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Dotcom marks silver anniversary

By Maggie Shiels
Technology reporter, BBC News, Silicon Valley

The internet celebrates a landmark event on the 15 March - the 25th birthday of the day the first dotcom name was registered.

In March 1985, Symbolics computers of Cambridge, Massachusetts entered the history books with an internet address ending in dotcom.

That same year another five companies jumped on a very slow bandwagon.

It took until 1997, well into the internet boom, before the one millionth dotcom was registered.

"This birthday is really significant because what we are celebrating here is the internet and dotcom is a good, well known placeholder for the rest of the internet," said Mark Mclaughlin, chief executive officer of Verisign the company that is responsible for looking after the dotcom domain.

"Who would have guessed 25 years ago where the internet would be today. This really was a groundbreaking event," he said.

Commercialisation

For most of the late 1980s and early 1990s hardly anyone knew what a dotcom was. The need for some sort of organising principles became apparent as more bodies connected into the fledgling internet but there is confusion as to the exact genesis of dotcom.

It is unlikely that the early dotcoms were thought of as businesses as the early internet was not seen as a place for commerce but rather as a platform for governmental and educational bodies to trade ideas.

Scholars generally agree that a turning point was the introduction of the Mosaic web browser by Netscape that brought mainstream consumers on to the web.

A season of reports exploring the extraordinary power of the internet, including:

Digital giants - top thinkers in the business on the future of the web

With 668,000 dotcom sites registered every month, they have become part of the fabric of our lives.

Today people go to dotcom sites to shop, connect with friends, book holidays, be entertained, learn new things and exchange ideas.

"Dotcoms have touched us in a way we could not have imagined," Robert Atkinson of the Information Technology and Innovation Foundation (ITIF) told BBC News.

"It used to be, 10 years ago you could live an okay life if you weren't engaged on a dot com site on a daily basis. You could get what you needed.

"But today we see how dotcoms have enriched our lives that if you are not engaged you would be fine but much further behind than the rest of us."

Proof of that Mr Atkinson said can be seen with how dotcoms have commercialised the internet "bringing consumers choice and value and businesses greater customer reach and profits".

DOTCOM GROWTH
21m domain names registered between 1985 and 2000
57m domain names registered between 2000 and 2010
Source: OECD

A study by the ITIF claims that "the average profitability of companies using the internet increased by 2.7%".

The research also found that the economic benefits equal $1.5 trillion, which it says is "more than the global sales of medicine, investment in renewable energy and government investment in research and development combined".

By 2020 the internet should add $3.8 trillion (£2.5trillion) to the global economy, exceeding the gross domestic product of Germany, it found.

The future

An estimated 1.7 billion people - one quarter of the world's population - now use the internet.

Verisign's Mr McLaughlin only sees that figure growing over the next quarter of a century.

"I think that the way we access information today, mostly still through PCs and laptops is highly likely to change; that the voice will be more important than text input.

"I think the whole fabric of how we access, search, find and get information is going to be radically different."

At the moment Verisign logs 53 billion requests for websites - not just dotcoms - every day, about the same number handled for all of 1995.

"We expect that to grow in 2020 to somewhere between three and four quadrillion," Mr McLaughlin told BBC News.

One quadrillion is one million billion.

It is a phenomenal pace of growth that would have been very difficult to predict 25 years ago when a small computer firm took the first pioneering steps into the connected world.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/8567414.stm

Published: 2010/03/15 08:49:15 GMT

Scientists Establish Leech as Model for Study of Reproductive Behavior

Injecting a simple hormone into leeches has resulted in a novel way to study how hormones and the nervous system work together to produce species-specific reproductive behavior. (Credit: Image courtesy of California Institute of Technology)

ScienceDaily (Mar. 17, 2010) — Researchers at the California Institute of Technology (Caltech) and the University of California, San Diego (UCSD) have discovered that injecting a simple hormone into leeches creates a novel way to study how hormones and the nervous system work together to produce species-specific reproductive behavior.

A paper describing the work appears in the March 11 online edition of the journal *Current Biology*.

Daniel Wagenaar, Broad Senior Research Fellow in Brain Circuitry at Caltech and first author of the paper, found that injecting a particular hormone into a medicinal leech (Hirudo verbana) induced a series of movements that closely mimic natural reproductive behavior, including a stereotypical 180-degree twisting of the body. Wagenaar's studies were initiated at UCSD.

The twisting, which occurs with a period of approximately five minutes -- making it one of the slowest behavioral rhythms ever discovered, aside from diurnal and annual rhythms -- serves to align the reproductive pores on the ventral (under) side of one leech with the complementary pores on the ventral side of a partner, thus facilitating copulation. Without this behavior, copulation would fail.

"In many animal species, sexual reproduction involves highly specific and complex behaviors at all stages from courtship to copulation and beyond," Wagenaar says. "Most animals perform these behaviors without any learning, which strongly suggests that the behaviors are somehow 'hardwired' in their nervous systems."

The relationship between the activity of nerve cells and leech behavior has been very well studied, and the simplicity of the leech nervous system, which contains only about 15,000 neurons -- orders of magnitude fewer than even a mosquito -- has greatly facilitated this work.

The studies described in Wagenaar's paper were inspired by the combination of the complex behaviors of leeches breeding in the laboratory and its relatively simple nervous system.

Reproduction is one of the most important activities of all animal species, Wagenaar notes, but in leeches, as in other sexually reproducing species, it has proven difficult to understand how this critical behavior is produced by activity in the nervous system.

"Few animals will execute reproductive behaviors while they are being subjected to neurobiological recording methods," Wagenaar says.

Wagenaar and his colleagues got around the relative reticence of the leeches by injecting them with a type of hormone found in a wide variety of animals. In humans and in other mammals, two versions of this

hormone -- vasopressin and oxytocin -- play a powerful role in reproductive physiology and pair-bonding. Leeches also produce a member of this hormone family, called hirudotocin. The groups at UCSD and Caltech discovered that the hormone plays a role in normal leech mating behavior.

Within minutes after a leech has received an injection of hirudotocin, it displays a variety of courtship behaviors, even if it is alone in a container. During courtship, leeches open their mouths wide and explore the bodies of potential partners by running the mouth along the skin, while also twisting their bodies like a corkscrew. These behaviors were known to be elicited by hirudotocin and other closely related members of the vasopressin molecular family."Hirudotocin is produced by the leech, but under ordinary conditions it may be present in very small quantities," Wagenaar says. "By injecting a relatively large quantity of the hormone, we may, in a sense, overwhelm the system. Whereas small doses only increase the tendency toward the behavior, allowing other cues to override it (as in the natural case), larger doses make this tendency so strong that nothing else can get in the way."

Using progressively more reduced leech preparations -- that is, smaller and smaller pieces of a leech -- the scientists identified the part of its central nervous system responsible for generating the mating behavior. "One of the attractions of the lower invertebrates is that you can literally cut them in pieces, and each of the pieces will more or less keep performing the function it would have performed in the whole animal," Wagenaar explains.

