federal Atomic Energy Commission and the private Atomics International chose the land high in the hills above the farthest end of the west San Fernando Valley precisely because the work could be dangerous and the population sparse.

The site was owned by Atomics International, a division of North American Aviation. It was merged into Rocketdyne, which Boeing acquired when it bought Rockwell International in 1996. Four years ago, United Technologies bought the Rocketdyne unit from Boeing, but Boeing kept the contaminated site.

Santa Susana hosted other sensitive projects, which in turn left their own more-public toxic legacies. Three other main areas of the lab were devoted to rocket testing, which polluted the land and groundwater with the toxic rocket fuel oxidizer perchlorate and the engine solvent trichloroethylene. Perchlorate has been found in water wells circling the site, including in adjacent Simi Valley.

There are varying estimates of the amount of TCE in Rocketdyne's groundwater from tens of thousands of rocket tests at the lab. Boeing's groundwater remediation system, which consists of "air-stripping" towers that allow the TCE to evaporate into the open air, removed 10 gallons of the toxic goo from the water annually.

"Since acquiring our site in 1996, Boeing has made significant progress in our cleanup efforts," Boeing spokesperson Kamara Sams said recently, although the company turned off the water-purifying system in 2001.

Meanwhile, the SRE was but one of 10 nuclear reactors at the site, plus a "hot lab" to cut apart and work on nuclear fuel for Santa Susana, Department of Energy and the Atomic Energy Commission facilities from around the country. The site also hosted a plutonium fabrication fuel facility which Dan Hirsch, president of the nonprofit anti-nuclear group the Committee to Bridge the Gap, called "perhaps the most dangerous facility they had on the property."

Hirsch, who has been a key figure in investigating and publicizing the 1959 nuclear accident, said there also had been serious accidents in at least three of the other SSFL reactors, plus "numerous nuclear fires and spills and releases."

And there were other dangerous practices on the site. "They had a sodium burn pit where they took radioactively contaminated components and illegally burned them in open pits in the open air," Hirsch said.

Additionally, workers routinely disposed of barrels of highly toxic waste by blowing them up with shotguns and releasing the contents into the air. That practice was halted in 1994 when two workers were killed and one severely injured when the procedure went terribly wrong. One worker was blasted so forcefully into a rock that all that remained was a gruesome petroglyph.

Summer of '59: Two long, hot weeks

John Pace had only been at the SSFL for four months 50 years ago this summer when the accident occurred. He was hired as a 20-year-old trainee to learn how to become an atomic reactor operator and mechanic in March 1959 (he was let go the following November). Due to his inexperience, Pace said he often was just an observer of many procedures at that time.

He is now the last surviving worker to have witnessed the 1959 meltdown and its immediate aftermath — an often chaotic attempt to prevent an even larger disaster as workers compromised their own safety to keep the SRE from overheating into a runaway meltdown.

They were only partially successful. Unknown to the workers, the coolant Tetralin had leaked into the sodium and gummed up the SRE, causing the fuel rods to overheat. When the reactor was finally shut down permanently after two weeks of starting and stopping the power and then venting the building radiation, one third of the fuel rods ruptured and had begun melting.

Pace said he arrived at work on July 13 for the shift immediately after the accident; he was told that the operators had noticed that something was not quite right. "They had little indications before that there was something a little edgy about the reactor, but they weren't quite sure," he said.

Hirsch said the accident actually began on July 12. "Radiation readings were very high," he said. "They had a power excursion [an out-of-control nuclear reaction] on July 13 and barely were able to shut the reactor down, spent a couple of hours trying to figure out what happened and couldn't figure out what happened and started it up again, and inexplicably ran it until July 26. The radiation monitors went off scale. They were too hot to measure."

Pace recalled that part of his job was to check which way the wind was blowing at the SSFL weather station. "A few hours after it happened, I found out that the reactor had run away from them and they had to release the gases. After leaking the gases, they discovered that the winds were headed toward the San Fernando Valley. All of our families lived [there] and all that radiation went over their homes."

