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Can we fly safely through volcanic ash?

- 17:14 20 April 2010 by **Paul Marks**

This ash sensor, being ground-tested on an erupting volcano in Papua New Guinea in 2003, could be developed to allow planes to spot a safe path through the air (Image: Fred Prata)

If airlines and aircraft makers did not understand the economic case for Fred Prata's invention a week ago, they will now.

Since 1991 the atmospheric physicist has been developing a sensor to warn pilots about volcanic ash clouds up to 100 kilometres ahead of their plane so they can thread a safe path around it. But despite successful ground tests (see image), he has not been able to secure the funding to test it in the air.

With an estimated 6.8 million passengers grounded by airborne ash cloud from Iceland's Eyjafjallajökull volcano, and millions of pounds at stake, serious questions are being asked about the technological shortcomings of the current approach to protecting flights.

Known unknowns

Ever since a Boeing 747 temporarily lost all four engines in an ash cloud in 1982, the International Civil Aviation Organization (ICAO) has stipulated that skies must be closed as soon as ash concentration rises above zero. The ICAO's International Airways Volcano Watch uses computerised pollution dispersal models to predict ash cloud movements, and if any projections intersect a flight path, the route is closed.

But although it is certain that volcanic ash like that hanging over northern Europe can melt inside a jet engine and block airflow, nobody has the least idea about just how much is too much. After a week of losing millions every day, airlines are starting to ask why we can't do better.

It need not be this way, concedes Jonathan Nicholson at the UK's aviation regulator, the Civil Aviation Authority. "There may be a non-zero safe ash level for commercial jets, of so many particles of a certain size per minute," he told *New Scientist*, "but we just don't know."

Denis Chagnon, spokesman for the ICAO, agrees, but says that isn't regulators' fault. "This has to be established by the engine makers themselves, because they produce the affected equipment. And that has not been done," he says.

Two of the biggest aero engine makers – Rolls-Royce in the UK and General Electric in the US – did not return phone calls or emails asking for comment on if, how and when they plan to establish safe thresholds. When the ash settles, it seems likely that they will be asked to think seriously about doing so.

Model makers

The wisdom of allowing computer models alone to ground flights is also being questioned. Frustrated companies including KLM, Lufthansa, BA, and aircraft maker Airbus have launched their own aircraft to explore how the reality in the air matched the models keeping them on the ground.

None suffered any damage, and some carried sampling instruments that found no ash in places where models predicted it, sparking strong complaints from the airline trade body IATA. Yet in a reminder of the risks, some military jets did encounter ash last week and sustained engine damage.

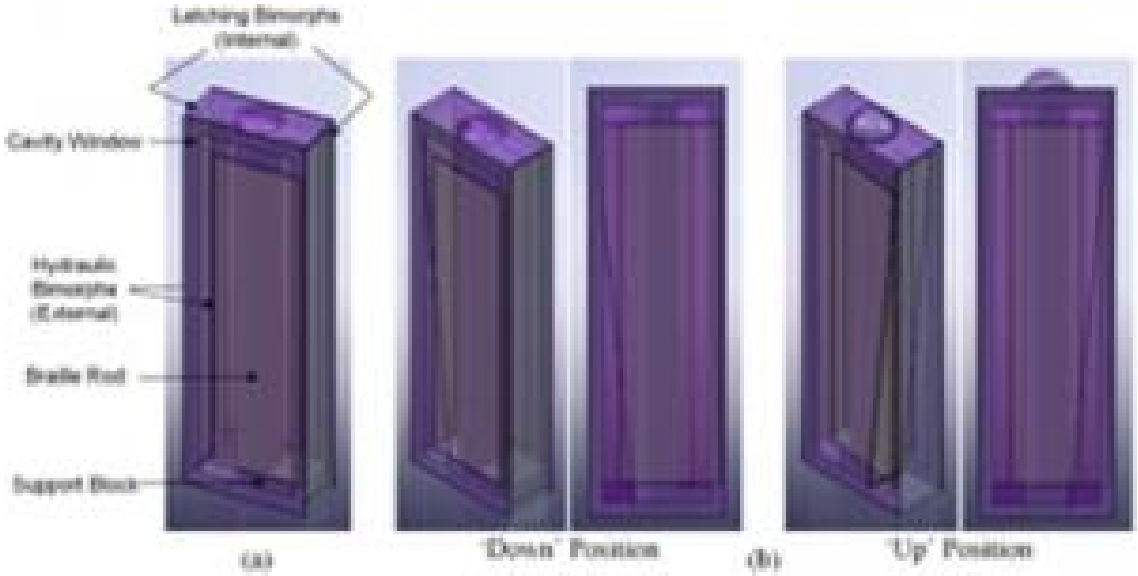
Prata says sensors like those he is developing at the Norwegian Institute for Air Research (NILU) in Kjeller could keep planes flying by letting them finesse the educated guesses of models to reveal ash-free patches and routes.

A spokeswoman for the British air-traffic control agency NATS said she was not aware of Prata's work, but said the idea of in-flight detection sounded "handy". However, Nicholson suggested that it could cause traffic problems if many flights ended up switching course to sidestep ash.

Whatever happens, one fallout from the ash cloud that has grounded Europe looks likely to be a fresh look at just how dangerous volcanic ash is, and whether planes can be given the smarts to dodge around it.

http://www.newscientist.com/article/dn18797-can-we-fly-safely-through-volcanic-ash.html

Breakthrough Design Opens Door to 'Full Screen' Braille Displays for the Blind



The researchers have developed a concept called a "hydraulic and latching mechanism," which would allow the development of a full-page, refreshable Braille display system. (Credit: Image courtesy of North Carolina State University)

ScienceDaily (Mar. 29, 2010) — Imagine if your computer only allowed you to see one line at a time, no matter what you were doing -- reading e-mail, looking at a Web site, doing research. That's the challenge facing blind computer users today. But new research from North Carolina State University is moving us closer to the development of a display system that would allow the blind to take full advantage of the Web and other computer applications.

"Right now, electronic Braille displays typically only show one line of text at a time. And they're very expensive," says Dr. Neil Di Spigna, a research assistant professor at NC State and co-author of a paper describing the research. In order to develop a more functional, and affordable, tool that would allow the blind to interface with their computers, Di Spigna and his colleagues are working to develop a full-page, refreshable Braille display. Braille uses a series of raised dots to represent letters and numbers, allowing blind people to read.

Such a display would also translate images into tactile displays, effectively mapping pixels in an image and allowing the full-page Braille display to represent the images as raised dots.

The researchers have developed a concept called a "hydraulic and latching mechanism," which would allow the development of such a display system. The mechanism would be made of an electroactive polymer that is very resilient and inexpensive, when compared to current Braille display technologies. "This material will allow us to raise dots to the correct height, so they can be read," says Dr. Peichun Yang, a postdoctoral research associate at NC State and co-author of the paper. "Once the dots are raised, a latching mechanism would support the weight being applied by a person's fingers as the dots are read. The material also responds quickly, allowing a reader to scroll through a document or Web site quickly."

Earlier this month, the researchers presented their findings on the hydraulic component of the mechanism, showing that it is a viable technology. The next step is to demonstrate a proof-of-concept model of the latching mechanism. "We hope to have a fully functioning prototype of the mechanism within a year," Di Spigna says, "and that could serve as the functional building block of a full-screen refreshable display."

"Reading Braille is essential to allowing blind people to find employment," says Yang, who is blind. "We're optimistic that this technology will give the blind additional opportunities in this area."

"The last 20 years of computer technology have been relatively inaccessible -- and today's common mobile computing devices, from smart-phones to digital navigators and iPads, have been completely nonexistent -- to blind people, because the display technology for the blind has not kept pace," says David Winick, a researcher at NC State and co-author of the paper. "We hope to enable the development of applications that will give the blind more complete access to the internet and other computer resources, such as e-books."

The research, "The integration of novel EAP-based Braille cells for use in a refreshable tactile display," was presented March 8 at the 12th International Conference on Electroactive Polymer Actuators And Devices in San Diego. The work was funded by the National Institute of Disability and Rehabilitation Research, which is part of the U.S. Department of Education. The work was co-authored by Di Spigna, Yang, Winick, Parthasarathi Chakraborti, an NC State graduate student, Dr. Tushar Ghosh, a professor of textile engineering chemistry and science, and Dr. Paul Franzon, a professor of electrical and computer engineering.

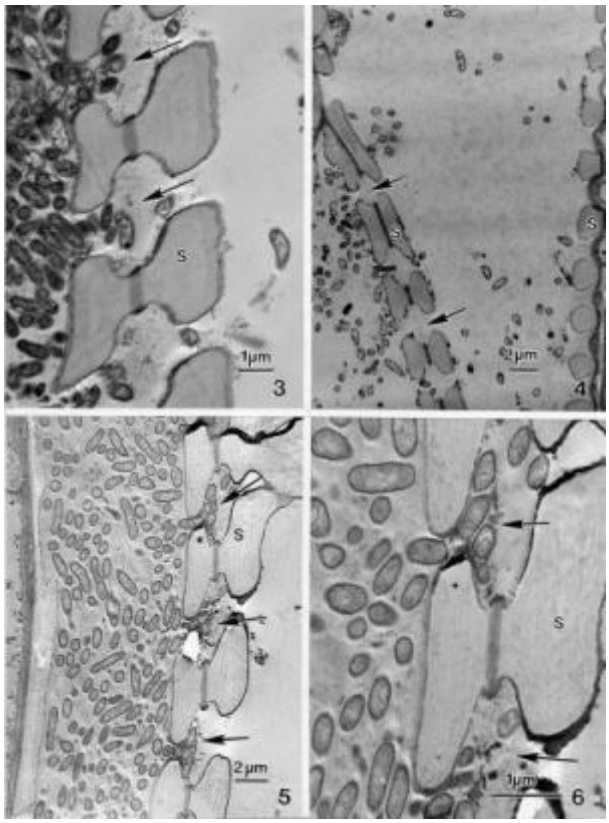
NC State's Department of Electrical and Computer Engineering is part of the university's College of Engineering. NC State's Department of Textile Engineering, Chemistry and Science is part of the university's College of Engineering and its College of Textiles.

Story Source:

Adapted from materials provided by North Carolina State University.

http://www.sciencedaily.com/releases/2010/03/100329093611.htm

Microscopic Photography Reveals Bacteria Destroying Grape Plant Cell Wall



Electron microscopy enabled researchers to see for the first time how a bacteria that kills grape vines is able to move through the plants at the cell level. (Credit: (Photo courtesy of Texas AgriLife Research))

ScienceDaily (Mar. 29, 2010) — Like a band of detectives surveying the movement of a criminal, researchers using photographic technology have caught at least one culprit in the act.

In this case, electron microscopy was used to watch a deadly bacteria breakdown cell walls in wine grape plants -- an image that previously had not been witnessed. The study will be published in *Botany*.

"Basically, we've been interested in determining how the bacteria moves," said Dr. B. Greg Cobb, Texas AgriLife Research plant physiologist in College Station. "How do they go from one part of the plant to another?"

The death of wine grape plants from Pierce's Disease is a serious threat to wineries from Texas to California, Cobb noted, and no one has been able to stop or reverse the effects of the bacteria that is injected into the vines by an insect known as the glassy-winged sharpshooter.

The bacteria that causes Pierce's Disease, Xylella fastidiosa, colonizes a plant over a period of time causing it to weaken and die.

"It can be a matter of a few years or more quickly, but plants tend to stop producing before they die, so growers will pull them out of a vineyard," Cobb said.

Cobb and his team of researchers zeroed in on the "matchstick" effect of Pierce's Disease. Plants suffering from the disease drop their leaves, but the petiole -- or stem that connects a leaf to the vine -- remains,

resembling a matchstick. This occurs over the length of the vine no matter where the initial insect injection occurred, Cobb explained.

"We've been looking at that area because we think that is a very important indicator of Pierce's Disease, but it also indicates that something is going on there," he explained.

The xylem of a plant is like a pipe with a spring in it which transports nourishing water to various parts of the plant. The bacteria that causes Pierce's Disease, Xylella fastidiosa, moves through the plant in this way.

"What is happening is that the bacteria is actually able to degrade and move through these very thin parts of the cell wall between the xylem elements," Cobb said. "You can actually see them in the 'pit membranes' that are the borders between adjacent cell walls."

The researchers focused the electron microscope at 100,000th of a millimeter along the pit membrane. The membrane normally blocks larger particles from passing through the pits that are located in the xylem, but high-level photographs show the bacteria breaking down the membrane in order to get through the plant.

Cobb said the study examined syrah and cabernet sauvignon plants because they have been known to be impacted by Pierce's Disease. In the field, they selected leaves that were still viable but had some "scorching" or water stress which indicated the disease was present.

"Then we isolated that very small part at the pit membrane and down the stem or petiole and looked at the xylem there," Cobb said. "To basically see the breakdown of the pit membranes had not been seen before."

Water stress contributes to the death of the Pierce's Disease-infected plant, he added, but it may not be the only factor.

With this information and the photographs to illustrate the process, Cobb's team continues to study the disease in hopes of figuring out what could be done to help an infected plant live longer.

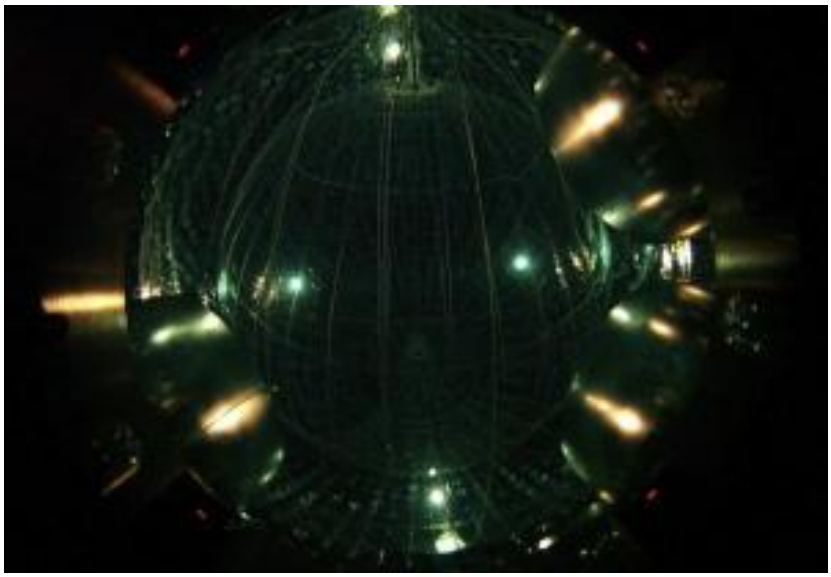
The two-year research effort was supported by the U.S. Department of Agriculture-Animal and Plant Health Inspection Service.

Story Source:

Adapted from materials provided by Texas A&M AgriLife Communications.

http://www.sciencedaily.com/releases/2010/03/100315091301.htm

Physicists Detect Rare Geo-Neutrino Particles, Peek Into Earth's Core



Inside the scintillator at Borexino. (Credit: Borexino Collaboration)

ScienceDaily (Mar. 29, 2010) — Using a delicate instrument located under a mountain in central Italy, two University of Massachusetts Amherst physicists are measuring some of the faintest and rarest particles ever detected, geo-neutrinos, with the greatest precision yet achieved. The data reveal, for the first time, a well defined signal, above background noise, of the extremely rare geo-neutrino particle from deep within Earth.

Funded by the National Science Foundation, UMass Amherst researchers Laura Cadonati and Andrea Pocar are part of the Borexino international team whose results are available in the current online edition of the journal *Physics Letters B*.

Geo-neutrinos are anti-neutrinos produced in the radioactive decays of uranium, thorium, potassium and rubidium found in ancient rocks deep within our planet. These decays are believed to contribute a significant but unknown fraction of the heat generated inside Earth, where this heat influences volcanic activity and tectonic plate movements, for example. Borexino, the large neutrino detector, serves as a window to look deep into the Earth's core and report on the planet's structure.

Borexino is located at the Laboratorio Nazionale del Gran Sasso underground physics laboratory in a 10 km-long tunnel about 5,000 feet (1.5 km) under Gran Sasso, or Great Rock Mountain, in the Appenines and operated by Italy's Institute of Nuclear Physics. The instrument detects anti-neutrinos and other subatomic particles that interact in its special liquid center, a 300-ton sphere of scintillator fluid surrounded by a thin, 27.8-foot (8.5-meter) diameter transparent nylon balloon. This all "floats" inside another 700 tons of buffer fluid in a 45-foot (13.7-meter) diameter stainless steel tank immersed in ultra-purified water. The buffering fluid shields the scintillator from radiation from the outer layers of the detector and its surroundings.

The scintillator fluid is so named because when neutrinos pass through it, they release their energy as small flashes of light. Neutrinos and their antiparticles, called anti-neutrinos, have no electric charge and a minuscule mass. Except for gravity, they only interact with matter via the weak nuclear force, which makes them extremely rare and hard to detect, as neutrinos do not "feel" the other two known forces of nature, the electromagnetic and the strong nuclear force.

Borexino is one of only a handful of such underground detectors in the world and is supported by institutions from Italy, the United States, Germany, Russia, Poland and France. Designed to observe and study neutrinos produced inside the Sun, it has turned out to be one of the most effective observatories of its kind in the world, with 100 times lower background noise, in part due to extremely effective scintillator purification and use of radiation-free construction materials.

Borexino is not the first instrument to look for geo-neutrinos. In 2005, a Japanese-United States collaboration operating a similar detector in Japan was able to identify some of these rare particles. But those measurements were affected by radioactive background noise, anti-neutrinos emitted from several nuclear reactors operating in Japan.

By contrast, the new Borexino data have stronger significance because of their purity and the absence of nuclear reactors. As Pocar explains, "the Borexino detector is very clean and has lower levels of radioactive impurities than ever achieved in experiments of this kind. It is indeed a very 'quiet' apparatus for the observation of low energy neutrinos, and exceptionally precise for distinguishing these particles by origin, either solar, geo or human-made." Italy has no nuclear power plants, he adds.

The small number of anti-neutrinos detected at Borexino, only a couple each month, helps to settle a long-standing question among geophysicists and geologists about whether our planet harbors a huge, natural nuclear reactor at its core. Based on the unprecedently clear geo anti-neutrino data, the answer is no, say the UMass Amherst physicists. "This is all new information we are receiving from inside the Earth from the geo-neutrino probe," Cadonati explains. "Our data are exciting because they open a new frontier. This is the beginning. More work is needed for a detailed understanding of Earth's interior and the source of its heat, with new geo-neutrino detectors above continental and oceanic crust."

In the future the international researchers hope that observations from similar detectors in Canada, Japan and Borexino in Italy can be coordinated to improve geo-neutrino detection and analysis even further.

Story Source:

Adapted from materials provided by University of Massachusetts Amherst.

Journal Reference:

1. G. Bellini, J. Benziger, S. Bonetti, M. Buizza Avanzini, B. Caccianiga, L. Cadonati, F. Calaprice, C. Carraro, A. Chavarria, F. Dalnoki-Veress. **Observation of geo-neutrinos**. *Physics Letters B*, 2010; DOI: 10.1016/j.physletb.2010.03.051

http://www.sciencedaily.com/releases/2010/03/100329083039.htm

How Marine Mussels Grip Rocks: Iron Atoms Convey Mussel Fibers With a Robust but Stretchy Covering

Mussels thrive in rocky seashore habitats, in spite of the enormous physical demands present there. This is in no small part due to the evolution of the byssus, which mussels employ to tether themselves to accessible surfaces. (Credit: iStockphoto/Simon Edwin)

ScienceDaily (Mar. 29, 2010) — We may like to eat mussels steamed in white wine, but we also like to find mussels at the beach. Mostly they are burrowed into the ground or tethered to rocks. But if you look closer you will find a mollusc which has adapted to life and nutrition in a special and fascinating way. Mussels thrive in rocky seashore habitats, in spite of the enormous physical demands present there. This is in no small part due to the evolution of the byssus, which mussels employ to tether themselves to accessible surfaces.

The individual byssal threads that compose the byssus are stiff, but stretchy and are fashioned by the mussel in a process resembling injection molding. Byssal threads are depended upon for dissipating the energy of crashing waves and also for resisting abrasive damage from water-borne debris. To this end, threads are sheathed with a thin and knobby outer cuticle; a biological polymer, which exhibits epoxy-like hardness, while straining up to 100% without cracking.

Incredible hardness and extensibility

Matthew Harrington, a researcher who worked on the project and Humboldt fellow at the Max Planck Institute for Colloids and Interfaces explains the motivation for studying the byssus cuticle: "Protective coatings are important for prolonging the lifetime of materials and devices. However, considering that hardness and extensibility are seldom coupled in engineered polymers or composites, understanding how one protects a flexible substrate becomes quite important." Byssal cuticles have a knobby appearance due to inclusions of submicron-sized granular structures in an apparently continuous matrix. Submicron-sized tears that form in the matrix during stretching of the cuticle are believed to hinder the formation of larger cracks that could lead to material failure.

Central to understanding the peculiar mechanical behaviour of the cuticle are the high concentration of iron ions in the cuticle and the presence of an uncommon modification of the amino acid tyrosine known commonly as dopa. Dopa is found at high concentrations in the main cuticle component, mussel foot protein-1 (mfp-1). Dopa is distinguished from typical amino acids due to its impressive affinity for complexing with transition metal ions, particularly iron. As Admir Masic, a scientist at the Max Planck Institute for Colloids and Interfaces who worked on the project, explains, "when 2-3 dopa residues complex with a single iron ion, they create an incredibly stable complex that can be utilized to cross-link structural proteins." These metal-protein complexes have a high breaking force (nearly half that of covalent bonds), but unlike covalent bonds they are reversibly breakable, making them ideal for creating sacrificial cross-links.

Cuticle is stabilized by dopa-iron complexes

Using a technique known as in situ Raman spectroscopy to probe the chemical composition of the cuticle, the researchers provided the first direct evidence that the cuticle is a protein-based polymeric scaffold stabilized by dopa-iron complexes. Moreover, it was discovered that the distribution of dopa-iron complexes is clustered, with areas of high density coinciding with the granular inclusions and low density with the inter-granular matrix. These observations, coupled with previous mechanical observations suggest that the densely cross-linked granules function as hard inclusions and the less cross-linked matrix functions in a sacrificial manner, allowing bonds to break prior to catastrophic failure.

"Nature has evolved an elegant solution to a problem that engineers are still struggling with; namely, how to combine the properties of abrasion resistance and high extensibility in the same material," says Peter Fratzl, director of the biomaterials department at the Max Planck Institute for Colloids and Interfaces. Apparently, the cuticle achieves this through a careful tailoring of protein-metal chemistry and the submicron organization of cross-link density. "Conceivably, this same strategy could be applied in engineered polymers and composites."

Story Source:

Adapted from materials provided by Max-Planck-Gesellschaft.

Journal Reference:

1. Harrington et al. **Iron-Clad Fibers: A Metal-Based Biological Strategy for Hard Flexible Coatings**. *Science*, 2010; DOI: 10.1126/science.1181044

http://www.sciencedaily.com/releases/2010/03/100304142234.htm

Nanosatellite To Clear Dangerous Debris From Space

Still image from a video animation of the CubeSail in orbit above Earth. (Credit: Image courtesy of University of Surrey)

ScienceDaily (Mar. 29, 2010) — New UK technology unveiled on March 26 is set to play a major part in clearing dangerous clouds of debris hurtling around the Earth's lower orbit.

More than 5,500 tonnes of debris is believed to be cluttering space around the planet as a result of 50 years of abandoning spacecraft, leading to a threat of collision to any manned or unmanned spacecraft, the destruction of hugely expensive technology and the potential threat of large debris plummeting back to Earth.

The build-up of debris -- expected to grow at a rate of 5% each year -- is also believed to obstruct satellite television and other communications signals.

Scientists at the University of Surrey, working on the project funded by the European space company Astrium, have devised a 3 kg miniature satellite or "nanosatellite" fitted with a "solar sail."

"CubeSail" is a device which can be fitted to satellites or launch vehicle upper stages that are sent into orbit and then can be deployed to successfully de-orbit equipment that has reached the end of its mission.

A 5 x 5 m, 3 kg, deployable sail is being developed to fit in a 10 x 10 x 30 cm nanosatellite and will be used in a demonstration mission to be launched in late 2011 demonstrating passive means of deorbiting for future satellites.

Dr Vaios Lappas, lead researcher on the project and Senior Lecturer in Space Vehicle Control at the Surrey Space Centre, said: "Protecting our planet and environment is key for sustainable growth. CubeSail is a novel, low cost space mission which will demonstrate for the first time space debris/satellite deorbiting using an ultra light 5 x 5 sail stowed and supported on a 3 kg nanosatellite.

"Successful deployment and testing of the sail can enable a low cost/mass solution to be used for future satellites and launch vehicle upper stages reducing dramatically the problem of space debris.

"Following successful in orbit demonstration, the proposed deorbit system will be offered as a standard deorbit system for Low Earth Orbit missions for satellites with a mass of less than 500 kg at a very low cost." "

CubeSail is due to be ready for launch on new satellites next year, and is expected to be available for shifting existing debris from 2013. Dr Craig Underwood, Deputy Director of the Surrey Space Centre, and Reader in Spacecraft Engineering at SSC, said: "The launch of this innovative new technology is very timely. This week's announcement of the creation of the UK's space agency is evidence of the commitment to space initiatives and their huge potential for creating growth in the UK economy. At the same time, this exciting future is increasingly dependent on finding a sustainable approach to launching and disposing safely of spacecraft.

"Innovation in this area is crucial -- and we're keen that a Centre like ours, able to give firms early experience of new space technologies at low cost -- is central to the growing UK space industry."

The Surrey Space Centre has a close working relationship with Astrium, part of EADS, focusing on technology innovation.

Story Source:

Adapted from materials provided by University of Surrey.

http://www.sciencedaily.com/releases/2010/03/100327145501.htm

Contact Lenses Loaded With Vitamin E May Treat Glaucoma

Contact lenses containing vitamin E like the one above can treat glaucoma, the second leading cause of blindness, and other eye conditions, scientists are reporting. (Credit: Anuj Chauhan, Ph.D.)

ScienceDaily (Mar. 29, 2010) — The popular dietary supplement vitamin E, loaded into special medicated contact lenses, can keep glaucoma medicine near the eye -- where it can treat that common disease -- almost 100 times longer than possible with current commercial lenses, scientists report.

In a presentation at the 239th National Meeting of the American Chemical Society (ACS) in San Francisco, they described use of vitamin E to develop contact lenses that may deliver more medication for glaucoma and perhaps other diseases to the eye.

Anuj Chauhan, Ph.D., who headed the research team, explained that glaucoma is second only to cataracts as the leading cause of vision loss and blindness in the world. It affects almost 67 million people. Eye drops that relieve the abnormal build-up of pressure inside the eye that occurs in glaucoma, are a mainstay treatment.

"The problem is within about two to five minutes of putting drops in the eye, tears carry the drug away and it doesn't reach the targeted tissue," said Chauhan, who is with the University of Florida in Gainesville. "Much of the medicine gets absorbed into the bloodstream, which carries it throughout the body where it could cause side effects. Only about one to five percent of drugs in eye drops actually reach the cornea of the eye."

Chauhan and colleagues have developed a new extended-release delivery approach incorporating vitamin E into contact lenses. The invisible clusters, or aggregates, of vitamin E molecules form what Chauhan describes as "transport barriers." that slow down the elusion of the glaucoma medication from the lens into the eye. The drug released from the lens into the eye stays in the tears far longer than the 2-5 minutes with eye drops, leading to more effective therapy.

"These vitamin structures are like 'nano-bricks'," Chauhan said. "The drug molecules can't go through the vitamin E. They must go around it. Because the nanobricks are so much bigger than the drug molecules --

we believe about a few hundred times bigger -- the molecules get diverted and must travel a longer path. This increases the duration of the drug release from the lenses."

In research with laboratory animals, the lenses containing vitamin E nanobricks administered drugs up to 100 times longer than most commercial lenses. The lenses could be designed for continuous wear for up to a month, Chauhan said. In addition to treating glaucoma, the contacts could help other eye conditions, such as cataract and dry eye. Cataract is a clouding of the lens of the eye, and dry eye involves decreased production of tears. It affects about 2 in 10 people and can lead to more severe eye problems.

"Vitamin E is a proven nutraceutical that in small amounts is good for the eye because of its ant-oxidant properties. Also Vitamin E presence in the contact lenses blocks UV radiation, leading to increased protection against the UV light. Our research has shown that the vitamin can be loaded into the lenses without any reduction in transparency. We believe it could be helpful in disease treatment and in prevention as well," he said.

Chauhan said that clinical trials of the new lenses could begin within a year to 2 years.

Here is an excerpt from Chauhan's ACS presentation:

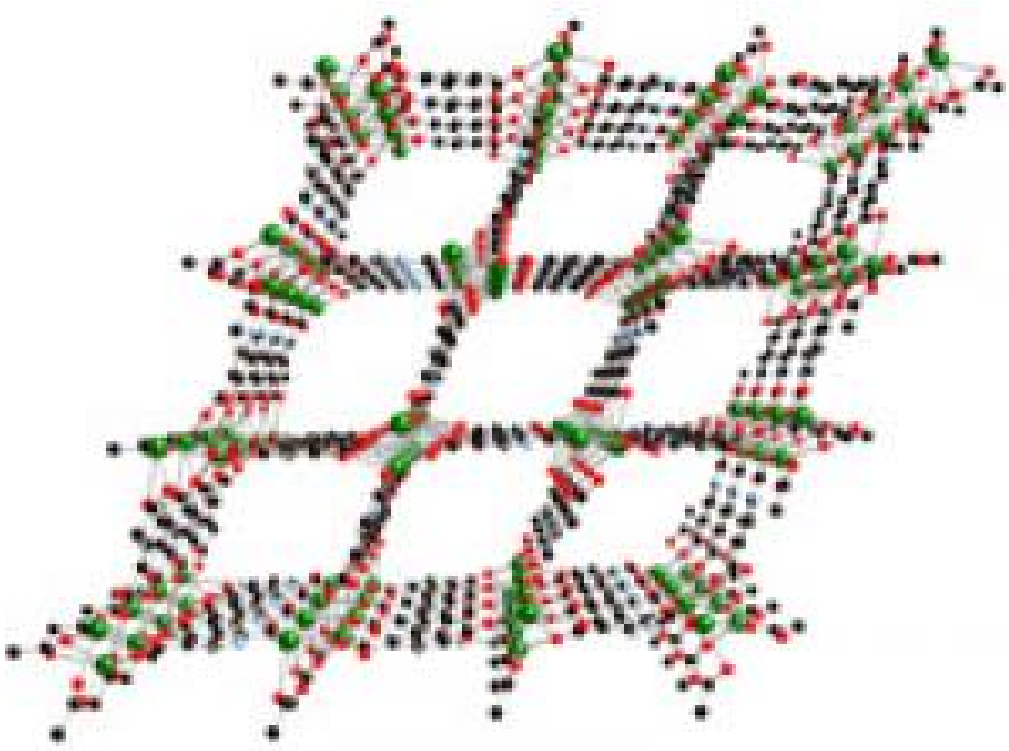
"We have developed a novel approach of extending the duration of drug release from contact lenses by including nanosized aggregates of Vitamin E in the lenses. The Vitamin E nano-aggregates force the drug molecules to travel in a tortuous path leading to increased drug release durations. Another benefit of Vitamin E incorporation is that Vitamin E is known to be an anti-oxidant, whose slow release from lenses could also help in prevention of ophthalmic diseases like cataract and glaucoma. Furthermore, Vitamin E blocks UV radiation, leading to reduced ocular damage from the UV light. Our research has shown that Vitamin E can be loaded into the lenses without any reduction in transparency. The drug release durations from Vitamin E loaded lenses are about 100 times longer than from commercial lenses for several ophthalmic drugs including glaucoma drug timolol, anti-inflammatory drug dexamethasone, and anti-viral drug flucanozole. Thus, Vitamin E loaded lenses could be highly effective in synergistic prevention and treatment of ophthalmic diseases through extended delivery of the desired drugs and the nutraceutical Vitamin E. Animal studies in beagle dogs are ongoing to explore glaucoma treatment through Vitamin E laden contact lenses."

Story Source:

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

http://www.sciencedaily.com/releases/2010/03/100324121002.htm

Making Car Fuel from Thin Air



Porous metal organic framework (MOF). (Credit: Image courtesy of University of the West of England)

ScienceDaily (Mar. 29, 2010) — Researchers from the South West are working on a £1.4 million project that could take carbon dioxide from the air and turn it into car fuel.

Scientists and engineers from the University of the West of England are collaborating with colleagues from the University of Bath, who are leading the research, and colleagues from the University of Bristol.

The project aims to develop porous materials that can absorb the gas that causes global warming and convert it into chemicals that can be used to make car fuel or plastics in a process powered by renewable solar energy.

The researchers hope that in the future the porous materials could be used to line factory chimneys to take carbon dioxide pollutants from the air, reducing the effects of climate change.

Dr Frank Marken, Senior Lecturer in Chemistry (University of Bath) said: "Current processes rely on using separate technology to capture and utilise the CO_2, which makes the process very inefficient. By combining the processes the efficiency can be improved and the energy required to drive the CO_2 reduction is minimised.

"It will be a massive challenge but we have a strong inter-disciplinary team that includes chemists, chemical engineers, biologists, and life-cycle analysts."

Dr Petra Cameron, RCUK Fellow from the Department of Chemistry (University of Bath), said: "We hope that the use of renewable energy to recycle CO_2 will be an effective way to reduce the amount of CO_2 in the atmosphere."

The Bath-Bristol collaboration brings together scientists from a range of disciplines, including researchers from Bath's Institute for Sustainable Energy and the Environment (I-SEE), the School of Chemistry at the University of Bristol, and the Bristol Robotics Laboratory (BRL) and School of Life Sciences at the University of the West of England.

Dr Ioannis Ieropoulos, (BRL), said, "One of great advantages of this project is that it will exploit the natural abilities of microorganisms to reduce CO_2 in the atmosphere and at the same time produce electricity or hydrogen, as required."

Dr David Fermin from the University of Bristol said: "Currently, there are no large-scale technologies available for capturing and processing CO_2 from air. The facts are that CO_2 is rather diluted in the atmosphere and its chemical reactivity is very low. By combining clever material design with heterogeneous catalysis, electrocatalysis and biocatalysis, we aim at developing an effective carbon neutral technology."

The project, funded by the Engineering & Physical Sciences Research Council (EPSRC), is in its early stages, but the researchers predict the new technology could make a real difference in the fight against climate change.

The project is part of Research Councils UK (RCUK) cross-Council programme 'Nanoscience: through Engineering to Application'.

Story Source:

Adapted from materials provided by University of the West of England.

http://www.sciencedaily.com/releases/2010/03/100324184556.htm

Naval Research Laboratory Takes a Close Look at Unique Diamonds

The Wittelsbach-Graff diamond (31.06 ct, left) and the Hope diamond (45.52 ct, right) apparently were not cut from the same crystal, even though they share several similarities, such as strong red phosphorescence (bottom). (Credit: Photos by Chip Clark Smithsonian)

ScienceDaily (Mar. 29, 2010) — The song says that "diamonds are a girl's best friend," but scientists at the Naval Research Laboratory are finding that diamonds are a researcher's best friend too. NRL, which has been involved in pioneering work involving chemical vapor deposition of diamond and the use of diamond materials in advanced technologies relevant to the Department of Defense since 1987, has recently undertaken some new projects in diamond research.

In collaboration with the Smithsonian Institution Museum of Natural History, NRL researchers have begun studying unique and historic natural colored diamonds to understand and characterize the defects/impurities, which cause the color. Many of the properties of diamond necessary for technology are impacted by defects and impurities present in the lattice. NRL has been complementing its studies of these defects and impurities in chemical vapor deposition diamond materials with its studies of natural diamonds at the Smithsonian.

Since late 2005, a team of NRL researchers led by Dr. James Butler of the Chemistry Division, has been examining unusual natural colored diamonds available to the Smithsonian. These included many of the diamonds in the Smithsonian Collection, such at the "Hope" and the "Blue Heart," as well as a collection of 240 fancy colored diamonds in the Aurora Butterfly collection on loan to the Smithsonian.

Hope Diamond and Wittelsbach-Graff Diamond

During 2005, NRL researchers James Butler, Sally Magana (NRC), Jaime Freitas and Paul Klein worked with the Smithsonian, Penn State University, and Ocean Optics to study the optical emission properties of the Hope Diamond. This work, "Using Phosphorescence as a Fingerprint for the Hope and Other Blue Diamonds," was published in Geology, 36, 83-86 (2008). Most recently, in 2010, NRL has been working with the Smithsonian and the Gemological Institute of America (GIA) to study another famous blue diamond, the Wittelsbach-Graff diamond.

Both the Hope and the Wittelsbach-Graff diamonds are believed to have originated from the same region in India in the 17th century, have similar blue color and nearly identical red/orange phosphorescence when excited by ultra-violet light. Hence, it has been speculated that they might have originated from the same stone. The Wittelsbach-Graff diamond was last seen in public in 1958; then in 2008 Laurence Graff, a diamond dealer, bought it at auction for 16.4 million GBP. Graff had the stone cut and repolished, reducing it from a 35.5 carat stone to a 31 carat stone, compared to the Hope diamond which is 45.52 carats.

The research team studying the Wittelsbach-Graff diamond used a variety of spectroscopic and microscopic analyzes to determine the extreme similarity of the gems, but also observed distinct differences in the dislocation and strain microstructure which suggests that the gems probably did not originate from the same rough stone.

The Wittelsbach-Graff is on display at the Museum of Natural History from February to August 2010 along with the Hope Diamond. This work continues the ongoing collaboration between NRL scientists and the Museum of Natural History on the Hope diamond and other blue diamonds at the Smithsonian which has examined the phosphorescence (due to donor-acceptor recombination), the boron concentration using secondary ion mass spectroscopy, and soon to be published work on the spectroscopic and structural properties of a collection of pink diamonds.

Pink Diamonds

Another aspect of NRL's diamond research collaboration with the Smithsonian involves an interdisciplinary effort to study rare pink diamonds. Many natural pink diamonds derive their color from colored bands or lamellae in an otherwise colorless diamond. Led by Jeff Post, Eloïse Gaillou, and Tim Rose of the Smithsonian Museum of Natural History; NRL researchers James Butler (Chemistry Division), Rhonda Stroud and Nabil Bassim (Materials Science and Technology Division); along with Alexander Zaitsev, CUNY; and Marc Fries, JPL/Cal Tech studied a suite of natural pink diamonds. The research team used a variety of spectroscopic and microanalytical tools to study the structure, defects, and impurities in and around the colored lamellae.

Pink diamonds are extremely rare, on a par with blue diamonds in rarity and value. But unlike most blue diamonds where the color is caused by an impurity atom, boron, pink diamonds seem to derive their color from structural, or a combination of structural and impurity related defects.

While the research team has not identified the exact structure of the defects causing the pink color, they have determined that it is contained in narrow colored lamellae in an otherwise clear matrix of diamond. Using a focused ion beam microscope, NRL researchers extracted cross-sections of the pink lamella for detailed examination in a transmission electron microscope (TEM). TEM examination of the lattice structure, combined with spectroscopic analysis, suggest that the lamellae are the result of plastic deformation, which occurred while the diamond was still in the earth's mantle and before it was transported to the surface in ancient volcanic eruptions. They will continue their studies to characterize a suite of rare pink diamonds to see if they can fully identify the nature and cause of the defects which cause the pink color.

"The pink lamella are twin domains, with atoms arranged to mirror almost exactly those of the surrounding clear diamond. The real question is, what subtle shift in the atomic arrangement makes the

twins pink but leaves the nearly identical sibling colorless? The sub-angstrom imaging capabilities of the latest generation of electron microscopes should tell us the answer," says Stroud.

"Understanding these unique colored natural diamonds provides knowledge useful to both technologists and gemologists," Butler explains. "A better understanding of these defects and impurities (dopants) allow us to tailor the materials properties of diamond materials: from electrically insulating to semiconducting; from optically transparent to a variety of colors; or to provide the isolated quantum states for quantum cryptography or quantum computing."

Story Source:

Adapted from materials provided by Naval Research Laboratory.

Journal Reference:

1. Sally Eaton-Magaña, Jeffrey E. Post, Peter J. Heaney, Jaime Freitas, Paul Klein, Roy Walters, James E. Butler. **Using phosphorescence as a fingerprint for the Hope and other blue diamonds**. *Geology*, 2008; 36 (1): 83 DOI: 10.1130/G24170A.1

http://www.sciencedaily.com/releases/2010/03/100323121801.htm

Vast Microbial Diversity of Carnivorous Pitcher Plant Uncovered

Sarracenia alata flowers. (Credit: Photo by Noah Elhardt / Courtesy of Wikimedia Commons)

ScienceDaily (Mar. 29, 2010) — The microbial ecosystem inside the carnivorous pitcher plant is vastly more diverse than previously thought, according to research published in the March 2010 issue of the journal *Applied and Environmental Microbiology*.

Researchers from Louisiana State University used genomic fingerprinting technology to assess the bacterial diversity inside leaves of *Sarracenia alata*, commonly known as the pitcher plant. A pitcher plant is a carnivorous plant that lives in nitrogen poor soil augmenting the inadequate nitrogen by trapping and digesting insects. It has tubular shaped leaves that contain a liquid that is used for digestion. Over the past 35 years studying these plants using traditional culture-based methods, scientists have only identified 20 distinct bacteria in the pitcher.

"The microbial richness associated with the pitcher fluid from *Sarracenia alata* is high, with more than 1,000 phylogroups identified across at least seven phyla and over 50 families," say the researchers, who studied 10 plants in a Louisiana wildlife management area for 5 months during the spring and summer of 2009.

The researchers noted as well that approximately a third of all the bacteria were unidentifiable. They also observed that not only were the bacterial populations distinctly different from nearby soil samples, they started out different in each plant but over time they became more similar to one another.

"These findings indicate that the bacteria associated with pitcher plant leaves are far from random assemblages and represent an important step toward understanding this unique plant-microbe interaction," say the researchers.

Story Source:

Adapted from materials provided by American Society for Microbiology.

Journal Reference:

1. M. M. Koopman, D. M. Fuselier, S. Hird, B. C. Carstens. **The Carnivorous Pale Pitcher Plant Harbors Diverse, Distinct, and Time-Dependent Bacterial Communities**. *Applied and Environmental Microbiology*, 2010; 76 (6): 1851 DOI: 10.1128/AEM.02440-09

http://www.sciencedaily.com/releases/2010/03/100323223913.htm

Mother-Son Relationship Key to Emotional Development

Mother and son. (Credit: Image courtesy of University of Reading)

ScienceDaily (Mar. 29, 2010) — New research from the University of Reading says that children, especially boys, who have insecure attachments to their mothers in the early years have more behaviour problems later in childhood.

The analysis by Dr Pasco Fearon, from the School of Psychology and Clinical Language Sciences, looked at 69 studies involving almost 6,000 children aged 12 and younger.

The quality of the relationship between children and their parents is important to children's development, but past research on the link between attachment and development has been inconsistent. The volume, range and diversity of earlier studies made it difficult to get a clear picture. However this new analysis has been able to pull together evidence from past research to answer a number of scientific questions around attachment.

According to attachment theory, children with secure attachments expect and receive support and comfort from their care givers. In contrast, children with insecure attachments have requests discouraged, rejected, or responded to inconsistently, which is thought to make them vulnerable to developing behavioural problems.

The new research sought to clarify the extent to which bonds between children and their mums early in life affect children's later behavioural problems, such as aggression or hostility. The studies included in the review used a range of methods for assessing children's behaviour problems, including parent and teacher questionnaires and direct observations.

Dr Fearon said: "The central question we posed was whether attachment insecurity was associated with behaviour problems across all the studies conducted to date. The results showed quite clearly that the answer to this question is a firm yes.

"More specifically, our analysis showed that children with insecure attachments to their mothers, particularly boys, had significantly more behavioural problems, even when the behavioural problems were measured years later."

The study also recommends the need for treatment studies focusing on attachment and for more research on the significance of attachment between children and their fathers.

The study was funded in part by the National Science Foundation.

Story Source:

Adapted from materials provided by University of Reading.

Journal Reference:

1. Fearon, RP et al. **The Significance of Insecure Attachment and Disorganization in the Development of Children's Externalizing Behavior: A Meta-Analytic Study**. *Child Development*, 2010; 81 (2): 435 DOI: 10.1111/j.1467-8624.2009.01405.x

http://www.sciencedaily.com/releases/2010/03/100325093124.htm

Cosmic magnetic field strength measured

Hints of weak magnetism between galaxies may provide information about early universe
By Alexandra Witze
Web edition : Thursday, April 1st, 2010

On targetFor active galaxies classified as blazars, jets of particles traveling near the speed of light beam right toward Earth.Goddard Space Flight Center/NASA

Astronomers say they have detected evidence of how strong the magnetic fields between galaxies must be. The finding helps illuminate how magnetism arose in the cosmos and could one day serve as a probe for understanding processes that happened soon after the Big Bang 13.7 billion years ago.

The new study, published online April 1 in *Science*, "may be a clue that there was some fundamental process in the intergalactic medium that made magnetic fields," says Ellen Zweibel, a theoretical astrophysicist at the University of Wisconsin, Madison, who was not associated with the work.

All galaxies contain magnetic fields. The Milky Way's field is most intense near its center, where its strength is about 1/20,000th the strength of Earth's magnetic field.

Magnetic fields also permeate intergalactic space, but until now astronomers haven't known how strong those fields are or how they arose. One "top-down" idea is that all of space was imbued with a slight magnetic field soon after the Big Bang, and this field grew in strength as stars and galaxies amassed and amplified its intensity. Another, "bottom-up" possibility is that magnetic fields formed initially by the motion of plasma in small objects in the primordial universe, such as stars, and then propagated outward into space.

The new work suggests that the top-down option is the right explanation and puts a lower limit on the intensity of the fields.

Andrii Neronov and Ievgen Vovk, of the Geneva Observatory, reached this conclusion by studying blazars, the bright hearts of active galaxies that spew jets of energized particles directly toward Earth.

The orbiting Fermi Gamma-ray Space Telescope has spotted a number of these objects, including the brightest one ever seen shining in the gamma-ray portion of the electromagnetic spectrum.

But blazars are more than cosmic beauties; they also provide information about the space the gamma rays have traversed on their way to Earth. Like all electrically neutral particles, gamma-ray photons zoom through empty space unperturbed by magnetic fields. But occasionally a gamma ray will encounter another photon, or particle of light, of much lower energy. The collision causes the gamma ray to splinter into an electron and a positron. Because those two new particles are electrically charged, they are suddenly subject to being deflected by a magnetic field. They later recombine to form a gamma ray again, which proceeds unharmed, but with a lower intensity.

Neronov's team looked at Fermi data for gamma rays of the intensity that would have arrived at Earth if they had not broken into pieces and been deflected by magnetic fields along the way. Even after including data from the HESS gamma-ray telescopes in Namibia, the researchers did not spot any of these types of rays.

That lack of detection, says Neronov, "tells us that electrons and positrons were deflected. There is nothing else to deflect them but a magnetic field." That means magnetic fields must exist in intergalactic space with a strength of at least one ten-million-billionths the strength of Earth's.

"The fact that they've put a lower bound on magnetic fields far out in intergalactic space, not associated with any galaxy or clusters, suggests that there really was some process that acted on very wide scales throughout the universe," Zweibel says.

And that process would have occurred in the early universe, not long after the Big Bang. "These magnetic fields could not have formed recently and would have to have formed in the primordial universe," says Ruth Durrer, a theoretical physicist at the University of Geneva.

Studying ancient magnetic fields using gamma rays might shed light on processes at work very early in the universe, she says. Currently, the best glimpse astronomers have at the primordial cosmos is the relict radiation, at microwave wavelengths, that permeates the sky as a leftover glow from the Big Bang. Gamma-ray observations could turn out to be an alternative probe, says Neronov.

"It would be a new piece of cosmological information," he says.

http://www.sciencenews.org/view/generic/id/57838/title/Cosmic_magnetic_field_strength_measured

Study reports hints of phthalate threat to boys' IQs

Researchers link lower IQs in children to a chemical found in some plastics and food packaging
By Janet Raloff
Web edition : Monday, April 5th, 2010

You may have a hard time spelling phthalates, but there's no avoiding them. They're in the air you breathe, water you drink and foods you eat. And this ubiquity may carry a price, particularly for young boys, emerging data suggest. Including a drop in their IQ.

A new study examines cognitive risks from phthalates. The study wasn't big — including just 667 third- and fourth-graders. But it does cover a broad and nationally representative cross-section of South Korea's youngsters. Moreover, whatever changes occurred in these kids might well develop elsewhere. And that's because residues of diethylhexyl phthalate, or DEHP — the phthalate that appeared most neurotoxic to these children — show up in people throughout the developed world, including the United States.

Soo-Churl Cho and Hee-Jung Yoo of Seoul National University College of Medicine and their colleagues recruited participants from nine grade schools. These drew from vastly different communities: Seoul, a metro area with 10 million people; Incheon, an industrial center with close to 3 million inhabitants; Ulsan, an industrial region about one-third Incheon's size; Seongnam, a suburban home to some million residents; and a rural region covering land mass comparable to Seoul's metro region, but inhabited by a mere 50,000 people.

Each child took the Korean version of a widely accepted IQ test known as the Wechsler Intelligence Scale for Children, or WISC. So did the kids' moms, which offered the researchers — from four Korean medical schools — a gauge for the genetic component to each child's IQ.

DEHP metabolites, or breakdown products, ranged from a minimum of 0.5 micrograms per liter to 445 µg/l. Two DEHP metabolites were measured and summed for each child. Then the kids were split into four groups on the basis of these metabolites. In an upcoming issue of *Environmental Health Perspectives* published online, ahead of print, the researchers report finding that as the amount of DEHP's breakdown products in urine climbed, a child's IQ fell a small amount.

And not uniformly across all components of the IQ testing. Sections where DEHP exposure seemed to play a role were the kids' "full-scale" IQ, vocabulary score, verbal IQ and block-design tests. For instance, on the full-scale IQ, boys in the highest DEHP-exposure group scored 1 to 2 points lower than did those in the other three groups, depending on contamination levels in the lower groups and the range of possible confounding variables used to test for statistical validity. No such trend of some phthalate-linked drop in full-scale IQ emerged among girls.

In fact, the scientists suspected that they might observe some gender effect. Earlier studies by others have shown boys are more susceptible to adverse changes in reproductive development following prenatal exposure to phthalates. A recent study also showed a difference in gender-related play preferences betweem boys who were more heavily exposed in the womb to phthalates.

A more limited IQ risk emerged for dibutyl phthalate — a plasticizer and solvent used widely, from polyvinyl chloride and inks to adhesives and cosmetics. Here too, block-design scores fell as levels of DBP's breakdown product in urine rose.

Although about a dozen other breakdown products of phthalates can also be measured, the researchers ignored them because none were very abundant in these kids.

For a little perspective, the U.S. Centers for Disease Control and Prevention notes that a 2005 study out of Korea found that children there tended to have mean DEHP metabolite values about triple those measured in U.S. children.

What to make of the findings? Well, the kids' values were controlled on the basis of their moms' IQ scores. That may or may not be the right thing to do, the researchers admit. For instance, the moms' IQs might have influenced — through smart or not-so-smart diet and product choices — DEHP exposures in themselves and their children.

They also can't say whether effects they measured in the children trace to recent exposures or ones that go back to the womb or infancy, when neural pathways were forming. Then again, recent studies have shown that at least when it comes to lead, another neurotoxic agent, the brains of even school-age children remain fairly plastic to its damage.

If follow-up studies do confirm a phthalate risk to cognition, Cho, Yoo and their colleagues speculate that it might be through a tinkering with thyroid hormone levels in the children. Thyroid hormones play a pivotal role in neural development. And the researchers point out, "Although human data are lacking, *in vitro* and *in vivo* studies suggest that phthalate exposure is associated with altered thyroid functioning." They also cite papers suggesting additional possible brain impacts from low-dose exposures to phthalates.

It's time that research identified how phthalates are getting into our children's bodies so that policymakers might consider regulations to limit such tainting. After all, IQ is nothing to play with. And parents can't be expected to make sound choices to protect their young unless they get solid data on sources of pollutants and possible risks from them.

http://www.sciencenews.org/view/generic/id/57949/title/Study_reports_hints_of_phthalate_threat_to_boys%E2%80%99_IQs

Alaskan peatlands expanded rapidly as ice age waned

Growth fueled by warm summers, cold winters
By Sid Perkins
Web edition : Monday, April 5th, 2010

Stacking up carbon Mosses that grew in Alaskan peatlands less than 8,600 years ago (samples at left, second from left) have decomposed more quickly and accumulated carbon at a rate only one-fourth that of mosses that grew between 8,600 and 11,500 years ago (third from left, far right), thanks to the recent trend toward decreasing seasonality in the form of cooler summers and warmer winters.Yu and Jones

A rapid expansion of Alaskan peatlands at the end of the ice age was fueled by highly seasonal climate conditions, a new analysis suggests. The finding raises the possibility that future warming could decrease or reverse carbon storage in peatlands and thereby further aggravate climate change.

The study, published online the week of April 5 in the *Proceedings of the National Academy of Sciences*, shows that most of Alaska's peatlands formed at a time when the region experienced warmer summers and colder winters than today.

Paleoecologists Zicheng Yu and Miriam Jones of Lehigh University in Bethlehem, Pa., analyzed core samples from peatlands, as well as data collected by other teams, to trace the expansion of peatlands in Alaska since the peak of the most recent ice age. The oldest of these prodigious storehouses of carbon first appeared about 18,000 years ago, a couple of millennia before such boggy areas appeared in Siberia and other high-latitude areas.

And those boggy regions expanded quickly: More than 75 percent of the Alaskan peatlands that have been dated are more than 8,600 years old, Yu says. The data indicate that Alaska's peatlands, which together cover an area 50 percent larger than California, got a substantial head start on their Siberian counterparts. "These areas formed about 2,000 years earlier than in other regions," says Yu. Many of those peatlands formed as climate warmed near the end of the most recent ice age, when rainfall increased and runoff gathered in low spots on the formerly arid tundra.

Previous estimates of Alaska's peatland coverage varied widely and information is still scant, says David Beilman, an environmental scientist at the University of Hawaii at Manoa. Nevertheless, he notes, "Alaska has needed a detailed inventory of its peatlands, and [Yu and Jones] did a nice job of collating existing information."