"We started out studying the behavior of whole animals that we simply injected with the hormone. Then we cut leeches in thirds and injected each part with hormone, and found that the hormone acted only in the central part, which contains the reproductive organs. We then cut open that central part and stretched out the skin so we could study in more detail the muscle contractions underlying the behavior of the whole animal."

"Finally," he says, "we removed the body entirely, keeping just the nervous system, and found that even the disembodied central nervous system" -- in particular, the ganglia (clusters of nerve cell bodies) located in the reproductive segments of the leech -- "produced the appropriate nerve signals to generate the pattern of muscle activity we had observed."

"Our next project will be to use voltage-sensitive dyes to record signals from a large fraction of all the neurons in the reproductive ganglia, to find which ones contribute to generating and maintaining the behavior," he adds.Wagenaar and his colleagues believe these studies establish the leech as a new model system for studying how hormones act on the nervous system to produce mating behavior, and for deciphering the specific neural circuits that control the behavior.

"The knowledge gained from these studies," adds study coauthor Kathleen French of UCSD, "is expected to shed new light on the interactions of hormones and neurons in controlling courtship and reproductive behavior in a wide variety of sexually reproducing species, from the lowly leech to humans in a singles bar."The work was supported by the National Institutes of Health, the National Science Foundation, the Broad Foundations, Microsoft Research, and a private gift from Richard Geckler.

Story Source:

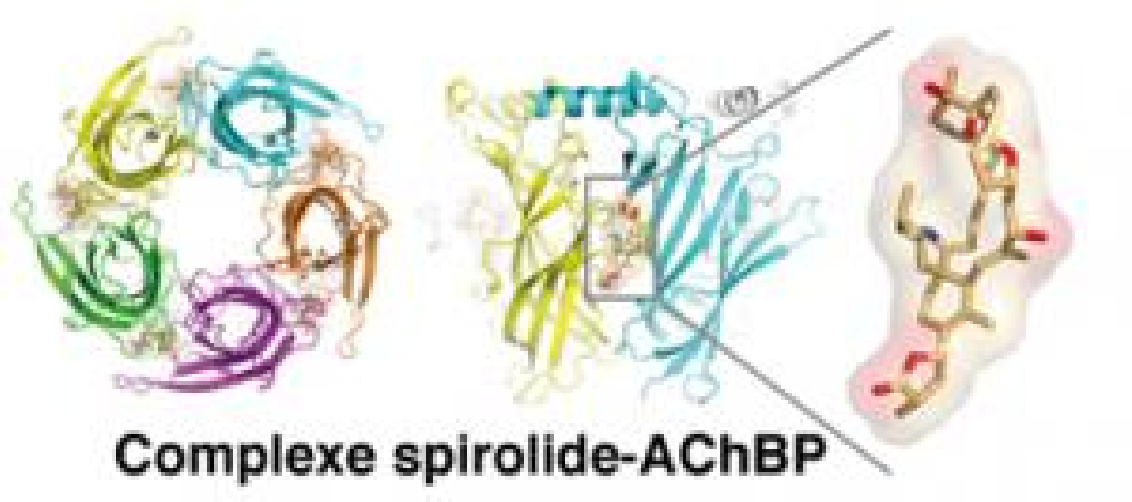
Adapted from materials provided by California Institute of Technology.

Journal Reference:

1. Wagenaar et al. **A Hormone-Activated Central Pattern Generator for Courtship**. *Current Biology*, 2010; DOI: 10.1016/j.cub.2010.02.027

http://www.sciencedaily.com/releases/2010/03/100316142521.htm

The Mode of Action of Certain Toxins That Accumulate in Seafood



The spirolide-AChBP complex AChBP, the protein used as a model for nRACh by the researchers, is made up of five identical sub-units (shown here in different colors). They are assembled in a ring, seen from above (left) and from the side when looking at the blue and yellow sub-units (middle image). The neurotransmitter inserts itself at the interfaces between the sub-units. It is also here that each phycotoxin (one of which is shown enlarged on the right) binds in order to inhibit the channel receptor function of nRACh. (Credit: Copyright Yves Bourne and Pascale Marchot / CNRS 2010)

ScienceDaily (Mar. 17, 2010) — Toxins released by certain microalgae can contaminate fish and shellfish which then become toxic to humans. Researchers from CNRS (1) and CEA (2) have, for the first time, identified the mechanisms of action of two of these toxins. They have shown how and why they cause neurological symptoms. These findings could provide a basis for the development of new tests to screen for these toxins.

This work was published online this week on the website of the journal *PNAS.*

Marine biotoxins are produced naturally by several species of single-cell algae. They can accumulate in the flesh of fish and shellfish and are then referred to as phycotoxins. In humans, the consumption of shellfish contaminated by these substances can cause diarrheal, paralytic, neurological and other symptoms. Phycotoxins can spread rapidly throughout the world, notably via the emptying of ballast tanks by merchant ships. As early as 1991, shellfish contamination was observed in Canada, then along the coasts of Norway, Spain and Tunisia. In 2005, contaminated oysters were detected in the Arcachon Basin on the west coast of France, which led the health authorities to impose a temporary ban on their sale.

A Franco-American collaborative project involving two joint CNRS/University laboratories in Marseilles, a CNRS intra-mural laboratory, a CEA laboratory in Gif-sur-Yvette and an American laboratory at the University of California has studied the functioning of two types of phycotoxins, a spirolide and a gymnodimine. These are "rapid-acting" neurotoxins; their injection in laboratory mice causes severe neurological symptoms that have a fatal outcome within a few minutes. The researchers were able to characterize the target of these toxins: they attack a receptor that is essential in living beings, the nicotinic acetylcholine receptor (3) (nRACh), a channel receptor situated on the membrane of muscle or nerve cells that allows the passage of small ionized molecules into and out of the cell. nRACh plays a crucial role in neuromuscular and neuronal transmission. More precisely, these toxins act by rapidly and almost irreversibly blocking the channel receptor function of nRAChs. This inhibition then causes muscle and/or cerebral dysfunctions, reminiscent of those observed during certain muscle diseases or cognitive disorders.

The scientists then characterized how the two phycotoxins bound to the receptor. Resolved using X-ray crystallography, the 3D structures of the complexes that formed between the phycotoxins and the receptor revealed that each toxin inserts itself at the heart of the binding site for acetylcholine, the natural neurotransmitter (4) of this receptor. This is a key position in that it can block the channel receptor function of nRAChs. Of particular interest (5) was the discovery that the binding mode of these toxins might provide new opportunities regarding the development of novel therapeutic agents active on nRAChs.

These results obtained in vitro thus explain the neurotoxicity of these phycotoxins in numerous animal species. A clearer understanding of their mode of action constitutes the first step towards the development of antidotes that might become a sanitary and economic necessity. Thus these findings raise hopes for the design of new, reliable, sensitive, practical and inexpensive tests that could detect the presence of phycotoxins in shellfish offered to consumers.