A 2006 report by David A. Lochbaum, the nuclear safety engineer with the Union of Concerned Scientists, determined that up to 30 percent of the reactor's radioiodine and cesium could have vaporized during the accident.

After the reactor was shut down two weeks later, Pace said the workers started cleaning up the immediate contamination so that they could reach the fuel rods and see what had happened. "We scrubbed it down with water and sponges," Pace said. "We tried mops. They'd get contaminated real quick and that was getting pretty expensive, so we ended up using Kotex."

All this was done without protective clothing beyond coveralls and cotton caps that read, "Your Safety is Our Business — Atomics International." There were no fully-enclosed radiation suits with face masks that nuclear workers routinely use today, designed to be dissolved and disposed of after one use.

"This had never happened before," Pace said, "so it was a learning experience of how to clean up contamination."

As the workers removed the fuel rods, one broke off. The worker accidentally dropped the broken rod back into the reactor. "He realized what had happened and panicked," Pace said. "All he could think of doing is run. And as he was running, he was pulling alarms and ran out of the building and got outside."

Pace said the situation deteriorated from there. "Now you have the rod up out of the shield. They were realizing radiation was leaking out into the atmosphere. There was one more fuel rod in there. They pulled it out and it broke off and hit the reactor floor. Now you have two broken off in the reactor. I could tell from the looks on their faces something was wrong."

Looking back with the benefit of 50 years experience, Pace realized that many mistakes were made. Experts, also with the benefit of hindsight, agreed.

In 1979 the *Los Angeles Times* reported that an Atomic Energy Commission-sponsored analysis determined there had been numerous indications that the SRE was malfunctioning. The report was critical that the operators continued to run the reactor for two weeks — and despite a power spike that didn't abate even after operators pushed control rods into the reactor to slow the nuclear reaction.

"They never should have done what they had done at the time," Pace said. "The reactor should have been closed down, but they did it anyway. You didn't want to lose your job. If the reactor is gone, nobody's got work."

The end of 20 years of silence

None of what John Pace described was ever revealed publicly. Atomics International prepared an unclassified report — it was titled "SRE Fuel Element Damage" — on the accident and delivered it to the Atomic Energy Commission in 1961.

One of several findings in the report read, "In spite of the cladding failure to 13 fuel elements and the release to the primary coolant of several thousands of curies of fission product activity, no radiological hazard was presented to the reactor environs. Recovery operations were conducted by SRE operating crews, working within standard AEC regulations on radiation exposure."

Two decades later, the 1979 accident and radiation release at Pennsylvania's Three Mile Island nuclear power plant focused public attention on the dangers accompanying nuclear power. In that environment, a UCLA student named Michael Rose, now a successful documentarian, was researching his first film when an old flyer in the Westwood office of Committee to Bridge the Gap caught his attention.

"The flyer had a little blurb about a meltdown at Atomics International," Rose said. "I knew I had to find out more about this. Of course, I was given the cold shoulder by Atomics International but discovered that documents relating to that company were on file at all Atomic Energy Commission repositories around the country. As luck would have it, UCLA was one of those repositories. One of the first documents that I discovered was the press release announcing the meltdown at the Sodium Reactor Experiment."

Rose worked with Hirsch and informed, or re-informed, the media. Hirsch and Rose took their discovery to Warren Olney, then of KNBC NewsCenter 4 in Los Angeles (he now hosts the National Public Radio news program *To the Point*). Olney produced a weeklong television series on the meltdown.

"There was a flurry of activity for a couple of years," Hirsch said. "A group called Alliance for Survival then intervened in the re-licensing of the Atomics International facility, getting a reduction in licensed amounts of nuclear material but no shutdown." Despite the activity, progress toward a cleanup was slow.

"Then things went quiescent," he continued, "until the Department of Energy study in 1989 finding widespread contamination at the site was made public in the *Los Angeles Daily News*, triggering a new round of interventions in licensing proceedings, which did succeed in shutting [the reactor] down." Hirsch said the study also sparked several other epidemiological studies.