Rates of carbon storage in Alaskan peatlands were highest when those boggy areas were young. Between 11,500 and 8,600 years ago, each square meter of peatland accumulated about 20 grams of carbon each year on average, Yu and Jones find. More recently, since 8,600 years ago, the average annual rate of carbon sequestration has been only 5 grams per square meter.

The prodigious rates of carbon storage before 8,600 years ago were triggered by huge differences in the seasons then, the researchers contend. In that era, summers were about 2 degrees Celsius warmer than they are now, so peat mosses grew more quickly. Plus, winters were substantially colder than today's, so the peat that accumulated during the summer didn't decompose so quickly in the off-season.

The team's new analyses show that, surprisingly, the rate of peat accumulation depended more strongly on increased seasonality than it did on the amount of annual precipitation, Yu adds.

This newfound link between carbon accumulation and climate variability is "interesting and provocative," says Philip Camill, a biogeochemist at Bowdoin College in Brunswick, Maine. "The warm summers and cold winters were like a one-two punch that maximized carbon accumulation."

By the end of this century, summers in Alaska are expected to be between 3 and 5 degrees C warmer than they are today, says Camill. But that doesn't necessarily bode well for carbon accumulation in peatlands, he notes, because winters are expected to be between 7 and 8 degrees C warmer as well. "There will be more productivity in the summer but more decomposition in the winter," he says, so it's tough to estimate whether peatlands will remain a repository for carbon or whether they'll begin to release more carbon than they accumulate. "It's not clear what the new balance will be," he notes.

Studies suggest that between one-quarter and one-third of the carbon stored in the world's soils since the last ice age has accumulated in high-latitude peatlands. Many scientists are concerned about changes in arctic climate that could trigger carbon emissions from peatlands, especially those that accelerate decomposition by warming the soil or drying it, which allows oxygen-rich air to infiltrate surface layers.

http://www.sciencenews.org/view/generic/id/57938/title/Alaskan_peatlands_expanded_rapidly_as_ice_age_waned

Dinosaur rise linked to volcanism

By Paul Rincon
Science reporter, BBC News

Immense volcanic activity helped the dinosaurs rise to prominence some 200 million years ago, a study suggests.

Dinosaurs were the dominant vertebrates on land for some 135 million years.

While it is widely accepted that an asteroid or comet wiped them out, there has been less agreement on the factors which led to their ascendancy.

Research in PNAS journal suggests volcanic eruptions changed the climate, causing a mass extinction that wiped out the dinosaurs' main competitors.

The scientific paper, by researchers from the US and Taiwan, looked at several lines of evidence such as the remains of plant wax and wood from sedimentary rocks interbedded with lava flows. From these, they were able to extract vital data about the climate at this time.

The lava flows are dated to the end-Triassic extinction, 201.4 million years ago, which wiped out 50% of tetrapods (four-limbed animals) on land, 50% of terrestrial plants and 20% of marine families.

The scientists examined how two different isotopes (or forms) of carbon fluctuated during these volcanic eruptions. They found that the "heavy" form of carbon was depleted relative to the "light" form.

Super greenhouse

They say this reflects disturbances in the carbon cycle at this time, including a spike in atmospheric carbon dioxide (CO2) and aerosols (fine solid particles).

This would have resulted in "super" greenhouse warming, according to lead author Jessica Whiteside, a geologist at Brown University in Providence, Rhode Island.

"We are showing that these events are synchronous with the extinction and that the events all occur within a few tens of thousands of years of the eruption of these huge lava flows," Dr Whiteside told BBC News.

The scientists have not yet determined the killing mechanism behind the mass extinction.

Neither can they say for sure why the dinosaurs survived it, although Dr Whiteside suggests it could have been "blind luck".

Nevertheless, they propose that the climatic catastrophe caused by the mass eruptions led to the extinction of the dinosaurs' main competitors, the crurotarsans.

These ancient crocodile-like creatures had competed vigorously with early dinosaurs during the Triassic Period.

The study is not the first to posit a link between volcanic activity and the end-Triassic mass extinction.

But the relationship between volcanism, carbon isotope anomalies and extinctions had never been tested in rocks preserving records of all three phenomena. The scientists say this is the first study to do so.

Big break-up

The so-called volcanic "flood basalts" form a giant geological entity known as the Central Atlantic Magmatic Province (Camp).

This was formed during the break up of the "supercontinent" known as Pangaea, causing lava to pour out on to the Earth's surface for some 700,000 years.

"This is actually the largest flood basalt province known in the Solar System. It covers something like 9-11 million sq kilometres. To give you an indication of how large that is, it's about one-third the size of the Moon," said Dr Whiteside.

"We're talking about a serious amount of the Earth being covered in lava."

It dwarfs the Deccan traps, a large igneous province in west-central India. The volcanism which created the traps had been implicated by some in the extinction of the dinosaurs 65 million years ago.

Earlier this month, a panel of experts strongly endorsed evidence that a space impact was instead responsible for this extinction.

Writing in Science journal, they ascribed the cause to a 10-15km space rock striking the Yucatan Peninsula. This caused a global winter that played havoc with marine and land ecosystems.

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Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8580444.stm

Published: 2010/03/23 05:05:11 GMT

Enter the matrix: the deep law that shapes our reality

- 07 April 2010 by **Mark Buchanan**
- Magazine issue 2755.

A numbers game (Image: Cey Adams/Corbis)

SUPPOSE we had a theory that could explain everything. Not just atoms and quarks but aspects of our everyday lives too. Sound impossible? Perhaps not.

It's all part of the recent explosion of work in an area of physics known as random matrix theory. Originally developed more than 50 years ago to describe the energy levels of atomic nuclei, the theory is turning up in everything from inflation rates to the behaviour of solids. So much so that many researchers believe that it points to some kind of deep pattern in nature that we don't yet understand. "It really does feel like the ideas of random matrix theory are somehow buried deep in the heart of nature," says electrical engineer Raj Nadakuditi of the University of Michigan, Ann Arbor.

All of this, oddly enough, emerged from an effort to turn physicists' ignorance into an advantage. In 1956, when we knew very little about the internal workings of large, complex atomic nuclei, such as uranium, the German physicist Eugene Wigner suggested simply guessing.

Quantum theory tells us that atomic nuclei have many discrete energy levels, like unevenly spaced rungs on a ladder. To calculate the spacing between each of the rungs, you would need to know the myriad possible ways the nucleus can hop from one to another, and the probabilities for those events to happen. Wigner didn't know, so instead he picked numbers at random for the probabilities and arranged them in a square array called a matrix.

The matrix was a neat way to express the many connections between the different rungs. It also allowed Wigner to exploit the powerful mathematics of matrices in order to make predictions about the energy levels.

Bizarrely, he found this simple approach enabled him to work out the likelihood that any one level would have others nearby, in the absence of any real knowledge. Wigner's results, worked out in a few lines of algebra, were far more useful than anyone could have expected, and experiments over the next few years showed a remarkably close fit to his predictions. Why they work, though, remains a mystery even today.

What is most remarkable, though, is how Wigner's idea has been used since then. It can be applied to a host of problems involving many interlinked variables whose connections can be represented as a random matrix.

The first discovery of a link between Wigner's idea and something completely unrelated to nuclear physics came about after a chance meeting in the early 1970s between British physicist Freeman Dyson and American mathematician Hugh Montgomery.

Montgomery had been exploring one of the most famous functions in mathematics, the Riemann zeta function, which holds the key to finding prime numbers. These are numbers, like 2, 3, 5 and 7, that are only divisible by themselves and 1. They hold a special place in mathematics because every integer greater than 1 can be built from them.

In 1859, a German mathematician called Bernhard Riemann had conjectured a simple rule about where the zeros of the zeta function should lie. The zeros are closely linked to the distribution of prime numbers.

Mathematicians have never been able to prove Riemann's hypothesis. Montgomery couldn't either, but he had worked out a formula for the likelihood of finding a zero, if you already knew the location of another one nearby. When Montgomery told Dyson of this formula, the physicist immediately recognised it as the very same one that Wigner had devised for nuclear energy levels.

To this day, no one knows why prime numbers should have anything to do with Wigner's random matrices, let alone the nuclear energy levels. But the link is unmistakable. Mathematician Andrew Odlyzko of the University of Minnesota in Minneapolis has computed the locations of as many as 10^{23} zeros of the Riemann zeta function and found a near-perfect agreement with random matrix theory.

The strange descriptive power of random matrix theory doesn't stop there. In the last decade, it has proved itself particularly good at describing a wide range of messy physical systems.

Universal law?

Recently, for example, physicist Ferdinand Kuemmeth and colleagues at Harvard University used it to predict the energy levels of electrons in the gold nanoparticles they had constructed.

Traditional theories suggest that such energy levels should be influenced by a bewildering range of factors, including the precise shape and size of the nanoparticle and the relative position of the atoms, which is considered to be more or less random. Nevertheless, Kuemmeth's team found that random matrix theory described the measured levels very accurately (arxiv.org/abs/0809.0670).

A team of physicists led by Jack Kuipers of the University of Regensburg in Germany found equally strong agreement in the peculiar behaviour of electrons bouncing around chaotically inside a quantum dot - essentially a tiny box able to trap and hold single quantum particles (*Physical Review Letters*, vol 104, p 027001).

The list has grown to incredible proportions, ranging from quantum gravity and quantum chromodynamics to the elastic properties of crystals. "The laws emerging from random matrix theory lay claim to universal validity for almost all quantum systems. This is an amazing fact," says physicist Thomas Guhr of the Lund Institute of Technology in Sweden.

Random matrix theory has got mathematicians like Percy Deift of New York University imagining that there might be more general patterns there too. "This kind of thinking isn't common in mathematics," he notes. "Mathematicians tend to think that each of their problems has its own special, distinguishing features. But in recent years we have begun to see that problems from diverse areas, often with no discernible connections, all behave in a very similar way."

In a paper from 2006, for example, he showed how random matrix theory applies very naturally to the mathematics of certain games of solitaire, to the way buses clump together in cities, and the path traced by molecules bouncing around in a gas, among others.

The most important question, perhaps, is whether there is some deep theory behind both physics and mathematics that explains why random matrices seem to capture essential truths about reality. "There must be some reason, but we don't yet know what it is," admits Nadakuditi. In the meantime, random matrix theory is already changing how we look at random systems and try to understand their behaviour. It may possibly offer a new tool, for example, in detecting small changes in global climate.

Back in 1991, an international scientific collaboration conducted what came to be known as the Heard Island Feasibility Test. Spurred by the idea that the transmission of sound through the world's oceans might provide a sensitive test of rising temperatures, they transmitted a loud humming sound near Heard Island in the Indian Ocean and used an array of sensors around the world to pick it up.

Repeating the experiment 20 years later could yield valuable information on climate change. But concerns over the detrimental effects of loud sounds on local marine life mean that experiments today have to be carried out with signals that are too weak to be detected by ordinary means. That's where random matrix theory comes in.

Over the past few years, Nadakuditi, working with Alan Edelman and others at the Massachusetts Institute of Technology, has developed a theory of signal detection based on random matrices. It is specifically attuned to the operation of a large array of sensors deployed globally. "We have found that you can in principle use extremely weak sounds and still hope to detect the signal," says Nadakuditi.

Others are using random matrix theory to do surprising things, such as enabling light to pass through apparently impenetrable, opaque materials. Last year, physicist Allard Mosk of the University of Twente in the Netherlands and colleagues used it to describe the statistical connections between light that falls on an object and light that is scattered away. For an opaque object that scatters light very well, he notes, these connections can be described by a totally random matrix.

What comes up are some strange possibilities not suggested by other analyses. The matrices revealed that there should be what Mosk calls "open channels" - specific kinds of waves that, instead of being reflected, would somehow pass right through the material. Indeed, when Mosk's team shone light with a carefully constructed wavefront through a thick, opaque layer of zinc oxide paint, they saw a sharp increase in the transmission of light.

Random matrix theory comes up with strange possibilities not suggested by other analyses, which are then borne out by experiments

Still, the most dramatic applications of random matrix theory may be yet to come. "Some of the main results have been around for decades," says physicist Jean-Philippe Bouchaud of the École Polytechnique in Paris, France," but they have suddenly become a lot more important with the handling of humungous data sets in so many areas of science."

In everything from particle physics and astronomy to ecology and economics, collecting and processing enormous volumes of data has become commonplace. An economist may sift through hundreds of data sets looking for something to explain changes in inflation - perhaps oil futures, interest rates or industrial inventories. Businesses such as Amazon.com rely on similar techniques to spot patterns in buyer behaviour and help direct their advertising.

While random matrix theory suggests that this is a promising approach, it also points to hidden dangers. As more and more complex data is collected, the number of variables being studied grows, and the

number of apparent correlations between them grows even faster. With enough variables to test, it becomes almost certain that you will detect correlations that look significant, even if they aren't.

Curse of dimensionality

Suppose you have many years' worth of figures on a large number of economic indices, including inflation, employment and stock market prices. You look for cause-and-effect relationships between them. Bouchaud and his colleagues have shown that even if these variables are all fluctuating randomly, the largest observed correlation will be large enough to seem significant.

This is known as the "curse of dimensionality". It means that while a large amount of information makes it easy to study everything, it also makes it easy to find meaningless patterns. That's where the random-matrix approach comes in, to separate what is meaningful from what is nonsense.

In the late 1960s, Ukrainian mathematicians Vladimir Marcenko and Leonid Pastur derived a fundamental mathematical result describing the key properties of very large, random matrices. Their result allows you to calculate how much correlation between data sets you should expect to find simply by chance. This makes it possible to distinguish truly special cases from chance accidents. The strengths of these correlations are the equivalent of the nuclear energy levels in Wigner's original work.

Bouchaud's team has now shown how this idea throws doubt on the trustworthiness of many economic predictions, especially those claiming to look many months ahead. Such predictions are, of course, the bread and butter of economic institutions. But can we believe them?

To find out, Bouchaud and his colleagues looked at how well US inflation rates could be explained by a wide range of economic indicators, such as industrial production, retail sales, consumer and producer confidence, interest rates and oil prices.

Using figures from 1983 to 2005, they first calculated all the possible correlations among the data. They found what seem to be significant results - apparent patterns showing how changes in economic indicators at one moment lead to changes in inflation the next. To the unwary observer, this makes it look as if inflation can be predicted with confidence.

But when Bouchaud's team applied Marcenko's and Pastur's mathematics, they got a surprise. They found that only a few of these apparent correlations can be considered real, in the sense that they really stood out from what would be expected by chance alone. Their results show that inflation is predictable only one month in advance. Look ahead two months and the mathematics shows no predictability at all. "Adding more data just doesn't lead to more predictability as some economists would hope," says Bouchaud.

In recent years, some economists have begun to express doubts over predictions made from huge volumes of data, but they are in the minority. Most embrace the idea that more measurements mean better predictive abilities. That might be an illusion, and random matrix theory could be the tool to separate what is real and what is not.

Wigner might be surprised by how far his idea about nuclear energy levels has come, and the strange directions in which it is going, from universal patterns in physics and mathematics to practical tools in social science. It's clearly not as simplistic as he initially thought.

Mark Buchanan is a writer based in the UK. His latest book is The Social Atom (Bloomsbury)

http://www.newscientist.com/article/mg20627550.200-enter-the-matrix-the-deep-law-that-shapes-our-reality.html?full=true&print=true

Monsoons send Asian pollution round the world

- 06 April 2010 by **Fred Pearce**
- Magazine issue 2754.

Pollution on the move (Image: Strdel/AFP/Getty Images)

ASIAN pollution is a global problem. Millions of tonnes of soot, sulphur dioxide and other pollutants are fast-tracked into the stratosphere each year by the summer monsoon.

"The monsoon is one of the most powerful atmospheric circulation systems on the planet, and it happens to form right over a heavily polluted region," says William Randel of the US National Center for Atmospheric Research in Boulder, Colorado.

The monsoon is extremely powerful, and it happens to form right over a heavily polluted region

The stratosphere begins about 12 kilometres up, above the troposphere where weather systems like the monsoon develop. Most pollution stays below the boundary between the two. However, by using satellite instruments to track hydrogen cyanide, a minor but telltale ingredient of the pollution, Randel and his colleagues found "pipes" of polluted air moving through the boundary.

They think that the exceptional updraughts of air inside the monsoon's giant clouds can bust through and send pollution deep into the stratosphere (*Science*, DOI: 10.1126/science.1182274). This is where the planet's ozone layer sits, filtering out ultraviolet radiation from the sun.

The findings will trigger a radical rethink about the state of the stratosphere. "Received wisdom has been that gases like sulphur dioxide and nitrogen oxides don't make it into the stratosphere," says Peter Bernath of the University of York, UK, a member of the research team. "Nitrogen oxides in particular are of concern," he says, because they can destroy ozone. Sulphur dioxide can shroud the planet in a cooling haze.

John Pyle, a specialist on the ozone layer at the University of Cambridge, agrees that the research raises key questions. "How much will the transport of pollution change in the future, as emissions increase or the monsoon changes?" he says. It's unclear whether climate change will weaken or intensify monsoons.

In the lower atmosphere, pollutants like sulphur dioxide "rain out" of the air within days. But in the stratosphere they can stay aloft for years, spread by fast winds known as jets, meaning the threat is global. The effects may have already been unwittingly detected: researchers recently noted an increase in sulphate particles in the stratosphere around the globe, which could be linked to China's rapid industrialisation over the past decade.

http://www.newscientist.com/article/mg20627544.900-monsoons-send-asian-pollution-round-the-world.html

Oceanology: Smart buoys warn oil rigs of freak waves

- 02 April 2010
- Magazine issue 2753.

(Image: Eye Ubiquitous/Rex Features)

AN EARLY warning system for destructive underwater waves has passed its first test in the Andaman Sea, north-west of Sumatra, Indonesia.

The system is designed to look for solitons, powerful pulses that can be triggered at the boundary between layers of dense and less-dense water, often when a step change in the sea's depth disrupts a tidal flow. On the surface they can appear as relatively innocuous white horses, but deep down they can generate powerful vertical currents that are a hazard to divers, says Martin Goff, a UK-based expert on solitons at Fugro GEOS, a geosciences consultancy.

Solitons can be a big problem for oil rigs. In one incident in the Andaman Sea, a soliton shunted a drilling rig so hard it broke the drill string, the rotating pipe that drives the drill bit. Repairing such damage can be seriously expensive.

To protect the rig, Goff and his colleagues built two buoys able to detect the rapid changes solitons create in water temperature, salinity and current flows. Having located the source of the solitons from satellite images, they placed the two buoys at intervals between the source and the rigs, and used the data sent back to determine the size and speed of the approaching waves.

Fugro operated the system for three months in 2008, during which time it issued several warnings of solitons to the rig owners. This gave staff 10 hours to cease drilling and prepare. With crews able to tighten the moorings in advance, the solitons passed through without incident.

Advance warnings issued to rig owners gave staff 10 hours to cease drilling and prepare

"This is significant," says Chris Jackson at Global Ocean Associates, a remote-sensing consultancy firm based in Alexandria, Virginia. "It's the first deployed system with a real-time warning capability."

http://www.newscientist.com/article/mg20527533.400-oceanology-smart-buoys-warn-oil-rigs-of-freak-waves.html

Knowing the mind of God: Seven theories of everything

- 15:33 04 March 2010 by **Michael Marshall**

Getting inside the mind of God (Image: John Lund/Getty)

This story has been edited to clarify that it discusses different approaches being taken to develop a theory of everything.

The "theory of everything" is one of the most cherished dreams of science. If it is ever discovered, it will describe the workings of the universe at the most fundamental level and thus encompass our entire understanding of nature. It would also answer such enduring puzzles as what dark matter is, the reason time flows in only one direction and how gravity works. Small wonder that Stephen Hawking famously said that such a theory would be "the ultimate triumph of human reason – for then we should know the mind of God".

But theologians needn't lose too much sleep just yet. Despite decades of effort, progress has been slow. Many physicists have confined themselves to developing "quantum gravity" theories that attempt to reconcile quantum mechanics with general relativity – a prerequisite for a theory of everything. But rather than coming up with one or two rival theories whose merits can be judged against the evidence, there is a profusion of candidates that address different parts of the problem and precious few clues as to which (if any) might turn out to be correct.

Here's a brief guide to some of the front runners.

String theory

This is probably the best known theory of everything, and the most heavily studied. It suggests that the fundamental particles we observe are not actually particles at all, but tiny strings that only "look" like particles to scientific instruments because they are so small.

What's more, the mathematics of string theory also rely on extra spatial dimensions, which humans could not experience directly.

These are radical suggestions, but many theorists find the string approach elegant and have proposed numerous variations on the basic theme that seem to solve assorted cosmological conundrums. However, they have two major challenges to overcome if they are to persuade the rest of the scientific community that string theory is the best candidate for a ToE.

First, string theorists have so far struggled to make new predictions that can be tested. So string theory remains just that: a theory.

Secondly, there are just too many variants of the theory, any one of which could be correct – and little to choose between them. To resolve this, some physicists have proposed a more general framework called M-theory, which unifies many string theories.

But this has its own problems. Depending how you set it up, M-theory can describe any of 10^{500} universes. Some physicists argue that this is evidence that there are multiple universes, but others think it just means the theory is untestable.

Loop quantum gravity

Although it hasn't had the same media exposure, loop quantum gravity is so far the only real rival to string theory.

The basic idea is that space is not continuous, as we usually think, but is instead broken up into tiny chunks 10^{-35} metres across. These are then connected by links to make the space we experience. When these links are tangled up into braids and knots, they produce elementary particles.

Loop quantum gravity has produced some tentative predictions of real-world effects, and has also shed some light on the birth of the universe. But its proponents have so far struggled to incorporate gravity into their theories. And as with string theory, a true experimental test is still some way off.

CDT

Causal dynamical triangulations looks pretty similar to loop quantum gravity at first glance. Just as loop quantum gravity breaks up space into tiny "building blocks", CDT assumes that space-time is split into tiny building blocks – this time, four-dimensional chunks called pentachorons.

The pentachorons can then be glued together to produce a large-scale universe – which turns out to have three space dimensions and one time dimension, just as the real one does. So far, so good, but there's a major drawback: CDT as it currently stands cannot explain the existence of matter.

Quantum Einstein gravity

This idea, proposed by Martin Reuter of the University of Mainz, Germany, takes a rather different tack.

Part of the problem with unifying gravity and quantum mechanics is what happens to gravity at small scales. The closer two objects are to each other, the stronger the gravitational attraction between them; but gravity also acts on itself, and as a result, at very small distances a feedback loop starts. According to conventional theories the force should then become ridiculously strong – which means there's something wrong with the conventional theories.

However, Reuter has come up with a way to generate a "fixed point": a distance below which gravity stops getting stronger. This could help solve the problem, and lead to a quantum theory of gravity.

Quantum graphity

All the theories above assume that space and time exist, and then try to build up the rest of the universe. Quantum graphity – the brainchild of Fotini Markopoulou of the Perimeter Institute for Theoretical Physics in Waterloo, Ontario, Canada, and colleagues – tries to do away with them.

When the universe formed in the big bang, Markopoulou says, there was no such thing as space as we know it. Instead, there was an abstract network of "nodes" of space, in which each node was connected to every other. Very soon afterwards, this network collapsed and some of the nodes broke away from each other, forming the large universe we see today.

Internal relativity

Developed by Olaf Dreyer of the Massachusetts Institute of Technology, internal relativity sets out to explain how general relativity could arise in a quantum world.

Every particle in the universe has a property called "spin", which can be loosely thought of as what happens to the particle when it is rotated. Dreyer's model imagines a system of spins existing independently of matter and arranged randomly. When the system reaches a critical temperature, the spins align, forming an ordered pattern.

Anyone actually living in the system of spins will not see them. All they see are their effects, which Dreyer has shown will include space-time and matter. He has also managed to derive Newtonian gravity from the model: however, general relativity has not yet emerged.

E8

In 2007 the physicist (and sometime surfer) Garrett Lisi made headlines with a possible theory of everything.

The fuss was triggered by a paper discussing E8, a complex eight-dimensional mathematical pattern with 248 points. Lisi showed that the various fundamental particles and forces known to physics could be placed on the points of the E8 pattern, and that many of their interactions then emerged naturally.

Some physicists heavily criticised the paper, while others gave it a cautious welcome. In late 2008, Lisi was given a grant to continue his studies of E8.

http://www.newscientist.com/article/dn18612-knowing-the-mind-of-god-seven-theories-of-everything.html

Electrical engineering fixes brain's circuit board

- 07 April 2010 by **Ewen Callaway**

Magazine issue 2755.

Brain mainframe (Image: John Lund/Getty)

DEEP brain stimulation has long been psychiatry's black magic: stick electrodes into a region linked to mental illness, deliver rapid pulses of weak current, and voila! Crippling symptoms of depression, obsessive compulsive disorder and even substance abuse are eased.

Now brain imaging of people undergoing deep brain stimulation (DBS) to treat depression is revealing the mechanism behind these effects - and who it will and won't work on. The crucial discovery is that DBS seems to tune an array of brain regions, not just the area around the electrode.

This once fringe treatment is now creating a new view of mental illness as a condition affecting an interconnected network rather than arising from chemical imbalances in specific regions. "The brain works on a circuit board," says Helen Mayberg of Emory University in Atlanta, Georgia, whose team is lifting the veil on DBS.

DBS involves continually delivering high-frequency pulses of weak current to a particular region via stimulators that are surgically inserted into the brain. Although invasive, it works so well for Parkinson's disease and other movement disorders that it is now mainstream, with tens of thousands of patients implanted.

In the last decade, researchers have tested DBS on a variety of other conditions. It has proved effective at reducing some symptoms of bipolar disorder and Tourette's syndrome (see table). It was recently approved by the US Food and Drug Administration to treat obsessive compulsive disorder.

Meanwhile, firms that manufacture DBS devices are looking to get the technique approved to treat depression, for which it seems to work well. In 2005, Mayberg's team showed that DBS could help people with a type of depression thought to be completely untreatable.

Instant response

The researchers implanted the stimulators into the subgenual area, which is involved in emotion, in six severely depressed patients for whom all other treatments had failed, including several types of antidepressant drugs and electroconvulsive therapy. Four reported vast improvements (*Neuron*, vol 45, p 651).

The region was selected because brain imaging studies had shown it to be hyperactive in many people with depression. Most researchers thought that DBS worked by silencing activity in that area. This would explain why so many patients responded as soon as their stimulators were switched on: many said the operating room looked brighter than when they had gone in, for example, a sign of a changed outlook on life. It was as if "something painful had suddenly stopped", Mayberg said at a recent lecture on her work at the Massachusetts Institute of Technology.

That wasn't the whole story, however. PET scans revealed that while DBS damped down activity in the subgenual area as expected, other regions appeared affected too, particularly parts of the nearby prefrontal cortex, which is involved in decision-making and evaluating emotions. "We got lucky," says Mayberg. "It worked, but probably not for the reason we thought."

So why does DBS work? Thomas Schlaepfer at University Hospital in Bonn, Germany, says that the brain is increasingly seen as not just a collection of regions but also as consisting of multiple networks, which can become "misconnected" in mental illness. DBS "retrains these dysfunctional networks", he says.

The brain consists of multiple networks, which can become 'misconnected' in mental illness

His own recent work on 10 patients with treatment-resistant depression supports this notion. His team used DBS on the nucleus accumbens, an area involved in assessing pleasurable stimuli that is known to behave abnormally in depression (*Biological Psychiatry*, DOI: 10.1016/j.biopsych.2009.09.013).

PET scans of seven of the patients revealed that the implant didn't seem to affect activity in the nucleus accumbens itself, but instead suppressed the subgenual area - also called Brodmann's area 25 - just as with Mayberg's team (see diagram). It also had reverberations in parts of the prefrontal cortex.

"There are clear connections between area 25 and the nucleus accumbens," Schlaepfer says. He suspects that the three areas are part of a brain network that his and Mayberg's teams both tapped into.

The experiments also raise the question of why DBS doesn't work in everyone. While all of Schlaepfer's patients felt their lives had improved a year after having the stimulator implanted - be it returning to work, taking up a hobby or making new friends - some fared much better than others. Mayberg noticed similar variation in 20 depressed people she treated with DBS, and 12 treated for bipolar disorder. "From a practical point of view you've got to figure out who you're going to offer this to," she says.

That's where Mayberg's most recent results, which she presented at the MIT lecture, come in. To see if there were any pre-existing differences in the brains of DBS responders and non-responders, which might predict who should go to the trouble of getting a DBS implant, Mayberg's team turned to functional MRI, which allows you to see which regions light up at the same time - indicating that they are "connected".

In depressed patients who went on to respond to DBS, a part of their prefrontal cortex tended to light up in conjunction with the subgenual area. This did not happen in non-responders. In these patients, the

amygdala, which is involved in fear and other emotions, tended to be connected to the subgenual area - not the case in responders.

Mayberg cautions that the results are preliminary, but she thinks she may be onto something. "If this pans out in larger numbers, there's a total dissociation between the two groups," she says. The ability to predict who will and won't benefit from DBS should mean the treatment can be offered to a greater number of severely depressed patients.

The technology could have much wider implications. The National Institute of Mental Health in Bethesda, Maryland, is launching an initiative soon to encourage researchers to describe mental illnesses as disorders of networks rather than by how they make people feel - part of a broader shift across neuroscience.

DBS is helping to map these networks, says Thomas Insel, director of the institute. "For us not to understand the parts of the brain involved in mental illness is really unacceptable," he adds. For now, the initiative is only aimed at researchers, but Insel hopes the brain networks idea will be taken up by doctors too.

Insel and Mayberg hope that a better understanding of how brain regions form networks will improve doctors' ability to match drugs and therapies to patients. It could even lead to drugs that target specific networks.

Mayberg also has her sights on the nascent field of optogenetics, in which individual neurons are turned off and on with pulses of light. Its use in mental illness would demand a much better understanding of the circuits, which DBS studies could help provide. Ultimately, the specificity of optogenetics might allow researchers to make far more subtle changes to brain networks. "That's my dream," Mayberg says.

http://www.newscientist.com/article/mg20627553.600-electrical-engineering-fixes-brains-circuit-board.html?DCMP=NLC-nletter&nsref=mg20627553.600

Earth struck by most powerful space storm in three years

- 15:32 06 April 2010 by **Rachel Courtland**

A curtain of light is the backdrop for Iceland's Eyjafjallajökull volcano (Image: Albert Jakobsson)

The most powerful geomagnetic storm since December 2006 struck the Earth on Monday, a day earlier than expected.

On 3 April, the SOHO spacecraft spotted a cloud of charged particles called a coronal mass ejection (CME) shooting from the sun at 500 kilometres per second. This velocity suggested the front would reach Earth in roughly three days.

"It hit earlier and harder than forecast," says Doug Biesecker of the US National Oceanic and Atmospheric Administration's Space Weather Prediction Center in Boulder, Colorado.

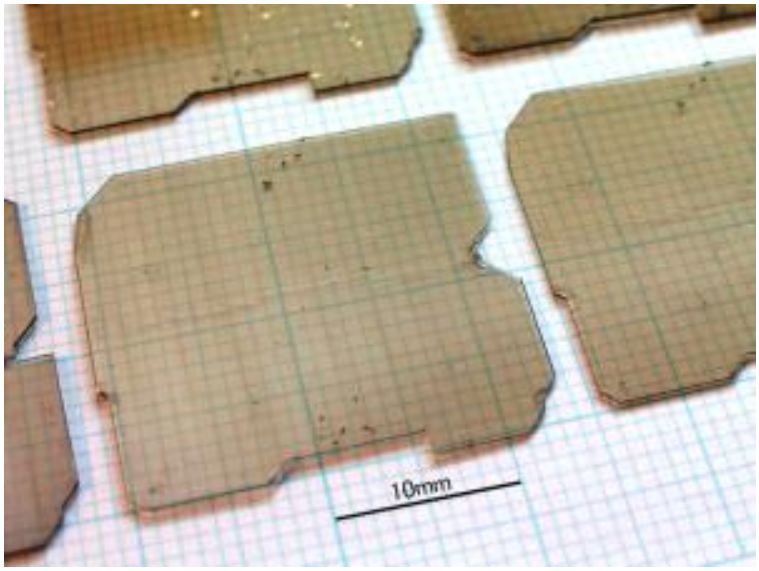
Fortunately, the storm was not intense enough to interfere strongly with power grids or satellite navigation, but it did trigger dazzling auroras in places like Iceland (pictured).

Such storms highlight the uncertainty in the arrival times of CMEs, which can easily be 15 hours off predictions, Biesecker says. Better modelling of the solar wind, which can accelerate CMEs en route to Earth, could reduce the uncertainty.

http://www.newscientist.com/article/dn18735-earth-struck-by-most-powerful-space-storm-in-three-years.html?DCMP=NLC-nletter&nsref=dn18735

Diamond chips to make meaner, greener electronics

- 11:11 07 April 2010 by **Paul Marks**



Lacklustre – but a sparkling green tech future? (Image: AIST)

The economics of the electronics industry depends on its ability to carve thousands of microchips simultaneously from silicon wafers the size of dinner plates.

A new generation of greener, more powerful electronics could be born if we could make those wafers from a material that is far superior, and incomparably more glamorous: diamond. Now it looks like we might be able to.

Pure diamond is a super-tough electrical insulator, but given the right impurities it becomes a semiconductor. Crucially, it is also the best thermal conductor on Earth. Those properties means synthetic diamond could be used to make microchips that handle high-power signals but do not require power-hungry cooling systems.

"Diamond-based control modules in electric cars and industrial machinery could lead to considerable energy savings," says Hideaki Yamada of National Institute of Advanced Industrial Science and Technology (AIST) in Tsukuba, Japan.

Sowing sparklers

Unsurprisingly, making diamond wafers big enough for economic mass production has been a stumbling block. Synthetic diamond is made using a process called chemical vapour deposition (CVD), in which a plasma of methane or other hydrocarbon gas deposits carbon onto a surface "seeded" with diamond particles. When the wafer has been grown, it is etched off the seed layer. But until now, the largest diamond wafers made like this have been around a centimetre square and a couple of millimetres thick.

To grow them further, the AIST team first tried using CVD to bond several smaller wafers together. The technique worked – but it created a patchwork of misaligned crystal lattices unsuited to making transistors.

To solve the problem, Yamada and his colleague Akiyoshi Chayahara used the same seed diamonds to make a series of small wafers, with the result that the wafers were "clones", all with the same crystal lattice. Yamada and Chayahara could then use CVD to join them up seamlessly.

Using that method the team made 25-millimetre-square wafers from six smaller "cloned" wafers (see picture).

Good enough

"It certainly has sufficient potential for fabricating electronic devices," says Yamada. Better still, "our method does not limit the area of the wafer", he adds. In the next 12 months his group is aiming to produce 50-by-50 millimetre and 75-by-75 millimetre wafers.

"Their bonding of cloned wafers into big monocrystalline mosaics is novel, interesting stuff," comments Keith Rosser, a diamond CVD researcher at the University of Bristol in the UK.

A paper on the new diamond wafers was presented at a meeting of the Japan Society of Applied Physics at Tokai University on 20 March.

http://www.newscientist.com/article/dn18736-diamond-chips-to-make-meaner-greener-electronics.html?DCMP=NLC-nletter&nsref=dn18736

Carnivorous plants eat toxic metal from their prey

- 17:37 06 April 2010 by **Michael Marshall**

Not a fussy eater, unfortunately for it (Image: Sfoelz/iStock)

Carnivorous plants may seem able to swallow anything, but if the wrong insect comes their way they can get food poisoning.

Humans release the toxic metal cadmium into the environment by burning waste and fossil fuels. It accumulates in many species, including insects.

To see if this affected the plants, Iain Green and Christopher Moody of Bournemouth University in the UK fed white-topped pitcher plants European blowfly larvae laced with the metal.

The plants absorbed the cadmium, making their shoots shrink over time – possibly as it interfered with photosynthesis (*Environmental Science and Technology*, vol 44, p 1610). Green says this could hinder their survival. Wild insects can contain 10 times more cadmium than he tested.

However, not all pollutants seem to be harmful. Similar tests showed the plants could regulate the uptake of copper, which the plants need in low doses but can be toxic to them in high doses.

http://www.newscientist.com/article/dn18737-carnivorous-plants-eat-toxic-metal-from-their-prey.html?DCMP=NLC-nletter&nsref=dn18737

Is densest Kuiper belt object a wayward asteroid?

- 00:50 07 April 2010 by **David Shiga**

Quaoar, a large object in the outer solar system, is mostly made of rock, unlike its icy neighbours (Illustration: NASA/G. Bacon/STScI)

A giant rock is walking among the "dirty iceballs" in the outer solar system, a new study suggests. Researchers say it may have journeyed there from the asteroid belt near Mars, or it may have been the victim of a cosmic crash that blasted away its once-icy exterior.

Quaoar was discovered in 2002 in the Kuiper belt, a ring of icy bodies beyond Neptune. At about 900 kilometres across, or 40 per cent as wide as Pluto, it is not the biggest denizen of the belt, but researchers now say it may be the densest.

Wesley Fraser and Michael Brown of Caltech confirmed its size by studying archival images from the Hubble Space Telescope. They also used Hubble images to study the motion of its moon, Weywot, which allowed them to calculate Quaoar's mass.

Combining the size and mass revealed Quaoar's density to be between 2.9 and 5.5 grams per cubic centimetre. That is much higher than that of other Kuiper belt residents like Pluto, which has a density of about 2.0 grams per cubic centimetre.

Quaoar's high density suggests it is made almost entirely of rock, unlike its neighbours, which are a mixture of ice and rock, the researchers conclude. They say the rocky world may be a refugee from the

asteroid belt between Mars and Jupiter, thrown outwards early in the solar system's history, when the orbits of the giant planets are thought to have shifted.

'Far-fetched' scenario

Previously, other researchers have suggested that the same upheaval threw some Kuiper belt objects into the asteroid belt, so the new study suggests the migration may have been a two-way street.

But Renu Malhotra of the University of Arizona in Tucson says that hurling Quaoar from the asteroid belt to the Kuiper belt would have left it with an elongated orbit, making it hard to explain why Quaoar is on a nearly circular orbit today.

"I think that's pretty far-fetched," she says.

She favours the other possible explanation that Fraser and Brown suggest – that a collision with another Kuiper belt object blasted off most of Quaoar's ice, leaving behind only its dense, rocky core.

"That kind of thing seems a lot more possible to me," she says, noting that there were probably far more objects in the early Kuiper belt than there are today, making collisions more common in the past.

Journal reference: *Astrophysical Journal Letters* (in press)

http://www.newscientist.com/article/dn18739-is-densest-kuiper-belt-object-a-wayward-asteroid.html?DCMP=NLC-nletter&nsref=dn18739

Laser 'punch' could bump up fusion power

- 18:09 01 April 2010 by **Colin Barras**

How do you create efficient fusion power with fewer radioactive by-products? Use a laser to send the equivalent of a seismic wave through the fuel.

Nuclear fusion – creating energy by fusing together light atomic nuclei, such as hydrogen – could begin at the National Ignition Facility (NIF) in California this year.

To kick-start the reaction, the plan is to focus 192 high-power laser beams onto a tiny hollow metal cylinder that contains a small spherical fuel pellet of deuterium and tritium. The lasers would heat the cylinder to several million degrees, encouraging it to emit high-power X-rays into the pellet.

The X-rays would compress the fuel to 1/1000th of its original volume, raising its temperature and kick-starting a fusion reaction that spews out helium-4 and neutrons. The hope is that the reaction would release more energy than was injected into the system.

Yet some of the neutrons from this reaction will produce radioactive isotopes by interacting with the walls of the reactor. "NIF also has to handle radioactive tritium, and this must not leak from the reactor," says Heinrich Hora at the University of New South Wales in Sydney, Australia.

Laser punch

Now Hora and his colleagues propose using the mechanical punch of a laser to trigger fusion instead. They suggest using a "flat-faced" laser pulse; ordinary pulses are pointed. The pulse would strike the surface of the fuel rather than penetrating it, as normally happens.

As the pulse hits the fuel, a layer of plasma would be created from ionised gas. This would generate a thermonuclear shock wave that ripples through the fuel, promoting compression.

The process relies directly on the mechanical force of the laser to trigger fusion, rather than converting the laser's energy first into heat and then X-rays, which means electricity generation is more efficient, says Hora.

What's more, fewer radioactive isotopes would form. This is because the method may eventually allow us to use a different fuel – hydrogen and boron-11 – that has fewer by-products. Compressing this fuel with the array of lasers at NIF would be very difficult;; it would require laser pulses 100 times more powerful, says Hora.

Powerful laser

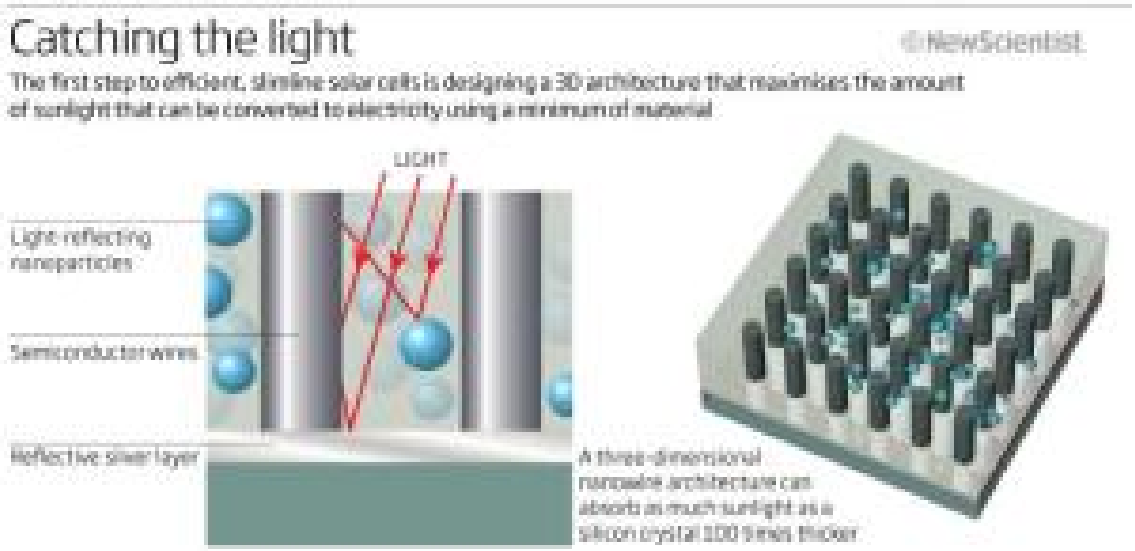
The team's initial calculations suggest that a 60-petawatt laser would be enough for their method. It will be a while before this fuel can be used, though; the most powerful laser today is 10 petawatts, which is more powerful than those used at NIF.Steve Haan at Lawrence Livermore National Laboratory in California, where the NIF is sited, thinks the idea has potential. The process would allow "more options for capturing [fusion] energy and turning it into electricity", he says, but adds that further experiments are needed to test the practicality of the theory.

Journal reference: *Energy & Environmental Science*, DOI: 10.1039/b904609g

http://www.newscientist.com/article/dn18732-laser-punch-could-bump-up-fusion-power.html?DCMP=NLC-nletter&nsref=dn18732

Skip the hard cell: Flexible solar power is on its way

- 07 April 2010 by **Joerg Heber**
- Magazine issue 2755.



Catching the light

ELECTRICITY from sunlight: bright hope for the future, or false dawn? Solar power has its share of detractors who'd go for the latter. Photovoltaic cells are too expensive, they say, requiring huge amounts of material and energy to make. And they are inefficient, too, converting at best about 20 per cent of the incoming solar radiation into usable power.

So, the sceptics say, solar cells are only ever likely to be a small, disproportionately expensive part of our future energy mix. In the temperate, oft-cloudy climes of much of Europe and North America, satisfying the population's electricity needs with photovoltaics alone would mean plastering something like 5 to 15 per cent of the land surface with them.

Such criticisms might be tempered by a new generation of solar cells about to flop off the production line. Slim, bendy and versatile, they consume just a fraction of the materials - and costs - of a traditional photovoltaic device. They could be just the fillip solar power needs, opening the way to a host of new applications: solar-charged cellphones and laptops, say, or slimline generators that sit almost invisibly on a building's curved surfaces or even its windows.

Photovoltaic cells have traditionally presented renewable-energy enthusiasts with an unenviable choice. If low cost and flexibility are the watchwords, inefficiency is the price to pay: the best flexible solar cells, made from thin films of amorphous silicon or organic polymers, convert barely 10 per cent of solar radiation into power. That makes them unsuitable for all but low-power gizmos such as solar cells for backpacks. For higher efficiency, you need crystalline silicon, which absorbs light less readily than its amorphous cousin, but does so over a much broader range of wavelengths. Making a solar cell that is 20 per cent efficient takes thick, expensive slabs of the stuff, as seen in today's rooftop solar cells.

Conventional solar cells force an unenviable choice on renewables enthusiasts: flexibility or efficiency

Marrying efficiency with low cost requires thinking outside the box, or at least outside the plane. Traditionally, solar cells consist of a single flat layer of a light-absorbing semiconductor. An alternative currently being explored is to replace this layer with a film of vertically grown nanoscale semiconductor wires (*Nano Research*, vol 2, p 829). Light gets trapped in this forest of nanotrees, bouncing between the individual nanowire trunks (see diagram). "That optimises light absorption," says Ali Javey, who is pioneering these new materials at the University of California, Berkeley.

Absorption alone is not enough: the light must be converted into charge carriers such as electrons, to be extracted from the wires and fed into a power grid. Here, the internal crystal structure of the nanowires is crucial. Any imperfections form "potholes" into which electrons fall, impeding their movement and limiting the cell's overall efficiency. The silicon of normal solar cells is particularly prone to imperfections, so Javey and his colleagues have been experimenting with an alternative semiconductor, cadmium telluride. The resulting cells are economical in their use of material, but, much like amorphous silicon cells, convert only about 6 per cent of the solar radiation into usable power.

That low conversion is partly due to a weak point in the vertical design: the tips of the wires cover only a few per cent of the cell's sun-facing surface, so much of the light hitting the cell passes through unabsorbed. In February this year, Harry Atwater and his colleagues at the California Institute of Technology in Pasadena reported a solution to this problem. They used microscale silicon rods slightly thicker than Javey's nanowires, and poured a polymer containing light-reflecting nanoparticles into the spaces between them. The polymer scatters unabsorbed light back onto the rods and this, combined with a silver reflecting layer at the bottom of the device, allows the cells to absorb up to 85 per cent of incoming light. Still, losses - chiefly from imperfections in the crystal structure of the microrods - drive the overall efficiency below the 20 per cent achieved by the best crystalline silicon cells (*Nature Materials*, vol 9, p 239).

So why the fuss, if these devices are no more efficient than what went before? The key is that although these cells are merely as efficient as conventional devices, they use only about a hundredth of the material. What's more, they are highly flexible: grown on a bed of silicon, Atwater's microrod arrays can simply be peeled off and stuck pretty much wherever you want. "They could even be integrated into buildings, as components that match the shape of roof tiles," says Atwater. He has started up a company, Alta Devices, to do just that, and has recently received research funding from the US Department of Energy.

John Rogers and his colleagues at the University of Illinois at Urbana-Champaign are at a similar stage. They make solar cells by using a rubber stamp to pick up a conventional cell structure etched onto a silicon substrate and imprint it onto a flexible polymer surface (*Nature Materials*, vol 7, p 907). The efficiency of the resulting cells is a respectable 12 per cent, although Rogers thinks they can do markedly better with tweaks such as adding fluorescent molecules to capture the light coming through the sides of the device. His cells also have a unique selling point: by spacing cell features more widely on the polymer substrate, the cells can be made virtually transparent. That makes power-generating windows a distinct possibility.

Rogers, too, has set up a company, Semprius, to commercialise his technology, and has installed about a dozen modules for power-generation companies across the world to test their long-term performance. Another target in the works is vehicle-top cells that generate electricity for music systems, GPS or even air conditioning - lending a whole new meaning to the word "sunroof". The US Department of Defense is also supplying funds for Rogers' work, with a view to equipping special operations troops with lightweight, efficient solar cells.

Other teams are exploiting the bumper light-harvest that comes when solar cells are sprinkled with a little stardust. This takes the form of gold or silver nanoparticles that quiver with electronic resonances known as plasmons when light hits them, focusing it onto the absorbing semiconductor film (*Nature Materials*, vol 9, p 205).

Plasmonic nanostructures can also be designed to bend the incoming light so that it travels along the surface of a device, rather than through it. A slimline layer of silicon 100 nanometres deep can then attain a light-harvesting efficiency usually only achieved with cells several thousand times as thick. "Absorption in 100 nanometres of silicon is negligible, but if you turn the light by 90 degrees then it is a different story altogether," says Albert Polman at the Institute for Atomic and Molecular Physics in Amsterdam, the Netherlands, who designs such cells.

Material wants

Since the first modern photovoltaic cell was demonstrated in 1954, solar-cell efficiency has been increased mainly by slowly improving the purity of the materials used - a strategy with inevitably diminishing returns. Alternative materials often contain scarce elements such as tellurium, indium and selenium, so any technology that reduces the amount of material needed to harvest the sun's power has an obvious appeal. Driving costs down also makes the technology more accessible to developing economies, many of which boast abundant sunlight but limited cash.

It is crunch time for these new technologies as they start to be implemented in real-world applications. Taking small-scale designs up to the realm of square metres is not trivial, and big breakthroughs in solar power have been heralded before. Yet with their winning combination of economy, efficiency and flexibility, this latest generation of solar cells might allow proponents of solar technology to silence its critics at last.

Joerg Heber is an editor at Nature Materials

http://www.newscientist.com/article/mg20627550.300-skip-the-hard-cell-flexible-solar-power-is-on-its-way.html?DCMP=NLC-nletter&nsref=mg20627550.300

The shock of the old: Welcome to the elderly age

- 07 April 2010 by **Fred Pearce**

Magazine issue 2755.

In one generation, Japan has gone from being the youngest developed country to the oldest (Image: Christophe Boisvieux/Corbis)

USHI OKUSHIMA is the oldest resident of Ogimi, the most elderly community in Japan - the country where the average age is higher than anywhere else in the world. At 108, she still takes to the floor for traditional Japanese dances. Afterwards she dabs a little French perfume behind her ears and sips the local firewater. Okushima was born when Japan had only recently seen off the shogun warlords. If an ageing population is on the way, she is not a bad advert for what we have in store.

The land of the rising sun has become the land of the setting sun with staggering speed. As recently as 1984, Japan had the youngest population in the developed world, but by 2005 it had become the world's most elderly country. Soon it will become the first country where most people are over 50 years old.

This is partly because Japanese people live longest: men can expect to reach 79 and women 86. It is also partly because the Japanese have almost given up having babies: the fertility rate is just 1.2 children per woman, far lower than the 2.1 needed to maintain a steady population. The rest of the world is following Japan's example. In 19 countries, from Singapore to Iceland, people have a life expectancy of about 80 years. Of all the people in human history who ever reached the age of 65, half are alive now. Meanwhile, women around the world have half as many children as their mothers. And if Japan is the model, their daughters may have half as many as they do.

Homo sapiens is ageing fast, and the implications of this may overwhelm all other factors shaping the species over the coming decades - with more wrinklies than pimplies, more walking frames than bike stabilisers, more slippers and pipes than bootees and buggies, and more grey power than student power. The longevity revolution affects every country, every community and almost every household. It promises to restructure the economy, reshape the family, redefine politics and even rearrange the geopolitical order over the coming century.

Ageing may overwhelm all other factors shaping our species in the years ahead

The revolution has two aspects. First, we are not producing babies like we used to. In just a generation, world fertility has halved to just 2.6 babies per woman. In most of Europe and much of east Asia, fertility is closer to one child per woman than two, way below long-term replacement levels. The notion that the

populations of places such as Brazil and India will go on expanding looks misplaced: in fact, they could soon be contracting. Meanwhile, except in a handful of AIDS-ravaged countries in Africa, people are living longer everywhere.

This is frightening, even for rich nations. In Germany, France and Japan, there are fewer than two taxpaying workers to support each retired pensioner. In Italy, the figure is already fewer than 1.3. Some predict that the world will face a wave of "ageing recessions".

But could there be an upside? I believe so. Flip the coin of ageing and what do we see? In 1965, The Who sang: "Hope I die before I get old." Today, those who survived drugs binges, fast cars, or bad marriages, are older, but often still rocking and making more use of condoms than colostomy bags. Mick Jagger (born 1943) is nobody's idea of a dependant. And Tina Turner took to the stage in London, dancing in heels and a microskirt in her 70th year.

Non-celebrities also remain active, assertive and independent as they age. They fill library and seminar halls once crammed with callow youths. They run picket lines - or marathons. Far from being a weight round society's neck, many of them look like a new human resource waiting to be tapped. Millions of the middle-class retired continue working at everything from lucrative consultancies to teaching literacy or finally finishing that PhD. They are often more valuable than the young workers the demographers imagine are supporting them: in fact, the growing number of society's most qualified, most experienced individuals is potentially a huge demographic dividend.

In future, old people will be expected to stay in the formal economy for longer. The idea of a retirement age was invented by Otto von Bismarck in the 1880s, when as chancellor of Germany he needed a starting age for paying war pensions. He chose the age of 65 because that was typically when ex-soldiers died. But today in developed countries, and soon in poorer ones, women can expect nearly 30 years of retirement, and men 20 years.

In developed countries, women can expect nearly 30 years of retirement

There is a deal to be done: longer working in return for more, and more powerful, legislation to outlaw the ageism that blights the working lives of many in late middle age. The old will also expect a society that does not marginalise them; they will consider it a right to live in homes, cities and workplaces redesigned to meet their physical requirements.

Some worry that an older workforce will be less innovative and adaptable, but there is evidence that companies with a decent proportion of older workers are more productive than those addicted to youth. This is sometimes called the Horndal effect, after a Swedish steel mill where productivity rose by 15 per cent as the workforce got older. Age brings experience and wisdom. Think what it could mean when the Edisons and Einsteins of the future, the doctors and technicians, the artists and engineers, have 20 or 30 more years to give us.

Of course, many older people do need healthcare, but many others are fit, competent and self-sustaining. Across Europe, typically only one retired person in 20 lives in a care home. In the UK, of 10 million over-65s, just 300,000 live in care homes (that's about 3 per cent). So the majority of Europe's elderly resemble Okushima in Japan. They are the councillors and counsellors, the social secretaries and neighbourhood wardens, the carers of other elderly people, and even the political and social campaigners and agitators - the glue that holds busy societies together. Far from impoverishing societies, says John MacInnes, a demographer at the University of Edinburgh, UK, all the evidence is that "mass longevity facilitates affluence".