Notes:

(1) Three CNRS units are involved: the Centre de Recherche en Neurobiologie -- Neurophysiologie in Marseille (CNRS/Universités Aix-Marseille 2 et 3), the "Achitecture et Fonction des Macromolécules Biologiques" Laboratory (CNRS/Universités Aix-Marseille 1 et 2) and the CNRS "Neurobiologie Cellulaire et Moléculaire" Laboratory.

(2) iBiTecS, Service d'Ingénierie Moléculaire des Protéines, Laboratoire de Toxicologie moléculaire, CEA Directorate of Life Sciences

(3) Acetylcholine was the first neurotransmitter to be discovered. This molecule plays an important role in both the central nervous system (where it is implicated in memory and learning) and the peripheral nervous system (where it controls muscle functioning).

(4) The chemical compounds released by neurons that act on other neurons or on muscles (e.g. acetylcholine).

(5) The binding mode of these toxins is interesting as it differs from that of other nRACh effectors.

Story Source:

Adapted from materials provided by CNRS (Délégation Paris Michel-Ange).

Journal Reference:

1. Yves Bourne, Zoran Radic, Romulo Aráoz, Todd T. Talley, Evelyne Benoit, Denis Servent, Palmer Taylor, Jordi Molgó, Pascale Marchot. **Structural determinants in phycotoxins and AChBP conferring high affinity binding and nicotinic AChR antagonism**. *PNAS*, 8 March 2010 DOI: 10.1073/pnas.0912372107

http://www.sciencedaily.com/releases/2010/03/100311092118.htm

Southern Ocean Winds Open Window to the Deep Sea

Deploying an Argo ocean profiler in the Southern Ocean. (Credit: Alicia Navidad)

ScienceDaily (Mar. 17, 2010) — Australian and US scientists have discovered how changes in winds blowing on the Southern Ocean drive variations in the depth of the surface layer of sea water responsible for regulating exchanges of heat and carbon dioxide between the ocean and the atmosphere.

The researchers' findings -- published in *Nature Geoscience* -- provide new insights into natural processes which have a major influence on the rate of climate change.

The surface-mixed layer is a crucial pathway between the atmosphere and the deeper layers of the ocean. Changes in the depth of the mixed layer can affect air-sea exchange, carbon and heat storage in the ocean, and the rate at which water sinks from the surface ocean into the deep ocean.

Changes in the mixed layer also affect biological productivity, by altering how much light and nutrients are available to support growth of plankton at the base of the food chain.

The paper's lead author, CSIRO Wealth from Oceans Flagship oceanographer Dr Jean-Baptiste Sallée, said the winds over the Southern Ocean had increased in strength and shifted closer to Antarctica in recent decades.

"The shift in winds is one of the strongest trends in southern hemisphere climate over the last 30 years," Dr Sallée said. "The key question is; 'How does the wind change affect the ocean?'

"Our knowledge of how the Southern Ocean changes in time is poor because of the lack of ship-based observations in this remote region. But we now have seven years of year-round observations from a fleet of profiling floats known as Argo, which allow us to see for the first time how the Southern Ocean changes with the seasons and from year-to-year."

The researchers, including Dr Steve Rintoul from the Antarctic Climate and Ecosystems CRC and CSIRO and Professor Kevin Speer from Florida State University, examined the relationship between changes in wind and changes in the surface-mixed layer.

"We found that the depth of the mixed layer was more sensitive than we expected to a wind pattern known as the Southern Annular Mode, the major mode of variability of the southern hemisphere atmosphere," Dr Sallée said. "Even more surprising was the fact that the response is very different in different regions."

When the winds strengthen and contract closer to Antarctica, the surface-mixed layer deepens in the eastern Indian and central Pacific oceans, and shallows in the western part of these basins. The reverse is seen when the winds weaken and migrate north.

The asymmetry can be explained by small deviations in the generally west-to-east winds and their effect on the heat exchange between ocean and atmosphere: when cold winds blow from the south, this causes heat loss from the ocean and deeper mixed layers.

"These changes in mixed layer depth affect how much light is available to support the growth of phytoplankton. We found that changes in the mixed layer depth driven by the winds are associated with changes in the amount of phytoplankton biomass," Dr Sallée said.

Story Source:

Adapted from materials provided by CSIRO Australia.

Journal Reference:

1. Sallée et al. **Zonally asymmetric response of the Southern Ocean mixed-layer depth to the Southern Annular Mode**. *Nature Geoscience*, 2010; DOI: 10.1038/ngeo812

http://www.sciencedaily.com/releases/2010/03/100315103820.htm

Flowering Plants May Be Considerably Older Than Previously Thought

A new analysis of the land plant family tree suggests that flowering plants may have lived much earlier than previously thought. (Credit: Wikimedia Commons)

ScienceDaily (Mar. 17, 2010) — Flowering plants may be considerably older than previously thought, says a new analysis of the plant family tree.

Previous studies suggest that flowering plants, or angiosperms, first arose 140 to 190 million years ago. Now, a paper to be published in the *Proceedings of the National Academy of Sciences* pushes back the age of angiosperms to 215 million years ago, some 25 to 75 million years earlier than either the fossil record or previous molecular studies suggest.

"If you just looked at the fossil record, you would say that angiosperms originated in the early Cretaceous or late Jurassic," said Michael Donoghue of Yale University. "Most molecular divergence times have shown that they might be older than that," added Yale biologist Jeremy Beaulieu. "But we actually find that they might be Triassic in origin," said Beaulieu. "No one has found a result like that before."

If confirmed, the study could bolster the idea that early angiosperms promoted the rise of certain insects. Modern insects like bees and wasps rely on flowers for nectar and pollen. "The fossil record suggests that a lot of these insect groups originated before angiosperms appeared," said Stephen Smith of the National Evolutionary Synthesis Center. This study shifts the oldest angiosperms back farther in time towards the origin of groups like bees and flies, the scientists say. "If you take our dates and superimpose them on the evolutionary tree for these insect groups, all of a sudden you get a match," said Beaulieu.

To trace the origins of flowering plants, the researchers used genetic comparisons of living plants and clues from fossils to reconstruct the relationships among more than 150 terrestrial plant species. Though their results contradict previous age estimates for angiosperms, they support estimates for other plant groups. "Many of the dates that we get correspond really well to the known fossil record, at least for the origin of land plants and the origin of vascular plants and seed plants," said Donoghue. "But we got a much older date for the origin of angiosperms -- one that's really out of whack with the fossil record," Smith added.

This disconnect between molecular and fossil estimates is not unheard of, the authors explained. "We see the same kind of discrepancy in other groups too, like mammals and birds," said Donoghue.

Why the mismatch between different approaches to dating the tree of life?

One possibility, the researchers explained, is that the first flowering plants weren't diverse or abundant enough to leave their mark in the fossil record. "We would expect there to be a time lag between the time of origin and when they became abundant enough to get fossilized," said Smith. "The debate would just be how long."