Urban sprawl added pressure. Over time, Southern California's population grew dramatically, and what primarily had been walnut orchards and sprawling ranches encasing Santa Susana became suburban tracts filled with families.

Once the widespread nature of contamination was known, the U.S. Environmental Protection Agency was brought in to aid in the cleanup. One focus of concern was the level of contamination in the actual power plant buildings.

"The EPA demanded that they be able to inspect the buildings themselves before they were torn down to make sure they had been cleaned up," Hirsch said. "When the EPA arrived on the appointed day, three of the five buildings they were supposed to study had been already torn down, including the SRE. And some of the debris from those buildings was taken to regular municipal trash facilities. Radioactive metals went to a metal recycler and got melted into metal products."

The official health studies

In the early 1990s, local legislators established the Santa Susana Field Laboratory Advisory Panel, a quasi-governmental organization composed of academics and activists who studied worker health issues resulting from the overall contamination issues at Santa Susana. The panel, co-chaired by Hirsch, enlisted the UCLA School of Public Health to conduct the study.

"They found that the workers had increased death rates from key cancers like lung cancer, cancers of the lymph and blood systems, than did workers at the same facility that had lower exposure to the radiation," Hirsch said. "That then led our panel to study the offsite population. We needed to know the wind data. And Boeing (now the owner of the site) refused to release it. So we had to draw more general conclusions."

Those conclusions were released in October 2006 and they were stunning. Based on the ratios of volative radionuclides found in the coolant, the panel estimated that the release of radiation in 1959 was hundreds of times the amount of radiation that was released at Three Mile Island — and that radiation was estimated to have caused between 300-1,800 cancer deaths.

Bonnie Klea of the San Fernando Valley suburb of West Hills worked at SSFL from 1963 to 1971. She has survived a 1995 episode of bladder cancer, which she is convinced was caused by the contamination that lingers on the site. "I have uranium in my body that is seven times the normal," she said. "The bladder cancer in the workers is abnormally high. Every single house in my neighborhood had a cancer death."

"After the study came out," Hirsch said, "members of the state Legislature became upset that the [wind] data had been suppressed, intervened with the Department of Energy and Boeing, and when the data were discovered to actually exist, they demanded that it be handed over. But by that time, our funding was over."

Meanwhile, more than 600 former SSFL workers had applied for compensation for their illnesses they attributed to working at the lab, but aside from a few dozen, most claims were denied because proof of exposure was required. As Sen. Dianne Feinstein said on the floor of the Senate in March, "Some records

show only estimated levels of exposure for workers, and are imprecise. In other cases, if records were kept, they cannot be found today."

Feinstein and Sen. Barbara Boxer, both California Democrats, and Rep. Elton Gallegly, a House Republican, this year introduced legislation to compensate SSFL workers or their families for workplace illnesses not covered by earlier laws covering so-called "energy employees." The legislation, which is still in committee in both houses, would allow those workers whose claims have been rejected to reapply for compensation.

The big clean: target deadline 2017

Despite all this, the site remains toxic, radioactive and dangerous, and will continue to be so until the cleanup is completed. And it's still a workplace for scientists and technicians: Although the go-go years of the Cold War are gone, when three shifts of 6,000 people each were working on the site, fewer than 200 remain today doing laser research and other defense industry work.

After lawsuits, several studies and attempts to force Boeing to clean the site, California state Sen. Sheila Kuehl introduced legislation that mandated that the site be cleaned to the highest standard before any other use of the land would be permitted. In addition to the radiation contamination, the bill includes the perchlorate and other dangerous chemicals that were spewed out during the rocket engine testing and other pursuits. Boeing opposed the bill, but Gov. Arnold Schwarzenegger signed it into law in early 2008 and a final date for completion of the cleanup was slated for 2017.