The "silver market" is huge. You have only to watch US network television to see the constant advertising aimed at the elderly, from Viagra and holidays to equipment and leisure wear. Oldies have

savings and cash from selling large houses they no longer need. The money is available for purchases and investment - and ultimately for their children.

But this is not fundamentally about economics or retirement. It is about society's zeitgeist, its social wellsprings. The cultural historian Theodore Roszak at California State University, East Bay, once took me to task over an article on the threat of ageing societies: "Ageing," he wrote, "is the best thing that has happened in the modern world, a cultural and ethical shift that looks a lot like sanity."

At 50, we do not expect to act or feel as we did at 20 - nor at 80 as we did at 50. The same is true of societies. What will it be like to live in societies that are much older than any we have known? We are going to find out, because the ageing of the human race is one of the surest predictions of this century. If the 20th century was the teenage century, the 21st will be the age of the old: it will be pioneered by the ageing baby boomers who a generation ago took the cult of youth to new heights. Without the soaring population and so many young overachievers, the tribal elders will return. More boring maybe, but wiser, surely.

The older we are, the less likely we are to be hooked on the latest gizmos and the more we should appreciate things that last. We may even reduce pressure on the world's resources by consuming less, and by conserving our environment more. We must especially hope for that, because unless the boomers can pay reparations for youthful indiscretions with the planet's limits then we may all be doomed.

The 20th century did great things. We should be proud that for the first time most children reach adulthood and most adults grow old. But after our exertions, perhaps we need to slow down a bit. Take a breather. Learn to be older, wiser and greener. Doesn't sound so bad, does it? Here's to Ushi Okushima.

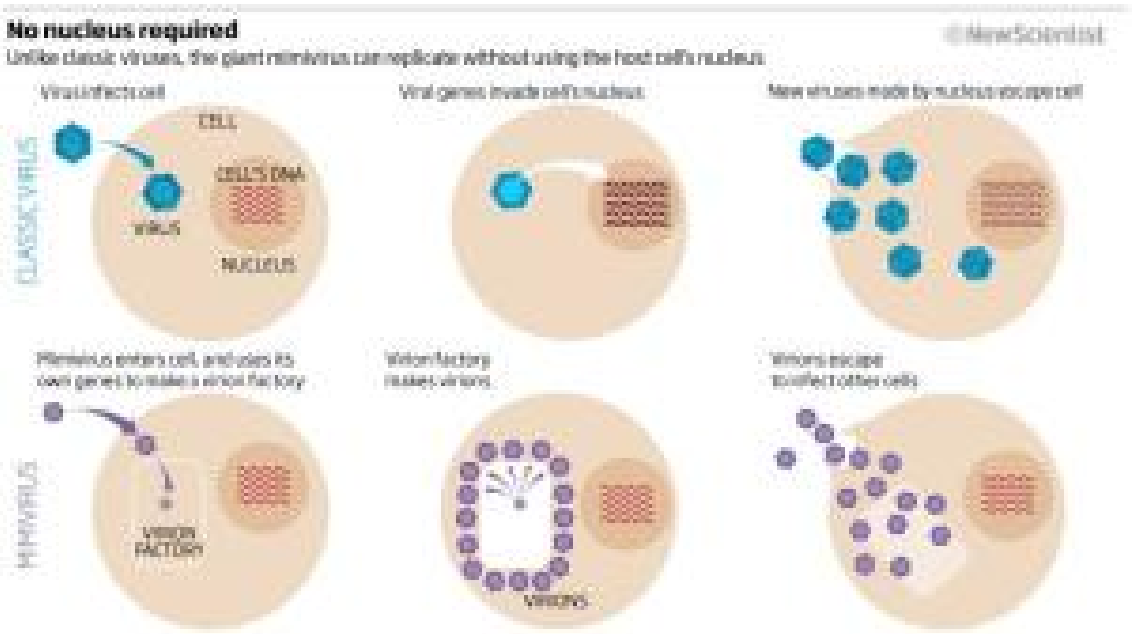
Profile

Fred Pearce is a *New Scientist* consultant. His books include *Confessions of an Eco-Sinner* and *The Last Generation*. This essay is based on his latest, *Peoplequake*, published by Eden Project Books (*The Coming Population Crash*, Beacon Press, in the US). He turns 59 this year

http://www.newscientist.com/article/mg20627550.100-the-shock-of-the-old-welcome-to-the-elderly-age.html?DCMP=NLC-nletter&nsref=mg20627550.100

Giant mimivirus does its replication in-house

- 07 April 2010 by **Andy Coghlan**
- Magazine issue 2755. **Subscribe** and get 4 free issues.



No nucleus required

THE world's largest known virus just got bigger, and analysis of its genome supports the controversial idea that giant viruses shaped the cells of all animals and plants.

Armed with almost 1000 genes, the mimivirus is a monster compared with classic viruses such as HIV or the flu virus, which seldom have more than 10 genes. Jean-Michel Claverie of the Structural and Genomic Information Laboratory in Marseilles, France, has performed the first analysis of its genetic machinery, identifying which of the mimivirus's genes are switched on during each stage of infection.

He found that the virus has 75 more genes than previously thought. Crucially, Claverie's study reveals that the mimivirus uses its own genes and proteins to orchestrate its replication (*Genome Research*, DOI: 10.1101/gr.102582.109).

Classic viruses insert their DNA into the nuclear DNA of the cells they infect and let their host do the hard work of replication for them (see diagram). In contrast, the mimivirus constructs a massive "factory" within the cell, where millions of new viruses, or virions, are produced. These eventually burst out from the dead host cell to spread and infect other cells. The only other viruses that replicate outside the nucleus are poxviruses, but even they rely on the nucleus to replicate some of their DNA.

In order to create the virus factory, the mimivirus appears to steal some of the host cell's resources. Claverie found that the virus has a gene that codes for a protein which carries ATP - the molecule that stores energy in a form that cells can use. It is also equipped to scavenge amino acids - the building blocks of proteins - from its host, thanks to genes that make proteins which transport amino acids.

Claverie found that these genes are activated when the mimivirus first invades a cell. He believes they are used to set up the virion factory, which then allows the mimivirus to replicate without help from the host cell's own nucleus. In fact, the factory is so large it was originally mistaken for a nucleus.

Claverie says the mimivirus's independence supports the theory that giant viruses gave rise to the nuclei that package up DNA in all plant and animal cells. Philip Bell of Macquarie University in Sydney, Australia, who first put forward the theory, agrees. "This paper shows the ability of viruses to completely take over cells," he says. "This is one of the key aspects of my theory."

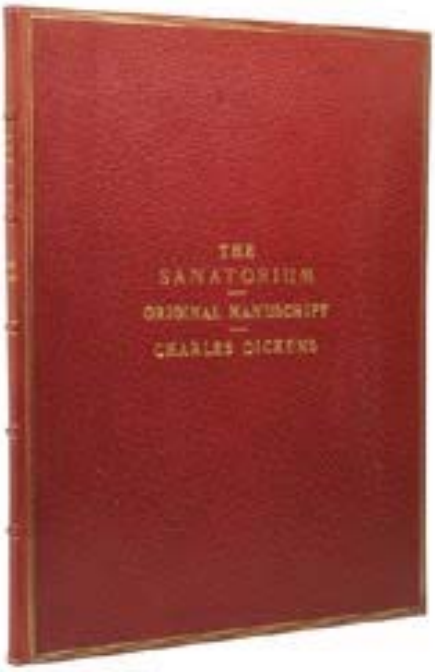
Abraham Minsky of the Weizmann Institute in Rehovot, Israel, says the results support his own team's recent study showing that the mimivirus lives in a cell's cytoplasm entirely independently of the host nucleus.

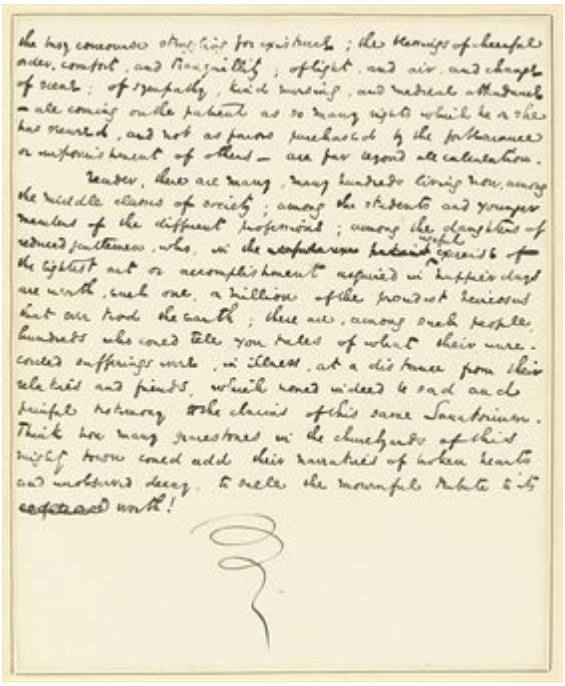
But David Moreira of the University of Paris-South, France, remains unconvinced. He argues that the mimivirus owes its enormous size to its ability to "pickpocket" genes from the eukaryotic cells it infects. "This paper does not alter my view," he says.

http://www.newscientist.com/article/mg20627553.700-giant-mimivirus-does-its-replication-inhouse.html?DCMP=NLC-nletter&nsref=mg20627553.700

Wednesday, April 07, 2010

Charles Dickens' Model for the Modern Rehab Facility: Victorian Health Care Reform





On November 29, 1842, London's Morning Chronicle published a short, unusual piece by Charles Dickens, already a celebrated writer and novelist, titled ***The Sanatorium.***

Written shortly after Dickens's return from his first American tour, it reflected both his deep and lasting interest in public affairs and his fascination with medicine and the medical profession, particularly mental illness, detailed descriptions of which form central passages in several of Dickens's novels.

Thomas Chapman was chairman of the Sanatorium Committee and a personal friend of Dickens (the character of Mr Dombey was supposedly based on Chapman). Chapman asked Dickens to write a brief piece describing and expounding the principal of The Sanatorium to attract press coverage. Dickens enthusiastically wrote an eloquent and convincing case for the importance of a sanatorium, rising to a pitch of dramatic urgency reminiscent of passages from his novels.

The middle classes - students, young professionals, the daughters of 'reduced gentlemen' - were to be the beneficiaries of the scheme:

"Let it never be forgotten that the Sanatorium is not a charity ... It is a self-supporting Institution where, in consideration of an annual subscription of one guinea in time of health, and the most moderate and economical weekly charge possible in time of sickness, any of that large and most respectable class of persons who are seeking a subsistence in the Metropolis can, being stricken ill, repair, as to a home Private cheerful and wholesome rooms; the first medical advice; the most delicate and unremitting attention; the best provision that can possibly be made for tranquility, rest and mental ease."

The Sanatorium was housed in Devonshire Place House, York Gate, Regent's Park, directly across the street from Dickens home. It was the brainchild of physician and philanthropist, Dr Thomas Southwood-Smith. and although it achieved its purpose admirably it was not a financial success. Yet "it was the forerunner of the modern nursing home and private patients' wing" (F.N.L.Poynter. Thomas Southwood-Smith: The Man in the Journal of the Royal Society of Medicine 1962).

The autograph manuscript of ***The Sanatorium*** is now being offered for sale and is one of the highlights of the upcoming, ABAA-sponsored, 50th New York Antiquarian Book Fair, April 9-11, 2010, at the Park Avenue Armory.

Accompanying the manuscript is a three-page autograph letter dated December 27, 1842 written to Thomas Chapman (chairman of the Sanatorium Committee) within which he explains the effect he is trying to achieve and advises discretion about 'disorders of the mind':

" ... it is as indispensable to our well-doing to keep the subject quiet, as to keep them quiet, supposing we have any," adding that the attending matron should be "as cheerful as possible," and not "as if she were a warranted mouser and they all mice."

In other words, Nurse Ratched need not apply. It'a rest stop for the discreet treatment of the nervous disordered, the dispsomaniac, and deeply distressed, with dignity, the business model an innovative pre-paid medical plan that if ultimately unsuccessful, foreshadowed later, successful by economy of scale, modern iterations. It was a convalescent home for those in need of rest and recovery from whatever; in short, a rehab facility in the broadest sense, part of a reform movement to improve the care of those whose needs fell between the medical hospital and the mental asylum, and at an affordable price.

The manuscript of ***The Sanatorium*** is being offered by Jonkers Rare Books, which last week made headlines with the sale of the most significant presentation copy of Jane Austen's classic, Emma.

It was acquired at Christies sale no. 5822, lot 91, last year. The estimate was £8,000 - £12,000. It sold for £17,500 ($28,490). Jonkers is asking £45,000 ($68,632). Considering that Dickens manuscript material is highly desirable yet rarely finds its way into the marketplace, the price is not unreasonable.

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DICKENS, Charles ORIGINAL AUTOGRAPH MANUSCRIPT "THE SANATORIUM" [1842]. A four page manuscript "sketch," including various emendations and deletions, with a three page autograph letter dated 27 December 1842 to Chapman. With two letter wrappers both addressed to Chapman and signed by Dickens. All window mounted and bound in full scarlet morocco by Riviere.
http://www.bookpatrol.net/2010/04/charles-dickens-model-for-modern-rehab.html?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+BookPatrol+%28Book+Patrol%29

Flowers bloom earlier as UK warms
By Richard Black
Environment correspondent, BBC News

British plants are flowering earlier now than at any time in the last 250 years, according to new analysis.

Researchers stitched together nearly 400,000 first flowering records covering 405 species across the nation.

Writing in the journal Proceedings B, they show that the average first flowering date has been earlier in the last 25 years than in any other period.

Flowering dates are closely linked to temperatures recorded in the Central England Temperature Record.

This is the longest continuous instrumental record of temperatures anywhere in the world, dating back to measurements made in 1659.

“ **We've been able to use data from all sites from anyone who's ever recorded a first flowering date** ”
Richard Smithers

During the 1980s and 1990s, the temperatures it registered rose by about 1C, although there is large variability from year to year.

"There is a strong correlation between the flowering index and temperature, so what you see is in large part a reflection of the CET (Central England Temperature Record)," said Richard Smithers, UK conservation adviser at The Woodland Trust and one of the researchers on this project.

"There have been other periods [in the record] when temperatures were warm, but the last 25 years is certainly the period when the index has been earliest," he told BBC News.

Across the plant record, researchers found that a temperature difference between two years of 1C equates to a difference in flowering time of about five days, with some species responding much more than others.

In general, spring-flowering species respond more to temperature changes than those blossoming later.

Seasonal blend

This is far from being the first study to look at how climatic changes are affecting timings of events in the natural world, the discipline known as phenology.

Researchers have investigated such phenomena as the appearance of blossom, the emergence of insects, and the hatching of birds.

Earlier this year, another study showed that on average, spring in the UK now begins 11 days earlier in the year than 30 years ago.

However, many sets of records are short-term or fragmented, and many focus on just one species.

The world's longest sequence plots the flowering dates of cherry trees in Kyoto back to the 9th Century, pieced together from diaries and chronicles.

Mr Smithers' team developed a technique for blending fragmented records in a way that takes account of where in the UK the records came from, what length of time they cover, and the differences between the flowering times of different species, from the snowdrops of early Spring to the ivy of Autumn.

It is a kind of nationwide, year-long, species-wide average.

Systematic recording of flowering times began in the UK in 1875 when the Royal Meteorological Society established a national network of observers. But before and after that date, sightings have also been made both by full-time biologists and part-time enthusiasts, supplemented in recent years by mass-participation projects such as BBC Springwatch.

"What this does is to take all of the data that exists, and meld it all together into one index," said Mr Smithers. "That means we've been able to use data from all sites from anyone who's ever recorded [a first flowering date], whether that's one person who happened to make a recording in one place or someone who's spent 50 years diligently working on a site."

The UK has a better record than the vast majority of countries, owing largely to the long tradition of amateur naturalism. This has culminated in the UK Phenology Network, which allows anyone to send in sightings using the web.

But the same research team is aiming to see whether the same techniques can be employed on a larger scale, to give a regional or global picture of nature's response to temperature change.

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Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8606406.stm

Published: 2010/04/07 01:42:32 GMT

Turtles die in nets 'in millions'
By Richard Black
Environment correspondent, BBC News

Millions of marine turtles have been killed over the past two decades through entrapment in fishing gear, according to a global survey.

Described as the first global synthesis of existing data, the study found especially high rates of "bycatch" in the Mediterranean and eastern Pacific.

Six of the seven sea turtle types are on the Red List of Threatened Species.

Writing in the journal Conservation Letters, researchers advocate much greater use of gear safe for turtles.

These include circular hooks rather than the conventional J-shaped hooks on long fishing lines, and hatches that allow the reptiles to escape from trawls.

Turtles must come to the surface to breathe.

When they are caught in a net or on a fishing hook, they cannot surface, and drown.

Lead researcher Bryan Wallace said the state of the world's turtles was an indicator of the wider health of the oceans.

" **We conservatively estimate that the true total is probably... in the millions of turtles taken as bycatch in the past two decades** "
Dr Bryan Wallace

"Sea turtles are sentinel species of how oceans are functioning," he said.

"The impacts that human activities have on them give us an idea as to how those same activities are affecting the oceans on which billions of people around the world depend for their own well-being."

Dr Wallace works in the global marine division of Conservation International and at Duke University in the US.

Off target

The raw material from the study came from records of bycatch - incidental catches in fishing gear - from different regions of the world.

Over the period 1990-2008, records showed that more than 85,000 turtles were snared.

However, those records covered a tiny proportion of the world's total fishing fleets.

"Because the reports we reviewed typically covered less than 1% of all fleets, with little or no information from small-scale fisheries around the world, we conservatively estimate that the true total is probably not in tens of thousands, but in the millions of turtles taken as bycatch in the past two decades," said Dr Wallace.

Three types of fishing gear are identified in the survey - long-lines, gillnets and trawls.

Modern long-line boats trail strings of hooks that can be 40km long, usually in search of high-value species such as tuna and marlin.

Gillnets are usually stationary, and use mesh of a set size in an attempt to target certain species of fish.

The researchers suggest that several areas of the world account for particularly high levels of bycatch - the Mediterranean Sea and the eastern Pacific Ocean for all types of gear, together with trawling operations off the west coast of Africa.

Catches cut

Modifying fishing gear can have a dramatic impact on the size of bycatch.

Shrimp trawls fitted with turtle excluder devices (TEDs) catch markedly fewer of the reptiles.

A grid prevents anything large from entering the back portion of the net, and a hole above the grid allows accidentally snared animals such as turtles to escape.

A number of countries now require that shrimp boats must use nets fitted with TEDs.

The circular long-line hooks also reduce bycatch of birds such as albatrosses.

However, some fleets have resisted adopting selective gear because fishermen believe it will reduce their catch.

In many parts of the developing world, the gear is not available.

Marine turtles face other significant threats.

Debris in the oceans, such as plastic bags, can also cause drowning, while development in coastal regions can affect nesting and reproduction.

Some turtles are still targeted for meat, and their shells used for tourist souvenirs.

Numbers of adult leatherbacks - the largest species, growing to more than 2m long and capable of journeys that span entire oceans - are thought to have declined by more than 75% between 1982 and 1996.

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Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8604723.stm

Published: 2010/04/06 12:57:36 GMT

Velociraptor 'caught' eating dino

By Matt Walker
Editor, Earth News

A predatory *Velociraptor* has been caught in the act of eating another larger plant-eating dinosaur.

Palaeontologists have uncovered fossil fragments of *Velociraptor* teeth alongside scarred bones of the large horned herbivore *Protoceratops* .

The teeth of the predator match marks on the herbivore's bones, suggesting *Velociraptor* scavenged its carcass.

The discovery is further evidence that predatory dinosaurs both hunted and scavenged their plant-eating relatives.

The find also helps validate another famous fossil discovery unearthed in 1971.

This looks like scavenging as the animal would be feeding on the haunches and guts first, not the cheeks
Fossil co-discoverer Dr David Hone

Known as the "fighting dinosaurs", that fossil shows a *Velociraptor* and *Protoceratops* apparently locked in combat, with both dinosaurs having died at the same time.

Evidence of feeding by theropod dinosaurs, such as *Velociraptor* or *Tyrannosaurus rex* , are scarce in the fossil record and the fighting dinosaurs is the most dramatic example known potentially illustrating such behaviour.

Palaeontologists continue to debate the fossil and many still consider it possible that the two animals killed each other - the *Velociraptor's* raptor-like claw is preserved lodged in the throat region of the much larger *Protoceratops* , which appears at the same time to be biting down on the predatory dinosaur's right arm.

However, it is also possible that *Velociraptor* did not regularly eat *Protoceratops* .

Instead, the fighting dinosaurs could represent a chance encounter between the two species that escalated into a fight.

However, the new fossil discovery, published in the journal Palaeogeography, Palaeoclimatology, Palaeoecology, suggests that is less likely.

It provides further evidence that *Velociraptor* did regularly eat *Protoceratops,* either by scavenging those that had already died or by actively hunting them.

Dr David Hone of the Chinese Academy of Sciences in Beijing made the new discovery in Upper Cretaceous deposits at Bayan Mandahu, in Inner Mongolia, China.

Colleague Dr Jonah Choiniere originally found a mass of badly eroded *Protoceratops* bones. Among them lay two *Velociraptor* -like teeth.

Together with Dr Hone and colleagues Dr Corwin Sullivan and Dr Mike Pittman, Dr Choiniere analysed the fossils for bite marks.

The team found the *Protoceratops* bones were scarred in this way, and the bite marks matched the teeth found alongside.

The *Velociraptor* found at the site likely scavenged this particular *Protoceratops* , rather than hunted it.

"The marks were on and around bits of the jaw," Dr Hone told the BBC.

" *Protoceratops* probably weighed many times what a *Velociraptor* did, with lots of muscle to eat. Why scrape away at the jaws, where there's obviously not much muscle, so heavily that you scratch the bone and lose teeth unless there was not much else there.

"In short, this looks like scavenging as the animal would be feeding on the haunches and guts first, not the cheeks.

"The fighting dinosaurs suggests predation. Combine the two and we have good evidence for both behaviours," says Dr Hone.

"Animals like *Velociraptor* were probably feeding on animals like *Protoceratops* regularly, probably including both predation and scavenging."

That is in line with the behaviour of many modern predators, as almost all living carnivores such as lions and jackals do both. "It's a question of degree," says Dr Hone. "Lions mostly predate, jackals mostly scavenge."

In that regard, the new fossil find confirms what many researchers have long suspected about how predatory dinosaurs such as *Velociraptor* interacted with plant-eating dinosaurs.

"Even the most dedicated predator won't turn down a free meal if they chance across a dead animal with a few bits of meat still attached, and this looks like the case here," says Dr Hone.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/earth/hi/earth_news/newsid_8596000/8596568.stm

Published: 2010/04/06 07:09:29 GMT

Five-a-day 'will not cut cancer'
By Clare Murphy
Health reporter, BBC News

Eating more fruit and vegetables has only a modest effect on protecting against cancer, a study into the link between diet and disease has found.

The study of 500,000 Europeans joins a growing body of evidence undermining the high hopes that pushing "five-a-day" might slash Western cancer rates.

The international team of researchers estimates only around 2.5% of cancers could be averted by increasing intake.

But experts stress eating fruit and vegetables is still key to good health.

In 1990, the World Health Organization recommended that everyone consume at least five portions of fruit and vegetables a day to prevent cancer and other chronic diseases.

The advice has formed a central plank of public health campaigns in many developed countries. It has been promoted in the UK since 2003 and in the US for nearly two decades.

But research has failed to substantiate the suggestion that as many as 50% of cancers could be prevented by boosting the public's consumption of fruit and vegetables.

" **It's still a good idea to eat your five-a-day but remember that fruits and vegetables are pieces in a much larger lifestyle jigsaw** "
Yinka Ebo Cancer Research UK

This latest study, which analysed recruits from 10 countries to the highly-regarded European Prospective Investigation into Cancer and Nutrition, confirms that the association between fruit and vegetable intake and reduced cancer risk is indeed weak.

The team, led by researchers from the Mount Sinai School of Medicine, in New York, took into account lifestyle factors such as smoking and exercise when drawing their conclusions.

But writing in the Journal of the National Cancer Institute, they said they could not rule out that even the small reduction in cancer risk seen was down to the fact that the kind of people who ate more fruit and vegetables lived healthier lives in many other respects too.

Broccoli not biscuits

In the best case scenario, an extra two portions of fruit and vegetables each day could prevent 2.6% of cancers in men and 2.3% of cases in women, the study concluded.

" **Research should focus more sharply on specific fruits and vegetables and their constitutents** "
Walter Willett Harvard School of Public Health

Vegetables, which tend to be richer in nutrients, appeared to be more beneficial than fruits, while heavy drinkers seemed to gain the most from a higher intake of both when it came to protection from cancers caused by alcohol and smoking.

In an accompanying editorial, Professor Walter Willet of Harvard University said the research strongly confirmed the findings of other studies, showing "that any association of intake and fruits and vegetables with risk of cancer is weak at best".

But he stressed specific substances contained in certain fruit and vegetables, if harnessed, could still have an important, protective effect.

Substantial evidence suggests lycopene from tomatoes, for instance, may reduce the risk of prostate cancer, while chemicals in broccoli are thought to stimulate a gene which protects against bowel cancer.

And data still suggests fruit and vegetables may provide protection against cardiovascular disease, one of the major killers in the developed world - although this too has yet to be proven categorically.

Keeping lean

But while the links between diet and cancer remain unclear, obesity is now seen as an established risk factor.

Fruit and vegetables could therefore be beneficial just by virtue of taking the place of more calorific fare, health experts say.

In any event, a reduced risk of 2.5% should not be dismissed out of hand, the World Cancer Research Fund argues.

"For the UK, this works out as about 7,000 cases a year, which is a significant number," says Dr Rachel Thompson from the charity, which in a major 1997 report said there was "convincing evidence" of the protective effect of fruit and vegetables.

Yinka Ebo of Cancer Research UK said: "It's still a good idea to eat your five-a-day but remember that fruits and vegetables are pieces in a much larger lifestyle jigsaw.

"There are many things we can do to lower our chances of developing cancer such as not smoking, keeping a healthy weight, cutting down on alcohol, eating a healthy balanced diet, being physically active and staying safe in the sun."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8605270.stm

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Crackdown on MOT-style body scans

Companies have been told to stop offering whole body and lung scans under a new regulation regime.

The Department of Health is introducing the tougher rules after a boom in so-called MOT-style scans.

Computerised Tomography (CT) scans are advertised as an MOT for people who want to be checked for illnesses.

But experts say there are risks to having unnecessary scans. They can be up to 400 times more powerful than a chest X-ray.

The government made the announcement after accepting the recommendations of its expert advisers, the Committee on Medical Aspects of Radiation in the Environment (COMARE).

Scanning for spinal conditions, osteoporosis and body fat will also cease.

“ **Any scan a patient undergoes should balance the clinical benefits against the risks of the radiation** ”
Public Health Minister Gillian Merron

COMARE also recommended that screening for colorectal cancer - outside of the NHS screening programmes - should only be undertaken in over-50s.

In keeping with the NHS screening programmes, scans should not be performed more frequently than once every two or three years.

The committee made nine recommendations in total and the Department of Health has accepted all of then.

New guidance

CT scanners use X-rays to take detailed images of cross sections of the body called "slices". The scanners can have different numbers of detectors.

Generally the greater the number of detectors, the increased amount of data that is acquired leading to more detailed images of the body.

The images are stored in a computer and are interpreted by a radiologist.

The Department of Health will now seek the help of the Royal College of Radiologists and the Royal College of Physicians in preparing guidance for practitioners.

The guidance will focus on the balance of risk and benefit involved in the CT scanning procedures.

Dr Tony Nicholson, dean of the Royal College of Radiologists, said: "This regulation will make the rules on CT scans more understandable. It's just not possible to justify using ionising radiation if there's no proven benefit."

Public Health Minister Gillian Merron said: "Any scan a patient undergoes should balance the clinical benefits against the risks of the radiation involved.

"I welcome the decision to define more closely the considerations that should govern CT scanning in cases of individual health assessments," she added.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8605126.stm

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Anti-psychotic pneumonia warning

The use of anti-psychotic drugs in the elderly doubles the risk of potentially fatal pneumonia, say Dutch researchers.

A study of almost 2,000 patients found the increased risk starts soon after treatment begins and concluded that patients should be closely monitored.

An expert review published in 2009 found the drugs are overused in many cases and are responsible for up to 1,800 deaths in the UK every year.

Ministers have said they want to see a significant cut in their use.

The latest research published in the Annals of Internal Medicine compared the health records of 258 over-65s with pneumonia with 1,686 patients without the infection.

" **This paper yet again gives us evidence why we should not prescribe them unless absolutely necessary** "
Professor Steve Field, Royal College of GPs

Of those with pneumonia, a quarter died within a month.

When they looked at prescribed drugs, they found current use of anti-psychotics was associated with a roughly two-fold increase in the risk of pneumonia.

Those on the newer types of anti-psychotic drugs were slightly less likely to have the infection than those on the older class of drugs but were still at significant increased risk.

The risk was found to start soon after treatment and increased the higher the dose of drugs the patient was prescribed.

Evidence

The researchers from Erasmus University Medical Center in Rotterdam said: "Clinicians who start treatment with anti-psychotic drugs should closely monitor patients, particularly at the start of therapy and if high doses are given."

Last year's UK review found that around 180,000 dementia patients a year are given the drugs in care homes, hospitals and their own homes to manage aggression but only around 36,000 would actually benefit from them.

Measures suggested in the report and accepted by the government included better monitoring of prescribing practices and ensuring that, where necessary, they were prescribed for short periods of time.

Professor Steve Field, chair of the Royal College of GPs said: "Anti-psychotics are prescribed too frequently without doctors thinking about the consequences.

"This paper yet again gives us evidence why we should not prescribe them unless absolutely necessary and if you do you should closely monitor the patient."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8599443.stm

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Scientists name large but elusive lizard

Scientists spent a decade chasing a big new species
By Susan Milius
Web edition : Tuesday, April 6th, 2010

GotchaAfter a decade-long hunt, herpetologists have tracked down and documented a new species of monitor lizard on the Philippine island of Luzon.Joseph Brown

Scientists couldn't see the lizard for the trees.

But now they've tracked down and named *Varanus bitatawa*, a skittish reptile that's hard to spot even though it grows up to 2 meters long and sports bright yellow speckles.

In forests on the Philippine island of Luzon, the newly discovered monitor lizard hauls itself up into trees in search of fruit and melts into the vegetation if humans approach, says herpetologist Rafe Brown of the Biodiversity Institute at the University of Kansas in Lawrence. He and his colleagues describe and name the species in paper published online the week of April 5 in *Biology Letters*.

The species is "new to us," Brown clarifies, because the Agta and Ilongot peoples living in forests of the Sierra Madre range know the lizard well — as a delicacy. It mostly eats fruit and reportedly tastes better than a much more common scavenging monitor that's "attracted to stinky stuff," Brown says.

A cousin to the giant Komodo dragon, *Varanus bitatawa* is hard to find but once detected, is pretty hard to ignore. During adulthood, yellow markings differentiate it from a much drabber neighbor — though both species sport colorful patterns as juveniles.

Reptile systematist Michael B. Harvey, who was not part of Brown's group, has helped name another *Varanus* lizard from New Guinea and examined specimens from Southeast Asia. "I quickly realized that diversity of these lizards had been greatly underestimated," says Harvey, of Broward College in Davie, Fla. "I only hope that we don't lose much of this biodiversity before scientists can study it."

Deforestation poses a major threat to the biodiversity of the Philippines, which Brown and his colleagues describe in their paper as a "global conservation hotspot."

Western scientists first glimpsed the big monitor in 2001, Brown says, when biologists exploring the forest happened on hunters carrying a large lizard home for dinner. The biologists were permitted to photograph it, but theirs was the first of several encounters in which hunters showed no interest in giving up the centerpiece of a big family meal.

Herpetologist Arvin Diesmos of the National Museum of the Philippines in Manila and other researchers persisted in collecting photographs, local intelligence and the occasional juvenile, but they could not secure a full-grown adult specimen.

Then, in the summer of 2009, a team led by Brown and his graduate student Luke Welton got its hands on an adult lizard. They documented identifying anatomical characteristics such as the distinctive little horns on the ends of the lizards' double-barreled male reproductive organs. Which, by the way, are far from unusual in and of themselves: "All snakes and lizards have a paired copulatory organ," Brown says.

DNA tests were even more important, confirming that the species differs from a previously identified fruit-eating monitor living in a different part of the island.

Brown actually learned of the adult specimen's existence via text message. After he and his students spent weeks in the mountains surveying other vertebrates and hoping for an adult *Varanus bitatawa,* Brown had to return home early to start the fall semester. But he received a message from his students in the expedition's final hours announcing their success — and letting him know that they were having a hard time finding a way to get from their camp to the airport.

http://www.sciencenews.org/view/generic/id/57985/title/Scientists_name_large_but_elusive_lizard

U.S. health system not adequately prepared for the aging sick

The problem can really break down for people with multiple chronic conditions.
By Janet Raloff
Web edition : Tuesday, April 6th, 2010

An editorial in tomorrow's *Journal of the American Medical Association* offers anything but welcome words for Baby Boomers and their elders. These aging, if not geriatric, individuals constitute a large share of the 75-million-and-growing number of patients annually who must cope with at least two chronic medical conditions — ones that will each require at least a year of ongoing treatment. Is the U.S. healthcare system prepared to deal with these patients? "Current indications suggest that it is not," according to physicians Anand Parekh and Mary Barton. And they might be expected know. Parekh is the Deputy Assistant Secretary for Health and Barton for the Agency for Healthcare Research and Quality.

Two-thirds of U.S. medical spending goes to treat the one-quarter of Americans with multiple chronic health conditions. There's a good reason that such a disproportionate share of insurance and government spending goes to help these people, Parekh and Barton note: As the number of chronic conditions that any individual has increases, so does the number of unnecessary hospitalizations; adverse drug events; redundant tests; instances of conflicting medical advice — and, most importantly, cases of "poor functional status and death." Yep, that last one is a killer.

The pair points to diabetes as a good example. One in ten American adults suffers from this metabolic disease — and 90 percent of these individuals have at least one additional chronic condition. Such as cardiovascular disease. Or incipient dementia. Or crippling arthritis. Or an osteoporotic fracture. Or prostate cancer. Or chronic obstructive pulmonary disease.

To maximize their patients' care and quality of life, physicians in disparate fields should be coordinating the monitoring and treatment of people with multiple, long-term illnesses. But there's little financial or even social incentive for them to do so, Parekh and Barton say. Under the current "fee-for-service" rubric, each additional medical test or office visit warrants another payment. And overworked docs can find it frustrating to try to touch bases with similarly overworked peers to review cases.Nor has there been much research investigating the special risks associated with managing comorbidities (although that is starting to change), Parekh and Barton point out. In the past, people with many chronic diseases would have died by middle age, or at least before a second, third (much less a fourth) long-term ailment was diagnosed. So one glass-half-full way to look at the problem is that people are surviving longer with disease. A good thing, right?

A more dismal prospect: Our golden years may be tarnished by having to suffer with more disease — and over far longer periods.As my 90-something mother-in-law said to me one day after perhaps her seventh doctor's visit of the month: "You know, Janet, getting old sucks." Aside from the out-of-character verb that she chose, there was a spare elegance to what she said. She was tired of the chronic pain, of having to remember to take all of those pills, of failing to remember what she'd planned for dinner and of having to hunt once again for her misplaced reading glasses (or shoes, house key, hearing aid, credit card . . . fill in the blank).

I valued every day we had with this sweet woman. And just wished her doctors had been able to manage her myriad symptoms better so that she didn't come to look forward to the end. As more — and an increasing proportion — of us approach our geriatric years, we had better hope that medicine learns how to manage multiple chronic ails. Indeed, it's in our collective vested interests to see that more research dollars get funneled into this understudied area. And soon.

http://www.sciencenews.org/view/generic/id/57981/title/U.S._health_system_not_adequately_prepared_for_the_aging_sick

Superheavy element 117 makes debut

International team fills gap in the periodic table
By Alexandra Witze
Web edition : Tuesday, April 6th, 2010

Editor's Note: Additional material was added to this story at 5 p.m. on April 6, 2010.

Physicists have reported synthesizing element 117, the latest achievement in their quest to create "superheavy" elements in the laboratory. A paper describing the discovery has been accepted for publication in *Physical Review Letters*.

A team led by Yuri Oganessian of the Joint Institute for Nuclear Research in Dubna, Russia, reports smashing together calcium-48 — an isotope with 20 protons and 28 neutrons — and berkelium-249, which has 97 protons and 152 neutrons. The collisions spit out either three or four neutrons, creating two different isotopes of an element with 117 protons.

Sigurd Hofmann, a nuclear physicist at the GSI research center in Darmstadt, Germany, calls the new work on element 117 "convincing."

Most elements heavier than uranium, which has 92 protons, do not exist stably in nature and must be made artificially in the laboratory.

The Russians collaborated with U.S. researchers, including some from Oak Ridge National Laboratory in Tennessee, where the berkelium target was made. Berkelium, with atomic number 97, is another of the rare artificially produced elements; the Russian team was able to obtain just 22 milligrams of it from Oak Ridge.

The researchers briefly spotted signs of element 117 during two runs of collisions lasting 70 days each. In their paper, the researchers report observing the heavier isotope of element 117 decay with a half-life of 78 milliseconds; they measured the lighter one's half-life at 14 milliseconds.

The new element, which has yet to be named, slips into a place on the periodic table between elements 116 and 118, both of which have already been discovered. Such superheavy elements are usually very radioactive and decay away almost instantly. But many researchers think it is possible that even heavier elements may occupy an "island of stability" in which superheavy atoms stick around for a while.

The new work supports that view. Analyses of the new element's radioactive decay, Oganessian's team writes in the new paper, "represent an experimental verification for the existence of the predicted 'Island of Stability' for super-heavy elements."

Hofmann says that one of the most interesting things about the new work is the different products that result when the two element 117 isotopes decay. The isotope with 177 neutrons decays down to dubnium (atomic number 105), whereas the isotope with 176 neutrons decays down to roentgenium (atomic number 111). Comparing the two chains, Hofmann says, will help researchers better understand the characteristics of superheavy elements.

Element 117 is tentatively known as ununseptium. After its existence is confirmed, it will receive a permanent name, suggested by the discoverers, from the International Union of Pure and Applied Chemistry – a process that can take some time. In February 2010, the IUPAC finally granted the name copernicium to element 112, which was first produced by Hofmann's group in 1996.

http://www.sciencenews.org/view/generic/id/57964/title/Superheavy_element_117_makes_debut

Wood and Civilization

Wood, as fuel and building material, is the unsung hero of the technological developments that brought humanity from a bone-and-stone culture to the Industrial Revolution.

By John Perlin

Wood helped humanity survive to master civilization, which included warfare. When king Xerxes I of Persia tried to invade Greece this fleet of ships was to totally defeat the Persians at the Battle of Salamis. The oracle of Delphi had prophesized that only a wall of wood would protect Athens, and Themistocles interpreted this wall to be the Athenian fleet.

The author of A Forest Journey: The Story of Wood and Civilization, writes a series for Miller-McCune on the world's first energy crisis: peak wood.

From the first cave society to the end of the 18th century, the world lived in the Biomass Age with wood as its primary building material and fuel.

England was first to leave the Era of Wood, embracing the fossil fuel coal at the dawn of the 1800s. Across the Atlantic, America's primary fuel and building material continued to be wood until the end of the Civil War in 1865. So the dominance of fossil fuels began only two centuries ago; reliance on wood, in contrast, lasted almost a million years.

Throughout this great span of time, trees have provided the material to make fire, the heat of which has allowed our species, unlike any other animal, to reshape the Earth for its own use. With heat from wood-fueled fires, relatively cold climates became habitable, allowing humanity to leave Africa to populate the globe and enhancing the survival of the species against any regional disaster.

Wood-fueled fires also turned otherwise inedible grains into a major source of food: Our diet became increasingly varied, enhancing the chances of survival and growth, and making possible the agricultural revolution that transformed human life from hunting-and-gathering groups to complex urban societies.

Wood, when reduced to charcoal, creates temperatures hot enough to extract metals from stone. Metals in turn revolutionized the implements for agriculture, construction and warfare. Compare a wooden plough with a metal one, or a stone axe with its metal counterpart, or firing artillery with stone throwing. Credit wood, then, as the unsung hero of the technological revolution that has brought us from a stone-and-bone culture to our present age.

In the Biomass Age, transportation would have been unthinkable without wood. Until the two ironclads went at it near Hampton Roads, Va., in the spring of 1862, every ship, from Bronze Age coaster to 19th-century frigate, was built of timber. Every cart, chariot and wagon was made of wood. Steamboats and railroad locomotives burnt wood fuel well into the 19th century. And railroad ties, of course, were wooden.

Timber beams propped up mine shafts. Wood provided the structural support for most buildings. Water wheels and windmills — all wood — were the major means of mechanical power before the steam engine was contrived. The peasant could not farm without wooden plow or tool handles. The soldier could not throw his spear or shoot his arrows without their wooden shafts or hold his gun lacking its wooden stock. What would the archer have done lacking wood for his bow; the brewer and vintner without wood for their barrels and casks; the wool industry without wood for its looms?

Wood was indeed our ancestor's chief resource. In their writings, they recognized wood's primacy. Lucretius, a Roman philosopher, for example, told of the emergence of civilization from forest fires. Such conflagrations "thoroughly heated the earth," he wrote in On the Nature of the Universe, accidentally smelting metal from the embedded rock. The sight of metals being made and available for the taking did not escape the view of those observing nature's metallurgical touch. "The thought then came to them," the philosopher wrote, "that these pieces of metal could be re-liquefied by heat and cast into the form and shape of anything" they so desired.

In this manner people began to make tools, which created a civilized world. The Roman orator, Cicero, in his On the Nature of Gods, expanded on the importance of wood, explaining that with these tools, "We cut up trees to cook our food, for building to keep out the heat and cold and also to build ships, which sail in all directions to bring us all the needs of life."

Another great Roman, Pliny the Elder, well summed up Lucretius and Cicero's thoughts by writing that wood was "indispensable for carrying on life." Hence, the word for wood in Latin and in Greek also meant primary matter (in Greek it's hulae; Latin, materia), demonstrating that people living in the Biomass Age regarded timber as the basis from which everything else was derived.

The recognition of the primacy of wood endured for millennia as the Era of Wood persisted. When an Englishman of note deliberated whether wood or iron topped society's list of material resources, he gave the nod to wood because, in his judgment, without wood fuel, "no iron could be provided." With respect to trade and power, an English naval official came to a similar conclusion, observing, "As the navy hath no being without ships, so no ships without timber."

Throughout the Biomass Age the same cycle repeated time and time again. Blessed by easy access to forests, material development proceeded with confidence that nature will always provide. Prosperity, power and population invariably increased. The faster demographic and economic growth occurred, greater became demands on the ever-shrinking woodlands. Military and commercial ventures as well as colonization ensued to procure new wood resources for the mother country to maintain and increase the material expectations of its citizenry. Clashes become inevitable when others want or hold the same sought-after lands.

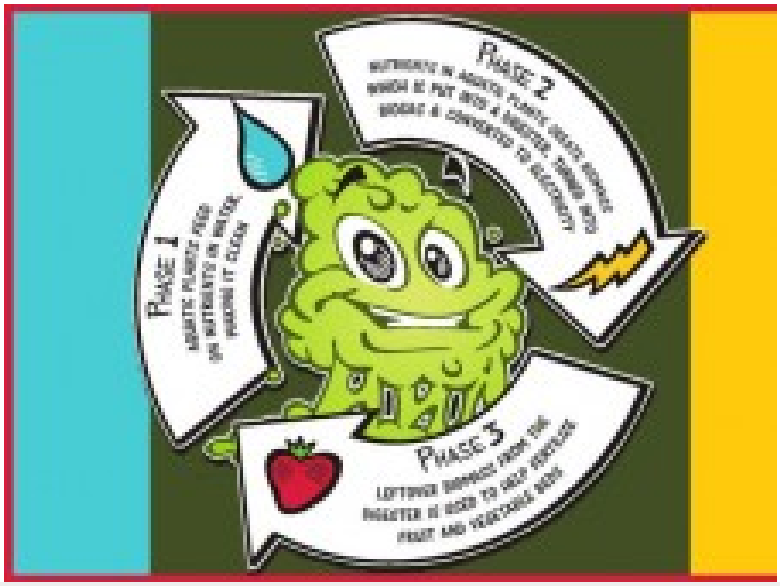
Substitute wood for oil in today's world and we gain from history a mirror to look forward by harking back to the past of what happens when supply of society's primary resource peaks. The articles that follow will show the promise and the dangers that lie ahead with history as a guide.

http://www.miller-mccune.com/science-environment/wood-and-civilization-12876/

When Sewage Is Not a Dirty Word

Algae can purify wastewater and provide electricity.

By Melinda Burns



Meet Algae, the central character of a coloring book about the city of Santa Rosa, Calif.'s "F.A.B" (Fuel from Aquatic Biomass) project. Real algae is also the central character in plans to purify wastewater and provide electricity.

Venture capitalists can chase the holy grail all they want, trying to convert algae into bio-diesel. The City of Santa Rosa, Calif., has hit on a more practical way to turn green slime into green power.

On May 10, the city's Laguna Wastewater Treatment Plant will inaugurate a small pilot project that relies on native algae and marsh plants to purify sewage and produce methane. The gas will run a generator that charges a fleet of four electric maintenance vehicles.

"It's a totally cool thing," said Dell Tredinnick, project development manager for the city's Utilities Department. "It's a real-life demo project in a real-life sewage treatment plant that can show you what you can do."

Nationwide, there's a rush to extract more energy from wastewater treatment, but Laguna boasts that it is the only operation in the U.S. harvesting algae for fuel. The city has published a coloring book about its "F.A.B" (Fuel from Aquatic Biomass) project, featuring Algae, a smiley, if scummy, little fellow.

Under the direction of Sonoma State University biologists, six algae channels or ponds at Laguna clean a small portion of the wastewater stream, meeting state standards for nitrates and phosphates. The algae, marsh plants and associated bacteria "eat" these contaminants, bringing to mind the words of Buckminster Fuller, the futurist: "Pollution is nothing but the resources we are not harvesting."

As the algae proliferate, the floating mats are harvested and fed into an airtight tank, along with invasive vegetation from nearby creeks. As the plants decompose in the tank, they produce methane that will fuel a generator for the electric vehicles. The plant leftovers will be spread as fertilizer on an acre of strawberries.

"You can make progress in little ways by closing loops and using waste products," said Cat Hare, a graduate student at Sonoma State. "I can get a 35 percent decrease of the level of nitrates in one day in the water coming through the channels, which is really good."

Laguna serves a population of 250,000 people, and it would require more than 100 acres of algae ponds to purify the entire waste stream of nitrates. The current project measures only 800 square feet. Treddinick plans to scale up the project to an acre, thinking that perhaps a smaller plant might want to copy the technology.

"What we're doing is advancing the science," he said.

Algae-to-fuel is a side operation at Laguna, but it has garnered top honors from the Association of California Water Agencies. In addition, Laguna has won state and federal awards for recycling and quality control. Ninety-nine percent of its biosolids — treated, nutrient-rich sewage sludge — are spread on the land, either as fertilizer on fodder or as compost on city parks and playgrounds. Only 1 percent is trucked to a landfill. Apart from the algae operation, 25 percent of the plant's electrical bill is offset by methane from biosolids.

Last year, Laguna became one of only 25 sewage plants in the country to be certified for high standards by the National Biosolids Partnership, made up of the U.S. Environmental Protection Agency and two nonprofit advocacy groups, the National Coalition of Clean Water Agencies and Water Environment Federation.

"When you look at the whole system, it's really quite phenomenal," Tredinnick said. "It's a cradle-to-cradle approach."

Recycling, not 'disposal'

In California, on average, 70 percent of biosolids are spread on farmland or used as compost, compared to 55 percent nationwide, said Greg Kester, a spokesman for the California Association of Sanitation Agencies, a nonprofit government group.

"We never use the term 'disposal' anymore," Kester said. "Everyone views biosolids as a renewable resource."

Well, not everyone. A number of agricultural counties in Southern California have tried to ban or limit the use of biosolids even for fodder because they view the practice as "rural dumping." Kern County banned it, was sued by the city of Los Angeles, and lost. In 2007, a federal court found "no evidence at all" of environmental harm to Kern County from biosolids.

"To me, it's the ultimate act of recycling," Kester said. "It's putting it back on the soil from which it came."

But rural reluctance in California, manifested in local ordinances requiring hard-to-get permits, has forced urban areas to convert more sewage into fuel. Last year, Ventura Regional Sanitation District, serving Ventura County, began converting biosolids into dried pellets for fuel. And in a pilot project, the city of Los Angeles started injecting some of its biosolids into wells a mile under the ocean floor at Terminal Island, where they will degrade into methane for fuel.

In northern San Diego County, the Encina Wastewater Authority now converts its biosolids into dried pellets for sale to a cement manufacturer in Victorville. The Encina treatment plant, like Laguna, is certified by the National Biosolids Partnership.

"We've gotten our ratepayers out of the game of paying millions of dollars to haul biosolids more than 200 miles to Yuma, Ariz.," said Kevin Hardy, the general manager. "Instead of five trucks to Yuma,

we're sending one truck a day to Victorville. That's half the distance. And we're getting to beneficially use the product as fuel."

Similarly, Los Angeles and Orange counties are hoping to recycle a third of their biosolids as pellets at the Rialto SlurryCarb Facility, which opened last June. The plant is designed to produce twice as much energy as it consumes. It has hit some technical hurdles and is operating only at 20 percent capacity, but it will be fully up and running by the end of this year, said Brian Dooley, vice president of marketing.

"It's a longer start-up process than we were anticipating," he said.

In the Bay Area, a coalition of 16 wastewater treatment agencies, including San Francisco, will put out a request for proposals later this spring for a biosolids-to-energy project.

"To date, facilities have found it easier to truck their biosolids a sizable distance, but it's beginning to turn around," said Lauren Fondahl, an environmental engineer at EPA headquarters in San Francisco. "They're starting to look at the overall carbon footprint and the cost of trucking biosolids a long way out."

A quixotic quest?

At the Laguna plant in Santa Rosa, scientists couldn't resist trying to extract oil from sewage-fed algae, though they were skeptical it would be worth it. Some algae has more lipids, or fats, per pound, than any other crop, but it's a tough proposition to get the oil out, said Michael Cohen, the Sonoma State biologist who oversees the algae operation.

"Algae have tough cell walls, so extraction is really difficult," he said. "They don't give up their oil so easily."

Hare, who is Cohen's student at Sonoma State, stuffed a trash bag full of algae into a giant duffle bag, got past airport security without incident, and flew to a U.S. Department of Agriculture lab in Philadelphia to see what she could do. After four months and two trips, she extracted a cup of oil, but it was not suitable for bio-diesel production.

"We knew going in that we were going to be fighting a losing battle, but we thought we would see if we could make it work," Hare said. "I proved I could do it, but it's not cost-effective. It looks like methane gas is going to be our best bet."

http://www.miller-mccune.com/science-environment/when-sewage-is-not-a-dirty-word-12563/

Are Parents Too Involved With Their Children?

While being involved in your children's lives and studies is intuitively (and statistically) smart, some techniques are better than others.

By Kathy Seal

Despite media fondness for reports of hyper- and helicopter parenting, the short answer to this question is a resounding no. While some kinds of parental involvement with kids are better than others, say researchers, any kind of involvement is better than none at all.

Psychologist William H. Jeynes' found that — regardless of race or gender — the more parents were involved in their kids' lives, the better their children's grades and test scores. The California State University, Long Beach, professor analyzed more than 140 other studies of elementary and secondary school students, and found that kids with involved parents also have fewer behavioral problems and are less likely to be bullied than kids with uninvolved parents.

Of course, much hinges on your definition of "involvement." Does it mean going to parent-teacher conferences? Watching kids play soccer? Checking their homework? Helping with school fundraising? There are infinite ways to take part in a child's life.

Which ways Jeynes found most influential should interest policymakers especially now as the Obama administration contemplates overhauling the federal No Child Left Behind law, which requires all school districts to establish parent involvement policies.

When Jeynes launched his meta-analyses, he thought that the usual parent involvement suspects — like helping with homework and attending school meetings — would have the greatest impact on school success. Not so.

"The numbers came out very differently than I thought they would," says Jeynes, whose book *Parental Involvement and Academic Achievement* is scheduled to be published by Routledge on June 1. Instead, he found that the most subtle forms of involvement have the most impact. Kids thrive when parents provide a "loving, supportive environment with high expectations," he says. Open, positive family communication and structure are likewise crucial.

Among these subtler forms of involvement, high expectations, such as expecting children to do their homework and go to college, have the greatest effect on school achievement, about one-half a grade point on a four-point scale, for kids of all ages.

Those expectations also surface through parental advocacy, which means making sure kids get aid if they're struggling and helping them get into good programs and to plan for the future, says Anne T. Henderson, senior consultant at the Annenberg Institute for School Reform.

Parental style — which at its best combines love and support with discipline and structure — produced an effect in Jeynes' study of about a quarter of a grade point.

Parental style that in particular fosters a child's autonomy is better than involvement that controls or pressures. So expectations conveyed subtly — as for example, when kids see their parents sacrificing to save money for their eventual college tuition — exert more power than goals pushed on kids, says Jeynes.

A large body of research underscores the importance of nurturing a child's autonomy.

When psychologists Wendy Grolnick and Richard Ryan interviewed mothers of third-graders, for example, they found as Jeynes did that the more involved the parents, the better the kids' academic achievement and behavior. In other words, any kind of involvement is better than none at all. Neglect is the worst problem.

But how the parents were involved had an even greater effect. Some parents of these third-graders pushed their kids, solved problems for them and tried to control them with rewards and punishments. Other parents encouraged their kids' autonomy, which psychologists define as the feeling of acting "because you want to," not "because you have to."

These autonomy-supporting parents coached their kids through solving dilemmas, encouraged them with positive feedback, empathized with their feelings and allowed them lots of choice. ("Do you want me to talk to the teacher about this problem, or do you want to handle it yourself?")

Kids of this second group of parents fared much better in school than the children of the more controlling parents.

What led this second group of parents to encourage their children's autonomy rather than taking over and pressuring them? Are some parents "enlightened" and others ignorant? Are poor parents less pushy than wealthy ones? Perhaps some parents are simply less narcissistic than others.

Yes, some parents believe in encouraging their kids' autonomy, even if they don't use that word. But, surprisingly, research also shows that a key determinant of parents' behavior is how much pressure they're under. If you give a group of parents a task to do with their children and tell half of them, as Grolnick and her colleagues did, that their child will be tested or judged afterward, those parents are more likely to control and intrude than the other parents.