"Imagine a long fuse burning and then KABOOM! There's a big explosion. Maybe angiosperms were in that fuse state," said Donoghue. "But it's hard to imagine flowering plants would have had a big impact on the origin of major insect groups if that were the case," he added.

Another possibility, the researchers allow, is that the molecular methods may be amiss. "If the angiosperms originated 215 million years ago, then why don't we find them in the fossil record for almost 80 million years?" said Beaulieu. "It could also suggest that our dates are wrong."

"We've done the best analysis we know how to do with the current tools and information," said Donoghue. To improve on previous studies, the researchers used a method that allows for variable rates of evolution across the plant family tree. "Rates of molecular evolution in plants seem to be correlated with changes in life history," he explained. "Older methods assume that rates of molecular evolution don't change too radically from one branch of the evolutionary tree to another. But this newer method can accommodate some fairly major rate shifts." Although researchers have come up with some savvy statistical tricks to account for rate shifts, Donoghue explained, the problem hasn't entirely disappeared.

"As we develop better molecular methods, people would like it if the molecular dates reconciled with the fossil record. Then everybody would be happy," said Donoghue. "But instead the gap is getting wider," he said. "And in the end, that might actually be interesting."

The team's findings will be published early online in the March 15 issue of *Proceedings of the National Academy of Sciences.*

Story Source:

Adapted from materials provided by National Evolutionary Synthesis Center (NESCent), via EurekAlert!, a service of AAAS.

Journal Reference:

1. Smith, S., J. Beaulieu, and M. Donoghue. **An uncorrelated relaxed-clock analysis suggests an earlier origin for flowering plants**. *Proceedings of the National Academy of Sciences*, March 15, 2010 DOI: 10.1073/pnas.1001225107

http://www.sciencedaily.com/releases/2010/03/100315161919.htm

How Plants Put Down Roots: Geneticists Research Organ Development in the Plant Embryo

One week old seed of the thale cress with embryo. (Credit: Martin Bayer / Max Planck Institute for Developmental Biology)

ScienceDaily (Mar. 16, 2010) — In the beginning is the fertilized egg cell. Following numerous cell divisions, it then develops into a complex organism with different organs and tissues. The largely unexplained process whereby the cells simply "know" the organs into which they should later develop is an astonishing phenomenon.

Scientists from the Center for Plant Molecular Biology (ZMBP) of the University of Tübingen and the University of Wageningen, in cooperation with colleagues from the Max Planck Institute for Developmental Biology, have investigated how this process is controlled. Based on their studies of the thale cress, Arabidopsis thaliana, they have succeeded in demonstrating how the plant forms its first roots: the root founder cell in the tiny group of cells contained in the seed is activated by a combination of a plant hormone and a transcription factor.

These insights could contribute to the breeding of plants with a particularly effective root system in the future.

The research appears in *Nature*, advance online publication on March 10, 2010.

In the seed of the thale cress, the embryo forms from the fertilised egg cell that initially divides into two daughter cells. One of these two cells later goes on to form almost the entire embryo, while the other generates connective tissue that anchors the embryo in the endosperm or nutritive tissue. When the embryo has grown into a small cluster of cells, the connective tissue cell that borders the embryo is stimulated by activating signals to become part of the embryo and form the root tissue.

The scientists studied these processes in detail under the supervision of Gerd Jürgens and Dolf Weijers and succeeded in identifying several of the players involved in this complex regulatory network.The formation of the root tissue depends firstly on the accumulation of the plant hormone auxin, which is channelled to the root founder cell by the embryo. This process is reinforced by the transcription factor MONOPTEROS. However, this is not sufficient on its own.

The researchers concluded that MONOPTEROS must deliberately activate other genes. In a comprehensive survey of all of the genes activated by MONOPTEROS, they identified two genes that already play a role in embryonic development: TMO5 and TMO7 (TMO = Target of MONOPTEROS). Both of these genes are required for the formation of the root tissue. For this purpose, the protein formed by the TMO7 gene must migrate from the location of its emergence in the embryo to the root founder cell.

"With TM07 we have identified a hitherto unknown intercellular signal for root formation in the embryo," says Gerd Jürgens. The detective work in the plant researchers' genetics laboratory does not end here, however. "Because the transcription factor TM07 is involved in other regulatory network of plant development, there can be no doubt that it holds further insights in store for us," says Jürgens.

Story Source:

Adapted from materials provided by Max-Planck-Gesellschaft.

Journal Reference:

1. Alexandra Schlereth, Barbara Möller, Weilin Liu, Marika Kientz, Jacky Flipse, Eike H. Rademacher, Markus Schmid, Gerd Jürgens und Dolf Weijers. **MONOPTEROS controls embryonic root initiation by regulating a mobile transcription factor**. *Nature*, 2010; DOI: 10.1038/nature08836

http://www.sciencedaily.com/releases/2010/03/100315132706.htm

Chemicals That Eased One Environmental Problem May Worsen Another

Forests are being damaged by acid rain, which contains a corrosive ingredient that may result from the breakdown of chemicals introduced to help protect Earth's ozone layer. (Credit: Wikimedia Commons)

ScienceDaily (Mar. 16, 2010) — Chemicals that helped solve a global environmental crisis in the 1990s -- the hole in Earth's protective ozone layer -- may be making another problem -- acid rain -- worse, scientists are reporting. Their study on the chemicals that replaced the ozone-destroying chlorofluorocarbons (CFCs) once used in aerosol spray cans, air conditioners, refrigerators, and other products, appears in ACS' *Journal of Physical Chemistry A.*

Jeffrey Gaffney, Carrie J. Christiansen, Shakeel S. Dalal, Alexander M. Mebel and Joseph S. Francisco point out that hydrochlorofluorocarbons (HCFCs) emerged as CFC replacements because they do not damage the ozone layer. However, studies later suggested the need for a replacement for the replacements, showing that HCFCs act like super greenhouse gases, 4,500 times more potent than carbon dioxide. The new study adds to those concerns, raising the possibility that HCFCs may break down in the atmosphere to form oxalic acid, one of the culprits in acid rain.

They used a computer model to show how HCFCs could form oxalic acid via a series of chemical reactions high in the atmosphere. The model, they suggest, could have broader uses in helping to determine whether replacements for the replacements are as eco-friendly as they appear before manufacturers spend billions of dollars in marketing them.

Story Source:

Adapted from materials provided by American Chemical Society.

Journal Reference:

1. Christiansen et al. **Hydroxyl Radical Substitution in Halogenated Carbonyls: Oxalic Acid Formation**. *The Journal of Physical Chemistry A*, 2010; 114 (8): 2806 DOI: 10.1021/jp9045116

http://www.sciencedaily.com/releases/2010/03/100303114001.htm

Earthquake Observatory in Northern Chile to Monitor the Last Seismic Gap

The stations of the Integrated Plate Boundary Observatory are energised by solar panels. (Credit: Copyright GFZ)

ScienceDaily (Mar. 16, 2010) — The high-magnitude earthquake of Feb. 27, 2010 in southern Central Chile closed one of the two remaining seismic gaps at the South American plate boundary. After the quake of Concepción, the remaining gap in the north of Chile now holds potential for a comparable strong quake and is, thus, moving more and more into the focus of attention.