Norman Riley, who works for the state EPA's Department of Toxic Substances Control and was in charge of the cleanup until Aug. 19, said the project is riddled with potential difficulties. "This is roughly 3,000 acres of extremely complicated geology, highly fractured bedrock on top of a mountain in an arid environment."

The area is prone to brushfires, such as the 2005 Topanga Canyon Fire, which swept through the contaminated site. "Fire will change the chemical composition, it will alter chemically on constituents that are at or near the surface, and it would add to the constituents," Riley said. "Dioxins, for example, are a common combustion product."

He doesn't consider size, complexity and potential natural disasters to be "insurmountable," but said political issues may be. "Being able to hit 2017 means being able to adhere to a schedule that is already pretty tight. One has to begin with a characterization of the site, which we expect to be finished in 2012."

(Riley was replaced on the project by 25-year DTSC veteran Rick Brausch, best known previously as the agency's policy and legislative director.)

Taylor at the DOE is doubtful that the original target dates can be met. "I don't know if 2017 still is in play since we are going to wait ... to get the results of the survey."

But that doesn't mean nothing is happening, he insisted. The DOE has been monitoring the site regularly, he said. "The impression that nothing has been done is not exactly correct. There's been an environmental report every year."

Then there is the ongoing unprecedented financial crisis devouring California. "The state's financial situation has already affected [the schedule]," Riley said. "People that work for me and myself are furloughed three days a month. That means no one is reviewing the data; no one is inspecting activities that are going on at the site."

However, the real delay may be just around the corner. "The entities responsible for meeting the standards [of the SSFL cleanup law] have resisted those standards, which they consider to be unreasonable," Riley said, referring apparently to Boeing. "I think that the standards are unnecessarily restrictive. We certainly

will enforce the law because that is our job. But here's a fact: When this clean up is done, this is going to be the cleanest land in Southern California."

The standards mandated by Kuehl's legislation dictate that there be no more than one chance in a million of getting cancer from any radionuclide in a rural agricultural setting, which has the most restrictive limits. In comparison, the damaged reactor at Three Mile Island, though defueled and decontaminated to a large degree, remains closed as the radiation continues to decay.

Taylor said that although there is a possibility of a walk-away clause, where the EPA decides to just fence off the site as was done at Three Mile Island, that alternative is not acceptable to the DOE. "We considered taking down the remaining structures. Basically, people are nervous about that."

"The public gave us, DOE, the indication to wait for the EPA surveys so we're not going to fight that. In any scenario, those buildings are still going to come down."

Taylor said the federal government accepts the stringent standards, and on Aug. 19 both the DOE and NASA (which along with Boeing were deemed the "responsible parties" for funding the cleanup) agreed to proceed on the cleanup - without Boeing.

"We're pleased that the federal agencies (NASA and DOE) have committed to moving forward on a draft cleanup order that covers a significant portion of contamination (90% RAD and 50% other chemicals) in strict compliance with [the Kuehl legislation]," the acting director of the Department of Toxic Substances Control, Maziar Movassaghi, wrote on Aug. 19.

"Unfortunately we are not yet at a public review stage with Boeing as to their cleanup responsibilities, so we have decided to move forward with the responsible federal agency portion of the cleanup. We're hopeful that the Boeing discussions will be similarly successful and have assigned project management to the executive level of the Department to lead those negotiations."

Riley said before he was removed that Boeing is not yet on board with the existing cleanup standards. "If we are not able to reach an agreement with them, then there will be litigation. If [Boeing] is going to file a claim concerning constitutionality of the measure, it would have to get started soon. Boeing is not a company without means. They have some very good lawyers."

Asked if Boeing indeed plans to initiate litigation, its spokeswoman Sams replied, "We are optimistic that a consensual agreement can be reached that allows us to proceed with an effective cleanup in a timely manner. Boeing will legally restrict future land use of our site to open space."

Taylor, meanwhile, acknowledged that the DOE has created some of its own problems by moving forward without consulting the public.