For example, when kids had an "about me" questionnaire to fill out, some of the parents were told that other children would use their answers to say whether they liked their child or not. While the other parents relaxed, the parents whose children faced a social judgment tended to take over.

"No, video games aren't your favorite activity," one mother told her son. "Put down baseball." In other words, outside pressure made these parents trample on their children's autonomy.

Today's outside pressures on parents, including the economy and the ever-increasing competition in kids' lives, are often fierce. Often they make parents worry that their children may fall behind, lose out and not "make it" in the world. The natural reaction to such anxiety is to pressure kids: "Sit down and get that essay done now." Realizing, however, that more subtle forms of involvement, including the encouragement of autonomy, produce superior achievement may help parents resist this pressure to push and control their children.

So while schools now often focus on bringing parents in to meetings, policymakers revising NCLB might now want to ensure that those meetings encourage the subtler forms of involvement pinpointed by the latest research, says Henderson, co-author of *Beyond the Bake Sale: The Essential Guide to Family/School Partnerships*.

For example, parents will pick up on high expectations conveyed by teachers. "If elementary school teachers tell parents, 'We want to make sure when your kids leave elementary school they're ready for the middle level work that will lead them to college prep courses in high school,'" she says, "then parents will go home and say to their children, 'You're going to go to college.'"

http://www.miller-mccune.com/culture-society/are-parents-too-involved-with-their-children-12882/

Feeling Impatient? Blame That Whopper

A new study finds exposure to fast food increases impatience in unrelated areas of our lives.

By Tom Jacobs

Americans have been saving less and less of their income in recent decades, a trend that has only recently abated. At the same time, we have been eating more and more meals at fast-food restaurants.

Coincidence? Perhaps not. A new study suggests thinking about fast-food chains — or even being exposed momentarily to their logos — can increase impatience and intensify one's desire for immediate gratification.

Two University of Toronto researchers, Chen-Bo Zhong and Sanford DeVoe, reach that conclusion in a paper titled "You Are How You Eat," just published in the journal Psychological Science. It is, appropriately, a quick read.

Zhong and DeVoe conducted three experiments to determine how our increasing tendency to grab a quick bite at Burger King has affected other areas of our lives. In the first, 57 university undergraduates were instructed to concentrate on the center of their computer screens while colorful objects flashed in the corners.

For half the students, those peripheral images — which flashed by too quickly to register in their conscious minds — included logos from McDonalds, Taco Bell and other fast-food chains.

All were then asked to read a 350-word text, and move to the next screen when they were finished. Those who had been exposed to the logos took less time to complete the task, suggesting to the researchers that they were impatient to move on.

In the second experiment, 91 undergraduates were asked to recall either a meal they had at a fast-food restaurant or their last visit to a grocery. They then completed "an ostensibly unrelated marketing survey" in which they rated the desirability of various time-saving products.

Those who had thought about the fast-food franchise rated the products more favorably than those who had been contemplating their sojourn to Safeway. "These findings suggest that thinking about fast food makes individuals impatient and strengthens their desires to complete tasks as quickly as possible," the researchers conclude.

In the final experiment, 58 undergraduates were asked to rate the aesthetics of corporate logos. Half the students assessed images representing fast-food franchises (including the famous golden arches), while the others looked at logos for inexpensive diners. All then participated in a standard experiment in which they were asked to choose between receiving $3 immediately or a larger amount in a week.

"Participants who were merely exposed to the fast-food logos … were much more likely to accept a smaller payment now rather than wait for a larger payment in a week, compared to those in the control condition," the researchers report. "Fast food seemed to have made people impatient in a manner that could put their economic interests at risk."

Zhong and DeVoe concede it is an open question whether the rise of fast food is a cause or a consequence of our culture of impatience. "What we can infer from our studies," they conclude, "is that exposure to fast food and related symbols reinforces an emphasis on impatience and instant gratification, and that fast food can have a far broader impact on individuals' behaviors and choices than previously thought."

And here we've been blaming Alan Greenspan for the low level of our 401Ks, when Ronald McDonald was hiding in plain sight all along.

http://www.miller-mccune.com/health/feeling-impatient-blame-that-whopper-11129/

Fifth Period: Life and Death Decision-making

Ethical quandaries at the nexus of science, technology and society are making it into high school curricula.

By Jordan Lite

Siska Brutsaert's biology students had gotten down the basics of stem cells, the early-stage cells many scientists believe could one day treat a variety of diseases. So in January, she asked them to apply that knowledge to a real-world bioethical dilemma: Was it acceptable to use the cells if they were taken from human embryos? Why or why not?

There was a catch, though: The 18 students in her class at Bard High School Early College, a public school in Manhattan, would defend the rationale of a public figure with whom they might not agree, based on the names they drew. That posed a challenge for Marina Molarsky-Beck, who calls herself a "second- or third-generation atheist" and had to take on the persona of a philosopher influenced by evangelical Christianity.

"My figure was so adamant: Life begins at conception. I certainly don't agree with that, but it made me question my own beliefs," said Molarsky-Beck, 17. "If I don't believe that, what do I believe? It's easy to say that you don't agree with something, but it's harder to figure out what your exact position is."

While bioethics may seem like a heady, esoteric subject for teenagers, it is increasingly being taught in high schools and alluded to in national and state education standards that — if they don't use the word "bioethics" expressly — call for students to become proficient in the relationship between science, technology and society.

At least a half dozen universities and nonprofits offer bioethics training or curricula for secondary school teachers, and the effort got a spike in credibility last fall when the National Institutes of Health released its own bioethics curriculum for kids, publishing a first run of 30,000 copies. Since its September release, the NIH's Office of Science Education has received about 9,000 requests for the free supplement.

The curriculum asks students to weigh the pros and cons of learning whether they carry gene mutations for Alzheimer's disease. It also includes real-world cases of when students should be required to receive vaccines, who should get scarce organs for transplant, what constitutes informed consent for research-trial participants, and the appropriateness of using animals in scientific studies.

The topics — linked to typical high school science lessons on cell biology and genetics — were selected to get students thinking about key concepts in bioethics: fairness, minimizing harms and maximizing benefits, and respect for humans and the natural world.

"It's more relevant to their lives than we may think, and our goal was to provide them with a more rigorous way to confront those issues," said Ezekiel Emanuel, head of the NIH Clinical Center's Department of Bioethics and a special adviser on health policy to President Obama's budget director.

He noted that teens are routinely confronted with whether the use of performance-enhancing drugs in sports amounts to cheating, and were at the center over how to distribute the initially limited supply of swine flu vaccine. Meanwhile, dilemmas such as the Terri Schiavo right-to-die controversy flood news coverage, and bioethics serves as a plot device on TV shows such as *Grey's Anatomy* and *House*.

While teachers appreciate the ability of bioethics to make science relevant for students who may not otherwise enjoy it, proponents cite the need for the lessons as civics courses have been eliminated in many schools. With time a concern, bioethics concepts are typically integrated into biology courses as one- to three-day lessons and revisited throughout the year. Occasionally they are the subject of semester-long philosophy courses.

Teenagers, who are often vocal with their opinions but may be struggling to distinguish their values from those of their parents and peers, are a receptive audience. Bioethics requires students not only to identify their opinions, but to justify them with scientific evidence and logical arguments. And they're required to note alternative perspectives, explaining how they'd respond to opponents' objections.

High school is "a perfect time" to introduce bioethics, said Liz Crane, a biology teacher at Brookline High School in Massachusetts who helped write the NIH curriculum. "Teenagers are very drawn to issues of fairness or justice — they're constantly having conversations with their parents about whether a rule in the house is fair, what's equitable or not. The job of a high school is to cultivate curious learners and responsible citizens. At 18, they'll be voting; a college or university is too late to be embarking on these issues."

Science teachers haven't always been so comfortable managing what can become tense classroom debates – one of the reasons the NIH, Georgetown's Kennedy Institute of Ethics, the University of Pennsylvania, University of Utah, Roche Pharmaceuticals, the nonprofit Hastings Center and Northwest Association for Biomedical Research (NWABR), working with the University of Washington — came up with workshops and lesson plans.

These days, the NWABR's Jeanne Ting Chowning packs standing-room-only crowds of teachers into her bioethics training sessions at meetings of the National Science Teachers Association and National Association of Biology Teachers. In 2003, she offered one or two sessions with a dozen instructors; she's since doubled the number of sessions, and each attracts 50-70 teachers, she said. And though it's difficult to say exactly how many instructors are now teaching bioethics, Chowning has watched annual downloads of the group's curriculum double in the four years it's been online.

Debbie Beam has taught science for 21 years, but only included bioethics for the past five or six after getting trained through a New York State mentorship program and using high school-specific bioethics lessons developed by the University of Rochester. "I wasn't as comfortable – I didn't feel like I had enough knowledge to teach them about ethics," said Beam, who includes classes on organ allocation in her biology classes at Red Hook High School in upstate New York.

"Some kids would say, 'No one should be able to get a new organ, they abused it,' and the others would say, 'but they're going to die.' [Before I was trained] I might say, 'Well, that's your opinion.' When I talk about why we have medicine and its purpose, they stop and think a little bit."

Of course, moral dilemmas often dovetail with religious ones, posing a challenge both for parochial institutions wary of questioning their own doctrines and nonsectarian schools worried about theology creeping into the classroom. But while schools may opt out of topics that raise questions with strong religious perspectives (Catholic schools sometimes bypass abortion in favor of discussing the ethics of genetically modified foods, said Arthur Caplan, director of Penn's Center for Bioethics), teachers are encouraged to accept religious points of view as valid. Bioethics began with theologians, and religious arguments are part of the public discourse, acknowledged, for example, in state laws allowing religious exemptions for inoculations, Emanuel said.

But noticeably absent from the NIH curriculum (which took three years to develop under a $900,000 federal contract) is discussion of two of the most volatile bioethical dilemmas: abortion and embryonic stem-cell research.

Emanuel insisted their omission wasn't a political decision. "That's simply not true," he said. "Abortion doesn't naturally come out of their biology classes as a topic, and it's one where the arguments on either side are pretty well known. It's not really challenging or illuminating."

In the case of stem-cell research, "The country may be focused on it, but from a bioethical standpoint in terms of the common issues that arise, some of these things are just more – it seems to me – more important," Emanuel said. "Everything we dealt with was an important public-policy debate. These are tough, tough issues. None of the issues that we threw out were easy."

Others who advocate for bioethics in high school argue that kids have a better shot at learning principles of the discipline when the subjects aren't so charged. "There's no real use in starting with real emotional things and short-circuiting the debate," said Dominic Sisti, Penn's High School Bioethics Project manager.

But others dive in. The stem-cell lesson Brutsaert used was based on the NWABR curriculum. And in the semester-long bioethics elective he's offered at Germantown Academy outside Philadelphia for the past two years, Craig Merow has asked his students to consider physician-assisted suicide laws and discuss abortion.

"You can't do bioethics without looking at the most contentious issue in American politics," Merow said.

Still, the potential for resistance to any bioethics discussion – whether the topic is volatile or not — is real, and acknowledged in a sample letter to parents drafted by the NWABR that teachers can send home before launching a class. The letter is intended to diffuse worry that teaching bioethics is just a sneaky way of indoctrinating students. "That's a big concern, obviously," Chowning said.

"Sometimes people have a quick reaction to the word 'values' or 'ethics,' and why are we having these things in schools? Once they realize that teachers are not trying to teach particular values, but students to articulate their positions, their link to ethical theories and to respectfully understand the views of others, that helps."

While it's difficult to quantify the effect of the programs (students are not tested on bioethics on state proficiency exams), the NWABR said in a grant report that 70 to 90 percent of teachers who taught bioethics believed their students' critical thinking skills had improved and that they had become more open-minded as a result.

That was true for Joeylyn Yockey, 19, who took Merow's bioethics class in 2008. "It made me respect people I originally pigeonholed," she said.

http://www.miller-mccune.com/science-environment/fifth-period-life-and-death-decision-making-12790/

One Book's Take on Life, Death and Devotion
By KAREN ROSENBERG

THE medieval book of hours was a novel, chapel and art gallery rolled into one. In the most luxurious examples, painstakingly illustrated folios transformed reading and prayer into intensely visual and sensual experiences.

Aristocrats and others wealthy enough to commission lavish books of hours from the top artisans couldn't own enough of them. Jean de France (1340-1416) — the Duke of Berry and third son of King John II the Good — was among these ardent bibliophiles. One of the duke's most vivid and sumptuously made books is a 15th-century work called the Belles Heures, created by Herman, Paul and Jean de Limbourg, three teenage brothers he retained as artisans. It has been in the collection of the Cloisters in New York since 1954.

Usually the book sits open there, allowing just a portion of the manuscript to be viewed by the public. Now, all 172 illuminations within the Belles Heures have been temporarily unbound and are on view at Metropolitan Museum of Art as part of "The Art of Illumination: The Limbourg Brothers and the Belles Heures of Jean de France, Duc de Berry." A condensed version of the show went on view at the Getty last winter, but this is the first time the public has been able to see all the illustrated pages at once.

In its dissected form, the Belles Heures is an immersive look at life, death and devotion in 15th-century France. Its seven picture-book insertions distinguish it from other books of hours and amount to a remarkable cache of well-preserved medieval painting. They look back to Giotto's 13th-century frescoes and ahead to the Northern Renaissance. The three folios below, from different cycles, show how the Limbourgs adapted scenes from the Bible, and paintings by other artists to produce an astonishingly precocious work of art.

Catherine Is Beheaded (above, left)

The Belles Heures is unusual among books of hours in that a cycle on the life of St. Catherine precedes the Hours of the Virgin. The duke was drawn to Catherine's erudition, and the Limbourgs took care to portray her as a scholar; the image that opens the cycle shows Catherine in her book-filled study.

The artists, however, seem to have been captivated by the grisly elements of Catherine's story. They depicted her torture at the hands of the emperor Maxentius and chose to illustrate not only Catherine's beheading but those of the empress Faustina and the emperor's guardsman Porphyrius. Oddly, the Limbourgs did not feature the saint's vision of the Virgin or her mystical marriage to Christ.

This painting of Catherine, at the moment just before her beheading, is one of the most compelling images in the Belles Heures. Out of context, it could be a frame from a contemporary graphic novel. A series of diagonals draws the eye right to Catherine's exposed neck as the executioner readies his sword. The torqued, mountainous form in the background adds to the tension.

Here, too, the Limbourgs use color with intensity and precision. The landscape is an exquisitely variegated green, and the blue of Catherine's robe owes its brilliance to an expensive pigment imported from Afghanistan.

The Annunciation (above, center)

As the brothers worked on the book, their compositions became increasingly sophisticated and their figures more expressive.

This Annunciation from a cycle on the Hours of the Virgin, one of the standard features of books of hours, is among the Limbourgs' earlier productions. A double arcade separates Gabriel and the Virgin, who aren't making eye contact. The Limbourgs use this architectural motif in seven other paintings from the Belles Heures, but in subsequent versions they establish greater continuity between the two halves of the picture and make the space behind the column recede more sharply.

Many paintings from this cycle are reminiscent of frescoes by Giotto. The figures stand on shallow platforms and appear strangely compartmentalized. The greenish- gray palette also recalls 13th-century Italian painting, which the Limbourgs most likely experienced through the duke's collection and in copies by French artists who had traveled to Italy.

The border, meanwhile, is anything but austere. Prophets and angels float in clusters of acanthus leaves, tended by mischievous putti. The Limbourgs also worked in the duke's coat of arms and his emblem, the bear.

Entombment (above, right)

The Belles Heures includes a generously illustrated Hours of the Passion, something that doesn't normally appear in a book of hours. This cycle features some of the busiest and most colorful compositions from the Limbourgs, as well as finely registered emotions.

In this scene the Limbourgs convey a wide range of responses to death. The men bear the physical burden; Joseph of Arimathea and two others lower Christ's body into a sarcophagus. In a subtle and affecting gesture, the haloed Virgin cradles Christ's hand in her palm. The woman behind her mourns more demonstrably, straining her neck and pulling at her blond hair; she appears to have been modeled on a figure in a painting of the entombment by the Italian Simone Martini.

Linking these disparate reactions is the blocky, incontrovertible form of the sarcophagus. The Limbourgs used lavender to distinguish this element of the composition and to accentuate Christ's death pallor.

http://www.nytimes.com/2010/04/04/arts/design/04close.html?ref=design

Obesity in Infants Can Be Diagnosed at 6 Months, Study Shows

ScienceDaily (Apr. 7, 2010) — Obesity can be detected in infants as young as 6 months, according to a new study by researchers at the University of Texas Medical Branch at Galveston.By analyzing the electronic medical records of babies seen for routine "well-child" visits to the UTMB pediatric clinic, the investigators found that about 16 percent of 6-month-olds fit the study's criterion for obesity -- a weight-for-length ratio that put them in the top 5 percent of all babies in their age group. (Weight for length was used instead of the conventional body mass index because BMI is based on weight and height as measured while standing, which neither 6-month-olds nor 24-month-olds can do well enough to measure.) Further analysis of the records indicated that obese 2-year-olds were much more likely to have been obese at 6 months than 2-year-olds who were not obese.The obese babies' medical records rarely showed that clinicians had addressed the issue at either 6-month or 24-month visits, despite a well-established connection between obesity at a young age and obesity later in life, which is linked to such serious health problems as diabetes, heart disease and high blood pressure.

"Until very recently, pediatricians really haven't been focusing on obesity in babies," said Dr. David McCormick, UTMB clinical professor of pediatrics and senior author of the study, "Infant Obesity: Are We Ready to Make this Diagnosis?" which is now online in the *Journal of Pediatrics*. "We're just getting a handle on it descriptively right now. What we're hoping to do is alert our colleagues and our parents. If we address weight management through nutrition and exercise as early in life as possible, it's going to work a lot better."According to McCormick, pediatricians confronting infant obesity can recommend a number of measures that other research has shown are linked to healthy weight, measures that should be particularly effective because babies' mothers have much more control over their diets than mothers of older children do."Studies have shown that exclusive breastfeeding -- breastfeeding alone, not breastfeeding combined with bottle-feeding -- prevents obesity," McCormick said. "Getting enough fiber -- eating apples instead of drinking apple juice, for example -- also helps keep babies on track to a healthy weight. By contrast, improper early introduction of cereal by adding it to an infant's bottle promotes obesity."McCormick observed that maternal data collected in his group's investigation matched well with other studies of children and adolescents that showed higher odds of obesity among boys and girls whose mothers were already obese before becoming pregnant or who gained an excessive amount of weight during pregnancy. Such results, he said, added even more urgency to the need to deal with childhood weight issues effectively and address what could be a multigenerational cycle of obesity."We need to do a lot better as clinicians and educators at getting our community educated and working through the entire age spectrum, because babies who are overweight are more likely to be overweight children and adolescents, and then later, when obese women are ready to have a family, their babies are more likely to become obese," McCormick said. "We need to deal with this through all ages and through pregnancy, because if a woman is already overweight when she becomes pregnant, it's extremely difficult for her to do anything about her weight at that point."Other authors of this study included UTMB assistant professors Dr. Kwabena Sarpong and Dr. Sunil Jain, medical student Lindsay Jordan, and assistant director of research support services Laura Ray. The National Institutes of Health and the U.S. Public Health Service helped support this research through grants to the UTMB General Clinical Research Center.

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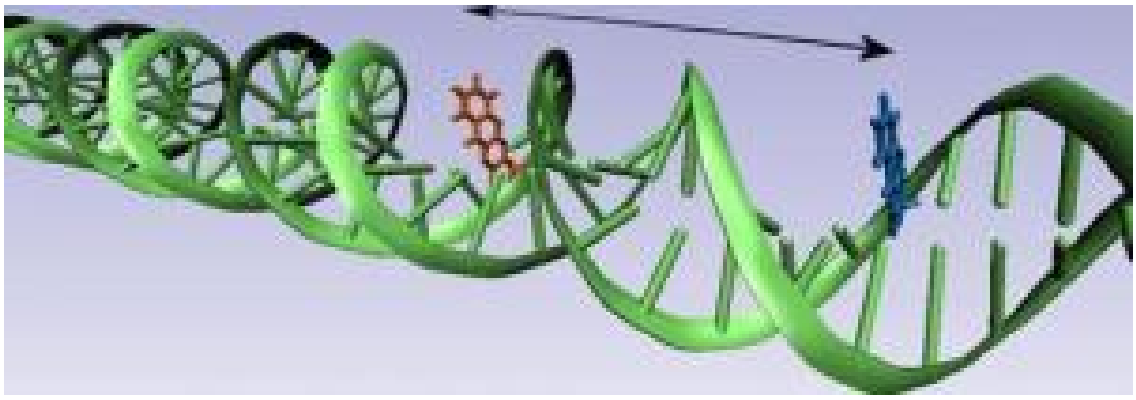
Journal Reference:

1. David P. McCormick, Kwabena Sarpong, Lindsay Jordan, Laura A. Ray, Sunil Jain. **Infant Obesity: Are We Ready to Make this Diagnosis?** *The Journal of Pediatrics*, 2010; DOI: 10.1016/j.jpeds.2010.01.028

http://www.sciencedaily.com/releases/2010/04/100406093632.htm

New Tool Developed for DNA Research



In brief FRET measurements are performed by forcing two luminescent markers to transfer light-energy from one to the other, and then measuring the efficiency of the transfer. The two different markers are placed in the DNA-helix. When they are subjected to a lightpulse one marker (tCO) emits part of the energy to the other (tCnitro). This energy transfer can be measured. And by calculating backwards it is possible obtain very exact information about the distance and angle that the two have relative to one another. (Credit: Image courtesy of University of Copenhagen)

ScienceDaily (Apr. 7, 2010) — Luminescent markers are an indispensable tool for researchers working with DNA. But the markers are troublesome. Some tend to destroy the function and structure of DNA when inserted. Others emit so little light, that they can barely be detected in the hereditary material. So researchers have been asking for alternative markers. Now a PhD student at Department of Chemistry at the University of Copenhagen has developed a tool in collaboration with researchers at Chalmers Technical University, which could solve both problems: A tool that you might call a molecular gauge.

PhD student Soren Preus has investigated the properties of the two luminescent so called DNA base analogues tCO and tCnitro trying to determine whether they could measure the structure of DNA without disrupting it. His scrutiny has shown that the function of DNA is unimpeded by the insertion of the molecular gauge. And even better: One base analogue is very efficient at emitting light, and the other very good at receiving it. And because you can provoke transport of light-energy between the two luminescent markers they are usable for a measuring technique known as FRET or Fluorescence Resonance Energy Transfer.

Measuring angles with light

In brief FRET measurements are performed by forcing two luminescent markers to transfer light-energy from one to the other, and then measuring the efficiency of the transfer. The two different markers are placed in the DNA-helix. When they are subjected to a lightpulse one marker (tCO) emits part of the energy to the other (tCnitro). This energy transfer can be measured. And by calculating backwards it is possible obtain very exact information about the distance and angle that the two have relative to one another.

Secrets from the center

Knowing distance and angle of the markers allows for calculations of distance and angle of all the natural base pairs in the DNA structure. And with that the researcher can put together a picture showing every twist and turn of the structure. Because structure and function are closely related in DNA, the method holds the potential to reveal new insights into the workings of DNA.

Putting the markers on the gauge

FRET-measurements are not a new phenomenon. What's new is, that Soren Preus has developed one of the base analogues tCnitro in collaboration with Swedish research institution Chalmers University of Technology. But even more important is the fact, that Mr Preus has used the facilities of the Molecular Engineering Group at University of Copenhagen to analyse every aspect of the energy-transfer between the two markers, because this allows future DNA-researchers to translate measurements to structure.

Fundamental as well as applied

Mr. Preus hopes that the new tool might find its use in characterising the structural changes that take place when a protein binds to DNA or RNA as that could explain basic cellular mechanisms. But equally important: The molecular gauge can be used to examine exactly how new drugs work, when they bind to DNA or RNA.

The results have been published in *Journal of Physical Chemistry*. B 2010, 114, 1050-1056 and *Journal of the American Chemical Society*, 2009, 131, 4288

Story Source:

Adapted from materials provided by University of Copenhagen. Original article written by Jes Andersen.

Journal Reference:

1. Bo%u0308rjesson et al. **Nucleic Acid Base Analog FRET-Pair Facilitating Detailed Structural Measurements in Nucleic Acid Containing Systems**. *Journal of the American Chemical Society*, 2009; 131 (12): 4288 DOI: 10.1021/ja806944w

http://www.sciencedaily.com/releases/2010/04/100406093526.htm

Scientific Risk-Taking by Young Students Fades With Age, Research Suggests

Ronald Beghetto, professor of education studies at the University of Oregon, finds that the willingness to take risks with their scientific ideas fades with with age. (Credit: Photo by Jim Barlow)

ScienceDaily (Apr. 7, 2010) — A truth in science is that a theory may fail or succeed initially and be shot down later. Now put yourself in the shoes of elementary school students faced with stating an idea and then facing potential criticism, even ridicule, of others.

A study on student willingness to take risks in the name of early scientific exploration -- done by the University of Oregon educator Ronald A. Beghetto -- is one of 10 research articles appearing on the suggested summer reading list of the National Association for Research in Science Teaching.

The study, published in the February 2009 issue of the *Journal of Research in Science Teaching*, looked at intellectual risk-taking of 585 students in the third- through sixth-grades in seven Oregon elementary schools. Fifty-one percent were girls. Ethnically, 76 percent (442) were white, 9 percent (55) were Native American, 7 percent (40) were Hispanic, 2 percent (14) were Asian/Pacific Islander and .5 percent (3) were black. The remaining 5 percent (31) were in the "other" category.

The students in Beghetto's study were drawn from a large group of elementary-aged schoolchildren who were receiving marine science instruction from teachers working with UO graduate students in the National Science Foundation-funded Graduate Teaching Fellows in K-12 Education Program, led by biologists Alan Shanks and Jan Hodder, at the UO's Institute of Marine Biology in Charleston, Ore.

Beghetto, a professor of education studies, found that, in general, as students get older they become less likely to take intellectual risks, such as sharing their tentative ideas, when learning science. Importantly, however, students who were interested in science had confidence in their own ideas, and felt that their teachers supported them -- by listening to their ideas and providing encouraging feedback. These children were significantly more willing to take intellectual risks when learning science.

In fact, he said, the findings indicate that science interest, confidence in their own ideas and perceived teacher support were more important than even science ability in predicting students' reports of intellectual risk taking.

The study drew upon self-reporting of participating students and teachers' ratings of the students' science abilities. While relying on student self-reports was noted as a limiting factor because some students' reports may be biased through false reporting, Beghetto says he believes the potential importance of these findings warrants serious attention by teachers.

"Science teachers in elementary schools have a great opportunity and a responsibility to encourage their students' interest in science and their willingness to take risks in pursuing scientific inquiry," said Beghetto, who currently serves as an associate editor for the International *Journal of Creativity & Problem Solving*. "Their front-line efforts to spark and sustain curiosity likely will pay off in the form of increasing students' willingness to engage in intellectual risk-taking."

The findings, he added, provide a roadmap for more comprehensive future studies aimed at understanding and finding ways to encourage elementary students' intellectual risk-taking when learning about science.

Story Source:

Adapted from materials provided by University of Oregon.

Journal Reference:

1. Ronald A. Beghetto. **Correlates of intellectual risk taking in elementary school science**. *Journal of Research in Science Teaching*, 2009; 46 (2): 210 DOI: 10.1002/tea.20270

http://www.sciencedaily.com/releases/2010/04/100406093514.htm

Northwest Lava Flows Could Have Altered Earth's Climate, Wiped out Species, New Evidence Suggests

Evidence of Columbia Basin lava flows can be seen throughout the Northwest. These columns of columnar basalt are on State Route 26 outside Washtucna, Wash. (Credit: WSU photo by Robert Hubner)

ScienceDaily (Apr. 7, 2010) — New research suggests the volcanic birth of the Northwest's Columbia Plateau happened much more quickly than previously thought and with an intensity that may have changed the earth's climate and caused some plants and animals to go extinct.

"What you're looking at are lava flows that repeat fairly quickly," said Steve Reidel, research professor of geology at Washington State University Tri-Cities. "Not decades or centuries, but months or years."

Reidel is a co-author of a paper in the recent issue of the journal *Lithos* refining the time frame of the Grande Ronde lava flows, which produced enough molten basalt to sink the earth's crust and created the vast Columbia River Plateau of Washington, Oregon and Idaho.

Just one of the 100 or so lava flows would have blanketed much of Washington State in 10,000 cubic kilometers of lava -- 10,000 times the volume of ash produced by the 1980 eruption of Mount St. Helens.

The flows moved at walking speed, enough time for the horses and other animals of the region to get out of their path. But a single flow could reach as far as Portland, be more than 2,000 degrees Fahrebheit and take half a century to cool. In the process, it would have generated monsoons across the Northwest and emitted enough heat and sulfur to alter the earth's climate, said Reidel.

Substantial evidence has implicated other lava flows in the extinction of species. Siberian flows coincided with the epic Permian-Triassic "mass dying" that wiped out 96 percent of the earth's marine species 250 million years ago. A mass extinction at the end of the Triassic Period 200 million years ago coincided with lava coming out of the Central Atlantic Magmatic Province between what is now northeastern South America and eastern North America. Gases from flows on India's Deccan plateau started a mass extinction some 65 million years ago, with the dinosaur-killing coup de grâce coming from a meteoroid that hit Mexico's Yucatán Peninsula.

To date the Grande Ronde flows, lead author Tiffany Barry of Britain's Open University obtained basalt samples from Hanford, Wash., and outcrops between Vantage, Wash., and Lewiston, Idaho. With some of the most precise equipment in the world, she compared argon isotopes in the oldest, deepest levels and younger, shallower levels and used the element's decay rate to determine the rocks' relative ages.

Barry, Reidel, WSU Professor Emeritus Peter Hooper and other colleagues estimated the Grande Ronde flows took place between 15.6 and 16 million years ago, give or take 150,000 to 200,000 years. The youngest and oldest rock samples were only 420,000 years apart at the most. With a margin of error of 180,000 years, the rock may have been created over an even faster time frame of 240,000 years.

With less accurate equipment, Reidel and others previously estimated the flows occurred over a period of 1.5 to 2 million years. And because the Grande Ronde had so many flows, with some much larger than others, they likely had a far greater impact on the climate of their era than previously thought.

Some flows, wrote the researchers, "may have, at times, been simultaneous and, if confirmed, would have significant implications for potential environmental effects."

"It's an interesting piece of work and definitely a contribution," said John Wolff, a WSU professor in the School of Earth and Environmental Sciences, who was not involved in the paper. Both Wolff and the paper's authors note that the argon dating conflicts with dates established by looking at how changes in the earth's magnetic field affected the rock.

If the argon dating holds up, Wolff said, it will coincide with changes in the life forms and chemistry in the Atlantic Ocean. Just last summer, British researchers writing in the journal "Geology" described evidence of such changes off the west coast of Africa and singled out the Grande Ronde basalt flows as a possible cause.

Story Source:

Adapted from materials provided by Washington State University.

Journal Reference:

1. T.L. Barry, S. Self, S.P. Kelley, S. Reidel, P. Hooper, M. Widdowson. **New 40Ar/39Ar dating of the Grande Ronde lavas, Columbia River Basalts, USA: Implications for duration of flood basalt eruption episodes**. *Lithos*, 2010; DOI: 10.1016/j.lithos.2010.03.014

http://www.sciencedaily.com/releases/2010/04/100406142602.htm

Savvy Injection Molding

IFAM researchers inspecting components produced using metal injection molding. (Credit: Copyright Fraunhofer IFAM)

ScienceDaily (Apr. 7, 2010) — With the help of neural networks, in which complex algorithms are used to monitor critical process steps, engineers are paving the way for zero-defect production in the area of metal powder injection molding. The gain for manufacturers is less waste combined with time savings.

The metal components used in the hinges of spectacle frames, surgical instruments or artificial heart valves are often very small. For some years now, manufacturers of components with complex geometries of this type have relied on a special production process: metal injection molding. Things can occasionally go awry during production, and then it is often impossible to detect defects until after sintering, the final step in the process chain, by which time it is too late to correct the defect.

Now, researchers at the Fraunhofer Institute for Manufacturing and Advanced Materials IFAM are working towards achieving zero-defect production. Their idea is that, at any time during the molding process, the system should be able to monitor all parameters -- such as weight, pressure and temperature -- and to deliver a verdict on the quality of the component.

"In this way, errors, dimensional inaccuracies and defects such as cracks, warps or cavities can be detected on line," explains IFAM project manager Dr. Thomas Hartwig. "This will allow the manufacturer to respond immediately by changing the relevant settings."

In the long run the system can, if required, even be programmed to alter the parameters fully automatically. The necessary technical support is provided by a neural network developed for metal injection molding (MIM) in a joint effort by the IFAM engineers and algorithmica technologies, a private company. "The neural network is based on highly complex algorithms," says Hartwig. "Its advantage over existing solutions is that it is self-learning."

After a mandatory initial training phase it can interpret all the measured data in the system, detecting correlations between them that would be impossible to find without the network. All information of relevance to the manufacturer can be given by the process control system, for instance the final weight of the component if the pressure or temperature is changed at a given step in the process.

"Our goal with neural networks is to reduce reject rates by at least 50 percent," says Hartwig. "This represents a huge cost saving for manufacturers because the raw materials are so expensive. Until now, companies often had to reject large numbers of components in the first few days before quality requirements could be met again."

Another advantage of neural networks is that they could eventually make quality checks superfluous and could also be deployed in other types of series production such as die-casting in the light-metal industry. Having successfully produced a test component with the aid of neural networks, the researchers are now looking for industrial partners.

Story Source:

Adapted from materials provided by Fraunhofer-Gesellschaft.

http://www.sciencedaily.com/releases/2010/04/100406093522.htm

Geologist Connects Regular Changes of Earth's Orbital Cycle to Changes in Climate

New ocean sediment core research reveals a pattern that connects the regular changes of Earth's orbital cycle to changes in the Earth's climate. (Credit: iStockphoto/Duncan Walker)

ScienceDaily (Apr. 6, 2010) — In an analysis of the past 1.2 million years, UC Santa Barbara geologist Lorraine Lisiecki discovered a pattern that connects the regular changes of Earth's orbital cycle to changes in Earth's climate.

The finding is reported in the scientific journal *Nature Geoscience*.

Lisiecki performed her analysis of climate by examining ocean sediment cores. These cores come from 57 locations around the world. By analyzing sediments, scientists are able to chart Earth's climate for millions of years in the past. Lisiecki's contribution is the linking of the climate record to the history of Earth's orbit.

It is known that Earth's orbit around the sun changes shape every 100,000 years. The orbit becomes either more round or more elliptical at these intervals. The shape of the orbit is known as its "eccentricity." A related aspect is the 41,000-year cycle in the tilt of Earth's axis.

Glaciation of Earth also occurs every 100,000 years. Lisiecki found that the timing of changes in climate and eccentricity coincided. "The clear correlation between the timing of the change in orbit and the change in the Earth's climate is strong evidence of a link between the two," said Lisiecki. "It is unlikely that these events would not be related to one another."

Besides finding a link between change in the shape of the orbit and the onset of glaciation, Lisiecki found a surprising correlation. She discovered that the largest glacial cycles occurred during the weakest changes in the eccentricity of Earth's orbit -- and vice versa. She found that the stronger changes in Earth's orbit correlated to weaker changes in climate. "This may mean that the Earth's climate has internal instability in addition to sensitivity to changes in the orbit," said Lisiecki.

She concludes that the pattern of climate change over the past million years likely involves complicated interactions between different parts of the climate system, as well as three different orbital systems. The first two orbital systems are the orbit's eccentricity, and tilt. The third is "precession," or a change in the orientation of the rotation axis.

Story Source:

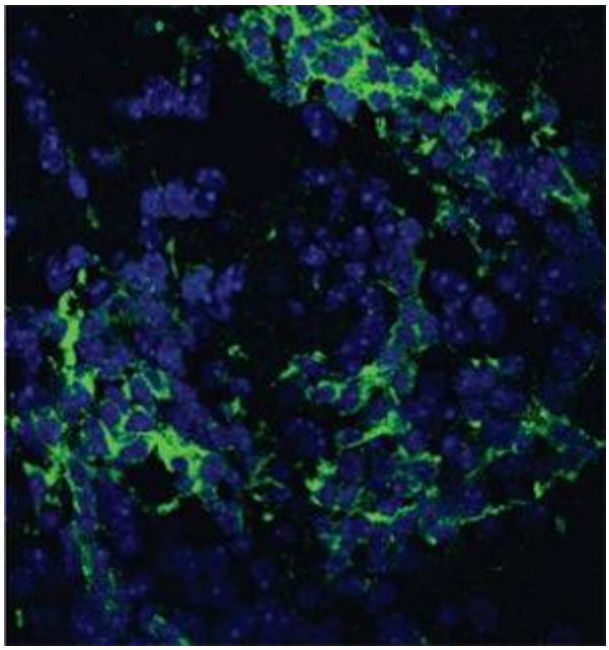
Adapted from materials provided by University of California - Santa Barbara.

Journal Reference:

1. Lorraine E. Lisiecki. **Links between eccentricity forcing and the 100,000-year glacial cycle**. *Nature Geoscience*, 2010; DOI: 10.1038/ngeo828

http://www.sciencedaily.com/releases/2010/04/100406133707.htm

Tissue Stem Cell Turning Into Tumor Stem Cell



Mice overexpressing Tlx develop glioma initiating lesions. (Credit: Haikun Liu, German Cancer Research Center)

ScienceDaily (Apr. 6, 2010) — The "cradle" of new neurons in the adult brain is well known. It is what is called the subventricular zone, a tissue structure lining the lateral ventricles. This is where neural or brain stem cells reside, which are responsible for generating new neurons if needed. For many years now, the subventricular zone has been suspected to be the origin of specific malignant brain tumors called gliomas, the most deadly type of which is glioblastoma.

Scientists from the divisions of Professor Dr. Günther Schütz and Professor Dr. Peter Lichter at the German Cancer Research Center (Deutsches Krebsforschungszentrum, DKFZ) have recently shown in mouse brains that brain stem cells in the subventricular zone are characterized by a specific molecule: Protein Tlx, a transcription factor, which stimulates the activity of various genes. In the adult animal, Tlx is expressed exclusively in brain stem cells. When the scientists switched off Tlx, there were no more detectable stem cells in the brain and the formation of new neurons ceased. Functioning of the stem cells thus appears to depend on the presence of this protein.

In their recent study, the teams headed by Günther Schütz and Peter Lichter, jointly with Professor Dr. Guido Reifenberger of Düsseldorf University, have now tested the opposite case: What happens if the production of Tlx is increased? Using a molecular-biological trick, the investigators induced an overproduction of Tlx by the brain stem cells of mice. As a result, cell division activity in the subventricular zone increased, the cells left their habitual environment called stem cell niche, and started forming glioblastoma-like tissue lesions. In another experiment in which the researchers additionally switched off the p53 protein as an important cancer brake, invasively growing glioblastomas arose from the cancer precursors.

Moreover, the scientists discovered that stem cells with increased Tlx production stimulate the formation of new vessels. This enables the cells to migrate into distant brain regions and, thus, to generate the typical coral-like growth of glioblastoma.

"We recognize brain stem cells specifically by their Tlx production. If we boost it, the tissue stem cell turns into a cancer stem cell from which malignant glioblastomas arise. Therefore, we are now able, for

the first time, to hold brain stem cells directly responsible for the formation of brain tumor stem cells," Günther Schütz explains.

The researchers expect to be able to develop new therapies to treat glioblastoma on the basis of these results from fundamental cell biology research. Tlx seems to play its fatal role not only in mouse brains. Studying tumor tissue from glioblastoma patients, Lichter and Reifenberger discovered that the Tlx gene is often present in multiple copies and, thus, more Tlx protein is produced. "Apparently, human brain tumor stem cells also depend on Tlx. Therefore, we can now try to develop therapies that are directed very specifically against Tlx producing cells," said Schütz describing the next steps. The mice whose brain stem cells overproduce Tlx are an ideal model system for such investigations.

Story Source:

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

Journal Reference:

1. Hai-Kun Liu, Ying Wang, Thorsten Belz, Dagmar Bock, Andrea Takacs, Bernhard Radlwimmer, Sebastian Barbus, Guido Reifenberger, Peter Lichter and Günther Schütz. **The nuclear receptor tailless induces long-term neural stem cell expansion and brain tumor initiation**. *Genes & Development*, 2010; 24 (7): 683 DOI: 10.1101/gad.560310

http://www.sciencedaily.com/releases/2010/04/100401100957.htm

Archaeologists Uncover Land Before Wheel; Site Untouched for 6,000 Years

Archaeologists have long surmised that the Ubaid people were among the first in the Middle East to experience division of social groups according to power and wealth. Now, the first excavation of Tell Zeidan in 6,000 years adds confidence to this theory. (Credit: Gil Stein, Oriental Institute, University of Chicago)

ScienceDaily (Apr. 6, 2010) — A team of archaeologists from the University of Chicago's Oriental Institute, along with a team of Syrian colleagues, is uncovering new clues about a prehistoric society that formed the foundation of urban life in the Middle East prior to invention of the wheel.

The mound of Tell Zeidan in the Euphrates River Valley near Raqqa, Syria, which had not been built upon or excavated for 6,000 years, is revealing a society rich in trade, copper metallurgy and pottery production. Artifacts recently found there are providing more support for the view that Tell Zeidan was among the first societies in the Middle East to develop social classes according to power and wealth.

Tell Zeidan dates from between 6000 and 4000 B.C., and immediately preceded the world's first urban civilizations in the ancient Middle East. It is one of the largest sites of the Ubaid culture in northern Mesopotamia.

Thus far, archaeologists have unearthed evidence of this society's trade in obsidian and production and development of copper processing, as well as the existence of a social elite that used stone seals to mark ownership of goods and culturally significant items.

"The project addresses questions not only of how such societies emerged but how they were sustained and flourished," said John Yellen, program director for archaeology in the National Science Foundation's (NSF) Social, Behavioral & Economic Sciences directorate. NSF supports the University of Chicago's research.

Covering about 31 acres, Tell Zeidan was situated where the Balikh River joins the Euphrates River in modern-day Syria. The location was at the crossroads of major, ancient trade routes in Mesopotamia that followed the course of the Euphrates River valley. The Ubaid period lasted from about 5300 to 4000 B.C.

"This enigmatic period saw the first development of widespread irrigation, agriculture, centralized temples, powerful political leaders and the first emergence of social inequality as communities became divided into wealthy elites and poorer commoners," said Gil Stein, director of the Oriental Institute and a leader of the expedition.

"The research also is important because it provides insight into how complex societies, based on linkages which extended across hundreds of miles, developed," said Yellen, noting the distance travelled for raw materials needed for many of the Tell Zeidan artifacts.

For example, copper ore was carried by workers from sources near modern-day Diyarbakir, Turkey, about 185 to 250 miles away, then smelted at Tell Zeidan to produce metal tools and other implements.

One of the most remarkable finds was a stone stamp seal depicting a deer, Stein said. The seal was about two inches by two-and-a-half inches and was carved from a red stone not native to the area. A similar seal design was found 185 miles to the east near Mosul in northern Iraq.

"The existence of very elaborate seals with near-identical motifs at such widely distant sites suggests that in this period, high-ranking elites were assuming leadership positions across a very broad region, and those dispersed elites shared a common set of symbols and perhaps even a common ideology of superior social status," said Stein.

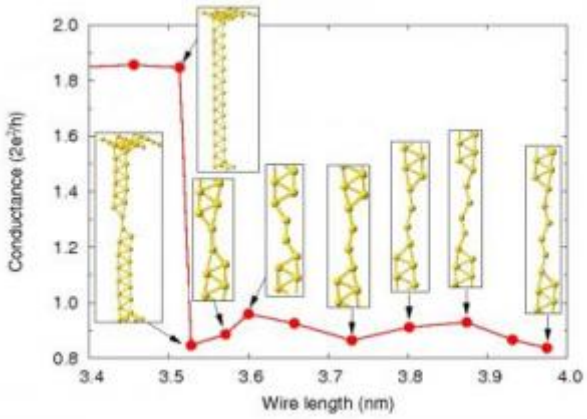
Stein said the location's potential for further discoveries is so great the project is likely to last for decades.

Story Source:

Adapted from materials provided by National Science Foundation.

http://www.sciencedaily.com/releases/2010/04/100406133712.htm

Researchers Holding Steady in an Atomic-Scale Tug-of-War



A quantum mechanics-based simulation demonstrates how a new NIST instrument can delicately pull a chain of atoms apart. The chart records quantum jumps in conductivity as a gold contact is stretched 0.6 nanometer. The junction transitions from a 2-dimensional structure to a one-dimensional single-atom chain, with a corresponding drop in conductivity. Following the last point, at a wire length of 3.97 nm, the chain broke. (Credit: Tavazza, NIST)

ScienceDaily (Apr. 6, 2010) — How hard do you have to pull on a single atom of -- let's say -- gold to detach it from the end of a chain of like atoms?* It's a measure of the astonishing progress in nanotechnology that questions that once would have interested only physicists or chemists are now being asked by engineers. To help with the answers, a research team at the National Institute of Standards and Technology (NIST) has built an ultra-stable instrument for tugging on chains of atoms, an instrument that can maneuver and hold the position of an atomic probe to within 5 picometers, or 0.000 000 000 5 centimeters.

The basic experiment uses a NIST-designed instrument inspired by the scanning tunneling microscope (STM). The NIST instrument uses as a probe a fine, pure gold wire drawn out to a sharp tip. The probe is touched to a flat gold surface, causing the tip and surface atoms to bond, and gradually pulled away until a single-atom chain is formed and then breaks. The trick is to do this with such exquisite positional control that you can tell when the last two atoms are about to separate, and hold everything steady; you can at that point measure the stiffness and electrical conductance of the single-atom chain, before breaking it to measure its strength.

The NIST team used a combination of clever design and obsessive attention to sources of error to achieve results that otherwise would require heroic efforts at vibration isolation, according to engineer Jon Pratt. A fiber-optic system mounted just next to the probe uses the same gold surface touched by the probe as one mirror in a classic optical interferometer capable of detecting changes in movement far smaller than the wavelength of light. The signal from the interferometer is used to control the gap between surface and probe. Simultaneously, a tiny electric current flowing between the surface and probe is measured to determine when the junction has narrowed to the last two atoms in contact. Because there are so few atoms involved, electronics can register, with single-atom sensitivity, the distinct jumps in conductivity as the junction between probe and surface narrows.

The new instrument can be paired with a parallel research effort at NIST to create an accurate atomic-scale force sensor -- for example, a microscopic diving-board-like cantilever whose stiffness has been calibrated on NIST's Electrostatic Force Balance. Physicist Douglas Smith says the combination should make possible the direct measurement of force between two gold atoms in a way traceable to national measurement standards. And because any two gold atoms are essentially identical, that would give other researchers a direct method of calibrating their equipment. "We're after something that people that do this kind of measurement could use as a benchmark to calibrate their instruments without having to go to all the trouble we do, " Smith says. "What if the experiment you're performing calibrates itself because the

measurement you're making has intrinsic values? You can make an electrical measurement that's fairly easy and by observing conductance you can tell when you've gotten to this single-atom chain. Then you can make your mechanical measurements knowing what those forces should be and recalibrate your instrument accordingly."

In addition to its application to nanoscale mechanics, say the NIST team, their system's long-term stability at the picometer scale has promise for studying the movement of electrons in one-dimensional systems and single-molecule spectroscopy.

** The answer, calculated from atomic models, should be something under 2 nanonewtons, or less than 0.000 000 007 ounces of force.*

Story Source:

Adapted from materials provided by National Institute of Standards and Technology (NIST).

Journal Reference:

1. D.T. Smith, J.R. Pratt, F. Tavazza, L.E. Levine and A.M. Chaka. **An ultra-stable platform for the study of single-atom chains**. *J. Appl. Phys.*, March 2010 (in press)

http://www.sciencedaily.com/releases/2010/04/100401130246.htm

Rapid Response Team Investigates Coral Disease Outbreak in Kaneohe Bay, O'ahu

This photo shows a trail of dead and dying corals as the disease spreads across the reefs. (Credit: Image courtesy of University of Hawaii at Manoa)

ScienceDaily (Apr. 6, 2010) — An outbreak of a disease called Montipora White Syndrome (MWS) was found in Kaneohe Bay, O□ahu within the last month prompting an interagency response team composed of scientists and students to document the extent, spread and potential causes of the disease. Members of the investigative team included scientists from the University of Hawai□i at Mānoa's Hawai□i Institute of Marine Biology (HIMB), USGS National Wildlife Health Center and Bishop Museum.

Corals are the very foundation of our coral reef ecosystem and are under threat from overfishing, land-based pollution and emerging coral diseases. Coral diseases have devastated the reefs of the Florida Keys, and MWS affects a prominent coral species (red rice coral or Montipora capitata) on Hawai□i reefs and rapidly kills colonies in weeks. The disease was originally discovered by Bob Tangaro, a boat driver at HIMB, who notified coral disease researcher Dr. Greta Aeby of his grisly discovery. Mr. Tangaro is a member of the Eyes of the Reef Reporting Network, a program that trains community members to identify threats to Hawai□i's reef including coral disease.

The investigative team discovered that over a 100 colonies of red rice coral have been killed by MWS. Clusters of diseased corals were found on reefs throughout Kaneohe Bay but the disease appears most prominent is South Kaneohe Bay. The cause of the disease is unclear, and laboratory studies are underway at HIMB and USGS to determine this. Coral diseases in Hawai□i have been studied by HIMB and USGS since 2001, and these research groups have documented 17 different diseases that occur at fairly low levels; however, this recent outbreak appears particularly severe.

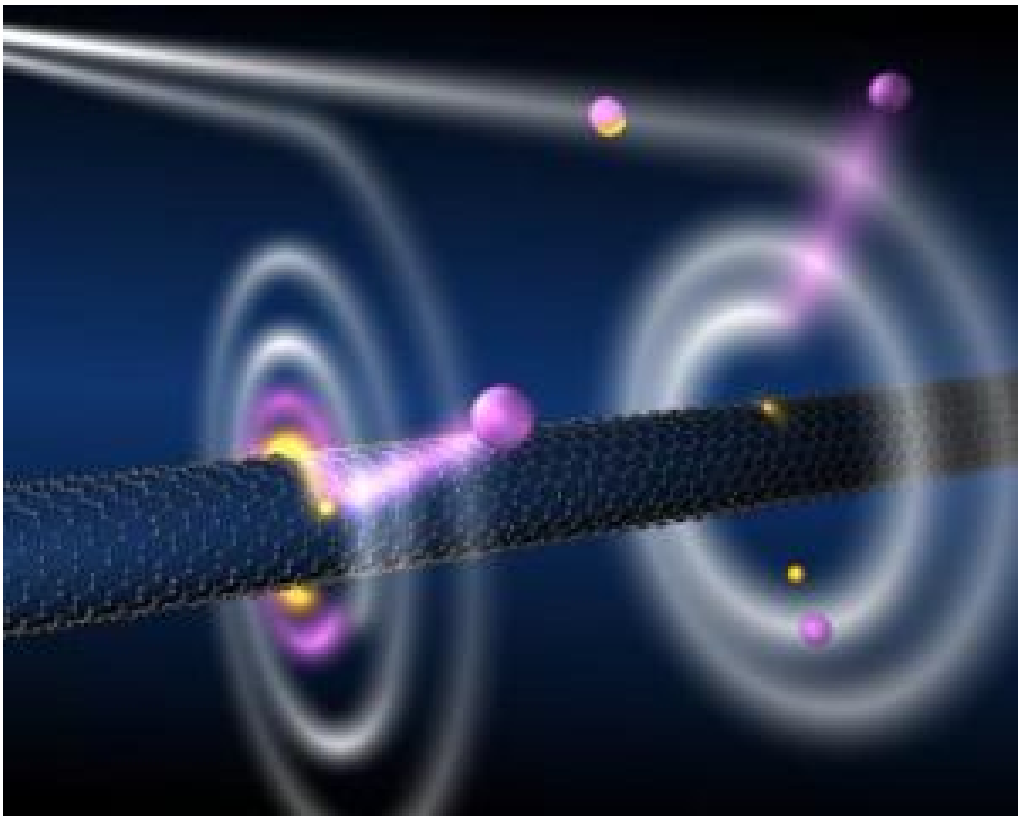
In 2003, Dr. Aeby discovered an outbreak of Acropora White Syndrome causing rapid tissue loss in table corals (Acropora cytherea) from French Frigate Shoals in the Papahānaumokuākea Marine National Monument; this disease killed numerous large corals. In January 2010 DAR biologists on Maui investigated an outbreak of chronic Montipora White Syndrome at Ahihi Kinau. These events illustrates that, like in the Caribbean, coral reefs in the Pacific are susceptible to disease outbreaks. Given that these reef resources play an important role in the culture and economy of Hawai□i, understanding these outbreaks and their causes can help us prevent or at least mitigate the impact of future events.

Story Source:

Adapted from materials provided by University of Hawaii at Manoa.

http://www.sciencedaily.com/releases/2010/04/100402110141.htm

Cold Atoms and Nanotubes Come Together in an Atomic 'Black Hole'



Launched laser-cooled atoms are captured by a single, suspended, single-wall carbon nanotube charged to hundreds of volts. A captured atom spirals towards the nanotube (white path) and reaches the environs of the tube surface, where its valence electron (yellow) tunnels into the tube. The resulting ion (purple) is ejected and detected, and the dynamics at the nanoscale are sensitively probed. (Credit: Anne Goodsell and Tommi Hakala/Harvard University)

ScienceDaily (Apr. 6, 2010) — Carbon nanotubes, long touted for applications in materials and electronics, may also be the stuff of atomic-scale black holes.

Physicists at Harvard University have found that a high-voltage nanotube can cause cold atoms to spiral inward under dramatic acceleration before disintegrating violently. Their experiments, the first to demonstrate something akin to a black hole at atomic scale, are described in the current issue of the journal *Physical Review Letters*.

"On a scale of nanometers, we create an inexorable and destructive pull similar to what black holes exert on matter at cosmic scales," says Lene Vestergaard Hau, Mallinckrodt Professor of Physics and of Applied Physics at Harvard. "As importantly for scientists, this is the first merging of cold-atom and nanoscale science, and it opens the door to a new generation of cold atom experiments and nanoscale devices."

Hau and co-authors Anne Goodsell, Trygve Ristroph, and Jene A. Golovchenko laser-cooled clouds of one million rubidium atoms to just a fraction of a degree above absolute zero. The physicists then launched this millimeter-long atomic cloud towards a suspended carbon nanotube, located some two centimeters away and charged to hundreds of volts.