The GFZ German Research Centre for Geosciences, has been monitoring this gap with the Integrated Plate Boundary Observatory (IPOC) in Chile since 2006. In a festive ceremony on March 15, the Chairman of the Board of the GFZ, Professor Reinhard Huettl, is handing over this Observatory to the Universidad de Chile with the seismological service of Chile and to the Universidad Catolica del Norte.

"Together with our Chilean colleagues and other partners we have developed and operated the IPOC. The transfer to the Chilean Earthquake Service will further strengthen this cooperation" explained Reinhard Huettl in Santiago de Chile. "The observatory will continue to be jointly operated, GFZ will finance the German share. The location for this observatory has obviously been very well selected, as the quake of 27 February shows. This last non-ruptured segment of the Earth's crust off the Chilean west coast is highly interesting for geosciences in the whole world." It is, however, not simply a question of earthquakes. The aim is to continuously measure all processes in connection with the dynamics of this plate boundary.

Approximately one-third of the world-wide seismic energy has discharged during the last century in earthquakes with magnitudes of over M = 8 along the South American-Pacific plate boundary. The repeat-time between two large earthquakes is shorter here than almost anywhere else on our planet.

The IPOC project investigates the area around Iquique on the South American Nazca Plate Boundary. One expects that within the next years a strong to devastating earthquake will occur in this area. Within the framework of investigations, deformation, seismicity, and magnetotelluric fields in the subduction zone will be monitored, i.e. in the periods before, between and possibly also during a quake.

The equipping of the observatory began in close collaboration with the Universidad de Chile (Santiago), the Universidad Católica del Norte (Antofagasta), the IPGP (Paris) and the GFZ (Potsdam). Professor Onno Oncken, Director of the Department "Geodynamics and Geomaterials" at the GFZ (Helmholtz Association) is coordinator of the IPOC activities and explains the construction of the observatory: "Currently the monitoring network consists of 20 seismological stations, equipped with broadband seismometers and acceleration sensors." In order to do justice to the requirements for dissolution and efficiency of the sensors and data capture, special care was given to choosing the exact location. Thus, at each station a lug of approx. 5 m deep was blown into the rock bed, in order to ensure stable site conditions for the monitoring instruments. All seismic installations are equipped with the new-generation GPS-instruments. Seven measuring points were furthermore equipped beyond that with magnetotelluric measuring instruments and serve for the measurement of electric current in the Earth's crust.

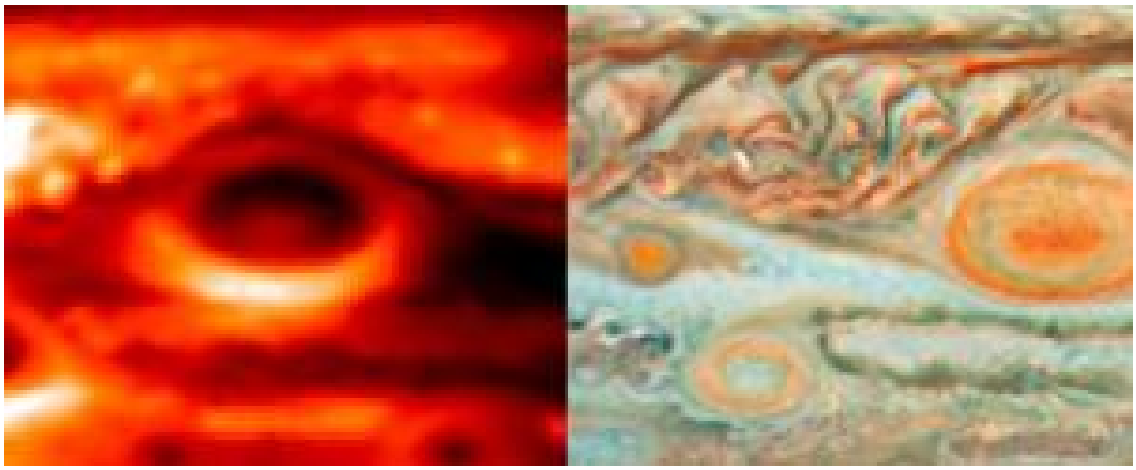
Professor Oncken has been leading research on geodynamics in the Andes since 1994. These investigations are not only of geoscientific interest. "Due to the numerous expeditions and measuring campaigns over the years in this subduction zone, the GFZ now holds the densest data set world-wide for such an area" says Onno Oncken. "When we monitor the conditions before, during and after a large quake this serves to help develop a hazard model for this and similar regions.

A strong quake in this region can have consequences for the global economy: the earthquakes here develop through the subduction of the Pacific-floor under South America. The same process also leads to the formation of ore deposits in the Earth's crust. Thus, the largest copper deposit of the world is to be found on the western boundary of the Central Andes. A strong quake could interrupt or even endanger the global supply of copper and lithium.

Story Source:

Adapted from materials provided by Helmholtz Association of German Research Centres.
http://www.sciencedaily.com/releases/2010/03/100315125559.htm

Jupiter's Spot Seen Glowing: Scientists Get First Look at Weather Inside the Solar System's Biggest Storm



New thermal images from ESO's Very Large Telescope (VLT) and other ground-based telescopes show swirls of warmer air and cooler regions never seen before within Jupiter's Great Red Spot. The images enable scientists to make the first detailed weather map of the inside of the giant storm system. One observation illustrated by this image is the correspondence between a warm core within an otherwise cold storm system and the reddest colour of the Great Red Spot. The image on the left was obtained with the VISIR on the VLT in Chile on May 18, 2008. It was taken in the infrared wavelength range of 10.8 microns, which is sensitive to Jupiter's atmospheric temperatures in the 300 to 600 millibar pressure range. That pressure range is close to the altitude of the white, red and brown aerosols seen in the visible-light image on the right, which was obtained by the NASA/ESA Hubble Space Telescope on May 15, 2008. These images show the interaction of three of Jupiter's largest storms -- the Great Red Spot and two smaller storms nicknamed Oval BA and Little Red Spot. (Credit: ESO/NASA/JPL/ESA/L. Fletcher)

ScienceDaily (Mar. 16, 2010) — "This is our first detailed look inside the biggest storm of the Solar System," says Glenn Orton, who led the team of astronomers that made the study. "We once thought the Great Red Spot was a plain old oval without much structure, but these new results show that it is, in fact, extremely complicated."