"I know things have been done in the past that probably have not taken into consideration the people's concerns around there, and we are doing our best to rectify that by working with the Department of Toxic Substances Control and working with EPA now. I appreciate these people who have followed this for 30 years, and I understand their frustration — but maybe some things aren't as bad as they seem."

The future of nuclear energy

As the Obama administration is developing a strategy for the nation's energy needs, including a nuclear component, there are many environmentalists who see the struggle to clean up the SSFL as an object lesson.

"You know the old saying, 'Those who cannot remember the lessons of the past are condemned to repeat them," Hirsch said. "People today are not remembering what happened the last time we went deeply into

nuclear power. We had meltdowns and horrible accidents that we are spending billions of dollars unsuccessfully trying to clean up."

Proponents of a nuclear revival say it is part of the answer to reduce the nation's carbon output. But Hirsch sees that path as a large step backwards. "It's a tragedy because this could be the point where we really solve the global warming problem."

The Nuclear Regulatory Agency has received applications from 14 companies to build new nuclear power plants. Financial problems in the form of cost overruns, delays and other problems had forced utilities to abandon earlier plans to build more nuclear power plants in the 1990s. The issue of terrorism has not yet been fully addressed. The federal government is anxious to solve the intractable problem of the disposal of nuclear waste. Today, most of the operating reactors simply have their spent fuel rods sitting temporarily but indefinitely in holding tanks. The U.S. still has no permanent facility for all of the country's spent fuel rods and other nuclear waste.

Whether the SSFL will finally be cleaned up within the negotiated schedule remains an open question. Fifty years have passed since that first press release told the world about a close brush with disaster just outside Los Angeles. Today, radiation remains on and off the premises, outliving a generation of workers.

http://www.miller-mccune.com/science_environment/50-years-after-nuclear-meltdown-1438

Media Multitaskers Pay Mental Price, Study Shows

Stanford researcher Eyal Ophir explains the study to a student. (Credit: Jack Hubbard)

ScienceDaily (Aug. 26, 2009) — Attention, multitaskers (if you can pay attention, that is): Your brain may be in trouble.

People who are regularly bombarded with several streams of electronic information do not pay attention, control their memory or switch from one job to another as well as those who prefer to complete one task at a time, a group of Stanford researchers has found.

High-tech jugglers are everywhere – keeping up several e-mail and instant message conversations at once, text messaging while watching television and jumping from one website to another while plowing through homework assignments.

But after putting about 100 students through a series of three tests, the researchers realized those heavy media multitaskers are paying a big mental price.

"They're suckers for irrelevancy," said communication Professor Clifford Nass, one of the researchers whose findings are published in the Aug. 24 edition of the *Proceedings of the National Academy of Sciences*. "Everything distracts them."

Social scientists have long assumed that it's impossible to process more than one string of information at a time. The brain just can't do it. But many researchers have guessed that people who appear to multitask must have superb control over what they think about and what they pay attention to.

Is there a gift?

So Nass and his colleagues, Eyal Ophir and Anthony Wagner, set out to learn what gives multitaskers their edge. What is their gift?

"We kept looking for what they're better at, and we didn't find it," said Ophir, the study's lead author and a researcher in Stanford's Communication Between Humans and Interactive Media Lab.

In each of their tests, the researchers split their subjects into two groups: those who regularly do a lot of media multitasking and those who don't.

In one experiment, the groups were shown sets of two red rectangles alone or surrounded by two, four or six blue rectangles. Each configuration was flashed twice, and the participants had to determine whether the two red rectangles in the second frame were in a different position than in the first frame.

They were told to ignore the blue rectangles, and the low multitaskers had no problem doing that. But the high multitaskers were constantly distracted by the irrelevant blue images. Their performance was horrible.

Because the high multitaskers showed they couldn't ignore things, the researchers figured they were better at storing and organizing information. Maybe they had better memories.

The second test proved that theory wrong. After being shown sequences of alphabetical letters, the high multitaskers did a lousy job at remembering when a letter was making a repeat appearance.