The vast majority of the atoms passed right by the wire, but those that came within a micron of it -- roughly 10 atoms in every million-atom cloud -- were inescapably attracted, reaching high speeds as they spiraled toward the nanotube.

"From a start at about 5 meters per second, the cold atoms reach speeds of roughly 1,200 meters per second, or more than 2,700 miles per hour, as they circle the nanotube," says Goodsell, a graduate student on the project and now a postdoctoral researcher in physics at Harvard. "As part of this tremendous acceleration, the temperature corresponding to the atoms' kinetic energy increases from 0.1 degrees Kelvin to thousands of degrees Kelvin in less than a microsecond."

At this point, the speeding atoms separate into an electron and an ion rotating in parallel around the nanowire, completing each orbit in just a few trillionths of a second. The electron eventually gets sucked into the nanotube via quantum tunneling, causing its companion ion to shoot away -- repelled by the strong charge of the 300-volt nanotube -- at a speed of roughly 26 kilometers per second, or 59,000 miles per hour.

The entire experiment was conducted with great precision, allowing the scientists unprecedented access to both cold-atom and nanoscale processes.

"Cold-atom and nanoscale science have each provided exciting new systems for study and applications," says Golovchenko, Rumford Professor of Physics and Gordon McKay Professor of Applied Physics at Harvard. "This is the first experimental realization of a combined cold atom-nanostructure system. Our system demonstrates sensitive probing of atom, electron, and ion dynamics at the nanoscale."

The single-walled carbon nanotube used in these researchers' successful experiment was dubbed "Lucy," and its contributions are acknowledged in the *Physical Review Letters* paper. The nanotube was grown by chemical vapor deposition across a 10-micron gap in a silicon chip that provides the nanowire with both mechanical support and electrical contact.

"From the atom's point of view, the nanotube is infinitely long and thin, creating a singular effect on the atom," Hau says.

This work was supported by the Air Force Office of Scientific Research and the National Science Foundation.

Story Source:

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

Journal Reference:

1. Goodsell et al. **Field Ionization of Cold Atoms near the Wall of a Single Carbon Nanotube**. *Physical Review Letters*, 2010; 104 (13): 133002 DOI: 10.1103/PhysRevLett.104.133002

http://www.sciencedaily.com/releases/2010/04/100406125716.htm

Mouth Breathing Can Cause Major Health Problems

ScienceDaily (Apr. 6, 2010) — For some, the phrase "spring is in the air" is quite literal. When the winter snow melts and flowers bloom, pollen and other materials can wreak havoc on those suffering from seasonal allergies, usually causing a habit called "mouth breathing." The physical, medical and social problems associated with mouth breathing are not recognized by most health care professionals, according to a study published in the January/February 2010 issue of *General Dentistry*, the peer-reviewed clinical journal of the Academy of General Dentistry (AGD).

Dentists typically request that their patients return every six months, which means that some people see their dentist more frequently than they see their physician. As a result, dentists may be the first to identify the symptoms of mouth breathing. And, because dentists understand the problems associated with mouth breathing, they can help prevent the adverse effects.

"Allergies can cause upper airway obstruction, or mouth breathing, in patients," said Yosh Jefferson, DMD, author of the study. "Almost every family has someone with mouth breathing problems."

Over time, children whose mouth breathing goes untreated may suffer from abnormal facial and dental development, such as long, narrow faces and mouths, gummy smiles, gingivitis and crooked teeth. The poor sleeping habits that result from mouth breathing can adversely affect growth and academic performance. As Dr. Jefferson notes in his article, "Many of these children are misdiagnosed with attention deficit disorder (ADD) and hyperactivity." In addition, mouth breathing can cause poor oxygen concentration in the bloodstream, which can cause high blood pressure, heart problems, sleep apnea and other medical issues.

"Children who mouth breathe typically do not sleep well, causing them to be tired during the day and possibly unable to concentrate on academics," Dr. Jefferson said. "If the child becomes frustrated in school, he or she may exhibit behavioral problems."

Treatment for mouth breathing is available and can be beneficial for children if the condition is caught early. A dentist can check for mouth breathing symptoms and swollen tonsils. If tonsils and/or adenoids are swollen, they can be surgically removed by an ear-nose-throat (ENT) specialist. If the face and mouth are narrow, dentists can use expansion appliances to help widen the sinuses and open nasal airway passages.

"After surgery and/or orthodontic intervention, many patients show improvement in behavior, energy level, academic performance, peer acceptance and growth," says Leslie Grant, DDS, spokesperson for the AGD. "Seeking treatment for mouth breathing can significantly improve quality of life."

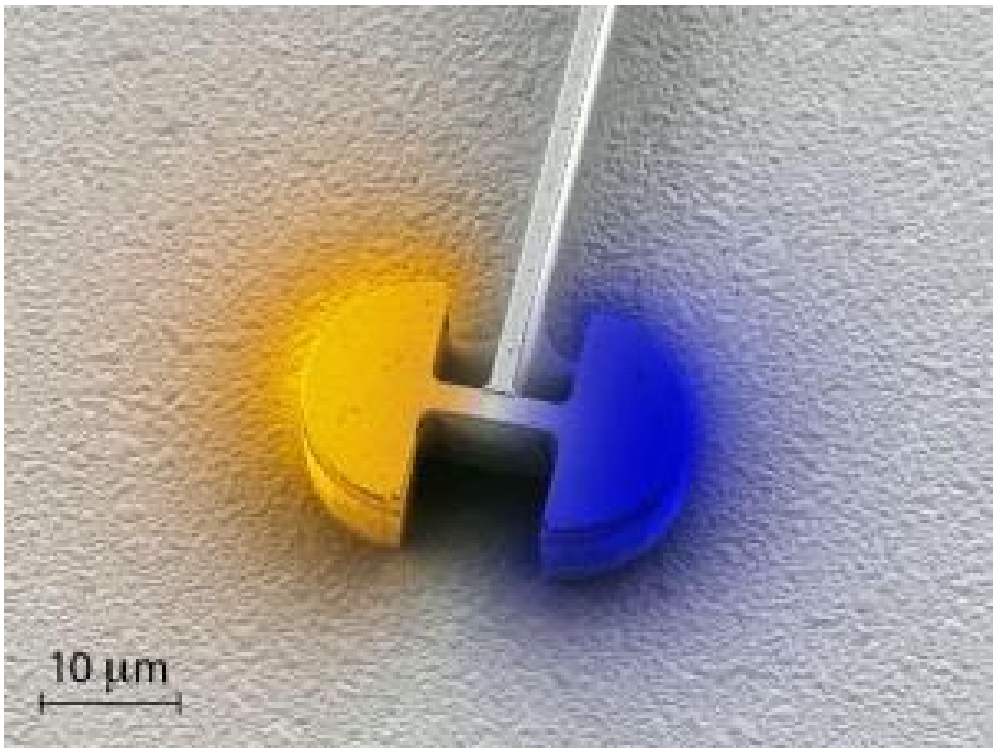
At this time, many health care professionals are not aware of the health problems associated with mouth breathing. If you or your child suffers from this condition, speak with a health care professional who is knowledgeable about mouth breathing.

Story Source:

Adapted from materials provided by Academy of General Dentistry.

http://www.sciencedaily.com/releases/2010/04/100406125714.htm

World's Smallest Microlaser Could Revolutionize Chip Technology



The centerpiece of the new microlaser is the electric resonator, consisting of two semi-circular capacitors that are connected via an inductor (here, a scanning electron microscope image). The color intensity represents the strength of the electrical field; the color itself, the respective polarity. (Credit: Photo: ETH Zurich)

ScienceDaily (Apr. 6, 2010) — ETH-Zurich physicists have developed a new kind of laser that shatters the boundaries of possibility: it is by far the smallest electrically pumped laser in the world and one day could revolutionize chip technology.

It took a good one and a half years from the idea to its inception; a time when Christoph Walther, a PhD student in the Quantum Optoelectronics Group at ETH Zurich, spent days and nights in the FIRST lab. This was because ETH Zurich's state-of-the-art clean-room facility provided him with the ideal conditions to set a new record in laser technology: the physicist teamed up with four colleagues and developed the smallest electrically pumped laser in the world to date.

Much smaller than the wavelength

It's 30 micrometers long -- that's 30 millionths of a meter -- eight micrometers high and has a wavelength of 200 micrometers. This makes the laser considerably smaller than the wavelength of the light it emits -- a scientific first. After all, lasers normally can't be smaller than their wavelength, the reason being that in conventional lasers light waves cause an optic resonator to oscillate -- much like acoustic waves do to the soundbox of a guitar. In doing so, the light waves basically "travel" back and forth between two mirrors. The principle only works if the mirrors are larger than the wavelength of the laser. Consequently, normal lasers are limited in terms of their size.

Other researchers have endeavored to push the boundaries; "But by developing a completely new laser concept we were able to go quite a way below the limit," says Christoph Walther.

Inspired by electronics

In developing their laser concept, Christoph Walther and some of his team mates under his supervisor Jérôme Faist, professor and head of ETH Zurich's Institute of Quantum Electronics, were inspired by electronics. "Instead of the usual optic resonators, we use an electrical resonant circuit made up of an inductor and two capacitors," explains Walther. The light is effectively "captured" in it and induced into self-sustaining electromagnetic oscillations on the spot using an optical amplifier.

"This means the size of the resonator is no longer limited by the wavelength of the light and can in principle -- and that's what makes it so special -- be scaled down to whatever size you want." This prospect especially makes the microlaser interesting for chip manufacturers -- as an optic alternative to the transistors. "If we manage to approximate the transistors in terms of size using the microlasers, one day they could be used to build electro-optic chips with an extremely high concentration of electronic and optic components," says Christoph Walther. These could one day considerably speed up the exchange of data on microprocessors.

Story Source:

Adapted from materials provided by ETH Zurich.

Journal Reference:

1. Walther et al. **Microcavity Laser Oscillating in a Circuit-Based Resonator**. *Science*, 2010; 327 (5972): 1495 DOI: 10.1126/science.1183167

http://www.sciencedaily.com/releases/2010/04/100405132251.htm

Babies Absorb the Most Bisphenol A

Not all baby bottles are safe. Babies absorb a lot of bisphenol A when fed from certain bottles. (Credit: iStockphoto/Spring Saldana)

ScienceDaily (Apr. 6, 2010) — The hormonally active substance bisphenol A is contained in many synthetic and packaging materials. As a result, the substance can find its way into the food chain and the human organism. Just who is exposed and to what extent is shown in a new study from ETH Zurich: babies who are fed with polycarbonate bottles are especially at risk.

Bisphenol A (BPA) is the key element in polycarbonate synthetics and epoxy resins -- about three million tons being produced annually all over the world. Many plastic everyday objects, medical equipment, baby bottles and food packaging are made of PC synthetic materials, whilst epoxy resins are used to coat food and drink cans and seal drinking water pipelines. Apart from via air, water and dental fillings, BPA therefore also finds its way into the organism as a result of the food coming into contact with the packaging materials or plastic containers.

Harmful even in small doses

BPA is a hormonally active substance that acts like the natural hormone estrogen and as an anti-androgen. Even small amounts of the substance can thus affect sexual development, especially for male fetuses and babies. Based on toxicological studies, the European Food Safety Authority has established a limit for the acceptable daily intake of BPA: currently 50 micrograms per kilogram of body weight. "However, the limit doesn't include the studies on the hormonal impact of bisphenol A, which are often difficult to interpret," says Natalie von Götz, a scientist from the Institute of Chemistry and Bioengineering.

Von Götz is the first author of a recent publication, in which various exposure studies on BPA were linked to exposure analyses. The aim was to calculate representative average values for the daily dose of BPA per kilogram of body weight for nine age groups in Switzerland, Germany and Austria. The research team from Konrad Hungerbühler's Safety and Environmental Technology Group began by determining the individual doses that are absorbed by a particular product. This involved measuring the concentration of BPA in various foods and other relevant sources. This was multiplied by the amount absorbed by the person, which the researchers worked out from previous nutrition studies. Finally, the product was divided by the consumer's body weight. The authors then totted up the individual doses of the 17 sources examined to obtain the average daily intake for the respective age groups.

Bottle-fed babies especially vulnerable

The study revealed that babies and infants absorb the most BPA. Babies fed using PC bottles are the worst affected, on average taking in 0.8 micrograms of BPA per kilogram of body weight via bottles. This amount is well below the statutory minimum. "But the latest studies on rats have shown that even low doses can have a harmful impact on the development of the animals," says von Götz. The exposure declines with age, although the study also shows that it depends on the kind of diet or lifestyle: people who live on a lot of canned food, warm up their meals in PC containers in the microwave or have just had a new epoxy resin-based filling are exposed to a comparatively higher dosage of BPA. The difference with the latest studies is that they were the first to examine how much the single sources contribute to the total exposure in relation to each other, stresses von Götz. However, the study also revealed where there is still a need for research. For instance, BPA is found in canned food in different amounts. Whether this is due to the type of can or the processing remains unclear. Von Götz thus calls for the industry to share its knowledge and for more research to be carried out on the subject. After all, according to the scientist we need to reduce the amount of the substance released into food. However, the synthetic materials cannot be dispensed with altogether as they also carry considerable advantages, the coating of the cans protecting the cans as well as the food from corrosion, for example.

For von Götz, an important aspect is that nutrition studies should not only pay attention to what people eat, but also how the food is packed. More research might be necessary on the chain of custody as it is often unclear as to how substances like BPA ultimately get into the food.

Bisphenol: experts disagree on harmfulness

Like phthalates, Bisphenol A is an essential component in many synthetic materials. The fact that there is still a considerable need for research on these chemicals not only shows that the way in which they are absorbed is often unknown, but also that some scientists warn against such substances whilst others do not perceive any adverse effects for the human organism.

Story Source:

Adapted from materials provided by ETH Zurich.

Journal Reference:

1. Von Götz N et al. **Bisphenol A: How the Most Relevant Exposure Sources Contribute to Total Consumer Exposure**. *Risk Analysis*, (2010), 30, 473-487 DOI: 10.1111/j.1539-6924.2009.01345.x

http://www.sciencedaily.com/releases/2010/04/100405105958.htm

Form or Function? Evolution Takes Different Paths, Genetic Study Shows

Do the same genetic mechanisms underlie changes in form and function? Researchers recently turned to a database of knockout mice -- lab mice that have been engineered to lack particular genes -- to answer that question. (Credit: iStockphoto)

ScienceDaily (Apr. 6, 2010) — Biologists long have known that both the appearance of organisms and their inner workings are shaped by evolution. But do the same genetic mechanisms underlie changes in form and function? A new study by scientists at the University of Michigan and Taiwan's National Health Research Institutes suggests not.

The research is scheduled for online publication in the *Proceedings of the National Academy of Sciences.*

In the study, U-M evolutionary biologist Jianzhi "George" Zhang and colleagues Ben-Yang Liao and Meng-Pin Weng set out to systematically test a hypothesis proposed by molecular biologist Sean Carroll in 2005. Carroll posited that changes in morphology (such things as shape, color and structure of external and internal parts) occur through different genetic mechanisms than changes in physiology (inner workings). Carroll backed up his assertion with examples, but the idea, which challenged previous dogma, was controversial, Zhang said.

To test the hypothesis, Zhang's team turned to a database of knockout mice -- lab mice that have been engineered to lack particular genes.

"We found about 5,200 genes that have been knocked out in the mouse and the resulting effects studied," said Zhang, a professor of ecology and evolutionary biology. "From those genes, we looked for genes that, when knocked out, affect only morphological traits, not physiological traits. We got about 900 of those genes, which we call morphogenes."

The researchers also found about 900 "physiogenes" -- genes that affect only physiological traits, not morphology.

"Next, we compared the two groups of genes to see if there are differences in the molecular roles of their products," Zhang said. "We found very large differences." Morphogenes were more likely to carry instructions for transcription -- the step that determines whether a gene should be turned on and how much gene product should be manufactured. Physiogenes were more likely to be blueprints for enzymes, receptors, transporters and ion channels (molecules that control the flow of ions across cell membranes).

The next step was to examine patterns of evolution in the two groups of genes.

In a classic paper published in 1975, evolutionary biologists Mary-Claire King and Allan Wilson argued that evolution of both morphology and "ways of life" (physiology and behavior) occurred through

changes in the way genes are turned on and off, rather than through direct changes in gene products themselves. In the parlance of geneticists, these traits were shaped over time through changes in gene expression, not changes in protein sequence. King and Wilson supported their claim with the example of chimpanzees and humans, which are remarkably similar at the protein sequence level, but quite different in appearance and behavior. It was this influential paper that Carroll commemorated 30 years later, but he suggested instead that physiological changes are due to protein sequence changes, while morphological changes result from changes in gene expression.

With their new analysis, Zhang and colleagues found that, at the protein sequence level, physiogenes evolved much faster than morphogenes. "This is consistent with the idea that physiological changes tend to be caused by protein sequence changes," Zhang said.

Next, the researchers examined gene expression data, looking to see how similarly or differently genes are turned on or off in identical tissues from different species, such as the livers of mice and humans. Greater differences indicate more rapid evolutionary change.

"We found more differences in morphogenes than in physiogenes," Zhang said. "In other words, morphogenes evolve faster, with respect to expression patterns, than do physiogenes -- a finding that supports the idea that morphological changes result mainly from gene expression changes."

The finding that morphology and physiology are shaped by different evolutionary genetic processes can not only aid in future evolutionary studies, but can also be helpful in the study of human disease, Zhang said. "Our analysis of the knockout mouse data suggests that morphological defects are more likely due to problems with gene expression. This knowledge could help identify the disease-causing mutations more quickly, because it narrows the set of candidate genes and mutations that one needs to search from."

Zhang's coauthors, Liao and Weng, are at the National Health Research Institutes (NHRI) in Taiwan. Funding was provided by the National Institutes of Health and NHRI.

Story Source:

Adapted from materials provided by University of Michigan.

Journal Reference:

1. Ben-Yang Liao, Meng-Pin Weng, Jianzhi Zhang. **Contrasting genetic paths to morphological and physiological evolution**. *Proceedings of the National Academy of Sciences*, 2010; DOI: 10.1073/pnas.0910339107

http://www.sciencedaily.com/releases/2010/04/100405152545.htm

Proposed Grid Could Make Offshore Wind Power More Reliable

Researchers analyzed hypothetical power output from five-megawatt offshore turbines similar to the one shown here off the coast of Belgium. (Credit: Photo courtesy of Hans Hillewaert)

ScienceDaily (Apr. 6, 2010) — The energy needs of the entire human population could potentially be met by converting wind energy to electricity. While offshore wind power resources are abundant, wind turbines are currently unable to provide steady power due to natural fluctuations in wind direction and strength.

Offshore wind power output can be made more consistent by choosing project development locations that take advantage of regional weather patterns and by connecting wind power generators with a shared power line, according to a paper by researchers from the University of Delaware and Stony Brook University published in the April 5 issue of the *Proceedings of the National Academy of Sciences.*

"Making wind-generated electricity more steady will enable wind power to become a much larger fraction of our electric sources," said the paper's lead author Willett Kempton, UD professor of marine policy in the College of Earth, Ocean, and Environment and director of its Center for Carbon-free Power Integration.

The research team -- which also included UD alumnus Felipe Pimenta, UD research faculty member Dana Veron, and Brian Colle, associate professor in the School of Marine and Atmospheric Sciences at Stony Brook University -- demonstrated thoughtful design of offshore wind power projects can minimize the impacts of local weather on power fluctuations.

The researchers analyzed five years of wind observations from 11 monitoring stations along the U.S. East Coast from Florida to Maine. Based on wind speeds at each location, they estimated electrical power output from a hypothetical five-megawatt offshore turbine. After analyzing the patterns of wind energy among the stations along the coast, the team explored the seasonal effects on power output.

"Our analysis shows that when transmission systems will carry power from renewable sources, such as wind, they should be designed to consider large-scale meteorology, including the prevailing movement of high- and low-pressure systems," Kempton said.

Colle explained the ideal configuration. "A north-south transmission geometry fits nicely with the storm track that shifts northward or southward along the U.S. East Coast on a weekly or seasonal time scale," he said. "Because then at any one time a high or low pressure system is likely to be producing wind (and thus power) somewhere along the coast."

The researchers found each hypothetical power generation site exhibited the expected ups and downs, but when they simulated a power line connecting them, the overall power output was smoothed so that maximum or minimum output was rare. In the particular five-year period studied, the power output of the simulated grid never completely stopped.

No wind turbines are presently located in U.S. waters, although projects have been proposed off the coasts of several Atlantic states. This research could prove useful as project sites are selected and developed.

Reducing the severity of wind power fluctuations would allow sufficient time for power suppliers to ramp up or down power production from other energy sources as needed. Solutions that reduce power fluctuations also are important if wind is to displace significant amounts of carbon-emitting energy sources, the researchers said.

The study was funded by the Delaware Sea Grant College Program and CAPES, a Brazilian research council.

Story Source:

Adapted from materials provided by University of Delaware.

Journal Reference:

1. Willett Kempton, Felipe M. Pimenta, Dana E. Veron, Brian A. Colle. **Electric power from offshore wind via synoptic-scale interconnection**. *Proceedings of the National Academy of Sciences*, 2010; DOI: 10.1073/pnas.0909075107

http://www.sciencedaily.com/releases/2010/04/100405152547.htm

Building a Green Economy

By PAUL KRUGMAN

If you listen to climate scientists — and despite the relentless campaign to discredit their work, you should — it is long past time to do something about emissions of carbon dioxide and other greenhouse gases. If we continue with business as usual, they say, we are facing a rise in global temperatures that will be little short of apocalyptic. And to avoid that apocalypse, we have to wean our economy from the use of fossil fuels, coal above all.

But is it possible to make drastic cuts in greenhouse-gas emissions without destroying our economy?

Like the debate over climate change itself, the debate over climate economics looks very different from the inside than it often does in popular media. The casual reader might have the impression that there are real doubts about whether emissions can be reduced without inflicting severe damage on the economy. In fact, once you filter out the noise generated by special-interest groups, you discover that there is widespread agreement among environmental economists that a market-based program to deal with the threat of climate change — one that limits carbon emissions by putting a price on them — can achieve large results at modest, though not trivial, cost. There is, however, much less agreement on how fast we should move, whether major conservation efforts should start almost immediately or be gradually increased over the course of many decades.

In what follows, I will offer a brief survey of the economics of climate change or, more precisely, the economics of lessening climate change. I'll try to lay out the areas of broad agreement as well as those that remain in major dispute. First, though, a primer in the basic economics of environmental protection.

Environmental Econ 101

If there's a single central insight in economics, it's this: There are mutual gains from transactions between consenting adults. If the going price of widgets is $10 and I buy a widget, it must be because that widget is worth more than $10 to me. If you sell a widget at that price, it must be because it costs you less than $10 to make it. So buying and selling in the widget market works to the benefit of both buyers and sellers. More than that, some careful analysis shows that if there is effective competition in the widget market, so that the price ends up matching the number of widgets people want to buy to the number of widgets other people want to sell, the outcome is to maximize the total gains to producers and consumers. Free markets are "efficient" — which, in economics-speak as opposed to plain English, means that nobody can be made better off without making someone else worse off.

Now, efficiency isn't everything. In particular, there is no reason to assume that free markets will deliver an outcome that we consider fair or just. So the case for market efficiency says nothing about whether we

should have, say, some form of guaranteed health insurance, aid to the poor and so forth. But the logic of basic economics says that we should try to achieve social goals through "aftermarket" interventions. That is, we should let markets do their job, making efficient use of the nation's resources, then utilize taxes and transfers to help those whom the market passes by.

But what if a deal between consenting adults imposes costs on people who are not part of the exchange? What if you manufacture a widget and I buy it, to our mutual benefit, but the process of producing that widget involves dumping toxic sludge into other people's drinking water? When there are "negative externalities" — costs that economic actors impose on others without paying a price for their actions — any presumption that the market economy, left to its own devices, will do the right thing goes out the window. So what should we do? Environmental economics is all about answering that question.

One way to deal with negative externalities is to make rules that prohibit or at least limit behavior that imposes especially high costs on others. That's what we did in the first major wave of environmental legislation in the early 1970s: cars were required to meet emission standards for the chemicals that cause smog, factories were required to limit the volume of effluent they dumped into waterways and so on. And this approach yielded results; America's air and water became a lot cleaner in the decades that followed.

But while the direct regulation of activities that cause pollution makes sense in some cases, it is seriously defective in others, because it does not offer any scope for flexibility and creativity. Consider the biggest environmental issue of the 1980s — acid rain. Emissions of sulfur dioxide from power plants, it turned out, tend to combine with water downwind and produce flora- and wildlife-destroying sulfuric acid. In 1977, the government made its first stab at confronting the issue, recommending that all new coal-fired plants have scrubbers to remove sulfur dioxide from their emissions. Imposing a tough standard on all plants was problematic, because retrofitting some older plants would have been extremely expensive. By regulating only new plants, however, the government passed up the opportunity to achieve fairly cheap pollution control at plants that were, in fact, easy to retrofit. Short of a de facto federal takeover of the power industry, with federal officials issuing specific instructions to each plant, how was this conundrum to be resolved?

Enter Arthur Cecil Pigou, an early-20th-century British don, whose 1920 book, "The Economics of Welfare," is generally regarded as the ur-text of environmental economics.

Somewhat surprisingly, given his current status as a godfather of economically sophisticated environmentalism, Pigou didn't actually stress the problem of pollution. Rather than focusing on, say, London's famous fog (actually acrid smog, caused by millions of coal fires), he opened his discussion with an example that must have seemed twee even in 1920, a hypothetical case in which "the game-preserving activities of one occupier involve the overrunning of a neighboring occupier's land by rabbits." But never mind. What Pigou enunciated was a principle: economic activities that impose unrequited costs on other people should not always be banned, but they should be discouraged. And the right way to curb an activity, in most cases, is to put a price on it. So Pigou proposed that people who generate negative externalities should have to pay a fee reflecting the costs they impose on others — what has come to be known as a Pigovian tax. The simplest version of a Pigovian tax is an effluent fee: anyone who dumps pollutants into a river, or emits them into the air, must pay a sum proportional to the amount dumped.

Pigou's analysis lay mostly fallow for almost half a century, as economists spent their time grappling with issues that seemed more pressing, like the Great Depression. But with the rise of environmental regulation, economists dusted off Pigou and began pressing for a "market-based" approach that gives the private sector an incentive, via prices, to limit pollution, as opposed to a "command and control" fix that issues specific instructions in the form of regulations.

The initial reaction by many environmental activists to this idea was hostile, largely on moral grounds. Pollution, they felt, should be treated like a crime rather than something you have the right to do as long as you pay enough money. Moral concerns aside, there was also considerable skepticism about whether

market incentives would actually be successful in reducing pollution. Even today, Pigovian taxes as originally envisaged are relatively rare. The most successful example I've been able to find is a Dutch tax on discharges of water containing organic materials.

What has caught on instead is a variant that most economists consider more or less equivalent: a system of tradable emissions permits, a k a cap and trade. In this model, a limited number of licenses to emit a specified pollutant, like sulfur dioxide, are issued. A business that wants to create more pollution than it is licensed for can go out and buy additional licenses from other parties; a firm that has more licenses than it intends to use can sell its surplus. This gives everyone an incentive to reduce pollution, because buyers would not have to acquire as many licenses if they can cut back on their emissions, and sellers can unload more licenses if they do the same. In fact, economically, a cap-and-trade system produces the same incentives to reduce pollution as a Pigovian tax, with the price of licenses effectively serving as a tax on pollution.

In practice there are a couple of important differences between cap and trade and a pollution tax. One is that the two systems produce different types of uncertainty. If the government imposes a pollution tax, polluters know what price they will have to pay, but the government does not know how much pollution they will generate. If the government imposes a cap, it knows the amount of pollution, but polluters do not know what the price of emissions will be. Another important difference has to do with government revenue. A pollution tax is, well, a tax, which imposes costs on the private sector while generating revenue for the government. Cap and trade is a bit more complicated. If the government simply auctions off licenses and collects the revenue, then it is just like a tax. Cap and trade, however, often involves handing out licenses to existing players, so the potential revenue goes to industry instead of the government.

Politically speaking, doling out licenses to industry isn't entirely bad, because it offers a way to partly compensate some of the groups whose interests would suffer if a serious climate-change policy were adopted. This can make passing legislation more feasible.

These political considerations probably explain why the solution to the acid-rain predicament took the form of cap and trade and why licenses to pollute were distributed free to power companies. It's also worth noting that the Waxman-Markey bill, a cap-and-trade setup for greenhouse gases that starts by giving out many licenses to industry but puts up a growing number for auction in later years, was actually passed by the House of Representatives last year; it's hard to imagine a broad-based emissions tax doing the same for many years.

That's not to say that emission taxes are a complete nonstarter. Some senators have recently floated a proposal for a sort of hybrid solution, with cap and trade for some parts of the economy and carbon taxes for others — mainly oil and gas. The political logic seems to be that the oil industry thinks consumers won't blame it for higher gas prices if those prices reflect an explicit tax.

In any case, experience suggests that market-based emission controls work. Our recent history with acid rain shows as much. The Clean Air Act of 1990 introduced a cap-and-trade system in which power plants could buy and sell the right to emit sulfur dioxide, leaving it up to individual companies to manage their own business within the new limits. Sure enough, over time sulfur-dioxide emissions from power plants were cut almost in half, at a much lower cost than even optimists expected; electricity prices fell instead of rising. Acid rain did not disappear as a problem, but it was significantly mitigated. The results, it would seem, demonstrated that we can deal with environmental problems when we have to.

So there we have it, right? The emission of carbon dioxide and other greenhouse gases is a classic negative externality — the "biggest market failure the world has ever seen," in the words of Nicholas Stern, the author of a report on the subject for the British government. Textbook economics and real-world experience tell us that we should have policies to discourage activities that generate negative externalities and that it is generally best to rely on a market-based approach.

Climate of Doubt?

This is an article on climate economics, not climate science. But before we get to the economics, it's worth establishing three things about the state of the scientific debate.

The first is that the planet is indeed warming. Weather fluctuates, and as a consequence it's easy enough to point to an unusually warm year in the recent past, note that it's cooler now and claim, "See, the planet is getting cooler, not warmer!" But if you look at the evidence the right way — taking averages over periods long enough to smooth out the fluctuations — the upward trend is unmistakable: each successive decade since the 1970s has been warmer than the one before.

Second, climate models predicted this well in advance, even getting the magnitude of the temperature rise roughly right. While it's relatively easy to cook up an analysis that matches known data, it is much harder to create a model that accurately forecasts the future. So the fact that climate modelers more than 20 years ago successfully predicted the subsequent global warming gives them enormous credibility.

Yet that's not the conclusion you might draw from the many media reports that have focused on matters like hacked e-mail and climate scientists' talking about a "trick" to "hide" an anomalous decline in one data series or expressing their wish to see papers by climate skeptics kept out of research reviews. The truth, however, is that the supposed scandals evaporate on closer examination, revealing only that climate researchers are human beings, too. Yes, scientists try to make their results stand out, but no data were suppressed. Yes, scientists dislike it when work that they think deliberately obfuscates the issues gets published. What else is new? Nothing suggests that there should not continue to be strong support for climate research.

And this brings me to my third point: models based on this research indicate that if we continue adding greenhouse gases to the atmosphere as we have, we will eventually face drastic changes in the climate. Let's be clear. We're not talking about a few more hot days in the summer and a bit less snow in the winter; we're talking about massively disruptive events, like the transformation of the Southwestern United States into a permanent dust bowl over the next few decades.

Now, despite the high credibility of climate modelers, there is still tremendous uncertainty in their long-term forecasts. But as we will see shortly, uncertainty makes the case for action stronger, not weaker. So climate change demands action. Is a cap-and-trade program along the lines of the model used to reduce sulfur dioxide the right way to go?

Serious opposition to cap and trade generally comes in two forms: an argument that more direct action — in particular, a ban on coal-fired power plants — would be more effective and an argument that an emissions tax would be better than emissions trading. (Let's leave aside those who dismiss climate science altogether and oppose any limits on greenhouse-gas emissions, as well as those who oppose the use of any kind of market-based remedy.) There's something to each of these positions, just not as much as their proponents think.

When it comes to direct action, you can make the case that economists love markets not wisely but too well, that they are too ready to assume that changing people's financial incentives fixes every problem. In particular, you can't put a price on something unless you can measure it accurately, and that can be both difficult and expensive. So sometimes it's better simply to lay down some basic rules about what people can and cannot do.

Consider auto emissions, for example. Could we or should we charge each car owner a fee proportional to the emissions from his or her tailpipe? Surely not. You would have to install expensive monitoring equipment on every car, and you would also have to worry about fraud. It's almost certainly better to do what we actually do, which is impose emissions standards on all cars.

Is there a comparable argument to be made for greenhouse-gas emissions? My initial reaction, which I suspect most economists would share, is that the very scale and complexity of the situation requires a market-based solution, whether cap and trade or an emissions tax. After all, greenhouse gases are a direct or indirect byproduct of almost everything produced in a modern economy, from the houses we live in to the cars we drive. Reducing emissions of those gases will require getting people to change their behavior in many different ways, some of them impossible to identify until we have a much better grasp of green technology. So can we really make meaningful progress by telling people specifically what will or will not be permitted? Econ 101 tells us — probably correctly — that the only way to get people to change their behavior appropriately is to put a price on emissions so this cost in turn gets incorporated into everything else in a way that reflects ultimate environmental impacts.

When shoppers go to the grocery store, for example, they will find that fruits and vegetables from farther away have higher prices than local produce, reflecting in part the cost of emission licenses or taxes paid to ship that produce. When businesses decide how much to spend on insulation, they will take into account the costs of heating and air-conditioning that include the price of emissions licenses or taxes for electricity generation. When electric utilities have to choose among energy sources, they will have to take into account the higher license fees or taxes associated with fossil-fuel consumption. And so on down the line. A market-based system would create decentralized incentives to do the right thing, and that's the only way it can be done.

That said, some specific rules may be required. James Hansen, the renowned climate scientist who deserves much of the credit for making global warming an issue in the first place, has argued forcefully that most of the climate-change problem comes down to just one thing, burning coal, and that whatever else we do, we have to shut down coal burning over the next couple decades. My economist's reaction is that a stiff license fee would strongly discourage coal use anyway. But a market-based system might turn out to have loopholes — and their consequences could be dire. So I would advocate supplementing market-based disincentives with direct controls on coal burning.

What about the case for an emissions tax rather than cap and trade? There's no question that a straightforward tax would have many advantages over legislation like Waxman-Markey, which is full of exceptions and special situations. But that's not really a useful comparison: of course an idealized emissions tax looks better than a cap-and-trade system that has already passed the House with all its attendant compromises. The question is whether the emissions tax that could actually be put in place is better than cap and trade. There is no reason to believe that it would be — indeed, there is no reason to believe that a broad-based emissions tax would make it through Congress.

To be fair, Hansen has made an interesting moral argument against cap and trade, one that's much more sophisticated than the old view that it's wrong to let polluters buy the right to pollute. What Hansen draws attention to is the fact that in a cap-and-trade world, acts of individual virtue do not contribute to social goals. If you choose to drive a hybrid car or buy a house with a small carbon footprint, all you are doing is freeing up emissions permits for someone else, which means that you have done nothing to reduce the threat of climate change. He has a point. But altruism cannot effectively deal with climate change. Any serious solution must rely mainly on creating a system that gives everyone a self-interested reason to produce fewer emissions. It's a shame, but climate altruism must take a back seat to the task of getting such a system in place.

The bottom line, then, is that while climate change may be a vastly bigger problem than acid rain, the logic of how to respond to it is much the same. What we need are market incentives for reducing greenhouse-gas emissions — along with some direct controls over coal use — and cap and trade is a reasonable way to create those incentives.

But can we afford to do that? Equally important, can we afford not to?

The Cost of Action

Just as there is a rough consensus among climate modelers about the likely trajectory of temperatures if

we do not act to cut the emissions of greenhouse gases, there is a rough consensus among economic modelers about the costs of action. That general opinion may be summed up as follows: Restricting emissions would slow economic growth — but not by much. The Congressional Budget Office, relying on a survey of models, has concluded that Waxman-Markey "would reduce the projected average annual rate of growth of gross domestic product between 2010 and 2050 by 0.03 to 0.09 percentage points." That is, it would trim average annual growth to 2.31 percent, at worst, from 2.4 percent. Over all, the Budget Office concludes, strong climate-change policy would leave the American economy between 1.1 percent and 3.4 percent smaller in 2050 than it would be otherwise.

And what about the world economy? In general, modelers tend to find that climate-change policies would lower global output by a somewhat smaller percentage than the comparable figures for the United States. The main reason is that emerging economies like China currently use energy fairly inefficiently, partly as a result of national policies that have kept the prices of fossil fuels very low, and could thus achieve large energy savings at a modest cost. One recent review of the available estimates put the costs of a very strong climate policy — substantially more aggressive than contemplated in current legislative proposals — at between 1 and 3 percent of gross world product.

Such figures typically come from a model that combines all sorts of engineering and marketplace estimates. These will include, for instance, engineers' best calculations of how much it costs to generate electricity in various ways, from coal, gas and nuclear and solar power at given resource prices. Then estimates will be made, based on historical experience, of how much consumers would cut back their electricity consumption if its price rises. The same process is followed for other kinds of energy, like motor fuel. And the model assumes that everyone makes the best choice given the economic environment — that power generators choose the least expensive means of producing electricity, while consumers conserve energy as long as the money saved by buying less electricity exceeds the cost of using less power in the form either of other spending or loss of convenience. After all this analysis, it's possible to predict how producers and consumers of energy will react to policies that put a price on emissions and how much those reactions will end up costing the economy as a whole.

There are, of course, a number of ways this kind of modeling could be wrong. Many of the underlying estimates are necessarily somewhat speculative; nobody really knows, for instance, what solar power will cost once it finally becomes a large-scale proposition. There is also reason to doubt the assumption that people actually make the right choices: many studies have found that consumers fail to take measures to conserve energy, like improving insulation, even when they could save money by doing so.

But while it's unlikely that these models get everything right, it's a good bet that they overstate rather than understate the economic costs of climate-change action. That is what the experience from the cap-and-trade program for acid rain suggests: costs came in well below initial predictions. And in general, what the models do not and cannot take into account is creativity; surely, faced with an economy in which there are big monetary payoffs for reducing greenhouse-gas emissions, the private sector will come up with ways to limit emissions that are not yet in any model.

What you hear from conservative opponents of a climate-change policy, however, is that any attempt to limit emissions would be economically devastating. The Heritage Foundation, for one, responded to Budget Office estimates on Waxman-Markey with a broadside titled, "C.B.O. Grossly Underestimates Costs of Cap and Trade." The real effects, the foundation said, would be ruinous for families and job creation.

This reaction — this extreme pessimism about the economy's ability to live with cap and trade — is very much at odds with typical conservative rhetoric. After all, modern conservatives express a deep, almost mystical confidence in the effectiveness of market incentives — Ronald Reagan liked to talk about the "magic of the marketplace." They believe that the capitalist system can deal with all kinds of limitations, that technology, say, can easily overcome any constraints on growth posed by limited reserves of oil or other natural resources. And yet now they submit that this same private sector is utterly incapable of coping with a limit on overall emissions, even though such a cap would, from the private sector's point of

view, operate very much like a limited supply of a resource, like land. Why don't they believe that the dynamism of capitalism will spur it to find ways to make do in a world of reduced carbon emissions? Why do they think the marketplace loses its magic as soon as market incentives are invoked in favor of conservation?

Clearly, conservatives abandon all faith in the ability of markets to cope with climate-change policy because they don't want government intervention. Their stated pessimism about the cost of climate policy is essentially a political ploy rather than a reasoned economic judgment. The giveaway is the strong tendency of conservative opponents of cap and trade to argue in bad faith. That Heritage Foundation broadside accuses the Congressional Budget Office of making elementary logical errors, but if you actually read the office's report, it's clear that the foundation is willfully misreading it. Conservative politicians have been even more shameless. The National Republican Congressional Committee, for example, issued multiple press releases specifically citing a study from M.I.T. as the basis for a claim that cap and trade would cost $3,100 per household, despite repeated attempts by the study's authors to get out the word that the actual number was only about a quarter as much.

The truth is that there is no credible research suggesting that taking strong action on climate change is beyond the economy's capacity. Even if you do not fully trust the models — and you shouldn't — history and logic both suggest that the models are overestimating, not underestimating, the costs of climate action. We can afford to do something about climate change.

But that's not the same as saying we should. Action will have costs, and these must be compared with the costs of not acting. Before I get to that, however, let me touch on an issue that will become central if we actually do get moving on climate policy: how to get the rest of the world to go along with us.

The China Syndrome

The United States is still the world's largest economy, which makes the country one of the world's largest sources of greenhouse gases. But it's not the largest. China, which burns much more coal per dollar of gross domestic product than the United States does, overtook us by that measure around three years ago. Over all, the advanced countries — the rich man's club comprising Europe, North America and Japan — account for only about half of greenhouse emissions, and that's a fraction that will fall over time. In short, there can't be a solution to climate change unless the rest of the world, emerging economies in particular, participates in a major way.

Inevitably those who resist tackling climate change point to the global nature of emissions as a reason not to act. Emissions limits in America won't accomplish much, they argue, if China and others don't match our effort. And they highlight China's obduracy in the Copenhagen negotiations as evidence that other countries will not cooperate. Indeed, emerging economies feel that they have a right to emit freely without worrying about the consequences — that's what today's rich countries got to do for two centuries. It's just not possible to get global cooperation on climate change, goes the argument, and that means there is no point in taking any action at all.

For those who think that taking action is essential, the right question is how to persuade China and other emerging nations to participate in emissions limits. Carrots, or positive inducements, are one answer. Imagine setting up cap-and-trade systems in China and the United States — but allow international trading in permits, so Chinese and American companies can trade emission rights. By setting overall caps at levels designed to ensure that China sells us a substantial number of permits, we would in effect be paying China to cut its emissions. Since the evidence suggests that the cost of cutting emissions would be lower in China than in the United States, this could be a good deal for everyone.

But what if the Chinese (or the Indians or the Brazilians, etc.) do not want to participate in such a system? Then you need sticks as well as carrots. In particular, you need carbon tariffs.

A carbon tariff would be a tax levied on imported goods proportional to the carbon emitted in the manufacture of those goods. Suppose that China refuses to reduce emissions, while the United States adopts policies that set a price of $100 per ton of carbon emissions. If the United States were to impose such a carbon tariff, any shipment to America of Chinese goods whose production involved emitting a ton of carbon would result in a $100 tax over and above any other duties. Such tariffs, if levied by major players — probably the United States and the European Union — would give noncooperating countries a strong incentive to reconsider their positions.

To the objection that such a policy would be protectionist, a violation of the principles of free trade, one reply is, So? Keeping world markets open is important, but avoiding planetary catastrophe is a lot more important. In any case, however, you can argue that carbon tariffs are well within the rules of normal trade relations. As long as the tariff imposed on the carbon content of imports is comparable to the cost of domestic carbon licenses, the effect is to charge your own consumers a price that reflects the carbon emitted in what they buy, no matter where it is produced. That should be legal under international-trading rules. In fact, even the World Trade Organization, which is charged with policing trade policies, has published a study suggesting that carbon tariffs would pass muster.

Needless to say, the actual business of getting cooperative, worldwide action on climate change would be much more complicated and tendentious than this discussion suggests. Yet the problem is not as intractable as you often hear. If the United States and Europe decide to move on climate policy, they almost certainly would be able to cajole and chivvy the rest of the world into joining the effort. We can do this.

The Costs of Inaction

In public discussion, the climate-change skeptics have clearly been gaining ground over the past couple of years, even though the odds have been looking good lately that 2010 could be the warmest year on record. But climate modelers themselves have grown increasingly pessimistic. What were previously worst-case scenarios have become base-line projections, with a number of organizations doubling their predictions for temperature rise over the course of the 21st century. Underlying this new pessimism is increased concern about feedback effects — for example, the release of methane, a significant greenhouse gas, from seabeds and tundra as the planet warms.

At this point, the projections of climate change, assuming we continue business as usual, cluster around an estimate that average temperatures will be about 9 degrees Fahrenheit higher in 2100 than they were in 2000. That's a lot — equivalent to the difference in average temperatures between New York and central Mississippi. Such a huge change would have to be highly disruptive. And the troubles would not stop there: temperatures would continue to rise.

Furthermore, changes in average temperature will by no means be the whole story. Precipitation patterns will change, with some regions getting much wetter and others much drier. Many modelers also predict more intense storms. Sea levels would rise, with the impact intensified by those storms: coastal flooding, already a major source of natural disasters, would become much more frequent and severe. And there might be drastic changes in the climate of some regions as ocean currents shift. It's always worth bearing in mind that London is at the same latitude as Labrador; without the Gulf Stream, Western Europe would be barely habitable.

While there may be some benefits from a warmer climate, it seems almost certain that upheaval on this scale would make the United States, and the world as a whole, poorer than it would be otherwise. How much poorer? If ours were a preindustrial, primarily agricultural society, extreme climate change would be obviously catastrophic. But we have an advanced economy, the kind that has historically shown great ability to adapt to changed circumstances. If this sounds similar to my argument that the costs of emissions limits would be tolerable, it ought to: the same flexibility that should enable us to deal with a much higher carbon prices should also help us cope with a somewhat higher average temperature.

But there are at least two reasons to take sanguine assessments of the consequences of climate change with a grain of salt. One is that, as I have just pointed out, it's not just a matter of having warmer weather — many of the costs of climate change are likely to result from droughts, flooding and severe storms. The other is that while modern economies may be highly adaptable, the same may not be true of ecosystems. The last time the earth experienced warming at anything like the pace we now expect was during the Paleocene-Eocene Thermal Maximum, about 55 million years ago, when temperatures rose by about 11 degrees Fahrenheit over the course of around 20,000 years (which is a much slower rate than the current pace of warming). That increase was associated with mass extinctions, which, to put it mildly, probably would not be good for living standards.

So how can we put a price tag on the effects of global warming? The most widely quoted estimates, like those in the Dynamic Integrated Model of Climate and the Economy, known as DICE, used by Yale's William Nordhaus and colleagues, depend upon educated guesswork to place a value on the negative effects of global warming in a number of crucial areas, especially agriculture and coastal protection, then try to make some allowance for other possible repercussions. Nordhaus has argued that a global temperature rise of 4.5 degrees Fahrenheit — which used to be the consensus projection for 2100 — would reduce gross world product by a bit less than 2 percent. But what would happen if, as a growing number of models suggest, the actual temperature rise is twice as great? Nobody really knows how to make that extrapolation. For what it's worth, Nordhaus's model puts losses from a rise of 9 degrees at about 5 percent of gross world product. Many critics have argued, however, that the cost might be much higher.

Despite the uncertainty, it's tempting to make a direct comparison between the estimated losses and the estimates of what the mitigation policies will cost: climate change will lower gross world product by 5 percent, stopping it will cost 2 percent, so let's go ahead. Unfortunately the reckoning is not that simple for at least four reasons.

First, substantial global warming is already "baked in," as a result of past emissions and because even with a strong climate-change policy the amount of carbon dioxide in the atmosphere is most likely to continue rising for many years. So even if the nations of the world do manage to take on climate change, we will still have to pay for earlier inaction. As a result, Nordhaus's loss estimates may overstate the gains from action.

Second, the economic costs from emissions limits would start as soon as the policy went into effect and under most proposals would become substantial within around 20 years. If we don't act, meanwhile, the big costs would probably come late this century (although some things, like the transformation of the American Southwest into a dust bowl, might come much sooner). So how you compare those costs depends on how much you value costs in the distant future relative to costs that materialize much sooner.

Third, and cutting in the opposite direction, if we don't take action, global warming won't stop in 2100: temperatures, and losses, will continue to rise. So if you place a significant weight on the really, really distant future, the case for action is stronger than even the 2100 estimates suggest.

Finally and most important is the matter of uncertainty. We're uncertain about the magnitude of climate change, which is inevitable, because we're talking about reaching levels of carbon dioxide in the atmosphere not seen in millions of years. The recent doubling of many modelers' predictions for 2100 is itself an illustration of the scope of that uncertainty; who knows what revisions may occur in the years ahead. Beyond that, nobody really knows how much damage would result from temperature rises of the kind now considered likely.

You might think that this uncertainty weakens the case for action, but it actually strengthens it. As Harvard's Martin Weitzman has argued in several influential papers, if there is a significant chance of utter catastrophe, that chance — rather than what is most likely to happen — should dominate cost-benefit calculations. And utter catastrophe does look like a realistic possibility, even if it is not the most likely outcome.

Weitzman argues — and I agree — that this risk of catastrophe, rather than the details of cost-benefit calculations, makes the most powerful case for strong climate policy. Current projections of global warming in the absence of action are just too close to the kinds of numbers associated with doomsday scenarios. It would be irresponsible — it's tempting to say criminally irresponsible — not to step back from what could all too easily turn out to be the edge of a cliff.

Still that leaves a big debate about the pace of action.

The Ramp Versus the Big Bang

Economists who analyze climate policies agree on some key issues. There is a broad consensus that we need to put a price on carbon emissions, that this price must eventually be very high but that the negative economic effects from this policy will be of manageable size. In other words, we can and should act to limit climate change. But there is a ferocious debate among knowledgeable analysts about timing, about how fast carbon prices should rise to significant levels.

On one side are economists who have been working for many years on so-called integrated-assessment models, which combine models of climate change with models of both the damage from global warming and the costs of cutting emissions. For the most part, the message from these economists is a sort of climate version of St. Augustine's famous prayer, "Give me chastity and continence, but not just now." Thus Nordhaus's DICE model says that the price of carbon emissions should eventually rise to more than $200 a ton, effectively more than quadrupling the cost of coal, but that most of that increase should come late this century, with a much more modest initial fee of around $30 a ton. Nordhaus calls this recommendation for a policy that builds gradually over a long period the "climate-policy ramp."

On the other side are some more recent entrants to the field, who work with similar models but come to different conclusions. Most famously, Nicholas Stern, an economist at the London School of Economics, argued in 2006 for quick, aggressive action to limit emissions, which would most likely imply much higher carbon prices. This alternative position doesn't appear to have a standard name, so let me call it the "climate-policy big bang."

I find it easiest to make sense of the arguments by thinking of policies to reduce carbon emissions as a sort of public investment project: you pay a price now and derive benefits in the form of a less-damaged planet later. And by later, I mean much later; today's emissions will affect the amount of carbon in the atmosphere decades, and possibly centuries, into the future. So if you want to assess whether a given investment in emissions reduction is worth making, you have to estimate the damage that an additional ton of carbon in the atmosphere will do, not just this year but for a century or more to come; and you also have to decide how much weight to place on harm that will take a very long time to materialize.

The policy-ramp advocates argue that the damage done by an additional ton of carbon in the atmosphere is fairly low at current concentrations; the cost will not get really large until there is a lot more carbon dioxide in the air, and that won't happen until late this century. And they argue that costs that far in the future should not have a large influence on policy today. They point to market rates of return, which indicate that investors place only a small weight on the gains or losses they expect in the distant future, and argue that public policies, including climate policies, should do the same.

The big-bang advocates argue that government should take a much longer view than private investors. Stern, in particular, argues that policy makers should give the same weight to future generations' welfare as we give to those now living. Moreover, the proponents of fast action hold that the damage from emissions may be much larger than the policy-ramp analyses suggest, either because global temperatures are more sensitive to greenhouse-gas emissions than previously thought or because the economic damage from a large rise in temperatures is much greater than the guesstimates in the climate-ramp models.

As a professional economist, I find this debate painful. There are smart, well-intentioned people on both sides — some of them, as it happens, old friends and mentors of mine — and each side has scored some

major points. Unfortunately, we can't just declare it an honorable draw, because there's a decision to be made.

Personally, I lean toward the big-bang view. Stern's moral argument for loving unborn generations as we love ourselves may be too strong, but there's a compelling case to be made that public policy should take a much longer view than private markets. Even more important, the policy-ramp prescriptions seem far too much like conducting a very risky experiment with the whole planet. Nordhaus's preferred policy, for example, would stabilize the concentration of carbon dioxide in the atmosphere at a level about twice its preindustrial average. In his model, this would have only modest effects on global welfare; but how confident can we be of that? How sure are we that this kind of change in the environment would not lead to catastrophe? Not sure enough, I'd say, particularly because, as noted above, climate modelers have sharply raised their estimates of future warming in just the last couple of years.

So what I end up with is basically Martin Weitzman's argument: it's the nonnegligible probability of utter disaster that should dominate our policy analysis. And that argues for aggressive moves to curb emissions, soon.

The Political Atmosphere

As I've mentioned, the House has already passed Waxman-Markey, a fairly strong bill aimed at reducing greenhouse-gas emissions. It's not as strong as what the big-bang advocates propose, but it appears to move faster than the policy-ramp proposals. But the vote on Waxman-Markey, which was taken last June, revealed a starkly divided Congress. Only 8 Republicans voted in favor of it, while 44 Democrats voted against. And the odds are that it would not pass if it were brought up for a vote today.

Prospects in the Senate, where it takes 60 votes to get most legislation through, are even worse. A number of Democratic senators, representing energy-producing and agricultural states, have come out against cap and trade (modern American agriculture is strongly energy-intensive). In the past, some Republican senators have supported cap and trade. But with partisanship on the rise, most of them have been changing their tune. The most striking about-face has come from John McCain, who played a leading role in promoting cap and trade, introducing a bill broadly similar to Waxman-Markey in 2003. Today McCain lambastes the whole idea as "cap and tax," to the dismay of former aides.

Oh, and a snowy winter on the East Coast of the U.S. has given climate skeptics a field day, even though globally this has been one of the warmest winters on record.

So the immediate prospects for climate action do not look promising, despite an ongoing effort by three senators — John Kerry, Joseph Lieberman and Lindsey Graham — to come up with a compromise proposal. (They plan to introduce legislation later this month.) Yet the issue isn't going away. There's a pretty good chance that the record temperatures the world outside Washington has seen so far this year will continue, depriving climate skeptics of one of their main talking points. And in a more general sense, given the twists and turns of American politics in recent years — since 2005 the conventional wisdom has gone from permanent Republican domination to permanent Democratic domination to God knows what — there has to be a real chance that political support for action on climate change will revive.

If it does, the economic analysis will be ready. We know how to limit greenhouse-gas emissions. We have a good sense of the costs — and they're manageable. All we need now is the political will.