The observations reveal that the reddest colour of the Great Red Spot corresponds to a warm core within the otherwise cold storm system, and images show dark lanes at the edge of the storm where gases are descending into the deeper regions of the planet. The observations, detailed in a paper appearing in the journal Icarus, give scientists a sense of the circulation patterns within the solar system's best-known storm system.

Sky gazers have been observing the Great Red Spot in one form or another for hundreds of years, with continuous observations of its current shape dating back to the 19th century. The spot, which is a cold region averaging about -160 degrees Celsius, is so wide that about three Earths could fit inside its boundaries.

The thermal images were mostly obtained with the VISIR [1] instrument attached to ESO's Very Large Telescope in Chile, with additional data coming from the Gemini South telescope in Chile and the National Astronomical Observatory of Japan's Subaru Telescope in Hawaii. The images have provided an unprecedented level of resolution and extended the coverage provided by NASA's Galileo spacecraft in the late 1990s. Together with observations of the deep cloud structure by the 3-metre NASA Infrared Telescope Facility in Hawaii, the level of thermal detail observed from these giant observatories is for the first time comparable to visible-light images from the NASA/ESA Hubble Space Telescope.

VISIR allows the astronomers to map the temperature, aerosols and ammonia within and surrounding the storm. Each of these parameters tells us how the weather and circulation patterns change within the storm, both spatially (in 3D) and with time. The years of VISIR observations, coupled with those from the other observatories, reveals how the storm is incredibly stable despite turbulence, upheavals and close encounters with other anticyclones that affect the edge of the storm system.

"One of the most intriguing findings shows the most intense orange-red central part of the spot is about 3 to 4 degrees warmer than the environment around it," says lead author Leigh Fletcher. This temperature difference might not seem like a lot, but it is enough to allow the storm circulation, usually counter-clockwise, to shift to a weak clockwise circulation in the very middle of the storm. Not only that, but on other parts of Jupiter, the temperature change is enough to alter wind velocities and affect cloud patterns in the belts and zones.

"This is the first time we can say that there's an intimate link between environmental conditions -- temperature, winds, pressure and composition -- and the actual colour of the Great Red Spot," says Fletcher. "Although we can speculate, we still don't know for sure which chemicals or processes are causing that deep red colour, but we do know now that it is related to changes in the environmental conditions right in the heart of the storm."

Notes

[1] VISIR stands for VLT Imager and Spectrometer for mid Infrared (eso0417). It is a complex multi-mode instrument designed to operate in the 10 and 20 micron atmospheric windows, i.e. at wavelengths up to about 40 times longer than visible light, and to provide images as well as spectra.

More information

This research was presented in a paper to appear in *Icarus*.

The team is composed of Leigh N. Fletcher and P. G. J. Irwin (University of Oxford, UK), G. S. Orton, P. Yanamandra-Fisher, and B. M. Fisher (Jet Propulsion Laboratory, California Institute of Technology, USA), O. Mousis (Observatoire de Besançon, France, and University of Arizona, Tucson, USA), P. D. Parrish (University of Edinburgh, UK), L. Vanzi (Pontificia Universidad Catolica de Chile, Santiago, Chile), T. Fujiyoshi and T. Fuse (Subaru Telescope, National Astronomical Observatory of Japan, Hawaii, USA), A.A. Simon-Miller (NASA/Goddard Spaceflight Center, Greenbelt, Maryland, USA), E. Edkins (University of California, Santa Barbara, USA), T.L. Hayward (Gemini Observatory, La Serena, Chile), and J. De Buizer (SOFIA -- USRA, NASA Ames Research Center, Moffet Field, CA 94035, USA). Leigh Fletcher was working at JPL during the study.

Story Source:

Adapted from materials provided by ESO.

Journal Reference:

1. Fletcher et al. **Thermal Structure and Composition of Jupiter's Great Red Spot from High-Resolution Thermal Imaging**. *Icarus*, 2010; DOI: 10.1016/j.icarus.2010.01.005

http://www.sciencedaily.com/releases/2010/03/100316174210.htm

Catastrophic Flooding May Be More Predictable With New Models

A satellite image of the Kosi fan avulsion in India during the 2008 flood. (Credit: NASA Earth Observatory)

ScienceDaily (Mar. 16, 2010) — An interdisciplinary team of physicists and geologists led by the University of Pennsylvania has made a major step toward predicting where and how large floods occur on river deltas and alluvial fans.

In a laboratory, researchers created a miniature river delta that replicates flooding patterns seen in natural rivers, resulting in a mathematical model capable of aiding in the prediction of the next catastrophic flood.

The results appear in the current issue of *Geophysical Research Letters.*

Slow deposition of sediment within rivers eventually fills channels, forcing water to spill into surrounding areas and find a new, steeper path. The process is called avulsion. The result, with the proper conditions, is catastrophic flooding and permanent relocation of the river channel.

The goal of the Penn research was to improve prediction of why and where such flooding will occur and to determine how this avulsion process builds deltas and fans over geologic time.

Research was motivated by the Aug. 18, 2008, flooding of the Kosi River fan in northern India, where an artificial embankment was breached and the resulting floodwaters displaced more than a million people.

Looking at satellite pictures, scientists from Penn and University of Minnesota Duluth noticed that floodwaters principally filled abandoned channel paths.

Meredith Reitz, lead author of the study and a graduate student in the Department of Physics and Astronomy in Penn's School of Arts and Sciences, conducted a set of four laboratory experiments to study the avulsion process in detail. Reitz injected a mixture of water and sediment into a bathtub-sized tank and documented the formation and avulsion of river channels as they built a meter-sized delta.

"Reducing the scale of the system allows us to speed up time," Reiz said. "We can observe processes in the lab that we could never see in nature."

The laboratory experiments showed flooding patterns that were remarkably similar to the Kosi fan and revealed that flooding and channel relocation followed a repetitive cycle.

One major finding was that the formation of a river channel on a delta followed a random path; however, once a network of channels was formed, avulsion consistently returned flow to these same channels, rather than creating new ones. An additional important finding was that the average frequency of flooding was determined by how long it took to fill a channel with sediment. Researchers constructed a mathematical model incorporating these two ideas, which was able to reproduce the statistical behavior of flooding.

"Avulsions on river deltas and fans are like earthquakes," said Douglas Jerolmack, director of the Sediment Dynamics Laboratory in the Department of Earth and Environmental Science at Penn and a co-author of the study. "It is impossible to predict exactly where and when they will occur, but we might be able to predict approximately how often they will occur and which areas are most vulnerable. Just as earthquakes occur along pre-existing faults, flooding occurs along pre-existing channel paths. If you want to know where floodwaters will go, find the old channels."