"The low multitaskers did great," Ophir said. "The high multitaskers were doing worse and worse the further they went along because they kept seeing more letters and had difficulty keeping them sorted in their brains."

Still puzzled

Puzzled but not yet stumped on why the heavy multitaskers weren't performing well, the researchers conducted a third test. If the heavy multitaskers couldn't filter out irrelevant information or organize their memories, perhaps they excelled at switching from one thing to another faster and better than anyone else.

Wrong again, the study found.

The test subjects were shown images of letters and numbers at the same time and instructed what to focus on. When they were told to pay attention to numbers, they had to determine if the digits were even or odd. When told to concentrate on letters, they had to say whether they were vowels or consonants.

Again, the heavy multitaskers underperformed the light multitaskers.

"They couldn't help thinking about the task they weren't doing," Ophir said. "The high multitaskers are always drawing from all the information in front of them. They can't keep things separate in their minds."

The researchers are still studying whether chronic media multitaskers are born with an inability to concentrate or are damaging their cognitive control by willingly taking in so much at once. But they're convinced the minds of multitaskers are not working as well as they could.

"When they're in situations where there are multiple sources of information coming from the external world or emerging out of memory, they're not able to filter out what's not relevant to their current goal," said Wagner, an associate professor of psychology. "That failure to filter means they're slowed down by that irrelevant information."

So maybe it's time to stop e-mailing if you're following the game on TV, and rethink singing along with the radio if you're reading the latest news online. By doing less, you might accomplish more.

Adapted from materials provided by Stanford University. Original article written by Adam Gorlick.

http://www.sciencedaily.com/releases/2009/08/090825113133.htm

High Blood Pressure Linked To Memory Problems In Middle Age

ScienceDaily (Aug. 26, 2009) — High blood pressure is linked to memory problems in people over 45, according to research published in the August 25, 2009, print issue of *Neurology*®, the medical journal of the American Academy of Neurology.

The study found that people with high diastolic blood pressure, which is the bottom number of a blood pressure reading, were more likely to have cognitive impairment, or problems with their memory and thinking skills, than people with normal diastolic readings.

For every 10 point increase in the reading, the odds of a person having cognitive problems was seven percent higher. The results were valid after adjusting for other factors that could affect cognitive abilities, such as age, smoking status, exercise level, education, diabetes or high cholesterol.

The study involved nearly 20,000 people age 45 and older across the country who participated in the Reasons for Geographic And Racial Differences in Stroke (REGARDS) Study and had never had a stroke or mini-stroke. A total of 1,505 of the participants, or 7.6 percent, had cognitive problems, and 9,844, or 49.6 percent, were taking medication for high blood pressure.

High blood pressure is defined as a reading equal to or higher than 140/90 or taking medication for high blood pressure.

"It's possible that by preventing or treating high blood pressure, we could potentially prevent cognitive impairment, which can be a precursor to dementia," said study author Georgios Tsivgoulis, MD, of the University of Alabama at Birmingham and a member of the American Academy of Neurology.

Research has shown that high diastolic blood pressure leads to weakening of small arteries in the brain, which can result in the development of small areas of brain damage.

Tsivgoulis said more research is needed to confirm the relationship between high blood pressure and cognitive impairment.

The study was supported by the National Institute of Neurological Disorders and Stroke (NINDS).

"The REGARDS study is one of the largest population-based studies of risk factors for stroke. These latest data suggest that higher blood pressure may be a risk factor for cognitive decline, but further studies will be necessary to understand the cause-effect relationship," said Walter J. Koroshetz, MD, deputy director of NINDS and Fellow of the American Academy of Neurology. "The National Institutes of Health is now organizing a large clinical trial to evaluate whether aggressive blood pressure lowering can decrease a number of important health outcomes including cognitive decline."

Adapted from materials provided by American Academy of Neurology.

http://www.sciencedaily.com/releases/2009/08/090824182430.htm<