Paul Krugman is a Times columnist and winner of the 2008 Nobel Memorial Prize in Economic Science. His latest book is "The Return of Depression Economics and the Crisis of 2008."

http://www.nytimes.com/2010/04/11/magazine/11Economy-t.html?th&emc=th

Make Birth Control, Not War

The human tendency toward war is based on biology, but the right family planning policies can redirect the world toward peace.

By Thomas Hayden and Malcolm Potts

Close your eyes for a moment and cast your mind back to the dominant news stories of early 2010. The economy in tatters? Certainly. Global stalemate on climate negotiations and unbreakable gridlock in Congress? Of course. And don't forget the terror — on Christmas Eve, 2009, a lone Nigerian man boards an airplane in Lagos and travels some 18 hours toward Detroit in what can only have been a dizzying combination of anxiety, fear and elation, and a grandiose sense of his own destiny. It all ends with a little ineffectual fumbling in the underpants, cut short by the heroism of Umar Farouk Abdulmutallab's fellow passengers.

The official response to the underwear bomber reveals the usual inability of large bureaucracies to connect the dots or take meaningful action on real threats. Instead of understanding and reassessment, we get yet another late, inappropriate and costly escalation in airport security and political infighting about the treatment of Abdulmutallab — all of it embedded in an unacknowledged but resolute refusal to see the bigger picture.

Meanwhile, the real killing continues to elude the headlines. It is on the Afghanistan-Pakistan border, in Afghanistan's Helmand Province where allied Western soldiers struggle with the almost impossible task of attacking the Taliban without killing civilians. It is in Darfur and the Congo, where death tolls are in the millions, not the thousands, and it is in Nigeria, where Christians and Muslims meet. Here is primeval warfare in full abundance, where bands of men are knit together by ancient bonds of shared violence. They are motivated to kill their neighbors systematically and deliberately, not just by lust for land and resources but also by hatred of the "other" and a too-seldom acknowledged love of war and warring ways. It is in these places, and scores of others where the violence simmers just below the surface, that people live close to one of the darkest realities of human nature.

Humans — human males, really — are not peaceful animals. They are in fact a spectacularly violent species, and very nearly uniquely so. Despite high-minded modern wishes and the received wisdom of three generations of anthropologists and sociologists, warfare is not an aberration in human development, nor is it a learned, culturally determined behavior. War and its ancillary behaviors — including racism, slavery, mass rape and the subjugation of women — are not cultural problems and thus do not have neat, sociological solutions. Along with terrorism, these most destructive of human behaviors derive clearly and directly from our biology, bequeathed to us by an evolutionary pathway that we share with just one other extant species, the chimpanzees.

War, simply put, is in our genes. It is a complex behavior built up out of a series of emotions and impulses that are, in general, expressed more in men than in women, and more in young men than in old. It arose early in our evolutionary history because the most violent of our pre-human male ancestors had more offspring than their more peaceful or timid competitors; it has been with us as long as we have been a species and in all probability will be with us as long as we remain one. Our warlike impulses cannot be stopped with enhanced airport imaging, extrajudicial treatment of terrorism suspects or any attempt at a literal "war on terror."

From biology, medicine, history, literature, political theory, sociology and evolutionary psychology, a clear picture emerges: War is a biological behavior. As robust science demonstrates — and common sense and the experience of warriors around the world and throughout history attest — war is part of the human condition. But does this mean that war is inevitable and peace an unattainable dream?

Emphatically, and demonstrably, no. Most of the world, despite economic challenges, is remarkably peaceful, and as improbable as it seems, the past century has actually been the most peaceful in known human history. The last soldiers who experienced the horrors of trench warfare in France have died, the guns are silent in Bosnia and Herzegovina, and the leaders of Pakistan and India are trying to talk to one another. The Vikings, who once personified the merciless terror of war for an entire continent, have become the Scandinavians, as resolute as anyone in the quest for tolerance at home, and peace and openness around the world.

Crucially, war's deep roots in our evolutionary past do not condemn us to a future as filled with warfare as our history has been. On the contrary, recognizing and accepting the centrality of war in human nature sheds new light on real, practicable policy prescriptions that can help make war less common in the future and less brutal when it does occur. Humans are complex, adaptable animals. And all genes, behavioral or not, are influenced by their environments. If humans truly want peace, they must seek to understand the biology of war and use that understanding to devise policies — chief among them, improved access to family planning services that can control some demographic drivers of war — so as to help the biology of peace win out.

The idea that warlike violence is not innate actually arose just recently. It can be traced back to Rousseau, and found full-throated proponents in Franz Boas, Margaret Mead, Ashley Montagu and other post-World War I anthropologists. Understandably shocked by the horrors of trench warfare and poison gas, these generally clear-minded academics sought evidence to distance humankind from such barbarism, and they found it — or so they thought — in an updated notion of the Noble Savage and the idea that civilization represents a fall from some earlier state of grace. But archaeologists such as Steven LeBlanc of Harvard and Lawrence Keeley of the University of Illinois at Chicago have found supposedly peaceful societies riddled with violence. Careful investigation reveals histories of murder and long-standing, pervasive and brutally lethal warfare in Mead's Pacific Islanders, the Copper River Inuit, the !Kung people of the Kalahari and many other purportedly "peaceful" societies. As LeBlanc writes in his clarifying 2003 book, *Constant Battles*, "Prehistoric warfare was common and deadly, and no time span or geographic region seems to have been immune."

Remarkably, the idea that violence and warfare are the fault of culture, not biology, remains widespread in academic circles. As recently as 1986, 20 international scholars drafted the Seville Statement on Violence at a UNESCO meeting asserting that, among other things, "It is scientifically incorrect to say that war or any other violent behavior is genetically programmed into our human nature." Several scientific associations, including the American associations of psychology, of anthropology and of sociology, voted to endorse the Seville Statement. But true science proceeds by observation, experiment and debate, and not by endorsing written statements. And the evidence — which we examined fully in our recent book, *Sex and War: How Biology Explains Warfare and Terrorism and Offers a Path to a Safer World* — reveals a very different story.

In 2009, fossil hunters in Ethiopia found "Ardi," a nearly complete skeleton of a 4.4 million-year-old ape with a brain slightly larger than that of a chimpanzee. She lived in an open savannah and walked upright, even though she still had an opposable toe, as chimps do, to climb trees. Identified as *Ardipithecus ramidus*, like other fossils such as the famous "Lucy," Ardi is not a "missing link" in the sense of a literal ancestor, but a cousin, a nearby branch on the tree of human evolution. Yet all the apes have a common ancestor, and Ardi is almost certainly descended from the branch of the ape family that gave rise to chimps and humans. We suggest that this chimp-human ancestor lived in small bands of related males who controlled a defined territory — just as do chimpanzees and virtually every hunter-gatherer society ever studied. And we suggest that war began when those ancestral males first banded together and, as

present-day chimpanzees and more recent hunter-gatherers still do, left their territory, found a member of another troop and set about killing it in the most vicious way possible.

At its most basic, we define war as a form of organized violence in which groups of males band together and intentionally set out to kill members of their own species. Many species are violent, of course, and may appear to enjoy hunting and killing "for sport," as humans do. Quite a few predators hunt and kill in packs or coordinated teams. But it is exceedingly rare that they should intentionally hunt and kill members of their own species, as opposed to the occasional and largely accidental deaths that result from male mating competitions. Wolves may do so on occasion, and hyenas, and perhaps one or two other species. But when it comes to warring behavior as a regular, integral part of life, no species come close to human beings and chimpanzees. Taken with the reality that war has been a constant feature of human behavior around the world and throughout time, this commonality of humans and the chimps suggests very strongly that war is an inherited behavior that first evolved in a common ancestor we shared more than 7 million years ago.

So how did war first evolve? As Jane Goodall, Richard Wrangham and others have shown, we share with chimps, our closest living biological relatives, the bizarre propensity to attack and kill others of our own species. Chimpanzees live, as humans did for the vast majority of evolutionary time, in male-dominated social groups in which the males are all blood relatives and only females move between troops. The dominant males largely monopolize mating opportunities and take the best food and other resources. Younger males are left either to work their way up the in-group hierarchy or attempt surreptitious matings with females of their own troop or others — high-stakes strategies that often end in a beating or worse. But, in a unique evolutionary innovation, these young males can also band together and launch attacks on isolated members of neighboring out-groups, ultimately eliminating these "enemies" and securing the territory, resources and females they require to survive and pass on their genes.

Today, we see remarkably similar patterns of territorial raiding, brutal attacks and, ultimately, campaigns of extermination in both humans and chimpanzees. Just as the most successfully violent alpha male chimpanzees have more mates and more offspring than the losers, genetic surveys show that the great human warriors of history have left outsized impacts on the human gene pool. One study published in 2003 estimated that Genghis Khan has 16 million living descendants worldwide. It takes little imagination to see the evolutionary benefit of warfare to Khan and his cohorts, and it leads to the uncomfortable realization that we are all, by definition, the descendants of the victors in conflicts over resources, territory and the right to mate.

We are all descended, in other words, from particularly successful rapists, murderers and brigands. Human males today bear the marks of this legacy in the behaviors and impulses that still spur us on to lethal conflict — including the widespread and devastating association between war and rape — even when other solutions are both available and preferable.

There is no doubt that other apes, like people, can be empathetic. They will help one another or slow down a march so a sick or wounded animal can catch up. In her important 2009 book *Mothers and Others: The Evolutionary Origins of Mutual Understanding*, Sarah Blaffer Hrdy of University of California, Davis, underscores the ability of human mothers to assist one another in the long, arduous task of raising children. How can such intensely social, empathic animals also kill other members of their own species? We postulate that the key that unlocked the full fury of war was an evolved psychological mechanism that allows us to dehumanize (or "dechimpanzize") those we would attack. Tragically, human history is replete with episodes of dehumanizing behavior.

A famous Stanford prison experiment shows that nice young students randomly assigned in a psychology experiment to be "prison guards" will adopt and exploit these roles in a couple of days and emotionally abuse people randomly assigned to play the role of "prisoners." The study lasted only a few days, but the behavior was little different from that of American soldiers in Abu Ghraib abusing Iraqi prisoners. Dehumanizing our enemies is not an aberration — it is default human behavior. *New York Times* columnist Nicholas Kristof, reporting from the Congo, recently described a woman who, while she was

being raped by soldiers, screamed to warn her neighbors. In revenge, her assailants cut off one leg with a machete, cooked the meat and ate it while the woman almost bled to death and her children looked on. When they tried to force her child to eat her mother's flesh, he refused, saying "shoot me." They did. Seemingly, the human ability to dehumanize others knows no limits — and most certainly has not disappeared from our shared evolutionary repertoire.

We go into more detail on the potential mechanisms for our evolved ability to dehumanize and kill our fellow humans in our book. But for a flavor of those root causes, let us suggest that the male sex hormone, testosterone, is in some ways the ultimate weapon of mass destruction. Testosterone levels are highest in men aged 19 to 30, a span that tracks closely the age distribution of convictions for violent crimes. Testosterone levels rise not just among men playing team sports but also their fans — and one need look no further than the passionate partisanship of team sports to see the "in-group" versus "out-group" dynamic that underlies both the camaraderie and cruelty of warfare. Women also secrete testosterone, but at about one-tenth the male level. Intriguingly, women's testosterone output does not change in response to competition.

In 2008, the world suffered the biggest economic collapse since the Great Depression. Like war, the global financial crisis had many specific and technical causes. But it was ultimately driven, in the words of one financial adviser in the City of London, by "a lot of alpha males with testosterone streaming out of their ears." This apparently flippant remark was actually an insightful analysis of the global crisis. Evolutionary psychologists Coren Apicella from Harvard and colleagues found that men with high testosterone levels make riskier investments, and others have observed that women make better investment managers over the long term than do men. The multimillion-dollar bonuses Wall Street bankers pay themselves, which for good reason infuriate the rest of society, can be best understood as a (predominantly male) troop displaying intense internal loyalty and total blindness to the outside world.

Six months after the publication of *Sex and War*, we were comforted to read two papers in *Science*. Two separate studies — Samuel Bowles writing one, and Adam Powell, Stephan Shennan and Mark Thomas the other — used different methodologies from ours but came to the conclusions we had.

Bowles, an economist and behavioral scientist who studies altruistic behavior, used a computer model of between-group competition together with a database of archaeological and ethnographic rates of adult mortality from warfare. His study supports the notion of "parochial altruism," in which humans developed the ability to be altruistic within an in-group, however defined, and callously violent to those outside it. In fact, Bowles' work suggests that the human compassion and altruism most people value today was made possible by the existence of warfare — that cooperation for both defense and offense within the group allowed the most successfully violent of our ancestors to flourish.

Powell and his co-authors focus on the evolution of technological and cultural complexity, as evidenced by the appearance of art, sophisticated tools — including such potential weapons as bows, boomerangs and spear-throwers — and long-distance trade. Their main purpose is to explain patterns of "modern" behavior in Africa and Eurasia. But in the process, they show convincingly that population growth and other demographic features may hold the key to some of our most complex behaviors.

Each particular war and battle has its own history and specific sets of grievances, turning points and precipitating triggers and personalities. But there is also a set of factors — social, political and environmental — that many wars and violent conflicts have in common. In fact, these shared characteristics are so common that statistical modeling of social, economic and environmental conditions can result in stunningly accurate predictions of armed conflict and unrest.

Briefly, the factors that seem most likely to increase the probability of open war or armed conflict include:

• Environmental stress and/or resource limitation.

• Extreme economic disparity within or between groups and lack of opportunities, especially for young men.

• Subjugation of women and a culture of male dominance.

• A high proportion of young males relative to older males.

All of these factors interact in one way or another with the warlike biology of the human male, and each is influenced quite directly by population growth rate, and as a result, population age structure or the relative ratios of young to old in a society.

We argue in *Sex and War* that our warring behaviors are essentially a hangover from our evolutionary past. It also seems clear that these behaviors have been rendered wildly maladaptive in the dual modern contexts of stable societies with social norms that condemn wild warring on the one hand and allow weapons of mass destruction on the other. (With simple technology, the impulses of war can kill hundreds or thousands; with nuclear and biological weapons, they can potentially kill us all.)

But the problem with evolved traits is that they neither know nor care when they're no longer wanted. And as catastrophically troublesome as our warrior genes often are today, the conditions in which they rose to prominence also persist. Our prescription for a more peaceful future follows directly from that observation: To limit the damage from unchecked warfare, humanity must understand and limit the physical, cultural and demographic conditions that make it most likely to occur.

War is the ultimate zero-sum game. Whether one side or another wins, and no matter what short-term economic stimulation comes to pass, war represents a squandering of resources and the greatest imaginable waste of human effort, ingenuity and life. We cannot argue that wars are never justifiable or necessary. But whatever utility this unique set of behaviors once had, human culture and morality have moved beyond the point where wars of extermination are acceptable, and killing technologies have become far too deadly, and indiscriminately so, for our warring impulses to be given free rein.

But can humans change? The answer, thank goodness, is that we can — and in fact we already have. As mentioned earlier, the 20th century was more peaceful than any other, both in terms of the number of people directly involved in warfare and in the percentage of adult males dying in armed conflict. As just one example, the Soviet Union suffered the greatest casualties of World War II — perhaps 15 million died, representing 8 percent of the population. As unimaginably horrific as those losses were, they are small compared to violent death rates in hunter-gatherer societies. Among the hunter-gatherers of New Guinea, studies show, from 5 to 30 percent of adults typically die from raids and wars; in the Yanomamo of the northern Amazon basin, a staggering four out of 10 adults have participated in killing another person and 20 percent of people over 40 have lost a parent, child or sibling to violence.

Just as there are many factors that initiate wars, there are also many factors that can in theory be tweaked or refined to make war less likely. The clarifying lens of biology helps show that one factor influences them all: The population growth rate turns out to be a crucial component in the biology of war, for reasons both direct and indirect.

Foremost, growing populations are young populations, and young men are the true engines of war. They provide the recklessness and bravery, the intense inward loyalty and outward hostility, and the other raw behavioral "material" that can be shaped easily into small, tightly bonded fighting units, which in turn can be built up into armies of millions with each soldier still fighting, ultimately, for the men at his side. At the same time, women in rapidly growing populations are women spending a great deal of time having and raising children — and not, usually, taking an equal role in politics at any level outside the home. Careful statistical studies show that the probability of violent conflict increases as the ratio of young men in a society rises above that of older men, and that the probability of war falls as the percentage of women involved in local politics rises.

More tangentially, growing populations stress their environments and lead to competition for increasingly scarce natural resources. The link between environmental instability and violent conflict is made frighteningly clear in a 2009 study by researchers at Stanford University, New York University, Harvard University and the University of California, Berkeley. Extrapolating from historical correlations of temperature rise and increased armed conflict in sub-Saharan Africa, the researchers project that expected climate change alone could spur a 60 percent increase in armed conflicts by 2030. That projection, if it came true, would translate to an additional 459,000 deaths from war in just two decades, and that is without taking population growth into account — in the fastest-growing region of the world.

Growing populations, especially in poorer areas, also tend to overburden existing infrastructure and outstrip the available employment. This leads to high operating costs for businesses and lost opportunities for individuals. Educational opportunities are lost for the same reasons, and in many cultures, it is girls who lose out first when education is rationed.

There is no one solution to the problem of war. But biology suggests — and quantitative studies support — the notion that if testosterone is the ultimate weapon of mass destruction, then the birth control pill may be the ultimate prescription for peace.

It is sobering to think of how many millions of our forebears died of sword and siege and famine, but it is also heartening to realize that humans have already found many ways to rein in our most violent impulses. In light of the true, root, biological causes of warfare, it becomes obvious that there is much more humans can and should be doing now.

Let's look again at some of the main predictors of war in the light of one particularly well-known conflict, the alternating battles and standoffs between Israel and Hamas in the Gaza Strip. Young men, in general, are motivated to fight for resources, or in revenge for those killed, or because they feel a sense of injustice, and those emotional cues surely help motivate young Palestinians to risk their lives firing rockets at Israel, or to become suicide bombers on Israeli streets. Israel's desire to stop such attacks is understandable.

Interestingly, the Palestine Liberation Organization under Yasser Arafat showed very clearly what it takes to truly stop terrorism. In 1972, the terrorist group Black September, based in Beirut, gained world attention by killing Israeli athletes at the Munich Olympic Games. But Arafat had his eye on the possibility of gaining observer status at the United Nations. Afraid Black September might launch more high-profile raids and undermine his U.N. ambitions, the PLO flew eligible young female volunteers to Beirut and offered militant members of Black September $3,000, an apartment with a TV, long-term employment and $5,000 if they married and had a child. The offer was overwhelmingly accepted, and Black September as a terrorist movement collapsed almost overnight.

Since the Six-Day War in 1967, the population of the Occupied Palestinian Territory has grown from just over 1 million to 3.9 million. The average woman there has about five children, and the U.N. estimates that by 2050 the Palestinian population could reach a mind-boggling 8.8 million to 11.8 million. Two-thirds of the current population is under age 25, giving rise to an unemployed, volatile, testosterone-fueled group of young men — an endless source of terrorists. Adding to their frustrations, and their motivation to lash out, Arab society discourages premarital sex, and unemployed men don't have the resources needed to marry.

The world is not going to pay young Palestinians to marry. But we do have options. Gaza has few jobs and virtually no natural resources. Already, Palestinians pull more water out of the ground than falls from the sky, and their drinking water is increasingly saline. Palestinians also have a strong entrepreneurial tradition, however, and, like Singapore in the 1960s and 1970s, could build a future in their overcrowded space by living by their brains. Israel may understandably want to build a wall around Gaza, but without the free flow of goods, capital and ideas — and education at all levels for both sexes — the problem of Palestinian terrorism will get worse, not better.

In the early 1990s, one of us spent time in Gaza working with an Arab colleague to develop family planning services. Palestinian women wanted help from the international community, but no government or donor would provide the modest support needed to improve access to family planning. That opportunity to improve the lot of Gazans was lost, and the situation has deteriorated to the point where today's radical Palestinians claim, "the Palestinian womb is the one weapon that Palestinians have." In a tragic sense, they are right. But as a strategy for building a better future, rapid population growth could not be more wrong.

There is a popular notion that education and rising economic fortunes lead to decreasing family size. We argue elsewhere that, conversely, decreased family size is actually a *prerequisite* for economic growth and social stability. We suggest that the cases of China, South Korea and Thailand, and even post-revolution Iran, present particularly powerful examples. In each of these cases, governments realized early on that rapid population growth threatened their continued peace, stability and prosperity. In China by coercive means, and more by top-down social consensus building in South Korea, Thailand and Iran, these countries were able to slow population growth rates dramatically, and each has had a more prosperous-than-expected outcome as a result.

Other problems persist of course. But even in Iran, with its incongruously antagonistic government and truncated economy, the benefits of slowing population growth are plain to see. There are now more women in the University of Tehran than men, and while Iran's chaotic president may support terrorist groups, young Iranians are not strapping on explosive vests and killing people — they are marching peacefully in the streets demanding more openness, democracy and peace.

In his 2009 speech accepting the Nobel Peace Prize, Barack Obama noted, quite correctly, that "security does not exist where human beings do not have access to enough food, or clean water, or the medicine they need to survive. It does not exist where children cannot aspire to a decent education or a job that supports a family." He did not, however, mention his single most significant contribution to world peace to date: reversing the Bush-era policy of refusing U.S. development funds to any agency supporting the availability of family planning. And it doesn't matter whether the goal is specifically to build peace — that result will come if the policies succeed and women in the most impoverished areas of the world are simply able to determine their own family size.

We have argued that offering women a range of family planning is always associated with falling family size. This assertion has recently been validated by the analysis of what might be called a natural experiment. In Kenya between 1970 and the early 1990s, considerable emphasis was put on improving access to family planning, and average family size fell from 8 to 5. But then the focus was taken off of family planning, and health professionals migrated to work on the AIDS epidemic.

Kenya's fertility decline stalled as contraceptive use fell, and unwanted pregnancies and unsafe abortions increased dramatically. In 1990, it was estimated that the population of Kenya would grow from 23.5 million then to 54 million in 2050. As a result of the stalled fertility decline, today's estimate for 2050 population has been raised to 83 million. Already, the ethnic violence following the disputed presidential election of December 2007 has undermined generations of peaceful coexistence and friendship within Kenya; population increases of this magnitude could well turn Kenya into a failed state like its neighbor, Somalia. If population growth is not slowed again in Kenya, the results will be as horrifying as they are avoidable: Ethnic violence related to diminished access to resources will increase, and a once shining light for stability and prosperity in Africa will have been snuffed out for generations because of the lack of attention to family planning over the past 15 years.

In fact, we have just come through a "lost decade" of family planning — and by extension, a lost decade for building peace in the world. Especially in sub-Saharan Africa and parts of the Middle East, this lost emphasis on both domestic and international family planning programs is already having tragic consequences. The latest research shows that a "contraception gap" between rich and poor — already a common phenomenon around the world — is widening in those countries where the poor are already most vulnerable. (The wealthy have always been more able to find ways to separate sex from

reproduction.) As the unmet demand for family planning continues to rise throughout the most impoverished nations, so too will the disparities in family size between rich and poor. Inevitably and as a direct consequence, the inequalities in education, health, employment and income will also continue to widen, infrastructure will continue to crumble, and the risk of food insecurity, environmental catastrophe and devastating warfare will continue to rise.

Ultimately, the decision to support family planning efforts comes down to making a moral choice. The profound success of humanitarian aid efforts and improved nutrition and health care for many in the developing world is greatly to be admired and celebrated. But in decreasing infant mortality, we have engendered a grim unintended consequence — millions of women throughout the developing world are now able to bear healthy children safely, but have no access to safe and effective contraception.

A prominent evolutionary biologist recently shared with one of us his recent realization that when it comes to vaccination and other means of preventing tropical illness, "to provide these measures without providing family planning assistance is tantamount to homicide/genocide." As important as it obviously is to work for greater health and longer life, we could not agree more emphatically that to do so without also giving people the ability to determine family size is to condemn them to an increased likelihood of overpopulation, poverty and environmental degradation, as well as a dramatic and quantifiable increase in the likelihood of bloody conflict.

It is not just perverse and foolhardy from a national security standpoint to pursue policies that increase the likelihood of famine, unemployment and war; it is morally wicked, on a historically vast scale, to condemn untold hundreds of millions of fellow humans to longer lives of decreasing opportunity and increasing misery. This is, of course, not an argument against health care and hygiene throughout the developing world, and it is emphatically no brief for eugenics or forced or coercive abortion, sterilization or contraception.

It is, rather, the strongest possible argument for the immediate, universal provision of the means of family planning and maternal health care, so that women throughout the world can have the freedom to choose the family size that's best for them. Those individual choices, made freely and without coercion, will inevitably lead to more stability, peace and prosperity. If those millions of women are denied the means to choose for themselves, then choice will diminish for the rest of us. We will all have continued population increase, a devastated environment and the looming prospect of a future just as bloody and war-filled as our past.

http://www.miller-mccune.com/culture-society/make-birth-control-not-war-11399/?utm_source=Newsletter104&utm_medium=email&utm_content=0413&utm_campaign=newsletters

Academic Research Does Not Take Holidays Off

There is, in fact, a surprising amount of scholarship on the subject of Thanksgiving, a uniquely American celebration marked by rituals that lend themselves to a wide range of interpretations.

By Tom Jacobs

Thanksgiving, a uniquely American celebration marked by rituals that lend themselves to a wide range of interpretations.

We gather together some of the more provocative papers of recent years, which are guaranteed to enliven the dinner table by providing fresh fodder for family squabbles.

Genocide, With Stuffing and Gravy

Anthropologist Janet Siskind of Rutgers University views the Thanksgiving holiday in sociopolitical terms in her 1992 paper "The Invention of Thanksgiving." The traditional gathering, she writes, "subtly expresses and reaffirms values and assumptions about cultural and social unity, about identity and history, about inclusion and exclusion."

She views the holiday, which ritually re-enacts a feast first held by the Pilgrims and their Native American neighbors in 1621, as a sort of welcoming ceremony for newcomers to the nation. "Participation in this ritual transforms a collection of immigrants into Americans by connecting them to a cultural history stretching back to the founding of the country," she writes.

Given that entirely reasonable analysis, it is a bit jolting to read further into the paper and find the following sentence: "The stuffed turkey represents the Native Americans, sacrificed and consumed in order to bring civilization to the New World."

Now there's an assertion that'll make you choke on your giblet gravy. The footnote that follows it reads: "Although I have found no other author who suggests this symbolism, there is a cartoonist who graphically showed a Pilgrim family grouped around a table, poised to eat an American Indian, served on a platter with an apple in his mouth and already missing several body parts. The caption says: 'For history's sake, let's say it was a turkey.'"

We can be thankful she spared us her thoughts on candied yams.

Carving Out a Room for a Safety Blitz

Siskind's concept of conquest and cannibalism aside, Thanksgiving has traditionally been seen as a rather gentle holiday celebrating peace and coexistence. So how did it become associated with the violent, aggressive sport of football? Several scholars have asked the question, and while their answers are speculative, one thing is certain: Football on Thanksgiving goes way back. According to historian

Elizabeth Pleck of the University of Illinois, the Intercollegiate Football Association scheduled its first championship game on Thanksgiving Day 1876.

The games were broadcast on radio by the mid-1920s and on television by the mid-1950s — a development that, in her view, helped reinforce traditional gender roles. While the women were cooking or cleaning in the kitchen, the men gathered around the set.

"One function of football, even enjoyed vicariously, was to reaffirm men's bonds with other men and their masculinity — to inject some manliness into the sentimentality," Pleck writes. "Listening to football was an additional masculine element that followed the ritual of carving the turkey: Man the gladiator side by side with man the hunter."

The Holiday That Failed to Stop the Civil War

When you are giving thanks to specific individuals this year, don't forget to include Sarah Josepha Hale. The editor of Godey's magazine (widely regarded as the Miller-McCune of its day), Hale began issuing yearly editorials in 1846 encouraging the "great American festival" of Thanksgiving, which at the time was celebrated only in New England. Hale sent letters urging its celebration to many of the nation's political and military leaders, in the hope that a new national holiday would unite the country and help avert a civil war.

We all know how that effort turned out. But one recipient of her correspondence, Abraham Lincoln, ultimately did take her advice. The president declared a national day of thanksgiving in November 1863, in part to commemorate the battle of Gettysburg.

Pleck of the University of Illinois provides this information in her 1999 paper "The Making of the Domestic Occasion: The History of Thanksgiving in the United States." She contends that the real impetus for the holiday was the changing economic environment in the mid- to late 19th century, which found more and more workers moving off the farm and to the cities.

"As a holiday of 'family homecoming,' Thanksgiving eased the social dislocations of the industrial and commercial revolutions," she writes. "The ritual of returning home at Thanksgiving … made it possible to reconcile individualism and obligation to family. A man could be self-made and an obedient son, so long as he was reunited with his family for Thanksgiving."

Weighty Findings

For all its symbolic significance, the Thanksgiving ritual does have one real-world result: It makes us fatter. Or does it? Two recent studies come to different conclusions. A team of researchers led by Holly Hull of the New York Obesity Research Center measured the weight of 94 University of Oklahoma students before and after Thanksgiving. In a 2006 paper, they reported an average weight gain of half a kilogram (a little more than one pound) over the brief break. The greatest amount of weight was gained by students who were already overweight or obese.

Another 2006 study, also headed by Hull, looked at weight gain over the entire holiday period from Thanksgiving through New Year's Day and reported more nuanced results. Again looking at a group of college students, the researchers found that total body weight was unchanged over the six weeks, but the participants' percentage of body fat increased significantly. They conclude: "With recent evidence showing marked morbidity and mortality to be associated with increased body fat … (focusing on) body weight alone may underestimate the potentially deleterious effects of the holiday season." So don't feel too smug when you step off that scale; the dial may be deceiving.

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http://www.miller-mccune.com/culture-society/academic-research-does-not-take-holidays-off-4095/

Peak Wood and the Bronze Age

The Mycenaean world was built on a solid base of bronze, but that edifice was found to have wooden feet.

By John Perlin

A Bronze Age helmet. The Mycenaean world revolved around bronze but at a price: Wood was a finite source of energy needed for metallurgy. (Wikimedia Commons)

Ever since humans began relying on fire, fuel became paramount to their survival.

When using metals, fire and the fuel required to feed the flame took on great significance since most metals come from ores, and it takes heat — and lots of it — to remove the metal from its parent stone. The discovery of copper smelting and bronze production — mixing copper with tin to make a harder metal — had a powerful effect on human society for thousands of years.

The alloy made weapons and tools much stronger and more durable than its wood, bone or stone antecedents. The Mediterranean world, when the heroes of Homer roamed its lands, depended on the availability of bronze for work and war.

Copper ranks as the primary component of bronze. In the Mediterranean, the greatest known source of copper lay in Cyprus. Lots of trees also grew on the island, and those trees supplied the fuel, in the form of charcoal, which turned ore from worthless stone to valued metal.

As its Mediterranean neighbors prospered, Cypriot copper furnaces proliferated to meet their demand for bronze. Major slag dumps serve as evidence of the extensive metallurgical activity between 1300 and 1000 B.C.

The increase in metallurgical activity put a great burden on the island's woods. Some 120 pine trees were required to prepare the 6 tons of charcoal needed to produce one copper ingot shaped roughly like a dried ox hide and weighing between 45 and 65 pounds. One ingot, therefore, deforested almost four acres.

One shipload consisted of two hundred ingots, which cost the island almost 24,000 pines. Trade with the mainland consisted of many such shipments, so much so that the regional copper trade deforested 4 to 5 square miles of woods annually.

But the benefits of the trade were attractive. As the copper industry grew, so did the island's standard of living. A wealthier citizenry demanded more ceramics, better heating, tastier foods and greater living space — and that all took its own toll on the woods. The combined need for fuel, for human demands and for smelting removed 10 square miles of forested land per year. Within 100 years, the 3,500-square-mile island probably lost about a third of its trees or most of its accessible woods. The change in flora was

reflected in Cyprus's fauna: Pigs, who thrive in a moist, woody environment, gave way to goats, who flourish in a more barren landscape.

As wood became scarcer, smelters made technological changes to conserve fuel. Late Bronze Age Cypriot metalworkers exposed the mined ore to the evening moisture to leach impurities rather than remove them in an initial roast, saving a third of the fuel formerly used. In another move to save fuel, people collected old and broken tools for re-smelting into new ingots. Underwater archaeologists found scrap metal aboard a ship involved in the bronze trade, indicating a lively recycling business during the period when trees became scarcer.

Despite such modern-sounding strategies, it was too little too late, and Bronze Age metallurgists could not sustain the high level of production of the previous two centuries. Copper production peaked around 1200 B.C. and the last copper furnaces were shut down in 1050 B.C. The collapse had nothing to do with the lack of raw copper feedstock. A thousand years later, after the woods had grown back following the abandonment of copper production and reserves set up by local kings, the Romans reopened the mines and produced more copper than ever before.

The decline of Cyprus' Bronze Age copper industry due to wood shortages had a ripple effect on the great Mycenaean society and its economy. Documents of the period speak of a large number of bronze smiths in the port city of Pylos in Messenia, on the southwestern projection of the Greek peninsula. In normal times, they turned tons of bronze into weapons and tools. But when the export of bronze from Cyprus dropped precipitously, a third of them had no metal to work with and the remaining smiths received minute quantities, ranging from 3 to 26 pounds.

As John Chadwick, one of the modern decipherers of these documents, points out, "The evidence is clear. There was a shortage of metal, or this careful rationing would hardly have been necessary."

Another document from the period orders local officials to provide "temple bronze as points for spears and javelins." Despite their likely worn-out and tenuous state, these artifacts held great religious significance and only a grave emergency would have forced the rulers to have such sacred objects collected as material for recycling into weaponry.

With so little of society's principal metal available, life as the Messenians had become accustomed came to a standstill. Productivity in agriculture dropped considerably without replacements for broken or worn out plows and scythes. Lacking new carpentry tools slowed down the construction of ships for commerce and war. Warriors without sufficient arrows or spearheads or armor or blades could not fight a better armed foe. Taking advantage of Messenia's privation, insurgents overpowered those protecting the palace and destroyed it. The wealth of the entire region disappeared as did the majority of its population.

Events at Messenia presaged the catastrophes other societies in the Mediterranean would soon face. Just as the abundance of bronze gave these civilizations the material basis to grow to new heights, its paucity no doubt helped life as they knew it to collapse.

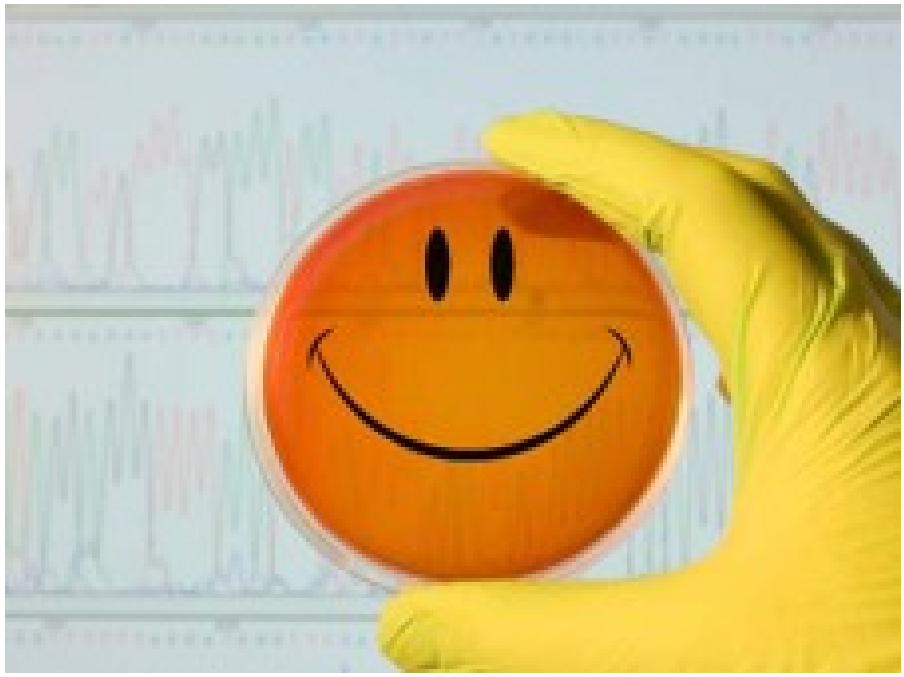
In this sea of sorrows new hope for future generations arose. Ore in Cyprus contained more iron than copper. Since metallurgists sought copper rather than iron, they ignored the slag which contained the latter. When fuel became scarce, those remaining in the metal business found they could manually remove the iron from the slag. Success in working with iron at this early stage laid the foundation for the coming of the Iron Age, and with it ultimately the fuels that would usurp wood.

http://www.miller-mccune.com/science-environment/peak-wood-and-the-bronze-age-14363/

Whipping Up Kindness in the Lab

Oxytocin, already dubbed the 'cuddle hormone,' may deserve a new moniker as the 'kindness molecule.'

By Michael Haederle



Scientists have known for more than 50 years that a hormone called oxytocin plays a critical role during labor, delivery and nursing of babies, but now they're discovering that the molecule reaches receptors in profound ways that suggest we are hardwired for empathy.

Scientists have known for more than 50 years that a hormone called oxytocin plays a critical role in stimulating uterine contractions during labor and delivery, and that afterward, it helps a nursing mother to release milk for her infant.

Men also produce oxytocin, it turns out, although at lower levels than women. Released during sexual arousal, it appears to promote feelings of contentment and attachment in both sexes, which accounts for one of its cuter nicknames: "the cuddle hormone."

But these days, scientists know oxytocin does so much more.

Made in a region of the brain known as the hypothalamus and secreted through the pituitary gland, the molecule reaches receptors throughout the body, modulating our moods and our social interactions in profound ways that suggest we are hardwired for empathy.

When experimenters at Claremont Graduate University administered oxytocin to male test subjects, for example, the men consistently scored higher on tests that measured pro-social traits like generosity and trust. At the same time, disruptions in the oxytocin system have been linked to autism, a disorder that is characterized by difficulty in forming human bonds.

Meanwhile, researchers from the University of California, Berkeley found that people who inherit variants of the gene that produces oxytocin receptors perform quite differently from one another on a battery of tests that measure how empathic and stress-prone they are.

Scientists Sarina Rodrigues and Laura Saslow already knew about oxytocin's powerful effect on emotional behavior, as well as its role in fighting stress and promoting the relaxation response.

They also knew that at a particular spot within the oxytocin receptor gene, people have one of three combinations of adenine (A) or guanine (G) molecules, which help form the base pairs in its DNA. Previous research has shown that people with the AA or AG variants are more likely to have had a childhood diagnosis of autism than those with the GG version.

Wondering whether these variations might reveal differences in people who have not been diagnosed with autism, they recruited 192 Berkeley college students and tested DNA drawn from their saliva samples. About 26 percent had the GG version, while the rest were either AA or AG, Rodrigues says.

Then they subjected the students to an empathy test called the Reading the Mind in the Eyes Task, showing them black-and-white photos of 36 strangers and asking them to judge which of four emotions they might be feeling. According to their paper published in the Proceedings of the National Academy of Sciences, members of the GG group were significantly more accurate than the rest while also rating themselves as more empathic in a self-report measure.

Two other tests to assess physiological and self-reported stress reactivity showed the GG group were calmer than the others.

The students were also asked about their parents' emotional style as well as their own interactions in romantic relationships to help account for differences in the nurturing styles that might have helped sculpt their empathic traits.

"We're definitely not trying to claim that that's not part of the equation," says Rodrigues, who is now an assistant professor of psychology at Oregon State University. "Genetics make just a small contribution to the whole person that we become."

The researchers also tested their own DNA as part of a pilot study. They were chagrined to find that none of them belonged to the more-empathic GG group, says Rodrigues, who declined to say whether she is an AG or AA.

"I really pride myself on being really pro-social, really empathic and pretty calm," she says. "I was a little disappointed, but I think it really helped me digest and make sense out of this stuff. … It allowed me to do a lot of introspection about my family and how people have gone on different trajectories in life."

One limitation of the study is that the gene locus where the adenine-guanine variation occurs does not actually play a role in shaping the oxytocin receptors, but it is likely associated with active places in the gene that do, Rodrigues says.

Scientists also do not yet understand the different versions of the receptor on a molecular level, she says.

Given its effects on emotional functioning, it's not surprising that oxytocin appears to shape human social behavior, affecting our predisposition to follow the law, trust one another and reciprocate in economic transactions.

Because of this, Paul Zak, a neuroeconomist at Claremont Graduate University, has his own nickname for oxytocin: "the moral molecule." (He also writes a blog by that name for Psychology Today.)

Zak and his team have male test subjects inhale a dose of pitocin (a synthetic form of oxytocin) before taking part in a computer game where they are asked to share some money with an unseen stranger. The enchanced-oxytocin group turns out to be a lot more generous than the controls.

Zak also runs similar experiments with males who received a boost of testosterone from a gel applied to their skin. They turned out to be less generous and more punitive than men with normal testosterone levels. Interestingly, Zak found the male tendency to enforce rules nonetheless tended to support sharing and cooperation on a group level.

"Oxytocin and testosterone really work on these evolutionarily old areas of the brain and the peripheral nervous system — the gut and the heart — that tell us whether it feels right or not," Zak says.

Research into oxytocin's behavioral effects languished for decades because researchers dismissed it as "a female hormone," Zak says. More recently, it became clear that in socially monogamous mammals, males and females have oxytocin receptors in their forebrains that help form what Zak has dubbed the HOME system (for Human Oxytocin-Mediated Empathy Circuit).

This feedback loop leads to the release of neurotransmitters that promote bonding and reduce anxiety, Zak says. "It essentially looks like we have this socially monogamous brain," he says.

"It is amazing that this little, ancient chemical that allows mammals to produce live births and to breastfeed spikes when someone sends you money by computer," Zak says.

"That's because it's a very robust mechanism. For 90 percent of the population it's very robust."

But some people seem to be immune to the effects of oxytocin, Zak says.

"They are people who are unconditional non-reciprocators," he says. "We call them 'bastards.'

"These are people who do not reciprocate when you're nice to them. They have very unusual personality traits. For example, they have a lot of sexual partners. What does that tell you? Well, they're not attaching to one person at a time."

The key of insight of all this research, according to Zak, is that "trust is kind of this economic lubricant. When trust is high, morale is high. … Higher trust environments produce individuals who are happier."

http://www.miller-mccune.com/science-environment/whipping-up-kindness-in-the-lab-11133/

Beating Back Space Invaders

Giant rocks or snowballs in space, while more likely to hit in Hollywood than anywhere else on Earth, remain a threat that policymakers are taking seriously.

By Bruce Dorminey

The European Space Agency has done an initial study for Don Quijote, a $500 million demonstration of kinetic asteroid impact. The plan calls for two spacecraft: one to study the asteroid's makeup and orbit, the other to actually smack the asteroid to change its velocity. (European Space Agency)

Hand-wringing over civilization-ending asteroid impacts has taken a back seat to health care, the economy and this winter's weather.

Still, catastrophic impacts do happen.

Ask the dinosaurs.

They were wiped off the map for good by an estimated 6-mile-wide impactor that struck the Yucatan peninsula 65 million years ago. (Although some scientists now finger climate change in their extinction.)

Anyone who's ever walked around Arizona's mile-wide Barringer crater, made about 50,000 years ago, can attest to the destructive force of our solar system's space junk.

Only a century ago in Russia, the 1908 Tunguska event flattened 8 million trees, roasted innumerable reindeer, and blasted heat felt by area residents up to 40 miles away. One unfortunate soul 100 kilometers from the blast's epicenter was knocked unconscious — all by an asteroid estimated to be some 50 meters in diameter, or about half the length of a football field, air-bursting over central Siberia.

In the current tempest that is Washington, D.C., it's remarkable that such high-risk, low-probability events haven't gone completely unnoticed by the U.S. Congress.

At Congress' behest, a National Research Council committee recently issued a report, "Defending Planet Earth: Near-Earth Object Surveys and Hazard Mitigation Strategies," which detailed the committee's recommendations. Those suggestions range from completing surveys of existing near-Earth objects — loosely defined as objects that cross or come near Earth's orbit — to how best to counter such "NEO" threats to Earth.

In 2005, Congress authorized the detection, tracking, cataloguing and characterization of 90 percent or more potentially hazardous NEOs larger than 140 meters (about 460 feet) in diameter. Congress singled

out those objects that could wreak havoc on Earth, but are thought to hit roughly every 30,000 years. The legislators set the survey's target completion date for 2020.

"Reaching down to 140 meters at the 90 percent level is not possible with the instruments now funded; I have no idea what Congress will do about this," said astrophysicist Irwin Shapiro of the Harvard Center for Astrophysics, who chaired the committee that wrote the NRC report.

The report recommended a peer-reviewed research program using space surveys, characterization and mitigation to counter potential impact threat. The committee also recommended setting up an international body tasked with defending the planet if an NEO is found to be on a definite collision course with Earth.

Any response to the report won't start from scratch. NASA currently allocates $4 million a year toward NEO detection and searches, and has more than 6,000 objects identified, not counting a separate effort to track all the junk humankind has left in orbit.

A few NEOs are remnants of our solar system's planetary construction 4.5 billion years ago. But most originate as fragments of colliding asteroids in the inner half of the main asteroid belt located between Mars and Jupiter. There, over many millions of years, the gravitational interactions of Mars, Jupiter and Saturn cause a significant number to enter Earth-crossing orbits.

For 3 billion years, Earth has been randomly impacted by such space detritus; some 150 tons of small objects likely strike every day. Most are harmless. Some thousand objects about a foot wide are thought to hit the upper atmosphere annually, while Tunguska-sized impactors may hit Earth regularly every few hundred years.

Some 170 Earth-impact craters have been documented. The largest, the 300 kilometer-wide Vredefort crater in South Africa, is 2 billion years old.

An object with a diameter of 3 kilometers that hits Earth is thought to be the threshold for global catastrophe. Fortunately, these hit roughly only every 10 to 30 million years.

And an Earth-killing impact of 10 kilometers or larger, the stuff of movies like Deep Impact or Armageddon, occurs roughly every 100 million years.

Not every NEO object is an automatic threat. Some of the largest asteroids have even ended up as moons of our nearby neighbors. Mars' moon of Phobos, for instance, is more than likely a large asteroid captured by Mars' gravity.

Planetary scientists are still unclear about asteroids' exact makeup and composition. Some are thought to be iron-rich and very dense. But many of these objects may be very loosely bound piles of rubble circling the sun on timescales that can range from less than a year to decades.

Nonetheless, most asteroids will never pose a serious threat to Earth, but just in case one does, NASA has an active NEO tracking and monitoring effort as part of its Near Earth Object Program. Sample posts on its Web site include "Small Asteroid 2009 VA Whizzes By The Earth" or "Asteroid Impactor Reported over Indonesia" in October. (The latter had a diameter of 10 meters and reportedly "detonated in the atmosphere with an energy of about 50 kilotons.")

Planetary scientist Don Yeomans, head of the Jet Propulsion Laboratory-based program, monitors the most up-to-date orbital data looking for objects that could hit Earth within the next 100 years. Of the 6,600 objects tracked, Yeomans says none represent a significant threat.

Some 85 percent of all NEOs a kilometer (seven times bigger than the minimum size Congress would have them track) and up have already been detected.

That excludes long-period comets, such as Halley's, which they estimate represent 1 percent of the total impact threat. Such comets, some taking 200 years or more to orbit the sun, are capable of sneaking up on us. A quick Jupiter flyby can gravitationally sling them into the inner solar system and onto an Earth-impacting trajectory.

"We'll never have more than a year or two of advance warning on a comet," said planetary scientist Clark Chapman, at the Southwest Research Institute in Boulder, Colo. "We don't see comets, even the big ones, until they get to the distance of Saturn or Jupiter. We're looking at next-century technology before we can really improve warnings for incoming comets."

Therefore, Yeomans says asteroids remain the bigger concern.

Of the three search programs currently in operation, the NASA-funded Catalina Sky Survey, using three telescopes in Arizona and Australia, finds the most NEOs at the highest rate.

NASA still leads the field in tracking NEOs, but Chapman says that a network of individual researchers worldwide contribute to the NEO database. Chapman, one of the NRC paper's co-authors, says that while Europe, Japan and Australia contribute to the detection effort, the bulk of such funding stems from the U.S.

To further such detection efforts, the NRC committee report looked at how best to meet Congress' stated NEO detection goals.

A partially funded ground-based survey telescope operating in the Southern Hemisphere could fill much of the detection effort. The Large Synoptic Survey Telescope, a private and U.S. government collaboration, would continually scan the sky from Chile. The NRC committee concluded that the congressionally authorized survey could be complete by 2030 — if the Chilean scope focuses more on NEO detection and less on astrophysics.

In addition, the German Aerospace Agency has selected AsteroidFinder, a 30-centimeter telescope funded through the development stage, for possible launch into low-Earth orbit in 2013. Its proposed one-year mission would specialize in detecting and characterizing "inner-Earth objects" — difficult to detect objects within Earth's orbit.

Of late, asteroid-trackers have been most occupied with 99942 Apophis, a 270-meter asteroid spotted in December 2004. On April 13, 2029, Apophis will pass at an altitude — 36,350 kilometers from Earth's center — that's below the orbit of some human-launched satellites. It will return again in 2036, when its chances of hitting Earth are an estimated 1 in 250,000.

Those are long odds. Even so, last year, the Russian Space Agency let it be known that it was very interested in Apophis, as well as future NEO detection and mitigation strategies. It even called for international cooperation on these issues.

While the U.S. surely would welcome such cooperation, NASA no longer considers Apophis to be a serious threat.

"There's a very slim possibility of an impact in 2036," said Yeomans. He admits if it hit, Apophis could wipe out a couple of big cities, but he remains adamant it will safely miss Earth.

Unlike Hollywood movies where national landmarks seem to magically attract civilization-ending asteroids on final approach, in reality, the geographical odds are in favor of an ocean impact.

Like much in this field, baseline research on ocean impacts was conducted by the military. Cold War research concluded that tsunami-like waves generated by underwater nuclear blasts posed neither a serious threat nor much potential as an offensive weapon. Tsunami expert William Van Dorn of San Diego's Scripps institution of Oceanography showed waves generated by nuclear blasts would likely break far from shore on the ocean's continental shelf. This is known as the "Van Dorn" effect.

Whether ocean impactors would create tsunamis is still debated among planetary scientists; H. Jay Melosh at the University of Arizona's Lunar and Planetary Lab labeled them "an over-rated hazard.".

So, until a real threat is detected and the clock begins its countdown to impact, theoretical debate over asteroid-generated tsunamis are at best premature. The day that threat is confirmed, will the human response be decisive … or quixotic?

"Upon detection of an Apophis-like threat," said Shapiro, "the first thing we'd do is call an international meeting. Hopefully, they wouldn't break down in bickering and we would know where it would hit and whose ox would be gored."

Twenty years out from impact, Chapman says, the object's path across Earth would likely already be known. If its path were on a line that passed through Los Angeles, that would suddenly generate enormous headlines, he notes: A 140-meter asteroid could create an impact radically bigger than the nuclear blast over Hiroshima, effectively wiping out everything from Santa Monica to Pasadena.

If time permitted, researchers would first send out a probe to learn as much as possible about the impactor's physical properties. Once that's done, Chapman says the idea would be to design and launch a "kinetic impactor," or maybe even a couple just in case.

The idea behind a kinetic impact is to hit the NEO in the opposite to its direction of motion, like a locomotive hitting another head on, or its direction of motion, like hitting that locomotive from behind. The idea isn't to smash it, but make it miss its appointment.

"You're trying to either slow down or speed up the asteroid in its solar orbit," said Chapman, "so that it arrives either at Earth's orbit before Earth gets there, or after Earth has already passed."

Gravitational attraction is directly proportional to its mass. So, a spacecraft's proximity to an asteroid can nudge the object out of its original orbit, acting as a so-called "gravity tractor."

Chapman says NASA's current launch capabilities would allow for a one-ton spacecraft to be launched, either an impactor or a tractor.

One idea calls for equipping the kinetic impactor observer spacecraft to also be a gravity tractor, says Chapman. That way, even if the kinetic impact maneuver failed, the gravity tractor could tweak the asteroid's motion away from an Earth-impacting rendezvous.

With 30 years notice of a definitive Apophis-type asteroid impact, Shapiro says the first 20 years might best be spent researching the latest mitigation strategies. Then, the last 10 years could be used to put that plan in motion.

The European Space Agency has done an initial study for Don Quijote, a $500 million demonstration of kinetic impact. The mission, unlike the fanciful title character from Cervantes' classic novel, would be expected to charge asteroids rather than windmills.

The mission would consist of two separate spacecraft. One, nicknamed Sancho, would study the asteroid's makeup and orbit before and after kinetic impact. The other, Hidalgo, would actually smack the asteroid to change its velocity.

The idea would be to prove that humans could deflect an asteroid via a kinetic impactor, says planetary scientist Alan Harris of the German Aerospace Center in Berlin.

Harris chaired the independent advisory panel that selected Don Quijote for further study. He says the mission would be aimed at an asteroid that has not already been deemed a threat to Earth.

While the project remains viable, the Europeans have yet to take it further.

"If we discover something dangerous, the money will flow like water," said Shapiro, who notes that current technology could deflect NEOs of a couple of kilometers in diameter "pretty well."

But if an NEO is 2 or 3 kilometers in diameter and expected to impact Earth within 20 years time, Chapman says the best option is to go nuclear.

In that case, he suggests sending out a series of warhead-laden spacecraft to literally blast the rock out of its Earth-impacting trajectory.

And if all else fails, there's always civil defense.

"But to the best of my knowledge, asteroid-related disasters are not on the disaster contingency list of any country or international organization," said futurist Jim Dator at the University of Hawaii in Manoa.

Even so, he says incorporating asteroid disaster preparedness should be a priority.

Evacuation might very well be the best response for local impacts, says Dator, who was one of the NRC report's co-authors. "If we're prepared," he said, "we will have enough time to get people out. So, we propose planning for these things now. If we wait until that asteroid shows up, it's too late."

If we become vigilant, the odds remain in our favor.

The NRC committee estimates that $50 million in annual funding could meet Congress' NEO detection, cataloguing, and characterization goals while also funding impact mitigation research.

As Shapiro puts it, "I sleep without worrying that my house will burn down. But I do have smoke alarms."

http://www.miller-mccune.com/science-environment/beating-back-space-invaders-14343/

Transcending Depression?

New research indicates Transcendental Meditation may help reduce symptoms of depression, which could also lower the risk of heart disease.

By Elisabeth Best

Researchers find that Transcendental Meditation techniques reduce depressive symptoms. (lisegagne/istockphoto)

With a plethora of research suggesting otherwise, few would argue that meditation yields no health benefits. But the sheer number of claims regarding meditation's benefits is overwhelming: A quick Google search yields about 26,800 articles suggesting there are at least 100.