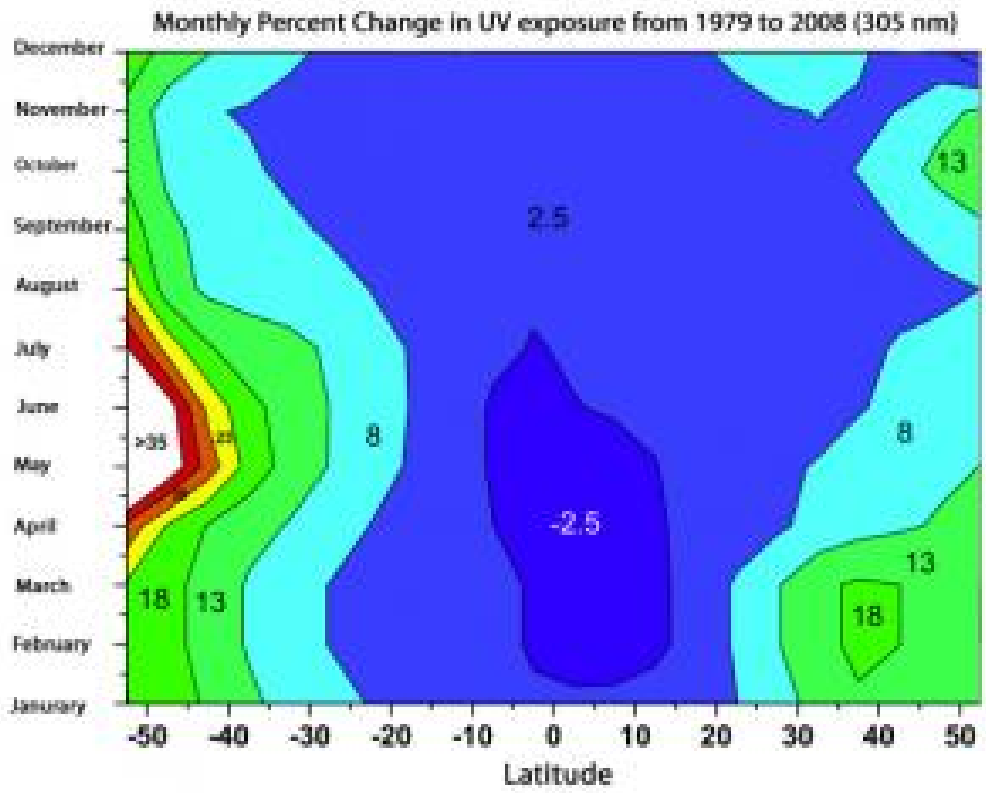
The authors derived a simple method for estimating the recurrence interval of catastrophic flooding on real deltas. When used in conjunction with satellite images and topographic maps, this work will allow for enhanced flood hazard prediction. Such prediction is needed to protect the hundreds of millions of people who are threatened by flooding on river deltas and alluvial fans. The work could also help in exploration for oil reservoirs, because sandy river channels are an important source of hydrocarbons.

The study was funded by the National Science Foundation and was conducted by Reitz and Jerolmack at Penn and John Swenson of the University of Minnesota Duluth.

Story Source:

Adapted from materials provided by University of Pennsylvania.
http://www.sciencedaily.com/releases/2010/03/100316142513.htm

UV Exposure Has Increased Over the Last 30 Years, but Stabilized Since the Mid-1990s



The largest increases in UV (shown in white, red, orange, and yellow) have occurred in the southern hemisphere during summers. In the tropics, increases in UV have been minimal (shown in blue). Though the size of UV wavelengths ranges from 290 to 400 nanometers, 305 nanometer UV is one of the most damaging types for humans. (Credit: NASA's Goddard Space Flight Center/Jay Herman)

ScienceDaily (Mar. 16, 2010) — NASA scientists analyzing 30 years of satellite data have found that the amount of ultraviolet (UV) radiation reaching Earth's surface has increased markedly over the last three decades. Most of the increase has occurred in the mid-and-high latitudes, and there's been little or no increase in tropical regions.

The new analysis shows, for example, that at one line of latitude -- 32.5 degrees -- a line that runs through central Texas in the northern hemisphere and the country of Uruguay in the southern hemisphere, 305 nanometer UV levels have gone up by some 6 percent on average since 1979.

The primary culprit: decreasing levels of stratospheric ozone, a colorless gas that acts as Earth's natural sunscreen by shielding the surface from damaging UV radiation.

The finding reinforces previous observations that show UV levels are stabilizing after countries began signing an international treaty that limited the emissions of ozone-depleting gases in 1987. The study also shows that increased cloudiness in the southern hemisphere over the 30-year period has impacted UV.

Jay Herman, a scientist at NASA's Goddard Space Flight Center in Greenbelt, Md., stitched together data from several earth observing satellites -- including NASA's Aura satellite, NOAA weather satellites, and commercial satellites -- to draw his conclusions. The results were published in the *Journal of Geophysical Research* in February.

"Overall, we're still not where we'd like to be with ozone, but we're on the right track," said Jay Herman. "We do still see an increase in UV on a 30-year timescale, but it's moderate, it could have been worse, and it appears to have leveled off."

In the tropics, the increase has been minimal, but in the mid-latitudes it has been more obvious. During the summer, for example, UV has increased by more than 20 percent in Patagonia and the southern portions of South America. It has risen by nearly 10 percent in Buenos Aires, a city that's about the same distance from the equator as Little Rock, Ark. At Washington, D.C.'s latitude -- about 35 degrees north -- UV has increased by about 9 percent since 1979.

The southern hemisphere tends to have more UV exposure because of the ozone hole, a seasonal depletion of the ozone layer centered on the South Pole. There are also fewer particles of air pollution -- which help block UV -- due to the comparatively small numbers of people who live in the southern hemisphere.

Despite the overall increases, there are clear signs that ultraviolet radiation levels are on the verge of falling. Herman's analysis, which is in agreement with a World Meteorological Report published in recent years, shows that decreases in ozone and corresponding increases in UV irradiance leveled off in the mid-nineties.

The Many Sides of Radiation

Shorter ultraviolet wavelengths of light contain more energy than the infrared or visible portions of sunlight that reach Earth's surface. Because of this, UV photons can break atmospheric chemical bonds and cause complex health effects.

Longer wavelengths (from 320 to 400 nanometers) -- called UV-A -- cause sunburn and cataracts. Yet, UV-A can also improve health by spurring the production of Vitamin D, a substance that's critical for calcium absorption in bones and that helps stave off a variety of chronic diseases.

UV-B, which has slightly shorter wavelengths (from 320 to 290 nanometers), damages DNA by tangling and distorting its ladder-like structure, causing a range of health problems such as skin cancer and diseases affecting the immune system.

As part of his study, Herman developed a mathematical technique to quantify the biological impacts of UV exposure. He examined and calculated how changing levels of ozone and ultraviolet irradiance affect life. For Greenbelt, Md., for example, he calculated that a 7 percent increase in UV yielded a 4.4 percent increase in the damage to skin, a 4.8 percent increase in damage to DNA, a 5 percent increase in Vitamin D production, and less than a percent of increase in plant growth.

"If you go to the beach these days, you're at slightly higher risk of getting skin cancer (without protection)," Herman said, though he noted the risk would have been even greater in the absence of regulations on ozone-depleting substances.