While arguments that meditation helps you "attain enlightenment" or leads to "increased job satisfaction" are difficult to prove (after all, if it's your job to do something that you're morally opposed to, meditation isn't likely to make it more fulfilling), many of the practice's health advantages have been documented. As a previous Miller-McCune.com article details, research indicates that meditation can protect your brain by preserving your gray matter and helping you pay better attention, among other things.

Two new studies by scientists at Charles Drew University in Los Angeles and University of Hawaii in Kohala suggest that the practice has another health perk: It reduces depression. Sanford Nidich of Iowa's (very-pro Transcendental Meditation) Maharishi University of Management and Andrew Grandinetti of the University of Hawaii found that the Transcendental Meditation technique lowered depressive symptoms, which are associated with cardiac events like heart attacks and strokes even at relatively moderate levels.

The National Institutes of Health paid for the studies using stimulus funding, making this one of the few government-sponsored bits of research into the technique. Transcendental Meditation® — and that's registered service mark, by the way — and "meditation" aren't identical; the former is a subset, and a controversial one, of the latter, and discussions of the technique often founder on disputes about its overseers. Many of the earlier studies that specifically addressed Transcendental Meditation techniques were criticized for poor methodology, and it has been derided as a religion and pseudoscience.

The studies examined African Americans and Native Hawaiians 55 and older who were at risk for cardiovascular disease. The first experiment included 59 African American men and women, and the second tested 53 Native Hawaiian men in Kohala, Hawaii. In both studies, the subjects were randomly assigned to either the Transcendental Meditation program or the "health education control group" and then given the Center for Epidemiological Studies Depression Scale test over nine to 12 months.

Meditating participants showed significant reductions in depressive symptoms compared to the control group. Those who had indications of clinically significant depression at the study's outset and practiced meditation reaped the greatest benefits, with an average reduction in depressive symptoms of 48 percent.

"The importance of reducing depression in the elderly at risk for heart disease cannot be overestimated," Gary P. Kaplan, a clinical associate professor of neurology at NYU School of Medicine, said in a press release. "Any technique not involving extra medication in this population is a welcome addition."

Some 18.8 million men and women suffer from depression in the United States, and approximately 20 percent of older adults suffer some form of depression. Although it has been argued that depression may have an evolutionary upside, few would defend the merits of cardiovascular disease.

These findings indicate that there's a 101st reason to meditate (albeit one that likely already appears on many lists). It's a drug-free way to fight depression, and one that your heart will thank you for later.

http://www.miller-mccune.com/health/transcending-depression-14476/

Home Libraries Provide Huge Educational Advantage

Will your child finish college? The answer may be as close as your bookshelves, or lack thereof.

By Tom Jacobs

Get thee a home library. Research shows that your child's academic success may depend on it. (Doug Miller / flickr.com)

In an era of electronic entertainment, the term "home library" increasingly has the word "video" in the middle. But before parents start giving away books to clear shelf space for DVDs, they'll want to consider the results of a comprehensive new study.

After examining statistics from 27 nations, a group of researchers found the presence of book-lined shelves in the home — and the intellectual environment those volumes reflect — gives children an enormous advantage in school.

"Home library size has a very substantial effect on educational attainment, even adjusting for parents' education, father's occupational status and other family background characteristics," reports the study, recently published in the journal Research in Social Stratification and Mobility. "Growing up in a home with 500 books would propel a child 3.2 years further in education, on average, than would growing up in a similar home with few or no books.

"This is a large effect, both absolutely and in comparison with other influences on education," adds the research team, led by University of Nevada sociologist M.D.R. Evans. "A child from a family rich in books is 19 percentage points more likely to complete university than a comparable child growing up without a home library."

This effect holds true regardless of a nation's wealth, culture or political system, but its intensity varies from country to country. In China, a child whose parents own 500 books will average 6.6 more years of education than a comparable child from a bookless home. In the U.S., the figure is 2.4 years — which is

still highly significant when you consider it's the difference between two years of college and a full four-year degree.

The researchers used data from the World Inequality Study, which pooled information from a series of representative national samples. In most nations, survey participants (a total of more than 73,000 people) were asked to estimate the number of books in their parents' home when they were 14 years old. The scholars compared that figure with other factors influencing educational achievement, including the education levels of one's parents.

"Regardless of how many books the family already has, each addition to a home library helps the children get a little farther in school," they report. "But the gains are not equally great across the entire range. Having books in the home has a greater impact on children from the least-educated families. It is at the bottom, where books are rare, that each additional book matters most."

Evans and her colleagues contend the number of books at home is an excellent reflection of a family's "scholarly culture," which they describe as a "way of life in homes where books are numerous, esteemed, read and enjoyed." An early immersion in such a culture "provides skills and competencies that are useful in school," and/or engenders "a preference for and enjoyment of books and reading that makes schooling congenial, or enjoyable," they conclude.

So mom and dad don't have to be scholars themselves; they just have to read and respect books, and pass that love of reading down to their children. Anna Quindlen was clearly onto something when she wrote: "I would be the most content if my children grew up to be the kind of people who think decorating consists mostly of building enough bookshelves."

http://www.miller-mccune.com/culture-society/home-libraries-provide-huge-educational-advantage-14212/

In Reporting Symptoms, Don't Patients Know Best?

By DENISE GRADY

About six years ago, my doctor gave me some samples of a drug to treat pain from an injury. I took it for a few days and then woke up one morning with a big red blister on my tongue. I'd never had anything like it before, and I wondered if the pills might be to blame. They weren't helping much anyway, so I quit taking them. The blister went away. I mentioned it the next time I saw the doctor, but he said it must have been a coincidence.

Not long after, the drug, Bextra, was taken off the market in the United States. It had been linked to heart attacks and also to a dangerous condition called Stevens-Johnson syndrome — which can cause mouth blisters, among other things.

There's no way to know if Bextra caused my problem, but it seemed like a reasonable idea, and I never understood why my doctor was so quick to dismiss it.

The episode came to mind when I read an article in the March 11 New England Journal of Medicine by Dr. Ethan Basch, an oncologist who treats men with prostate cancer and does research at Memorial Sloan-Kettering Cancer Center in New York. He argues that doctors, researchers, drug makers and regulators should pay more attention to patients' firsthand reports of their symptoms while they take medicines, because their information could help to guide treatment and research, and uncover safety problems.

Direct reports from patients are rarely used during drug approval or in clinical trials, Dr. Basch says. If patients' comments are sought at all, they are usually filtered through doctors and nurses, who write their own impressions of what the patients are feeling.

In addition, he writes, doctors and nurses "systematically downgrade the severity of patients' symptoms" and sometimes miss side effects altogether. One result is "preventable adverse events" — for instance, suicidal thoughts in young people taking antidepressants, or severe constipation in people taking a drug for irritable bowel syndrome, both of which might have been detected earlier if symptoms had been systematically tracked.

Dr. Basch, 42, said he first became interested in this subject around 2003, when he attended a presentation of the results from a study of a new cancer drug. The researchers had not found fatigue to be much of a problem, but other doctors in the audience said their patients had suffered terribly from it while on the drug, so much that some had to quit taking it. Somehow, the study had completely missed that finding.

Intrigued, Dr. Basch began to study people receiving chemotherapy, and to compare symptom reports by patients with those from doctors and nurses. The differences were striking. For every problem — fatigue, nausea, appetite loss, vomiting, diarrhea, constipation — patients reported it earlier and more often than did doctors and nurses.

Why does this happen so often? There's no simple answer.

"There is a sensibility among some old-school clinicians that they have a better sense of their patients' experience than patients do themselves," Dr. Basch said. "But doctors and nurses bring their own biases to the evaluation. They might say, 'Mrs. Smith always exaggerates her fatigue — she says 9, but I rate it a 6.' "

Three clinicians asked to rate the same patient's nausea will often give three different scores, he said.

The tendency to downgrade symptoms may be based on the doctor's knowledge that a patient is in the early stages of an illness and could be much worse. Or the doctor may be making mental comparisons

with other patients who are sicker: "You think your nausea is bad, you should have seen the patient I saw this morning, let me tell you," as Dr. Basch put it.

Sometimes, he said, the downgrading may reflect wishful thinking by doctors, who may think that a certain drug will help patients and don't want to take them off it.

Another reason, Dr. Basch said, is that "we live in a litigious society." Describing a problem in a chart creates a record that the doctor may have to act on. "There may be a defensive lack of documentation," he said.

But he went on, "Increasingly, scientifically, we believe that whatever Mrs. Smith says is what Mrs. Smith is experiencing, and it's important to know how patients themselves feel about how they're doing."

But the doctor's perspective is important, too, he said, and he suggested that symptoms be rated the way the Web site Metacritic rates movies: it posts two types of score, one from the public and one from professional critics.

"I want both," Dr. Basch said.

Sometimes the information is lost altogether, when doctors and patients, distracted by test results and treatment plans, forget to discuss symptoms. "This is where a checklist could help," he said.

Mistakes and distortions in reporting symptoms can be compounded in studies, where one researcher collects the information, another retrieves it from the chart and enters it into the study record, and still others evaluate it. The results can be like playing telephone.

"There are multiple steps of transcription and information filtering," Dr. Basch said. "We know there are omissions and misinterpretations at every step of data transmission. We know information gets lost."

Patients may also tell doctors one thing and then write another in their own reports, Dr. Basch said; most say their written accounts are closer to reality.

The idea of not telling doctors the whole truth struck a guilty chord with me. Growing up, I got weekly hay fever shots that I don't think helped me at all. But I kept hoping they would, and the doctor was very kind, so whenever he asked if I was feeling better, I said yes, even though I actually spent most of August and September sneezing my brains out. This charade went on for years. Would I have been more honest in a diary? Maybe.

The Food and Drug Administration does have a system, Medwatch, that lets doctors and patients report problems that they think are adverse events from drugs already on the market. But it's a passive system that waits for reports instead of actively surveying patients. Many people don't know about it, and it has failed to catch some important adverse events, Dr. Basch said.

A better approach, he says, would be to have large numbers of patients filling out questionnaires before and after drugs are marketed. In an e-mail message, he said, "For example, in the postmarket setting we could ask 5,000 selected patients starting Bextra to report monthly (you would have reported the mouth sore without knowing if relevant or not, and this would then be pieced together with other reports)."

If patients had been asked to report their symptoms while the drug was still being tested, he added, problems might have been detected before it was even approved.

Gathering the patients' information would cost money, but not much compared with the overall cost of drug development and clinical trials, Dr. Basch said, adding that it would also save money by heading off potentially expensive problems.

Dr. Basch said he was surprised to find drug companies enthusiastic about his research.

"You'd think it would not be appealing to them, because you're generating more adverse events," he said. "But the grade of the data is superior. You catch a lot of baseline symptoms before people start the drug, so you can understand what's probably related to the drug versus what's related to the patient's arthritis or whatever they had before the trial."

Although the regular reporting may sound like a nuisance for patients, researchers find that many people are eager to have their say. In one study, Dr. Basch said, subjects "typed volumes" into a small online text box, even though they couldn't see what they were typing after the first few sentences.

"We'd get two pages of stream of consciousness," Dr. Basch said. "The clinicians became overwhelmed."

The challenge is to create surveys that focus on what's relevant — and yet still provide a way to describe symptoms the researchers hadn't anticipated. Dr. Basch is working on it, for the National Cancer Institute.

"Patients have a lot to say," Dr. Basch said.

We're just waiting for someone to listen.

http://www.nytimes.com/2010/04/13/health/13seco.html?nl=health&emc=healthupdateema1

Hallucinogens Have Doctors Tuning In Again

By JOHN TIERNEY

As a retired clinical psychologist, Clark Martin was well acquainted with traditional treatments for depression, but his own case seemed untreatable as he struggled through chemotherapy and other grueling regimens for kidney cancer. Counseling seemed futile to him. So did the antidepressant pills he tried.

Nothing had any lasting effect until, at the age of 65, he had his first psychedelic experience. He left his home in Vancouver, Wash., to take part in an experiment at Johns Hopkins medical school involving psilocybin, the psychoactive ingredient found in certain mushrooms.

Scientists are taking a new look at hallucinogens, which became taboo among regulators after enthusiasts like Timothy Leary promoted them in the 1960s with the slogan "Turn on, tune in, drop out." Now, using rigorous protocols and safeguards, scientists have won permission to study once again the drugs' potential for treating mental problems and illuminating the nature of consciousness.

After taking the hallucinogen, Dr. Martin put on an eye mask and headphones, and lay on a couch listening to classical music as he contemplated the universe.

"All of a sudden, everything familiar started evaporating," he recalled. "Imagine you fall off a boat out in the open ocean, and you turn around, and the boat is gone. And then the water's gone. And then you're gone."

Today, more than a year later, Dr. Martin credits that six-hour experience with helping him overcome his depression and profoundly transforming his relationships with his daughter and friends. He ranks it among the most meaningful events of his life, which makes him a fairly typical member of a growing club of experimental subjects.

Researchers from around the world are gathering this week in San Jose, Calif., for the largest conference on psychedelic science held in the United States in four decades. They plan to discuss studies of psilocybin and other psychedelics for treating depression in cancer patients, obsessive-compulsive disorder, end-of-life anxiety, post-traumatic stress disorder and addiction to drugs or alcohol.

The results so far are encouraging but also preliminary, and researchers caution against reading too much into these small-scale studies. They do not want to repeat the mistakes of the 1960s, when some scientists-turned-evangelists exaggerated their understanding of the drugs' risks and benefits.

Because reactions to hallucinogens can vary so much depending on the setting, experimenters and review boards have developed guidelines to set up a comfortable environment with expert monitors in the room to deal with adverse reactions. They have established standard protocols so that the drugs' effects can be gauged more accurately, and they have also directly observed the drugs' effects by scanning the brains of people under the influence of hallucinogens.

Scientists are especially intrigued by the similarities between hallucinogenic experiences and the life-changing revelations reported throughout history by religious mystics and those who meditate. These similarities have been identified in neural imaging studies conducted by Swiss researchers and in experiments led by Roland Griffiths, a professor of behavioral biology at Johns Hopkins.

In one of Dr. Griffiths's first studies, involving 36 people with no serious physical or emotional problems, he and colleagues found that psilocybin could induce what the experimental subjects described as a profound spiritual experience with lasting positive effects for most of them. None had had any previous experience with hallucinogens, and none were even sure what drug was being administered.

To make the experiment double-blind, neither the subjects nor the two experts monitoring them knew whether the subjects were receiving a placebo, psilocybin or another drug like Ritalin, nicotine, caffeine or an amphetamine. Although veterans of the '60s psychedelic culture may have a hard time believing it, Dr. Griffiths said that even the monitors sometimes could not tell from the reactions whether the person had taken psilocybin or Ritalin.

The monitors sometimes had to console people through periods of anxiety, Dr. Griffiths said, but these were generally short-lived, and none of the people reported any serious negative effects. In a survey conducted two months later, the people who received psilocybin reported significantly more improvements in their general feelings and behavior than did the members of the control group.

The findings were repeated in another follow-up survey, taken 14 months after the experiment. At that point most of the psilocybin subjects once again expressed more satisfaction with their lives and rated the experience as one of the five most meaningful events of their lives.

Since that study, which was published in 2008, Dr. Griffiths and his colleagues have gone on to give psilocybin to people dealing with cancer and depression, like Dr. Martin, the retired psychologist from Vancouver. Dr. Martin's experience is fairly typical, Dr. Griffiths said: an improved outlook on life after an experience in which the boundaries between the self and others disappear.

In interviews, Dr. Martin and other subjects described their egos and bodies vanishing as they felt part of some larger state of consciousness in which their personal worries and insecurities vanished. They found themselves reviewing past relationships with lovers and relatives with a new sense of empathy.

"It was a whole personality shift for me," Dr. Martin said. "I wasn't any longer attached to my performance and trying to control things. I could see that the really good things in life will happen if you just show up and share your natural enthusiasms with people. You have a feeling of attunement with other people."

The subjects' reports mirrored so closely the accounts of religious mystical experiences, Dr. Griffiths said, that it seems likely the human brain is wired to undergo these "unitive" experiences, perhaps because of some evolutionary advantage.

"This feeling that we're all in it together may have benefited communities by encouraging reciprocal generosity," Dr. Griffiths said. "On the other hand, universal love isn't always adaptive, either."

Although federal regulators have resumed granting approval for controlled experiments with psychedelics, there has been little public money granted for the research, which is being conducted at Hopkins, the University of Arizona; Harvard; New York University; the University of California, Los Angeles; and other places.

The work has been supported by nonprofit groups like the Heffter Research Institute and MAPS, the Multidisciplinary Association for Psychedelic Studies.

"There's this coming together of science and spirituality," said Rick Doblin, the executive director of MAPS. "We're hoping that the mainstream and the psychedelic community can meet in the middle and avoid another culture war. Thanks to changes over the last 40 years in the social acceptance of the hospice movement and yoga and meditation, our culture is much more receptive now, and we're showing that these drugs can provide benefits that current treatments can't."

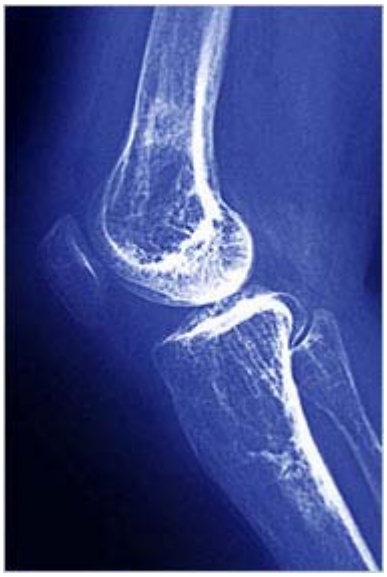
Researchers are reporting preliminary success in using psilocybin to ease the anxiety of patients with terminal illnesses. Dr. Charles S. Grob, a psychiatrist who is involved in an experiment at U.C.L.A., describes it as "existential medicine" that helps dying people overcome fear, panic and depression.

"Under the influences of hallucinogens," Dr. Grob writes, "individuals transcend their primary identification with their bodies and experience ego-free states before the time of their actual physical demise, and return with a new perspective and profound acceptance of the life constant: change."

http://www.nytimes.com/2010/04/12/science/12psychedelics.html?ref=research

Cancer Survival Demands Steady Progress

By JANE E. BRODY



I continue to find reasons to be hopeful that one day, though probably not within my lifetime, medical researchers will overcome the challenges that thwart efforts to cure or at least contain most cancers, especially the more common ones. My guarded optimism stems from the progress made in devising treatments for several less well-known malignancies. For many patients with cancers like chronic lymphoma, chronic myelocytic leukemia and now multiple myeloma, longevity lies in the ability of science to remain one step ahead of the malignancy by unraveling its genetic and molecular underpinnings and producing treatments tailored to counter them.

One Patient's Struggle

Janet Battaile, 63, now in her 10th year with multiple myeloma, said her retirement-age oncologist at the Mayo Clinic in Rochester, Minn., Dr. Philip R. Greipp, told her, "I can't bring myself to retire because it's too exciting." Ms. Battaile (pronounced battle), a former reporter and editor for The New York Times, is a living testimonial for Dr. Greipp's enthusiasm. At the time of diagnosis, she said in an interview, "the average life expectancy for people with my disease was two or three years." Though living in Maryland, she was advised to consult the experts at Mayo, who have long been at the forefront of refining the diagnostic features of myelomas and testing therapies based on the particular characteristics of patients and their cancers.

In December, the clinic's 22-member team of myeloma experts issued new treatment guidelines for multiple myeloma, the second most common blood-based malignancy (after lymphoma). It affects about 20,000 new patients each year.

In its updated review of management strategies, published in The Mayo Clinic Proceedings, the team noted that "during the past decade, considerable progress has been made in our understanding of the disease process and factors that influence outcome, along with development of new drugs that are highly effective in controlling the disease and prolonging survival without compromising quality of life."

A major advance, the team stated, has been unraveling the genetic characteristics that underlie the disease and how these factors influence patient outcome. Along with other previously known factors that affect the success of treatment, the newly identified genetic abnormalities are making it possible to predict how a patient will respond to treatment and to tailor therapy "in an individualized manner."

Ms. Battaile, for example, did not have one genetic characteristic — a missing piece of Chromosome 13 in her cancer cells — that is associated with more aggressive disease and poorer chances of survival. She was treated at first with thalidomide, an orally administered immune stimulant that also blocks blood flow to tumor cells. Better known for causing birth defects in the children of women who took it for morning sickness, it has found a second life as a cancer drug. It kept her disease at bay for three years.

After a relapse, Ms. Battaile underwent a stem cell transplant using her own stored cells. A second relapse a year later was treated with bortezomib (Velcade), a drug that inhibits division of plasma cells, and dexamethasone, a steroid, which worked for two more years. Then came treatment with a successor to thalidomide, lenalidomide (Revlimid), also taken orally, which gave her three more years in remission.

Now, faced with a fourth relapse, she is battling her insurance company, United Healthcare, to cover her participation in a trial of another specially designed cousin of thalidomide, pomalidomide (Actimid).

"I hope this third-generation drug will work for me, but even if it doesn't, there are amazing drugs out there and so many new things coming up," Ms. Battaile said. She noted that through the Multiple Myeloma Research Consortium — started by Kathy Giusti, herself a myeloma patient — "about 15 medical centers are doing collaborative research" on new treatments.

Symptoms and Diagnosis

Multiple myeloma is a cancer of the plasma cells in the bone marrow, a vital part of the immune system. When these cells grow out of control, they crowd out normal blood-forming cells, causing anemia and an increased risk of infection, bleeding and bruising. But the most common symptom of the disease, bone pain and fractures, results from a protein produced by myeloma cells that causes bones to dissolve.

Thus, the first symptom experienced by Dr. Martin Fisher, a retired dentist living in Brooklyn, was extreme pain, "like a third-rail electric shock," caused by bone damage. After the diagnosis, in 2007, Dr. Fisher was treated for six months with Revlimid and dexamethasone, which put his disease in remission for nine months.

His second drug, Velcade, given by intravenous injection, has kept him healthy so far. Last October, stem cells were harvested from his blood and frozen in liquid nitrogen in case they are needed in the future to replenish normal bone marrow cells. He is also treated with medication to counter bone loss.

Myeloma is a disease of many stages, including one called smoldering or somnolent that is rarely treated unless it starts to progress. Some patients have no symptoms; their diagnosis may follow a routine test revealing low levels of blood cells, high levels of calcium or excess protein in the urine. The most common symptoms are bone pain, weakness, shortness of breath, frequent infections with prolonged recovery, excessive bruising or bleeding, unusual thirst, loss of appetite, severe constipation and nerve pain.

Diagnostic tests typically include blood and urine analyses, CT scan, M.R.I., PET scan and bone marrow biopsy, which together can reveal the extent of disease. In addition, genetic studies are done to help determine a patient's chances of prolonged survival. Taken together, the results can help doctors choose the most effective therapies, based largely on the Mayo Clinic guidelines.

According to the Mayo experts, all patients with multiple myeloma should undergo a risk assessment before having treatment. About 75 percent of new patients face a "standard risk" of survival based primarily on the genetic characteristics of their cancer cells, they wrote. Like Dr. Fisher, their treatment could start with the oral drug Revlimid or the intravenous treatment, Velcade, followed by stem cell collection.

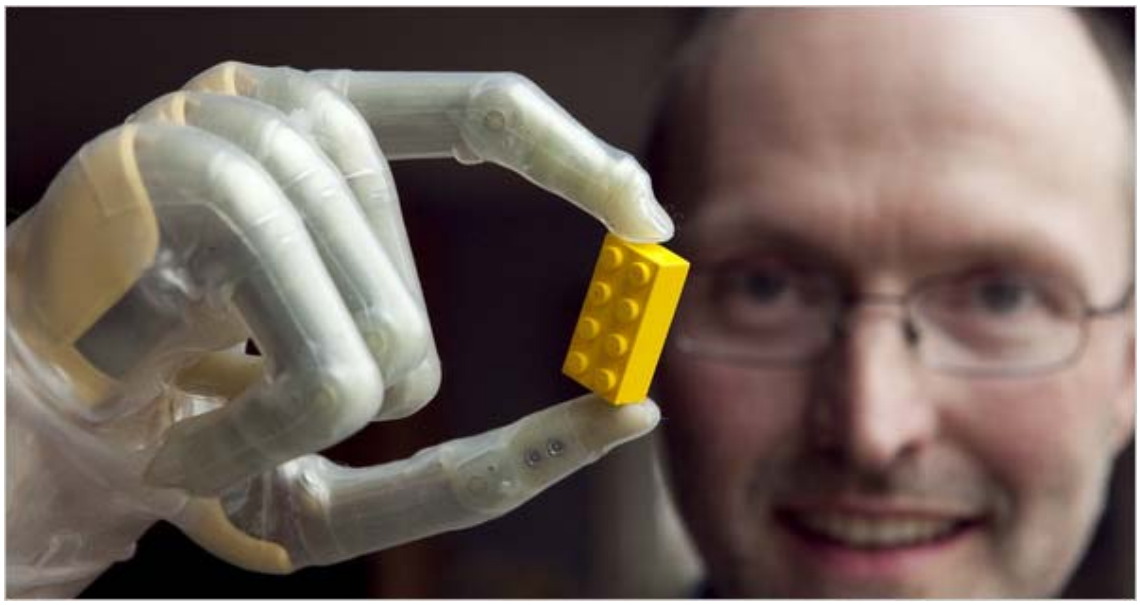
The remaining 25 percent have a more aggressive version of the disease, which the experts said should be treated more aggressively from the start, with Velcade followed by stem cell collection. As new drugs come along, no doubt these regimens will be revised as well. With no cure in hand, the goal for most patients with multiple myeloma is to keep treating relapses as long as treatments are available.

But for new treatments to be developed, patients and their insurers must be willing to participate in well-designed clinical trials. Ms. Battaile is willing. But what about her insurance company?

http://www.nytimes.com/2010/04/13/health/13brod.html?ref=research

Grabbing Gracefully, With Replacement Fingers

By ANNE EISENBERG



ERIC JONES sat in a middle seat on a recent flight from the New York area to Florida, but he wasn't complaining. Instead, he was quietly enjoying actions that many other people might take for granted, like taking a cup of coffee from the flight attendant or changing the channel on his video monitor.

These simple movements were lost to Mr. Jones when the fingers and thumb on his right hand were amputated three years ago. But now he has a prosthetic replacement: a set of motorized digits that can clasp cans, flimsy plastic water bottles or even thin slips of paper.

"Pouring a can of soda into a cup — that is a mundane daily action for most people, but to me it is a very big deal," said Mr. Jones, who lives with his family in Mamaroneck, N.Y. "I slip my bionic fingers on like a glove, and then I have five moveable fingers to grasp things. It's wonderful to have regained these functions."

Mr. Jones's prosthesis, called ProDigits, is made by Touch Bionics in Livingston, Scotland. The device can replace any or all fingers on a hand; each replacement digit has a tiny motor and gear box mounted at the base. Movement is controlled by a computer chip in the prosthesis.

ProDigits was released commercially last December, said Stuart Mead, the chief executive of Touch Bionics. About 60 patients have been fitted worldwide, he said, and some have been wearing it for three or four years. The cost is $60,000 to $75,000, including fitting and occupational therapy.

The technology used by Touch Bionics is based on prostheses that the National Health Service in Scotland developed for children there who suffered effects of the drug thalidomide, he said. The company, founded in 2003 as a spin-off from the health service, adapted the technology from custom prostheses into ones that could be produced commercially. It had funding from investors including Archangel Informal Investment and the Scottish Co-investment Fund.

The company's first product, released two and a half years ago, was the i-Limb Hand, an entire hand that opens and closes and can grasp objects. It has been a success, Mr. Mead said, with more than 1,200 patients fitted with it in 40 countries.

The company then turned to creating ProDigits. “We decided to develop the technology to mechanize not just a hand, but individual fingers,” he said. “We always knew that it would be the bigger market — more people lose individual digits than lose entire hands — but also the most challenging technically."

The individual, motorized fingers are a new and promising development in the field, made possible in part by miniaturization of components, said John Miguelez, founder and president of Advanced Arm Dynamics of Redondo Beach, Calif. The company specializes in prosthetics for hands and arms for, among others, soldiers returning from Afghanistan and Iraq at Walter Reed Hospital in Washington. “More voltage and current can be applied to the motors,” he said, “creating increased speed and force.”

Dr. Douglas G. Smith, a professor of orthopedic surgery at the University of Washington and Harborview Medical Center in Seattle, agreed. “Motors are getting stronger and smaller, and the batteries are thinner and smaller, too,” he said, making it possible to fit mechanical components into the space formerly occupied by a finger.

Eric Jones has been wearing a ProDigits prosthetic for 18 months. The artificial fingers are slightly larger than the originals, but that is not a problem, he said. “The fingers look cool,” he said. A switch on the side turns the power on and off, and he charges the digits overnight, as he would a cellphone

Mr. Jones starts the action by flexing or relaxing a muscle in the palm of his hand. Sensors built into the prosthesis pick up the signals sent by the muscles and send the message to the computer chip that controls the motor. The artificial fingers stop closing when they detect resistance, said Karl Lindborg, professional services director for Touch Bionics.

A single, outstretched prosthetic finger can operate a microwave oven or a cellphone; a finger and a thumb can hold a chess piece; three or more fingers can grasp a sphere. Mr. Jones said the fingers also provided a touch of class. “I can grasp a wine glass with my bionic fingers,” he said. “My pinkie and ring finger curve under the bowl very elegantly.”

PRODIGITS may be opened and closed not only by sensors that pick up muscle contractions, but also by dime-size pads put at the base of the fingers to detect pressure exerted by remnant bone. “If you can wiggle the bones in your palm, Mr. Miguelez explained, “that wiggle can be translated into controls to open and close the fingers.”

Robert J. Green of Bel Air, Md., who lost the fingers and thumb on his dominant left hand last year, operates his ProDigits in just that way. He uses his prosthetic fingers, for example, to write with a pen or a pencil. The artificial digits have actually improved his handwriting, he said, and he likes their appearance, too. “I look something like Arnold Schwarzenegger in ‘The Terminator,’ ” he said.

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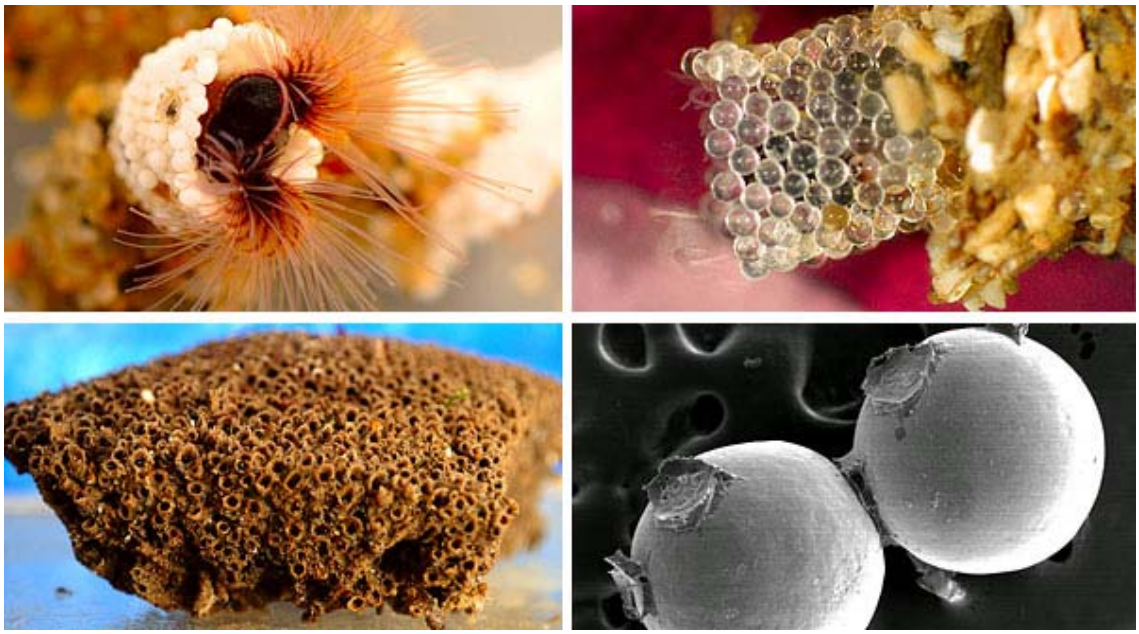
http://www.nytimes.com/2010/04/11/business/11novel.html?ref=research

Studying Sea Life for a Glue That Mends People

By HENRY FOUNTAIN



SALT LAKE CITY — Along one wall of Russell J. Stewart's laboratory at the University of Utah sits a saltwater tank containing a strange object: a rock-hard lump the size of a soccer ball, riddled with hundreds of small holes.

It has the look of something that fell from outer space, but its origins are earthly, the intertidal waters of the California coast. It's a home of sorts, occupied by a colony of Phragmatopoma californica, otherwise known as the sandcastle worm.

Actually, it's more of a condominium complex. Each hole is the entrance to a separate tube, built one upon another by worm after worm.

P. californica is a master mason, fashioning its tube, a shelter that it never leaves, from grains of sand and tiny bits of scavenged shell. But it doesn't slather on the mortar like a bricklayer. Rather, using a specialized organ on its head, it produces a microscopic dab or two of glue that it places, just so, on the existing structure. Then it wiggles a new grain into place and lets it set.

What is most remarkable — and the reason these worms are in Dr. Stewart's lab, far from their native habitat — is that it does all this underwater.

"Man-made adhesives are very impressive," said Dr. Stewart, an associate professor of bioengineering at the university. "You can glue airplanes together with them. But this animal has been gluing things together underwater for several hundred million years, which we still can't do."

Dr. Stewart is one of a handful of researchers around the country who are developing adhesives that work in wet conditions, with worms, mussels, barnacles and other marine creatures as their guide. While there are many possible applications — the Navy, for one, has a natural interest in the research, and finances some of it — the biggest goal is to make glues for use in the ultimate wet environment: the human body.

It is too early to declare the researchers' work a success, but they are testing adhesives on animal bones and other tissues and are optimistic that their approaches will work. "I would have moved on to

something else if I didn't think so," said Phillip B. Messersmith, a Northwestern University professor who is developing adhesives based on those made by mussels and is testing whether they can be used to repair tears in amniotic sacs, among other applications.

While some skin sealants — mostly of the cyanoacrylate, or superglue, variety — are on the market, their effectiveness is limited. They often cannot be used, for example, on incisions where the skin is pulled or stretched, or must be used in tandem with sutures or staples. Adhesives strong enough to hold skin together under tension, or repair bone or other internal tissues — without inviting attack by the body's immune system — have eluded researchers.

Nature shows how it can be done, said J. Herbert Waite, a professor at the University of California, Santa Barbara, who did much of the early work of identifying the adhesives that mussels use to stick to rocks and other surfaces. But researchers should view nature's approach as a general guide, he said, rather than a precise pathway.

"In my view of bioinspired research or materials, I almost always don't think it's safe to be slavishly wed to the specific chemistry," Dr. Waite said, "but rather to distill the important concepts that can then be mimicked."

So the goal of these researchers is not to duplicate natural adhesives that work well underwater, but to imitate them and make glues that are even better suited for humans. "We want to take elements of the structural adhesives that chemists have made and combine them with the unique elements that nature has used," Dr. Stewart said.

Synthetic adhesives might not only work better, but they should also be able to be produced in large quantities. Marine organisms make their glues in very small amounts — the typical dollop from a sandcastle worm, for example, is on the order of 100 picoliters. Even if it could somehow be collected before it set, it would take roughly 50 million dollops to make a teaspoon.

"At the end of the day, the single biggest reason to do this is you can get more stuff," said Jonathan Wilker, an associate professor of inorganic chemistry at Purdue University who works on analogues of mussel adhesives and studies oysters, barnacles and other organisms as well.

But there are several hurdles to making glues that work underwater, Dr. Wilker said. "One is that whenever the surface is really wet, you're going to be bonding to the surface layer of water, rather than the surface itself. So it's going to lift off."

Another is that in order to cure, glues need a little water or none at all — they need to dry out. Most will not cure underwater, but those that do tend to set as soon as they are out of the container, overwhelmed by all the water. Beyond that, Dr. Messersmith said, as with any glue, "adhesion is a complicated thing, even when it appears very simple."

"There are events going on at the interface of adhesive and surface, and there's the strength of the adhesive itself," he said. "If you have one but not the other, you're nowhere, really, because somewhere you'll have a weak point in the system and it will break."

The sandcastle worm resolves the underwater issues neatly. The proteins that are the basis of its adhesive contain phosphate and amine groups, molecular fragments that are well-known adhesion promoters. "Those side chains are probably what helps it wet the surface in the first place," Dr. Stewart said.

The worm produces the glue in two parts, with different proteins and side groups in each. The two are made separately in a gland, and, like an epoxy, come together only as they are secreted. When they mix they form a compound that, even though water based, does not dissolve. The glue sets initially in about 30 seconds, probably triggered by the abrupt change in acidity — it is far more acidic than seawater, Dr.

Stewart said. Over the next six hours, the adhesive hardens completely as cross-links form between the proteins. “It turns into this thing that has the consistency of shoe leather,” he said. “It’s still flexible but very tough.”

Like other researchers, Dr. Stewart decided to use synthetic polymers as the backbone for his adhesive, and to ignore many other aspects of the worm’s chemistry. “Who says the exact amino acids are important?” he said, citing one example. “That’s just something the worm is stuck with.

“On the other hand, if we just decide maybe the real important part is the side chains, that’s very simple to copy with a synthetic polymer.”

Dr. Stewart’s adhesive forms what chemists call a complex coacervate, a kind of molecular circling of the wagons against water. So it’s an injectable, immiscible liquid. “Perfect for a water-borne underwater adhesive,” he said. But unlike the worm, he can tweak the chemistry to make it cure faster or slower depending on the application.

Dr. Stewart says the glue appears to be strong enough to repair fractures in craniofacial bones, an application he is studying with rats. He also thinks it may be useful for repairing corneal incisions, and for setting other bone fractures more precisely, by anchoring small pieces that cannot be secured with pins or screws. “But we don’t have any fantasies about gluing femurs back together,” he said.

Dr. Stewart has worked with sandcastle worms since 2004, and recently began studying another group of tube-building creatures, caddisfly larvae. Fly fishermen are familiar with these organisms, which inhabit the bottom of freshwater streams until the flies hatch.

Caddisflies build their tubes in the same way as P. californica, but with a much different glue — strands of silk that attach to the bits of sand, tying them all together. At some evolutionary point tens of millions of years ago the flies were related to silkworms, so the fact that they spin silk is not too surprising. “Except it’s a sticky, underwater silk,” Dr. Stewart said.

He is just beginning to characterize the silk and understand how the caddisflies produce it, but the eventual goal is the same as with the sandcastle worm.

“We want to try to mimic it someday soon, and spin fibers underwater,” he said. “Waterborne polymers underwater, which might have some medical application.” A big concern with any synthetic glue, no matter how closely it mimics one from a living creature, is biocompatibility. “We might be able to solve the adhesion problems,” Dr. Messersmith said, “but then we confront the biological problems.”

There are medical superglues that do form strong bonds, he said, “but those materials are highly immunogenic.” Dr. Stewart said that so far he has seen little inflammation in the rat studies, and little if any evidence of toxicity or inhibition of bone healing.

But he noted that since one goal would be to have the glue eventually degrade, some response by the body would seem to be necessary. With a bone glue, for example, “you want it to degrade roughly at the same rate as the bone regrows,” he said. So in degradable versions of his synthetic polymer glues, Dr. Stewart actually adds back proteins that can be attacked and broken down by specialized cells.

“You wouldn’t want some plastic glue in your bones for the rest of your life,” he said.

http://www.nytimes.com/2010/04/13/science/13adhesive.html?ref=science

Riddle? Yes. Enigma? Sure. Documentary?

By MELENA RYZIK

Is there an art-world equivalent of crying wolf? If so, Banksy has probably done it.

Banksy, the pseudonymous British street artist, has built his reputation on stunts — like inserting his own work among the masters' in museums — that taunted the market in which his pieces sold for millions. But with his latest project, the documentary "Exit Through the Gift Shop," he is laboring to convince audiences that he's playing it straight.

The film, which opens on Friday in New York and California, follows Thierry Guetta, an amiable Frenchman who lives in Los Angeles and videotapes everything — or so we're told. When Mr. Guetta and camera eventually tunnel into the world of street art — he was introduced to the scene through a cousin, the Parisian artist Space Invader — his enthusiastic recording melds nicely with the artists' desire to have their otherwise ephemeral work documented. He captures that scene's luminaries, like Shepard Fairey and Swoon working on rooftops and in alleys under cover of night.

It seems to be a natural fit for a documentary. But Mr. Guetta's nonstop footage turns out to be unwatched (he has boxes and boxes of unlabeled tapes) and even when he cobbles something together after years of shooting, largely unwatchable. "He was maybe just somebody with mental problems who happened to have a camera," Banksy says in the film.

So Banksy decides to take control of the material himself — or so we're told. Robbed of his camera and prodded by Banksy, Mr. Guetta, meanwhile, morphs into a street artist, inventing an alter ego called Mr. Brainwash and staging an opening exhibition in Los Angeles that turns him into an overnight sensation, all of which is captured in "Exit Through the Gift Shop."

The film itself was a sensation at the Sundance Film Festival this year, especially after Banksy works (including stenciled images of a cameraman shooting a flower) began popping up on storefront walls in Park City, Utah. At the Berlin International Film Festival in February, he called a news conference, only to cancel it at the last minute and show a video, in which he appears in shadows, cloaked in a hoodie and with his voice disguised, as he does in the film, to vouch for its veracity.

The thing is, both Banksy and Mr. Guetta are pretty unreliable narrators. The immediate scuttlebutt was that Mr. Guetta either didn't exist at all, that he was in cahoots with Banksy or that he was Banksy himself. Even aficionados of the scene were unsure what to think.

"Is it real?" asked Andrew Michael Ford, the director of the Last Rites Gallery in New York and an independent curator who has worked with street artists. "Is it a hoax?" The film, he added, offered so many circular possibilities that it was "tough to comment on it directly."

But everyone involved has vouched for it. "Of course the more I try to say it's all true, the more it sounds like I'm somehow perpetuating the conspiracy," said Mr. Fairey, a friend of Banksy's.

Mr. Guetta did not respond to a request for comment — though he does seem to exist and to be as idiosyncratic as he is in the film.

"I don't know why so many people have been fooled into thinking this film is fake," Banksy, or someone purporting to be he, wrote in an e-mail message from Los Angeles, where the film had a premiere on Monday night. "It's a true story from real footage. Does it bother me people don't believe it? I could never have written a script this funny."

As Marc Schiller, the proprietor of the street-art-enthusiast Web site woostercollective.com, put it, "It is one of these cases where Banksy has found in his art that truth is stranger than the best fiction you can imagine."

Both Mr. Schiller and Mr. Fairey said that "Exit Through the Gift Shop" was of a piece with Banksy's site-specific work, like a guerilla Guantánamo installation at Disneyland and an ersatz pet store in the West Village.

"Banksy is making a movie that's 100 percent like a Banksy exhibition," Mr. Schiller said. He called it a prank, then corrected himself, labeling it "a Banksy event."

Mr. Fairey, who said that he and Banksy were in the same situation in trying to recover the footage of their career-defining moments from Mr. Guetta, added: "This is a way for Banksy to tell his story but at the same time critique the street art phenomenon. It's perfectly aligned with how he does things. But it was a very shrewd adaptation to a problem that existed, not something premeditated."

Banksy said it was a stretch to call the film his directorial debut.

"I didn't take the director's credit because I thought that was a bit unfair," he wrote. "The editors essentially built the whole thing, and I deferred to the producer on the scenes I feature in — otherwise I'd just have picked the shots where my silhouette looks good."

Still, he added, making it was "an all-consuming process, and my vandalism has certainly suffered as a result." And Mr. Schiller said that Banksy was "involved in the smallest little detail of every aspect of this production and of the marketing of the film." (Banksy said he financed it himself; new graffiti appeared in Los Angeles for the premiere.)

The surprise, Mr. Ford said, is in how quickly non-art-world audiences were to accept the notion of graffiti as a major spectacle.

"It's one of those things where I'm not quite sure what I'm here for, but I'm excited about it," a fan in line for Mr. Brainwash's 2008 show, where works sold for tens of thousands — still far less than Banksy's prices — says in the film.

"Banksy cares very much about selling art and what people think of him," Mr. Fairey said, "and he understands thoroughly that people's fantasy is a far better marketing tool than reality."

Ultimately, wondering whether "Exit Through the Gift Shop" is real or not may be moot. It certainly asks real questions: about the value of authenticity, financially and aesthetically; about what it means to be a superstar in a subculture built on shunning the mainstream; about how sensibly that culture judges, and monetizes, talent.

Asked whether a film that takes shots at the commercialization of street art would devalue his own work, Banksy wrote: "It seemed fitting that a film questioning the art world was paid for with proceeds directly from the art world. Maybe it should have been called 'Don't Bite the Hand that Feeds You.' "

http://www.nytimes.com/2010/04/14/movies/14banksy.html?ref=design

Artful Way to Expand a Museum

By ROBERTA SMITH

To expand downtown or not to expand downtown, this is the nagging, seemingly unanswerable question facing the Whitney Museum of American Art. The museum won't know the right answer for sure until it tries it; if it doesn't, it will never know. But it is right in asserting that it must do something to remain viable in what has become a cutthroat competition for museum visitors in New York.

Its 1966 Marcel Breuer building has all the disadvantages of starchitecture and few if any of the rewards. Even in a country where museums are rarely designed with art in mind, it stands out as relentlessly unforgiving to works of all styles and periods. If the stone floor doesn't kill, the oppressive overhead concrete structure almost undoubtedly will.

Unlike the Guggenheim, the Breuer building is not considered a must-see destination by tourists, regardless of what shows are on view. And Breuer's Brutalist bunker is not getting better with age, or inspiring artists to come up with new, exciting uses for it as Wright's spiral is. At the same time, the Whitney doesn't have enough space to have a big chunk of its collection serve as the draw, which is the case at the Museum of Modern Art and the Metropolitan Museum of Art.

So a second site seems like a good idea. But is the lower West Side the way to go? The west end of the meatpacking district is already something of a zoo, like SoHo. Which is to say that tourists are probably as thick there as in any other part of our increasingly Disneyfied city. But are they shoppers or art lovers? And even if they love art, will they pay to see it, when so much is available for free in Chelsea's many art galleries? Attendance at the Dia Center for the Arts, which used to be on West 22nd Street, dropped as the number of neighborhood galleries increased.

The Whitney doesn't just need more gallery space, it also needs great or even just good gallery space. This commodity is in short supply in New York these days. The New Museum's galleries are generally viewed as horribly proportioned and oppressive in their lack of windows. The Modern's new building is, simply put, one of the great cultural tragedies of 21st-century New York.

The Whitney's design for its downtown site is by Renzo Piano, whose track record for museums hasn't been too great lately. His Broad building at the Los Angeles County Museum of Art is SoHo-Chelsea chic times three. His atrium at the Morgan Library and Museum, while beautiful as a space unto itself, is of the event variety; it has diminished, not improved, that museum's gallery spaces and their layout. And then there is the Art Institute of Chicago, another event-oriented space where art is tucked away. It was definitely a relief to read in The New York Times on Monday, that Mr. Piano's plans for angled walls at the Whitney's proposed downtown building had to be eliminated to cut costs on his new design.

Not to diminish the financial and logistical risks of a venture like this, but New York's recent museum debacles have taught us that space can justify the means. The success of an undertaking like this hinges not on the size but on the quality of the space, which is never thought about enough and never by the people who really know what they're doing where museums are concerned. The idea that trustees have the final word on a museum's design, considering all the atrocious buildings that have been erected in this country, is chilling. When will they ever learn to listen, and to people who have the right experience? They would get better spaces if they would loosen the reins.

A new downtown Whitney has to make art look good, make people feel good in it, inspire curators to do their best and give the place some kind of identity — a profile — the way Dia's old building did. Which is to say that it doesn't have to have tourist-attracting bells and whistles, as is the case with the Guggenheim (no disrespect intended). It just has to give people a breathtaking, vision-expanding experience of art. This is as much a matter of proportion, openness and light as square footage, as the old Dia proved repeatedly. Its spaces set a standard for display that seems to have been lost in Manhattan, and

it was lost, again, because of trustee arrogance and administrative mismanagement that put too many of the Dia's eggs in its Beacon, N.Y., basket.

Whom should the people in charge of museums listen to? Perhaps to those who have consistently made art look best because they are most directly dependent on it looking best: artists and dealers. A well-chosen committee of such people would probably be able to pare down and improve Mr. Piano's design even more.

Here's a shocking idea: hire Larry Gagosian as a consultant. This could be seen as a more cautious, less desperate version of the move by the Museum of Contemporary Art in Los Angeles in hiring the dealer Jeffrey Deitch as its new director: maybe it's outside-the-box thinking Manhattan-style. Such an idea might occur to anyone who saw the Gagosian Gallery's recent exhibition of a mere four sculptures by Alexander Calder, which unfortunately closed on Saturday. It was a heart-stopping, art-loving show that rewired and strengthened both the sense of Calder's greatness and one's own personal ability to see art. Affirmations like that keep people coming back.

http://www.nytimes.com/2010/04/13/arts/design/13whitney.html?ref=design

Jack Kirby's Heroes in Waiting

By DAVE ITZKOFF

The characteristics of a Jack Kirby illustration are easily distinguished: extravagantly costumed heroes and nefarious villains locked in titanic struggles; foreshortened fists, feet and muscles that seem to pop off the page; intricately detailed settings meant to conjure the ancient past or suggest the distant future.

His style made Mr. Kirby a sought-after talent at DC Comics, now a piece of the Time Warner empire, and at Marvel Comics, a recent acquisition of the Walt Disney Company. At Marvel in particular he played a crucial role in creating superheroes like the Fantastic Four, the Hulk and the X-Men — work that is now at the center of a property dispute between the heirs of Mr. Kirby, who died in 1994, and Marvel and Disney.

Those same signature design elements are also vividly on display in hundreds of illustrations for never-produced cartoon shows and toy lines that Mr. Kirby created in the 1980s for the animation studio Ruby-Spears Productions — work that thus far does not belong to any of the media conglomerates and that has been seen by few people.

Now, a partnership between that studio's founders, Joe Ruby and Ken Spears, and Sid and Marty Krofft, the longtime children's entertainment producers ("H. R. Pufnstuf," "Land of the Lost"), is planning to revive these unseen Kirby characters in as many forms as possible. It's a proposition that faces challenges as the studios scour the landscape for the next comic book or cartoon character they can transform into a franchise, but also one that has piqued the interest of some powerful Hollywood players.

"I love comic books, but this is a treasure," said Ariel Z. Emanuel, the co-chief executive of the William Morris Endeavor Entertainment agency, who is representing these Kirby works for Ruby-Spears and the

Kroffts. “It’s like a boat sank at the bottom of the ocean, and all of a sudden you’ve uncovered it.” Mr. Kirby started working for California’s animation studios in the late 1970s after becoming disillusioned with comic-book companies in New York that he said he felt did not give him fair payment or credit for his creations. After a stint with Hanna-Barbera, he was hired by Ruby-Spears in 1980, first to design characters and backgrounds for its Saturday morning action series “Thundarr the Barbarian,” then to draw presentation boards for new projects.

“Many times, he didn’t have enough to do, or there weren’t enough assignments,” Mr. Spears said. “He was such a prolific guy that he would, on his own, just start sketching out some thoughts.” Among the far-flung, unrealized projects that Mr. Kirby helped create or contributed to were “Roxie’s Raiders,” an Indiana Jones-style serial about a female adventurer and her allies; “Golden Shield,” about an ancient Mayan hero seeking to save earth in the apocalyptic year 2012; and “The Gargoids,” about scientists who gain superpowers after being infected by an alien virus.Though none of these series made it past the planning stages, Mr. Kirby was glad to have gainful employment, health insurance for himself and his family and a job where he felt he was respected.

“He’d walk in, and all the young animators would fuss over him and salute him,” said Mark Evanier, the author of “Kirby: King of Comics” and a television writer who has worked for Ruby-Spears and the Kroffts. “It was fun for him to go in there, whereas in the past, when he’d gone to a comic-book company’s offices, it was a contentious atmosphere and a lot of emotional baggage.”In an e-mail message, Lisa Kirby, one of Mr. Kirby’s daughters, wrote, “My dad always spoke well of Ruby-Spears, and that they treated him fairly.”For more than two decades, the work that Mr. Kirby created for Ruby-Spears — an estimated 600 production boards — remained boxed up and unseen while the studio was unsure what to do with it.

“I’m going, ‘Joe, why don’t we just take this stuff and give it away?’ ” Mr. Spears said. But Mr. Ruby, he said, was “absolutely insistent” that “someday, someplace, somebody’s going to want this stuff.”Last fall Mr. Ruby and Mr. Spears brought the properties to the Kroffts, who have begun adapting their vintage television shows into feature films, and who also saw potential in the Kirby material.

“This is a 20-year business for somebody,” Marty Krofft said. Unlike the work that Mr. Kirby did for Marvel Comics — whose ownership may be decided by a lawsuit filed last month against Marvel and Disney by the artists’ heirs, who seek the copyrights to many of his lucrative Marvel characters — the control of his animation art is more clear-cut.

During his time with Ruby-Spears, Mr. Kirby was employed under a work-for-hire agreement, which means that his work is the property of the studio, lawyers for the partnership said. Marc Toberoff, a copyright lawyer representing the Kirbys in their suit against Marvel and Disney, said that he reviewed Mr. Kirby’s agreement with Ruby-Spears and that he believed any art produced under it was work for hire.

This affords Ruby-Spears and the Kroffts a wide berth to turn their Kirby properties into movies, television shows, comics, videos games and more — all of which they intend to pursue.They will face steep competition in a marketplace already saturated with established (and not-so-established) comics characters that major media companies have spent years snapping up for their own development purposes. Compared with decades-old franchises like Batman, Superman and Captain America (the last of which Mr. Kirby created with Joe Simon), unknown properties like Roxie’s Raiders and Golden Shield have only Mr. Kirby’s pedigree to distinguish them.

For Mr. Emanuel, that is more than enough to get behind this cache of rediscovered material.

“You can’t go wrong,” he said. “Just close your eyes and throw a dart. And I only saw 5 percent of it.”

http://www.nytimes.com/2010/04/13/movies/13kirby.html?ref=design

Artists Embellish Walls With Political Visions

By SIMON ROMERO

CARACAS, Venezuela — Of all the murals and graffiti that adorn this anarchic city's trash-strewn center, one creation by the street artist Carlos Zerpa fills him with special pride: a stenciled reinterpretation of Caravaggio's "David with the Head of Goliath," in which a warrior grasps the severed head of Secretary of State Hillary Rodham Clinton.

Mr. Zerpa, 26, a slightly built painter sporting a few days of stubble, shrugged at the possibility that American visitors to Caracas — or Mrs. Clinton for that matter — might find the mural offensive. "It's a metaphor for an empire that is being defeated," he said nonchalantly in an interview. "My critics can take it or leave it, but I remain loyal to my ideas."

So does the government, which supports Mr. Zerpa's creations and the work of many other street artists, and is increasingly making them a central element of its promotion of a state ideology. Government-financed brigades of graffiti artists and muralists are blanketing this city's walls with politicized images, ranging from crude, graffiti-tagged slogans to bold, colorful works of graphic art.

The more overtly political images tend to glamorize President Hugo Chávez's Bolivarian revolution, and his demonization of Washington is a favorite subject.

One stencil painting near the Plaza Bolívar in the old center depicts a smiling President Obama in a Santa Claus outfit distributing missiles labeled with the words Afghanistan and Iraq. Another painting lambastes the government of Colombia, Washington's top ally in the region, by showing a knife thrust into a map of Colombia by a cherubic right-wing Colombian politician.

Some of these images were painted near billboards advertising American products like Heinz ketchup or Pepsi (the United States remains Venezuela's top trading partner). The billboards themselves stand above traffic-snarled streets that go almost completely dark at night because of electricity shortages.

Once darkness falls, soaring numbers of murders and kidnappings make many districts a no man's land. Not even once-esteemed public works of art are safe, with aerosol-equipped taggers carrying out a visual assault on sculptures by renowned artists like Gego and Jesús Soto.

Street artists here, who largely differentiate themselves from the city's hordes of graffiti taggers, say the slow-burning chaos that increasingly characterizes Caracas makes it an ideal place for them to ply their trade.

"There's a great deal of freedom here to do what we want," said Yaneth Rivas, 27, a member of the same street-art brigade as Mr. Zerpa, called the Communications Liberation Army. Her work, mainly posters placed at bus stops, is more nuanced than Mr. Zerpa's. She explores, for instance, the polarization of Venezuelan society in one image showing two policemen from different districts of Caracas pointing guns at each other. Their groups, together with other street-art brigades, were created over the past year or so by the Ministry of Communes. Some groups remain part of the ministry, like Guerrilla Communications, which offers graffiti and stencil workshops around the city.

Others, like Communications Liberation Army, operate somewhat autonomously but still get material like spray paint from the government. "These groups share the objective of reclaiming public space and turning it into a kind of street periodical that can be constantly renewed and painted over to get their message out," said Sujatha Fernandes, a sociologist at Queens College in New York who has written a book on urban social movements in Venezuela.

Not everyone putting up images on walls here draws support from the government. Saúl Guerrero, a stencil painter who ranks among the city's most prolific street artists, has painted dozens of melancholic portraits of people around the eastern districts of Caracas, signing them with the nom-de-plume "Ergo."

Mr. Guerrero, 29, an anthropologist and aid worker who spends part of the year in Africa, opted to forego sharp political statements for simple portraits, often of young Africans or of worn-out faces that reflect a life of destitution. He painted dozens of them on walls and telephone boxes in Chacao, a relatively prosperous municipality here. "I wanted to get away from the European-looking faces that dominate advertising in Venezuela in an attempt to trigger people into thinking about the reality of the place we live," Mr. Guerrero said.

But his work, which does not toe the party line, has provoked a backlash among some supporters of Mr. Chávez. After his full name appeared in a Caracas culture magazine, some progovernment graffiti taggers identified Mr. Guerrero as Jewish (mistakenly, it turned out) and began directing anti-Semitic slurs against him in online forums.

Some scribbled swastikas on his street paintings, reviving concerns of anti-Semitism here. Last year, after a Sephardic synagogue was desecrated by vandals, senior officials insinuated that Jews were responsible. Officials later arrested 11 people, including seven police officers, in connection with the episode. Mr. Guerrero said the defilement of his work was unfortunate, especially since it stemmed from polarization that he was hoping to assuage. But he also said he expected others to paint over work he viewed as ephemeral. "I would have preferred for someone to have colored parts of my work, making it 300 times better, but that doesn't always happen," he said. Other street artists here said that they also expected their work to disappear into the chaos of Caracas. Ms. Rivas, for instance, reacted almost with indifference when she learned that someone had recently pasted campaign posters on top of a multicolored poster at a bus stop that had taken her weeks to design and commented on the ideological tug-of-war on Venezuelan television.

"We're not looking for immortality with our work," she said. "Our gallery is the street, and that means we have to hope our images spur passers-by to think a little before they disappear."

Sandra La Fuente P. contributed reporting.

http://www.nytimes.com/2010/04/12/world/americas/12caracas.html?ref=design

Reshaping the Art of Nature

By BENJAMIN GENOCCHIO

In the last few decades, quite a few sculptors and installation artists working with materials scavenged from nature have risen to the forefront of the international art world.

What distinguishes the three artists included in "Regarding Nature: Thorns, Twigs, Buds and Branches," the terrific show currently at the Amelie A. Wallace Gallery at SUNY College at Old Westbury, is an exclusive focus on thorns, twigs, buds and branches. The artists transform their chosen materials into elaborate, often beautiful installations, sculptures and drawings.

None of the artists dabble in environmental politics, at least not openly. They are more interested in aesthetics — the way in which tree and shrub materials can be shaped, bent, twisted or combined to create evocative, symbolic objects and environments. First and foremost, this show celebrates the understated beauty and malleability of nature.

But it does touch on themes of sustainability and the preservation of the environment, for the artists all work with found materials, using mostly dead or discarded branches and other plant debris. Their artwork is also usually not sold, and generally the materials are recycled after each exhibition.

John Day, a Californian now living in New York, spent two months foraging the forested areas of the State University's Old Westbury campus to collect the more than 8,000 sticks, twigs and tree branches that he used to create "Heliotrope" (2010). A site-specific installation, it consists of a single large spiral ascending from the center of the room toward a small upper window, in the manner of a plant growing toward light. (I visited the show as the finishing touches were being put on this and the other large installation, by Barbara Andrus. Cui Fei's work was already in place.)

"Heliotrope" is more an art environment than an installation, for it is to be experienced rather than simply viewed. Walking in and around the spiral, you are reminded of astronomically oriented structures made of natural materials, like Stonehenge. The raw meshing together also creates the impression of a fence, and thus feelings of confinement.

But what is especially interesting about "Heliotrope" is the way Mr. Day has incorporated the rhythms and systems of nature within the work. The structure mimics the behavior patterns of plants, with the branches arranged so that they seem to be growing toward the light.

Barbara Andrus also uses tree branches to construct spirals, but with a different idea in mind. Her elaborately layered, soaring conical structures, made of tree parts collected on walks in Yonkers and in Maine at Montville and Otis and on Swan's Island, serve as sheltering towers that suggest protection but also a raw natural energy.

More than the other artists here, Ms. Andrus seems aligned with the sometimes spiritual attitude toward the environment found in art. The passage into her spirals can even evoke the experience of being alone in quiet wilderness. These works also smell like the forest, enriched by the scents of the birch, beech, maple, ash and other trees that supplied the materials used in their construction.

Cui Fei makes very different work. Her mixed-media drawings consist of dried thorns from all sorts of plants stuck onto rice paper in patterns that evoke Arabic script, Chinese calligraphy and even Braille (with an obvious hazard for the user).

Ms. Cui has been working with thorns for some time, and her artworks using them are widely admired, if a little vacuous. But as a new, major piece in this show makes clear, she is pushing the idea further; in "Not Yet Titled" (2009), the twists and twirls of the thorns are the basis of a message about the second Sino-Japanese War (1937-45).

"Not Yet Titled" consists of hundreds of long thorns arranged along a wall to resemble the simple crosshatch markings that are often used to record the passage of time. Each thorn represents a day of the war; they are arranged in rows representing months. The work is an act of remembrance, a means of reminding viewers of the duration and brutality of the Japanese occupation of China.

Beyond the use of tree or plant material, it is hard to see how Ms. Cui fits with the other artists in this show. Her work is also a kind of drawing, not sculpture. But it doesn't matter, for this is a beautiful, inviting exhibition that invites us to ponder art's enduring links with nature.

"Regarding Nature: Thorns, Twigs, Buds and Branches," Amelie A. Wallace Gallery, Campus Center, SUNY College at Old Westbury, Route 107, Old Westbury, through May 2. Information: (516) 876-3056 or oldwestbury.edu.

http://www.nytimes.com/2010/04/11/nyregion/11artsli.html?ref=design

Views of Mao's China, and What It Became

By BENJAMIN GENOCCHIO

With just over a dozen artists, "State of the Dao," at the Lehman College Art Gallery, is smaller than many of the Chinese contemporary art shows that have come to the New York region over the past decade. But it is just as politically attuned.

Dao, or Tao, is a concept from ancient Chinese philosophy concerned with the underpinnings of the universe. "State of the Dao" purports to survey the current order of things in China, a country undergoing social, cultural and economic transformation. But the work assembled here by Patricia Karetzky, an independent curator and an adjunct professor of art history at Lehman College, does not tell us much about Chinese art or society that we do not already know. Themes of pollution, consumerism and militarism predominate this show, as they have done in Chinese art for over a decade.

Although several of the artists, like the Gao Brothers, Long-Bin Chen and Miao Xiaochun, are well known, happily there are also a handful of fresh faces. Among them is the sculptor Zhao Suikang, who makes sensual, elemental abstract assemblages using thin ribbons of powder-coated steel.

Yang Jinsong is another extremely talented artist who is relatively little known in this country. His large, colorful painting "Watermelon" (2009), an expressionistic tour de force depicting a ripe watermelon, is the most visually alluring work in the show.

But the real strength of the exhibition is the way in which it highlights the continuing influence of imagery from the Cultural Revolution (1966-76) in the work of contemporary Chinese artists.

Shen Jingdong makes glossy, idealized but tongue-in-cheek takeoffs of cheery peasants, model workers, soldiers and other imagery once used by the Chinese authorities to serve political ends — art for the masses mobilized for the views and aims of the few. On display are a pair of 2009 shiny, colorful porcelain sculptures of Chinese soldiers wearing Mao jackets, part of Mr. Shen's "Soldiers" series. Among the works of Mr. Chen, an artist who carves into stacks of discarded telephone books to create delicately beautiful figurative sculptures, is a monumental portrait of Mao Zedong.

Not only is Mr. Chen's work appealing, but it also makes references to the mindless cult of Mao that arose during the Cultural Revolution. Few political figures in the 20th century were the subject of more portraits than Mao, China's leader from 1949 until his death in 1976. Estimates of the number of his portraits, including political posters, are as high as two billion. Today, Mao's image continues to exert a tremendous fascination for Chinese artists. But because it has been so widely used in art, it no longer possesses the power of serious political critique, and I have to agree with the widespread view among Chinese critics (and possibly Mr. Chen) that its current use is opportunistic and facile.

Other works in this show are oriented toward a more current revolution: China's obsession with consumerism and materialism in the wake of seismic economic growth. "The Forever Unfinished Building No. 4" (2008), by the Gao Brothers, is a very densely detailed, computer-generated photograph that depicts China as a giant shopping mall perpetually under construction.

A series of painted tomb sculptures by Liu Fenghua and Liuyong deals with one of the most important art world issues of our era: cultural property, specifically the looting of archaeological sites for objects that are then smuggled out of the country, often painted to look like souvenirs.

There is a kitsch quality to these tomb sculptures, which remind you somewhat of tacky garden gnomes. They also bring to mind the work of 1990s appropriation artists, especially Jeff Koons, who fabricated everyday objects in stainless steel or porcelain. But, over all, they are successful works of art, appealing equally to the eye and the mind.

Not everything in the show is about politics. Pang Yongjie paints charmingly quaint atmospheric abstractions, while Xu Yong takes black and white photographs of the old, traditional communal Hutong neighborhoods in Beijing, now largely destroyed for redevelopment. His pictures ooze nostalgia for a way of life that is all but gone.

The only flaw in this otherwise enjoyable exhibition is that it lacks a standout piece, something that you absolutely have to go to the Lehman College Art Gallery to see. The upshot is nothing more, or less, than a somewhat random survey of contemporary Chinese artists.

"State of the Dao: Chinese Contemporary Art," Lehman College Art Gallery, Lehman College, 250 Bedford Park Boulevard West, the Bronx, through May 4. (718) 960-8731 or lehman.edu/gallery.

http://www.nytimes.com/2010/04/11/nyregion/11artwe.html?ref=design

Conversation About Picasso Spanning 4 City Blocks
By ROBERTA SMITH

Picasso's prints form a world unto themselves. You can know a lot about his paintings and sculpture without having much of an inkling of his achievement in this supposedly lesser medium.

As luck would have it, that world is unusually visible in a small corner of Midtown Manhattan. Two exhibitions within strolling distance provide access to an eye-popping 327 examples of Picasso's etchings, aquatints, lithographs and linocuts. This total is probably more than can be seen in any other four-block area on the planet.

"Picasso: Themes and Variations," at the Museum of Modern Art on West 53rd Street, brings together 123 prints from the museum's collection, nimbly accounting for many of the high points of Picasso's crafty exploration of the primary print mediums. It also parses nearly 20 themes — saltimbanques, wives and mistresses, Cubist nudes, hommages to the old masters, animals, half-animals (the burly minotaur) and so on — and includes some stunning acquisitions that the museum has made during the last 15 years. Organized by Deborah Wye, chief curator of the department of prints and illustrated books, this show casts a wide net and arranges its catch with penetrating clarity.

In contrast "Celebrating the Muse: Women in Picasso's Prints From 1905-1968," at the Marlborough Gallery on West 57th Street, is considerably larger in size with 204 works but far narrower in focus. As its title implies, this venture is pretty much girls, girls, girls. Here we have more of the aforementioned wives and mistresses, along with mythological figures, unnamed models and their more sexualized counterparts: mantilla-topped majas in assorted degrees of undress. This project was organized over two years by Tara K. Reddi, the vice president at Marlborough, whose first job after college was as a curatorial intern in the Modern's prints department, and Marilyn McCully, chief collaborator on John Richardson's monumental Picasso biography. You could say that the Marlborough show fitfully fills out the spare yet relatively complete armature of the Modern's show, while offering rarities of its own.

In many ways printmaking was perfect for Picasso. Nearly all its forms were more physically resistant than painting or drawing, more like sculpture in the physical strength they frequently required and in the physical changes an artwork could accommodate. In addition they allowed a record of whatever changes were made: instead of worrying whether a possible adjustment might ruin an image, an artist could simply stop work, make some proofs of the current image, or even a formal edition, and resume work. The Modern's show begins with three quite handsome, noticeably different lithographs of Françoise Gilot in an elaborate jacket given to her by Picasso. Each is from a separate edition of 50 pulled from a portrait as it evolved on a single stone. At Marlborough one of the most striking moments is the contrast between two proofs of a large etching from the 1933 "Vollard Suite" of four nudes and a sculptural head.

With great differences, illuminating moments of dovetailing and 25 instances of out-and-out overlap, the Modern and Marlborough shows are accidental complements that at times seem to finish each other's sentences. The Modern proudly displays a large version of Picasso's "Weeping Woman" etching from 1937 (Dora Maar, distraught), acquired in 1999. Marlborough has a later version — more densely worked and satisfying — flanked by smaller related prints, lined up like ducklings beside their mother.

Each show has an example of the spare, elegant drypoint etching of an acrobat family from the 1905 Saltimbanques series. The print shows a landscape with 11 people whose ages imply the cycle of life. The work is a touchstone. It announces a dominant motif of Picasso's art: two or more figures in varying degrees of intimacy or entanglement (erotic or otherwise) contained within varying amounts of space. Later, as things heated up, the space could shrink to almost zero, the figures crowding the image like fish in a too-full aquarium.

Neither show can do without several of Picasso's great minotaur images from the "Vollard Suite," or the large, bristling masterwork "Minotauromachy" that followed in 1935. Its dark foreboding and stage-set arrangement of figures and architecture look forward to "Guernica" two years later.

On the other hand, the Modern show includes only three of the largest, most elaborately worked etchings from the 1968 "Suite 347" — so named because that's how many prints Picasso made in an etching marathon of just under seven months. The Marlborough show, meanwhile, has a swirling vortex of more than 60 "347" etchings, many of them small, blatantly erotic and rendered with a quick, taut, dazzling simplicity of line. They feature the hapless and randy musketeers in the show of late Picasso paintings and prints at the Gagosian Gallery last spring.

In both of the current shows the linocuts stand out. Each exhibition has a version of the brightly colored linocut based on a 16th-century portrait by Lucas Cranach the Younger. It depicts a queenly young woman in Elizabethan garb, her demure face subdivided with lines that evoke the striated, Africanized women of Picasso's groundbreaking "Demoiselles d'Avignon." The Modern displays several strikingly haunting linocuts of Jacqueline Roque, Picasso's second wife and final companion, including two in which he printed one version of the image over an earlier one. Marlborough offers some of these too, as well as larger, more colorful images of a happier Jacqueline.

Only at the Modern will you find, among the new additions, two differently colored takes on "Nocturnal Dance With Owl," a 1959 linocut in dark brown and black, a work with an antic Keith Haring-like energy that the Modern acquired in 1962. The contrasting tones of the new arrivals — one black and white, the other black and white with green and pink — were achieved sometime in 1963-64, when Picasso covered two proofs with ink and then rinsed them with a hose. And don't miss the 1970 etching "Ecce Homo" nearby, a tribute to Rembrandt's "Christ Presented to the People" but recast as a secular entertainment with a short, bald man on a throne. Is he Picasso or Pilate? The bright scene is ringed by a darkness that swarms with faces and figures, like bad memories that refuse to be quieted. It was published in 1978, five years after Picasso's death, and acquired by the Modern in 2009.

If these shows have a formal through line, it is line itself, which the print mediums make possible in a diversity unequalled by any other visual art form. It could be argued that no other artist made this as clear as Picasso, working away at his plates and stones for 65 years or more, following the lines of his life and his art in their mercurial manifestations.

"Celebrating the Muse: Women in Picasso's Prints From 1905-1968" runs through May 1 at the Marlborough Gallery, 40 West 57th Street, Manhattan; (212) 541-4900, marlboroughgallery.com. "Picasso: Themes and Variations" runs through Aug. 30 at the Museum of Modern Art; (212) 708-9400, moma.org.

http://www.nytimes.com/2010/04/09/arts/design/09picasso.html?ref=design

'Modern Art, Sacred Space'
Audacious Expressions on the Walls of the Temple

By KAREN ROSENBERG

“How to get better religious art is very simple: just commission an artist. Then ask him to act as an artist, with imagination, with freedom, with vision, with daring.” So said the painter Adolph Gottlieb, one of three Modern artists who worked on an innovative Millburn, N.J., synagogue in the early 1950s.

That Conservative synagogue — Congregation B’nai Israel — is now renovating and expanding, and has lent some of its art to the Jewish Museum for a small but transcendent exhibition. “Modern Art, Sacred Space: Motherwell, Ferber and Gottlieb” explores a postwar phenomenon, a meeting of secular and spiritual agendas that would be hard to convene today. Back then, artists, architects, dealers and rabbis shared progressive ideas about art’s place in the world.

Today Abstract Expressionism is sacrosanct, and Modernist Reform and Conservative synagogues like Congregation B’nai Israel are the norm for suburban Jews. But at the time the Millburn synagogue was being constructed, both the building and the art in it were audacious.

Congregation B’nai Israel, designed by the architect Percival Goodman and completed in 1951, marked a drastic change from the Old World architecture of earlier American synagogues. A set of low, sprawling boxes in glass, brick and light wood, it exemplified utopian Modernism and the aspirations of American Jewish communities after the war.

Just as novel as the synagogue’s architecture was the fact that it incorporated cutting-edge art by abstract painters and sculptors. The art world at midcentury was full of Jewish artists and intellectuals: the painters Jack Tworkov, Ad Reinhardt and Barnett Newman, to name just a few. But it was more common to find Jewish theology in a museum or gallery than Abstract Expressionism in a place of worship.

The synagogue’s three large artworks — Gottlieb’s Torah curtain, Herbert Ferber’s exterior sculpture and Robert Motherwell’s lobby mural — make up the bulk of “Modern Art, Sacred Space,” which was organized by Karen Levitov, associate curator at the museum. The Ferber and Motherwell are on loan from Millburn; the museum owns the Gottlieb, because its textiles are too fragile for ritual use. (The synagogue now uses a reproduction.)

The artists were chosen by Goodman, who had the trust of the congregation and its rabbi, Max Grunewald. In his search, the architect consulted the dealer Samuel Kootz, whose gallery on Madison Avenue was at the vanguard of American Abstract Expressionism. (He showed Gottlieb and Motherwell; Ferber exhibited with Betty Parsons). All three artists already had a mystical/spiritual dimension to their work.

Ephemera on view at the museum give you an idea of how important the B'nai Israel project was to the New York art world. René d'Harnoncourt, the director of the Museum of Modern Art, spoke at the dedication ceremony. Publications, including Time magazine and The New York Herald Tribune, weighed in on the building and its art.

Gottlieb's Torah curtain is the largest of the three works, and the most striking. Made with crimson and amber velvet and metallic thread, it's a smooth adaptation of the artist's Jung-inspired "pictograph" paintings. Symbols, including the Lion of Judah and the Tree of Life, occupy their own rectangular compartments.

The curtain is recognizable as Gottlieb's, but it's also a collaboration. The artist worked closely with the rabbi on the choice of symbols, and the final piece was sewn by the women of the congregation under the direction of Gottlieb's wife, Esther.

Motherwell's lobby mural, "The Wall of the Temple," was also a team effort. Though he wasn't Jewish, Motherwell had studied with one of the great rabbis of art history, the Columbia professor Meyer Schapiro. Schapiro encouraged Motherwell to switch his concentration from philosophy to painting, and continued to mentor him as he became a successful artist.

When consulted on the Congregation B'nai Israel project, Schapiro gave Motherwell a long reading list and advised him to visit the Jewish Museum. He also encouraged him to use representational imagery (something Motherwell rarely did in his painting), despite the biblical prohibition of "graven" images.

Motherwell also used Surrealist ideas about automatic drawing and the unconscious to facilitate his artistic "conversion." He tried to surround himself with Jewish iconography, so that images that emerged during his drawing sessions, he told a reporter from The Herald Tribune, "had a tendency to be Jewish."

You can't fault him for trying. He made more than 15 studies for the mural, moving abstracted versions of Jacob's ladder, the tablets of Moses and other symbols into various positions. The finished project has some of the hallmarks of gestural abstraction — loose brushwork, rough outlines — but it looks far from spontaneous, and not all that much like a Motherwell.

Ferber isn't as well known today as Motherwell or Gottlieb, but he was successful enough to have been included in MoMA's "Fifteen Americans" show of 1952. (The dedication of B'nai Israel was delayed by several months so that his sculpture for the synagogue could be seen at the museum.) He was also a multitasker, a working dentist who maintained a practice throughout his art career and published articles in scientific journals.

In his 12-foot-high relief sculpture, "And the bush was not consumed ...," spiky "flames" of lead-coated copper leap out from the wall. Unlike Gottlieb's curtain or Motherwell's mural, Ferber's piece comes across as aggressive and even threatening. The rabbi, who had suggested the subject of the Burning Bush, was initially taken aback by the work's appearance; drivers on Millburn Avenue, where the Ferber was installed on the synagogue's facade, were reportedly distracted.

Photographs by Hans Namuth, Ad Reinhardt and others of Ferber and his assistants making the sculpture reinforce the work's Abstract Expressionist bravado. In one, Ferber leans over the piece, a cigarette dangling from his mouth, looking very much like Jackson Pollock in Namuth's famous film.

Congregation B'nai Israel isn't the only example of a place of worship for which Modern art has been made. Matisse's chapel in Vence, France, also from around 1950, comes to mind. So does the remarkable stained-glass window that Gerhard Richter created just a few years ago for the Cologne Cathedral.

Neither artist could be called a practicing Roman Catholic. Their works, nevertheless, embrace and enhance spirituality. The same can be said of Motherwell, Ferber and Gottlieb, who had varied attitudes toward religion but an unshakable belief in the power of abstract art.

"Modern Art, Sacred Space: Motherwell, Ferber and Gottlieb" continues through Aug. 1 at the Jewish Museum, 1109 Fifth Avenue, at 92nd Street; (212). 423-3200, thejewishmuseum.org.

http://www.nytimes.com/2010/04/09/arts/design/09sacred.html?ref=design

Enjoy the Bugs, but Don't Feed the Scientists

By EDWARD ROTHSTEIN

LONDON — There is something daring, almost provocative, about the Cocoon. This eight-story-high egg-shaped structure, which contains major new exhibition space along with scientific-research facilities, is housed in an enormous glass-and-steel box. It is annexed to the Natural History Museum here as if it were a gigantic specimen brought back by 21st-century heirs to the collectors, entomologists and zoologists who created that great institution.

But Alfred Waterhouse's original 1881 Romanesque cathedral of a museum — which rivals its collections as an attraction with its vaulted entrance hall, ornamented pillars, ornate towers, elaborate murals and terra-cotta evocations of the animal kingdom — can almost seem dwarfed by this newly built chrysalis, particularly if you imagine the wing span of the creature that would emerge if the Cocoon were made of silk rather than plaster-coated sprayed concrete.

This might be a sign of the sly wit of the Danish firm C. F. Moller Architects, which designed this part of the museum's Darwin Center. It opened last fall to much acclaim and seems to straddle two worlds: the new building's apparent concern with geometric abstraction, light and shape also can give rise to King Kongish fantasies.

But spend some time in this £78 million (roughly $120 million) annex, and the wit becomes subtler, for the Cocoon, the center's prime exhibition area, is the most important transformation of the Natural History Museum in more than a century. It even seems to define a new approach to science museums. For all the Cocoon's shortcomings, its effect is palpable, changing your perspective on its classic and venerable ancestor.

The Darwin Center was a two-phase expansion project for the museum; in the first part (which opened in 2002), a new home was found for its zoologists and extraordinary "spirit collection," some 22 million specimens stored in hundreds of thousands of glass jars filled with preservative "spirits." Visitors can't wander along some 13 miles of shelves, but free tours are available, and you can't get a full sense of the museum's collection without one. You might glimpse, perhaps, a "parota signata" — a fish bottled by Charles Darwin during his journey on the Beagle — or look inside the museum's Dermestarium, where flesh-eating beetles clean specimens down to the bones.

The center's second phase, which made its debut last September, is basically the Cocoon, which aside from its exhibition houses 2 miles of cabinets containing 3 million botanical and 17 million entomological specimens; the 200-some scientists that study them work in more than 11,000 square feet of new laboratory space. The Cocoon is also designed to protect the collections with controlled humidity and temperature, scrupulously preventing infestations of creatures that might prefer devouring pinned specimens to becoming them.

The Cocoon will have a greater impact on the museum than the center's first phase because it is also designed to draw visitors into a different kind of encounter. It is an inversion of the old institution. In place of ornamentation there is geometric form; instead of Victorian-era skylights and dark rooms there is a bright atrium; instead of displays of objects there are accounts of ideas and procedures; and instead of presenting a fixed order of things it offers one under constant flux and revision.

The research facilities and scientists are part of the exhibition; they are glimpsed through windows, framed by explanations. They even become the subject of the show. The Cocoon's displays are not really about botany and bugs; they are about the collection and study of botany and bugs. The exhibition is really about the museum itself — its methods and materials, its passions and enterprise. I don't know of another science museum that does this. Along the way, of course, you learn about the natural world, but the real focus is on how that world is studied, and how the museum pursues that goal.

Visitors are given timed entry tickets to the Cocoon, take an elevator to its top, and then follow a descending ramp inside that spirals around its research-oriented heart; along the way, they are presumably transformed into nascent scientists or budding devotees. You are meant to emerge from this Cocoon in more ways than one.

"Everyone can play a valuable part in science," one of the wall displays points out — something that the very existence of the museum proves, since it grew out of amateurs' collections (and in its early years was bumblingly overseen by amateurs as well). And through the preservation, naming and study of the museum's 20 million objects, we read, they have become part of "an international network of knowledge." More than 100,000 beetle specimens, one video tells us, are lent every year to other institutions for study.

In an introductory room, touch screens show individual specimens, and we learn how to think of them as related to others, recognizing similarities and differences before broader questions are raised. That is how the exhibition proceeds, beginning with classification. "There are 3.5 million butterflies in our collections," the text says, "representing 95 percent of the 20,000 species known in the world." And you can see them mounted in scrupulous order in drawers. But how, the show asks, do we sort and classify? How do we make sense of variation within a species? What resemblances matter and why?

What happens too when we are able to examine organisms on a microscopic level? Museum scientists, we are told, after studying the DNA of termites, decided they were more closely related to cockroaches than previously thought and so reclassified the termite order Isoptera. Such seemingly arcane insights, we learn, can have larger consequences; similar feats might discern how ferns evolved or how to fight diseases like malaria.

Technology is heavily used here, generally to good effect, in videos that project against curved walls, on touch screens that allow you to page through virtual specimens, in guided investigations in which you are challenged to find the essential aspects of an organism and discern its familial relations. The museum has also set up an extensive series of Web pages (nhm.ac.uk/natureplus/) that give a flavor for the exhibition's tone and character.

But at times technology can become a trap: each visitor is also given a bar-coded card to swipe at various screens to request more information on the Web after leaving the museum, a gimmick that's superfluous and awkwardly executed.

The Cocoon's strength is that it humanizes scientific research, stressing that it is an inquiry conducted by curious individuals who undertake strenuous labors before reaching insight. In one display case we see the kinds of items scientists have taken on expeditions as they conduct field work in the jungles of Borneo or other forbidding climes, including a battered copy of "War and Peace," a deck of cards, a Mars bar and athlete's foot powder, supplements to the tools of the trade we already have seen (like a machete for clearing undergrowth). We also learn how specimens are preserved and displayed, and how they become the object of international cooperation.

Several museum curators also appear in videos, on walls and on touch screens, passionately advocating for their specialties. "When I was young," we read next to a large image of the curator Jan Beccaloni, "I used to watch spiders for hours. I've never lost that curiosity." For our delectation, she holds a tray of extremely furry, somewhat creepy arachnids.

There are moments, though, when the exhibition goes too far in its promotional preoccupations, almost becoming creepy itself. We watch researchers at work through windows, as if they too were specimens in a giant hive. "Scientists at work," warn the posted signs, as men and women in white coats talk, write or peer into microscopes. "Please do not use flash photography."

But the Cocoon's biggest weakness is that it deliberately pitches itself low rather than high, perhaps because the museum is among Britain's Top 5 tourist attractions. Nothing is taken for granted; arguments are made on the most basic level: botany is interesting, entomology is fascinating, research is important, collections are revealing, natural history museums are scientific institutions. The Cocoon is saved from obviousness by the cleverness of its displays, and because, in some, it is possible to probe more deeply. It may be that over time the museum can aim higher, since the displays seem flexibly designed.

This intellectual softness made the chrysalis metaphor itself seem overdone; the pains of rebirth are sacrificed for ease and popularity. This is not a new quandary of course. It echoes the kind of debates that went on when the museum evolved in the 1860s as the new building was being planned. The institution's first brilliant curator, Richard Owen (who invented the name for dinosaurs and taught biology to Queen Victoria's children), argued that this "cathedral to nature" should be accessible to the broadest public and that it should almost overwhelm visitors with the scale of its collections; the scientist Thomas Huxley felt just the opposite.

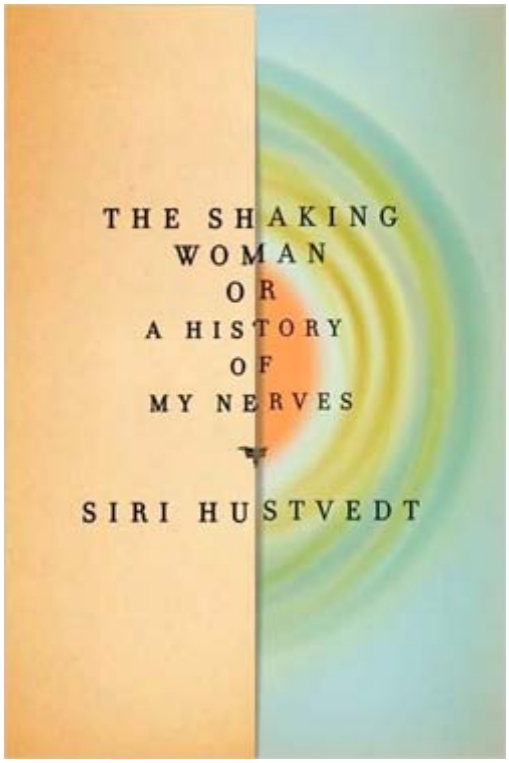
But what the Cocoon fully succeeds in doing is teaching us that the collections found in the museum's older halls are themselves reflections of curiosity, compulsion and analysis, that they were laid out because of arguments being made. Owen, for example, a religious believer opposed to evolutionary theory, believed that extinct and living species should occupy different wings. The Cocoon also shows us that what we see as a static array of specimens is actually a stroboscopic image of knowledge in perpetual motion. And while not a shocking revelation, for the museum that is still a kind of rebirth.

The Darwin Center is part of the Natural History Museum, Cromwell Road, London; +44-(0)20-7942-5000.

http://www.nytimes.com/2010/04/08/arts/design/08darwin.html?ref=design

Call Me Crazy...
But don't try to quantify it.
By Jessa Crispin

I think we are entering a new Freudian era. This struck me as I was recently reading some stories in the *New York Times* science section: Depressive disorders may have a beneficial mechanism behind them; dreams may be meaningful after all; and hysteria — now called conversion disorders, and by which they mean the physical expression of emotional trauma — may actually exist. This may not totally redeem Freud from his sex-obsessed cokehead crackpot reputation, but this is his territory.



- ***The Shaking Woman or A History of My Nerves*** **by Siri Hustvedt. 224 pages. Henry Holt and Co. $23.00**

For decades, Freud has been slowly discredited until his name is more a punchline than a scientific reference. But the more science wades into the murky territory of the mind, the more we see that we have to look backward to move forward. There are certain things we know, and certain things we can prove. Often the "know" category is presided over by the philosophers and the poets, the witches and the healers. The "proven" is the realm of the white lab coat. It can take centuries to go from "known" to "proven." Louis Pasteur may have discovered penicillin, but mold has been used to treat infections since the time of the ancient Egyptians. Likewise, the idea of the unconscious — that there were drives completely out of our control, and out of our sphere of awareness, working as the engine behind our behavior — used to be a joke. Now it's an accepted truth.

Jonah Lehrer's *Times* article about dreams did not come as an Earth-shocking revelation because it's something we've all kind of known. No one is going to scientifically prove Jung's theories about dreams, of course, because the theories are bonkers (I say with affection). Scientists have been denying for years that dreams held any real purpose, and yet people are still recording them and decoding them, bringing them up in therapy and occasionally changing their lives because of them. I know more than one person

who has ended a relationship because a dream brought sudden clarity about the person's character. Does that make them crazy? Kinda maybe sorta. In 2006, neuro-psychologist Mark Solms and dream researcher J. Allan Hobson held a debate about whether dreams had any meaning. Solms argued yes. Hobson believes dreams are built from random images created by brain activity that we don't fully understand. Despite the scientific evidence Hobson brought out at the debate and in books and studies, the audience instinctively rejected his argument. As Siri Hustvedt reports in her new book *The Shaking Woman, or a History of My Nerves,* "he lost the debate to Solms (the audience voted) by a large margin."

Siri Husvedt's investigation into the mind/body divide and a modern account of hysteria begins with a personal story: when speaking at a memorial for her father, having not properly mourned his death, she started convulsing in a strange manner. Her entire body below her neck thrashed and wobbled, and yet she was able to speak clearly. It wasn't epilepsy. Her brain scans showed no physical cause, and she began to wonder if the episode was due to repressed emotions' exhibiting themselves in a physical and undeniable way. It's easy for us to shove aside strong emotions, say we'll get to that later. But when we suddenly can't move our neck or we begin to convulse, it's something that needs to be dealt with immediately. "Pay attention!" our bodies shriek. Or maybe they're not, and we humans — being pattern-seeking animals — are simply drawing associations that aren't really there.

Hysteria may have only been declared scientifically proven in 2006, according to *The New York Times*, but people have been battling it for centuries, millennia even. Not the hysteria of the uterus-taking-a-tour-of-your-other-internal-organs variety, but Hustvedt reports neuroimaging shows that emotional pain can occasionally be expressed through the body, manifesting as paralysis, pain, fits, limb dysfunction — all those things that used to be called the Vapors and were treated by perfuming the woman's pubic hair, lacing it with rose petals, to entice the uterus back into place. (Well, sometimes. Other times they cut out the clitoris and burned off the labia with a red hot iron and attached leeches to the cervix.)

For a long time, hysteria was very fashionable for the ladies. (And the men, too, though not having uteruses, they called it "spleen.") Sure, a lot of the women claiming hysteria were bored and lonely and needed someone to pay attention to them. But in Andrew Scull's *Hysteria: A Biography*, doctors such as George Cheyne celebrated the sensitivities of the afflicted. James Boswell became enchanted with his spleen despite the anguish he was in. He took on the name the Hypochondriack for a series of essays, writing "we Hypocondriacks may console ourselves in the hour of gloomy distress, by thinking that our sufferings mark our superiority." Before Freud, and certainly before *The New York Times Magazine* article, there was a pride in their affliction. Boswell believed that the sensitivity causing so much emotional and physical pain allowed him to reach depths he would be otherwise unable.

Moving from the "known" to the "proven" column can be a little messy. The point of finding proof is to shed light on the idea, and in the case of Freud's realm, to bring order to the disordered. And yet there's resistance. There's a lot of charisma in the disorder. Boswell is the Hypochondriack, Hustvedt is the Shaking Woman. There is also the Hysteric, the Epileptic, the Depressive, the Schizophrenic, the Migraineur. It becomes an identity. Reordering our minds would mean reordering our entire world and the way we interact with it; and maybe our depression does have an upside, maybe the vapors coming off of our uterus help us think; maybe our horrible, shameful dreams reveal secrets. In the comments section of Lehrer's dream article, a woman admitted that while she was so tormented by her vivid, terrifying dreams, when they went away, she missed them. Hustvedt writes:

L. used to wake up at night to see her sister flailing and flapping in the bed next to her own. L. told me that her sister does not feel alienated from her auras and fits. In fact, they are so deeply part of her, she is reluctant to medicate them away. In his essay 'Witty Ticky Ray,' Oliver Sacks describes a Tourette's patient who, after his tics vanished with a drug, missed them so much that he began taking weekend holidays from his pharmaceuticals, so he could tic again with happy abandon. The bipolar patient P. who produced the seven-thousand-page manuscript made it clear to me that she mourned her mania terribly.

The Greeks did not believe in hysteria, but they referred to similar disorders as *enthusiasmos*, meaning the possession by a god or demon. *The New York Times* recently reported that a schizophrenic was more likely to recover if he lived in a country that still believed the symptoms were signs of *enthusiasmos*, of

possession, than a diagnosis of an organic brain disease to be corrected through medication. Part of it is because the family rallies to help you retake possession of your body, and doesn't put you in some sort of assisted living facility, telling you, "Don't forget to take your meds! We'll write on all of the major holidays!" Thorazine's got nothing on love and support.

Even if you provided me with incontrovertible proof that my dreams were meaningless (who knows what such evidence would even look like), I would still spend my mornings documenting my dreams in detail and associating out the visuals. I really do wish I could be more rational — honestly, it's a goal of mine. And yet that "proven" column, with its right angles and straight lines, its belief that depression is a chemical imbalance best treated with SSRIs, that dreams are problem-solving mechanisms and not symbol-laden poetry, that the physical plane is the only one there is... As someone who has ended relationships because of dreams, and had prolonged periods of unexplained (I would say hysterical) blindness, I don't quite fit in there. The white coats often look into that unscientific past and see merely superstition and fear, useless nonsense. But hidden in the mire, we have thinkers and ideas, waiting for their wisdom to be re-acknowledged. • *5 April 2010*

Jessa Crispin is editor and founder of Bookslut.com. She currently resides in Berlin, but spent many years in Chicago.

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http://www.thesmartset.com/article/article04051002.aspx

Lo' and Behold
On the appeal of the fashion logo.
By Paula Marantz Cohen

The other day, I saw a Louis Vuitton handbag with a price tag of $750 locked inside a department store glass case, and, I confess, I coveted the thing. The bag was made of laminated canvas, was covered with muddy LV monograms, and resembled, in shape and size, a beach tote — none of which attributes are especially prepossessing. And yet, I wanted it. Why? Why, for that matter, are so many women willing to spend a small fortune on bags emblazoned with Gucci G's, Chanel reverse-facing C's, dangling leather Coach tags, Kate Spade stitched labels, and Hermes perforated H's?

The rise of the logo as a source of appeal took off 30 years ago in response, I would postulate, to a new kind of consumer that came into being with the investment-driven economy of the 1980s. Before that, old-moneyed people were content to know that their things were better made (and more expensive) than those of the hoi polloi, while new-moneyed people were content to engage in conspicuous consumption, flaunting their cars and their jewels in the time-honored fashion of the nouveau riche.

But in the 1980s, a new kind of new-moneyed class emerged with a more savvy relationship to consumerism. Maybe because they all had MBAs, they wanted to advertise their wealth in a more efficient and succinct way. Hence, the birth of the logo.

The trend began quietly enough, making its first appearance in menswear. The first stirrings can be traced to the custom-made shirt with its monogrammed breast pocket — though the monogram here was of the buyer, not the seller. There was also the bespoke suit, most famously associated with Savile Row in London, which carried the subtle mark of its made-to-measure craftsmanship by having the buttons on the jacket cuffs actually open and close — those in the know knew to look. But it was the Lacoste crocodile that was the real harbinger. The little croc on the breast pocket of a men's tennis shirt (referred to, for complicated reasons, as an Izod shirt) marked its wearer as "preppy" — a sportive type with a trust fund, as *The Official Preppy Handbook*, published in 1980, informed us. (It may interest readers to know that Lacoste, in 2003, sued Crocodile Garments, a lower-end manufacturer, over the use of the crocodile logo, with the result that the latter agreed to have its crocodile face the other direction.)

As the success of *The Official Preppy Handbook* indicated, a *new* new-moneyed class had arisen that, though they didn't have trust funds, wanted to be preppies. In other words, they didn't want to engage in simple conspicuous consumption as their nouveau riche forerunners had done: They instead wanted to appropriate the style associated with old money. The solution, as they came to understand it, lay in surrounding themselves with the right sorts of things.

Traditional European fashion houses like Louis Vuitton, Chanel, Prada, and Hermes, and eventually, even the stodgier British and American companies like Burberry and Coach, understood this and began to market their products in new ways. They did this by making their goods more instantly recognizable — aggressively promoting their distinctive aspects: the ridiculous horsey designs on the Hermes scarf; the dangling leather tags on the lead-heavy Coach bag; the dowdy plaid of the Burberry raincoat — all became emblems of old money exclusivity, marketed through trendy campaigns and ingenious product placement to the new Masters and Mistresses of the Universe. The high-end companies that didn't understand, such as the venerable leather goods retailer Mark Cross, went under. Grace Kelly shows off her discreet Mark Cross overnight case to James Stewart in the 1954 movie *Rear Window* ("I'll bet yours isn't this small," she boasts), but she wouldn't be able to carry one today. The company was bought by the Sara Lee Corporation in the early '90s and closed in 1998. With no aggressive marketing campaign

behind it, it had to play second fiddle to frozen baked goods before moving quietly into extinction.

As luxury manufacturers came to understand the new market, they also began to see the value in promoting themselves in even simpler ways — hence the increasing ubiquity of the logo. Logos are the quickest possible means of making clear that a product has the right provenance — i.e., comes from an exclusive place. And one of the salient characteristics of the new logo-ed merchandise is that it encourages "graded" purchase. Training goods, like training bras, prepare the less well-endowed for what is hopefully to come. Thus, those aspiring to wealth can buy the Louis Vuitton key chain, wallet, and, in a splurge, the handbag, while those who have definitively "arrived" can buy the full set of Louis Vuitton luggage — also, the Chanel suit and the Hermes Kelly bag with its distinctive lunchbox shape (unlike the Mark Cross overnight case, this Grace-associated item is alive and selling like hotcakes — $40,000 hotcakes that come only after a year spent on a waiting list).

Meanwhile, new high-end merchants began to imitate the old ones. For example, Dooney & Bourke, though it looks like it derives from 19th-century fox-hunting gear, was founded in 1975 in Norwalk, Connecticut. And Ralph Lauren, the seeming epitome of the English country gentleman, was originally Ralph Lifshitz from the Bronx, who started his empire with a necktie store in 1970. Lauren went on to devise the Polo Pony logo (more to the point than the Izod crocodile) and to exploit the idea of graded merchandise more brazenly than anyone had before. He separated his goods into strata: purple at the top (appointment only), with black and blue labels, then Polo and Rugby, and finally, Ralph Lauren Sport bringing up the rear.

But capitalism is also resourceful in underhanded ways, and no sooner did the logo make an appearance on luxury goods than imitation logo-ed goods began to flood the market. I recall that in the '90s one could buy a very nice imitation Gucci bag for $30 from a street vendor on the corner of 53rd and Fifth in Manhattan. Since then, in a predictable counter-move, the manufacturers of high-end merchandise have gone to court to stop the imitators, which means that you now have to make a real effort to find the knock-offs, and, when you do, you have to pay more for them. That $30 imitation Gucci that I could have bought on 53rd and Fifth 15 years ago would now cost at least $100 and take some looking for on the Lower East Side. The trick, as I see it, is to get yourself to Beijing where, if you whisper Gucci in a crowded mall, half a dozen people will descend on you, lead you to the back rooms of their shops, and display merchandise arranged by degree of quality: from $10 super-cheap imitations to $200 ones likely to have been produced in the same high-end sweat shop as the $2,000 originals.

You probably couldn't find a better expression of capitalistic enterprise in action than the various moves and countermoves involving logo-ed merchandise, where value is continually undergoing revision and re-appropriation. And it's amazing that I can write this and still covet a Louis Vuitton handbag. Karl Marx would say that I've succumbed to the delusional effects of the bourgeois marketplace, the LV bag being just about the purest example there is of "exchange value" — an item entirely severed from its *use* value. I know I would do as well hauling my junk around in a plastic bag, but that doesn't prevent me from wanting the Louis Vuitton Neverfull GM bag ($750) or, as long as I'm being honest about it, the Louis Vuitton Artsy GM ($1,630). As Marx explained, esthetic and market forces won't get disentangled until the Revolution comes. • *5 March 2010*

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http://www.thesmartset.com/article/article03061001.aspx

Ancient creature's skull probed

By Jonathan Amos
Science correspondent, BBC News

X-rays show in stunning detail the interior of the skull of a new human-like creature found in South Africa.

The hominid *Australopithecus sediba* was presented to the world last week.

The X-ray images reveal information about the ancient animal's brain and tantalising evidence of the insects that may have fed on the dead body.

Its discoverers say it fills a key gap between older creatures and the group of more modern species known as *Homo* , which includes our own kind.

The work was conducted at the European Synchrotron Radiation Facility (ESRF) in Grenoble, France, which has developed expertise in the non-destructive study of fossils.

Probing such artefacts with a brilliant light source is the only way to see inside the specimens without actually breaking them apart.

South African researchers took the skull of the juvenile, 1.9-million-year-old creature, and many other parts of its skeleton, to the European facility for a two-week investigation.

Firm age

The ESRF uses a technique known as micro-tomography to assemble its images. This involves taking a series of a high-contrast, high-resolution X-ray radiographs of the target fossil in rotation to build up a 3D representation.

One of the main reasons for undertaking the study was so that scientists could learn more about *A. sediba* 's teeth and get a firm age for the juvenile at death.

The X-ray images can discern the fine details of internal growth lines and other hidden features.

"The teeth are very beautiful especially the third molars, the non-erupted teeth; and given the quality of the scans we will have no problem virtually extracting them to study them," said the ESRF's Dr Paul Tafforeau.

"What we want to know is the real age at death and not just the developmental age, or modern-equivalent age, because what we want to track is how, during the evolution of hominids, the life stories slowed down - to go from a pattern that is rapid like apes to one which is slow like modern humans," he told BBC News.

It will take a year at least to complete this investigation.

The analysis of the terabytes of data produced at the ESRF has only really just started, but the early analysis of the complete skull has already thrown up some intriguing observations.

Among them are what appear to be three fossilised insect eggs inside the skull.

Cautious approach

"We have to be cautious because it is possible they are modern insects; we have to look more at the data," said Dr Tafforeau.

"But their high density suggests they are fossils, and if that is the case they could correspondent to the insects that came to eat on the flesh of the body at the time of death."

Researchers also identified a low-density area within the skull which could be a remnant of the brain after its bacterial decay. The scientists liken it to a natural cast, perhaps made of clays that filled the brain cavity after decomposition.

It is highly unusual for important fossils like *A. sediba* to be taken out of their country of discovery. The one major exception is for detailed scientific investigation using techniques that are only available abroad; and South Africa has no synchrotron facility.

Since its first presentation last week, *A. sediba* has generated some controversy in palaeoanthropology circles, with many competing scientists arguing over the true status and position of the creature in the human family tree.

What is not in doubt, however, is the quality and beauty of the latest fossil finds.

The remains of an adult female were found alongside those of the juvenile hominid investigated at the ESRF.

The fossils had been laid down in cave deposits at Malapa in the famous Cradle of Humankind World Heritage Site close to Johannesburg.

The ongoing investigation of the site is being led by Professor Lee Berger of the University of the Witwatersrand.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8615424.stm

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Web child health advice 'wrong'

Typing your child's medical problem into Google is unlikely to deliver much in the way of good advice, UK researchers have said.

The Nottingham-based team used the search engine to find UK-based advice on five common issues, including breastfeeding and autism.

Only about 200 of 500 sites offered correct information, Archives of Disease in Childhood reports.

Government-run sites were the only completely reliable source, they found.

It is now estimated that 70% of UK households have access to the internet, and increasingly, parents are turning to search engines for a second opinion - or even a sole one - on medical matters.

" **Healthcare professionals should continue to strive to be the main source of information for patients but we should be aware that most will continue to use the internet to gather information** " Study researchers

Many doctors, however, are concerned that the huge quantity of information and advice is at best unreliable, and in some cases misleading or even dangerous.

One earlier study looking at advice for children with a fever found only three out of 22 sites visited gave information which matched current "best practice" guidelines.

The researchers from Nottingham University Hospitals NHS Trust tested this by typing key words from commonly-asked questions into Google, restricting results to UK-based sites only.

The five chosen were "MMR autism", "HIV breastfeeding", "mastitis breastfeeding", "baby sleeping position" and "green vomit".

They found the quality of advice varied significantly, with half the search results failing to answer the intended question.

In total, 11% of the 500 results gave inaccurate information, and 39% gave the right answer.

The most incorrect replies were given to search results about MMR and autism, and HIV and breastfeeding.

News websites were accurate 55% of the time.

Vaccine sales

Particularly poor at answering the question were "sponsored links" which appeared prominently, even though the information they contained was not closely related to the search terms.

In the case of the "MMR/autism" search, many of the sponsored links offered single vaccination as an alternative to MMR.

However, the accuracy of governmental websites such as NHS Direct or NHS Choices meant that they should be recommended more widely by doctors, the researchers said.

"Healthcare professionals should continue to strive to be the main source of information for patients but we should be aware that most will continue to use the internet to gather information," they wrote in the journal.

"We suggest that in addition to verbal and written information, patients and parents should be signposted to NHS, governmental or other pre-approved websites."

A spokesman for the Department of Health said NHS Choices was now the most popular health website in the UK, receiving nearly nine million hits a month.

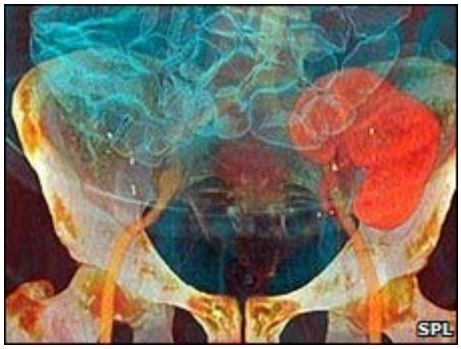
He said: "It offers a range of health information on over 800 treatments and conditions, waiting times and survival rates for elective procedures. Patients using the site are also able to post feedback on hospitals and GP surgeries."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8611045.stm

Published: 2010/04/12 00:44:48 GMT

Kidney gene find a 'breakthrough'

The identification of 20 genes which could help explain the causes of kidney disease could one day "revolutionise" treatment, researchers say.



Chronic kidney disease affects about one in 10 adults and can require dialysis or even an organ transplant.

The genes identified by the international team of researchers control kidney functions such as filtering waste from the blood.

Experts said the Nature Genetics study was "a great breakthrough".

Chronic kidney disease (CKD) is a long-term condition in which the kidneys progressively lose their function.

" **These are still early days but it is truly a great breakthrough** "
Charles Kernahan, Kidney Research UK

People tend not to notice symptoms, which can include swollen ankles and hands or blood in the urine, until the condition is advanced.

It is linked to ageing - about one in five men and one in four women aged between 65 and 74 will have some degree of CKD.

The most common cause of CKD is damage caused by other long-term conditions, such as diabetes and high blood pressure.

It was known there was a genetic component to the disease, but not which genes were involved.

'First step'

In this study, an international team of scientists, including researchers at the University of Edinburgh, looked at the genes of nearly 70,000 people across Europe.

They found 13 new genes that influence renal function and seven others that affect the production and secretion of creatinine - a chemical waste molecule that is generated from muscle metabolism and filtered through the kidneys.

Dr Jim Wilson, a geneticist at the University of Edinburgh who worked on the study, said: "This work could revolutionise the treatment of kidney disease in the future - but this will take some time.

"It's a very critical first step towards a completely new understanding of the biology behind CKD. Transferring what we've found into clinical benefits will take some years."

Charles Kernahan, chief executive of the charity Kidney Research UK, said "These are still early days but it is truly a great breakthrough.

"No-one knows who will be affected or when kidney disease may strike next, so even more research needs to be funded to help us tackle this challenge."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8611312.stm

Published: 2010/04/12 01:07:56 GMT
rst oxygen-free animals found