Last year, one of Herman's Goddard colleagues, Paul Newman, published a study showing that the ozone hole likely would have become a year-round fixture and UV radiation would increase 650 percent by 2065 in mid-latitude cities if not for the Montreal Protocol, an international treaty signed in 1987 that limited the amount of ozone-depleting gases countries could emit.

Clouds and Hemispheric Dimming

In addition to analyzing ozone and ultraviolet trends, Herman also used satellite data to study whether changes in cloudiness have affected UV trends. To his surprise, he found that increased cloudiness in the

southern hemisphere produced a dimming effect that increased the shielding from UV compared to previous years.

In the higher latitudes especially, he detected a slight reduction -- typically of 2 to 4 percent -- in the amount of UV passing through the atmosphere and reaching the surface due to clouds. "It's not a large amount, but it's intriguing," Herman said. "We aren't sure what's behind it yet."

Vitali Fioletov, a Canadian scientist and member of the World Meteorological Organization's advisory group on ultraviolet radiation, agreed that Herman's findings about cloudiness warrant additional investigation. "I found the cloud effects on the global scale to be the most interesting aspect of the study," he said. "This isn't something you could see without satellites."

Herman synthesized measurements from the Total Ozone Mapping Spectrometer (TOMS) aboard Nimbus 7 and Earth Probe, the Ozone Monitoring Instrument (OMI) on NASA's Aura satellite, NASA's Sea-Viewing Wide Field-of-view sensor (SeaWiFS) on the commercial SeaStar satellite, and the Solar Backscatter Ultraviolet Instrument (SBUV) on several polar orbiting NOAA weather satellites.

Story Source:

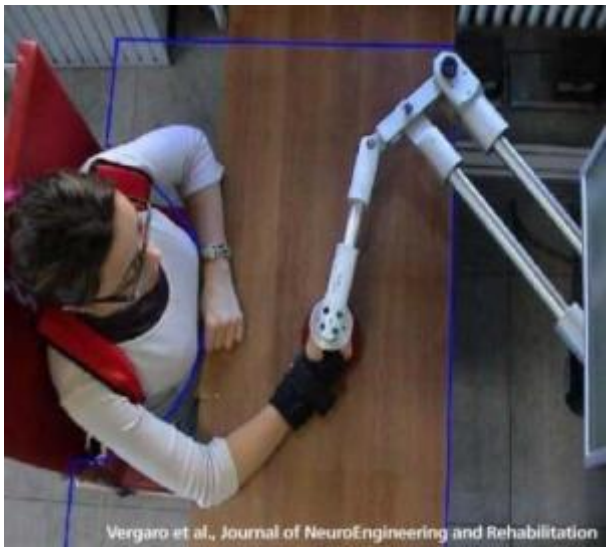
Adapted from materials provided by NASA/Goddard Space Flight Center.

Journal Reference:

1. Herman, J. R. **Global increase in UV irradiance during the past 30 years (1979–2008) estimated from satellite data**. *Journal of Geophysical Research*, 2010; 115 (d4): D04203 DOI: 10.1029/2009JD012219

http://www.sciencedaily.com/releases/2010/03/100316142529.htm

Robot Teaches Stroke Survivors



The arm is being used by a patient. (Credit: Vergaro et al., Journal of NeuroEngineering and Rehabilitation)

ScienceDaily (Mar. 16, 2010) — Shaking hands with a robotic arm could be a new way to help stroke patients learn to use their arms again. Researchers writing in BioMed Central's open access *Journal of NeuroEngineering and Rehabilitation* report a pilot trial of the 'Braccio di Ferro' (Iron arm) robot in 10 patients.

Elena Vergaro, from the University of Genoa, Italy, worked with a team of researchers from the Italian Institute of Technology, Genoa, to develop the robotic aid. She said, "Our preliminary results from this small group of patients suggest that the scheme is robust and promotes a statistically significant improvement in performance. Future large-scale controlled clinical trials should confirm that robot-assisted physiotherapy can allow functional achievements in activities of daily life."

The researcher's robot assists patients as they attempt to guide its 'hand' in a figure-of-eight motion above a desk, pulling in the correct direction and resisting incorrect movements to a minutely controlled degree. This interactive assistance allows for alternating levels of help, encouraging patients to re-learn how to use their arms. Vergaro said, "Stroke survivors perform arm movements in abnormal ways, for example by elevating the shoulder in order to lift the arm, or leaning forward with the torso instead of extending the elbow. Use of such incorrect patterns may limit their ability to achieve higher levels of movement ability, and may lead to repetitive use injuries. By demonstrating the correct movements, a robot can help the motor system of the subject learn to replicate the desired trajectory by experience."

Story Source:

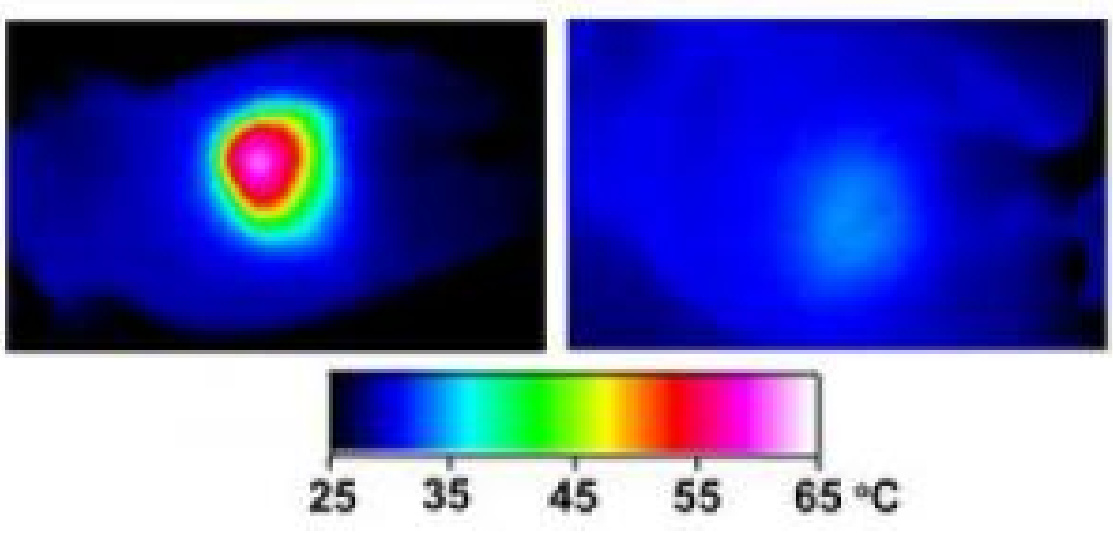
Adapted from materials provided by BioMed Central, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Elena Vergaro, Maura Casadio, Valentina Squeri, Psiche Giannoni, Pietro Morasso and Vittorio Sanguineti. **Self-adaptive robot training of stroke survivors for continuous tracking movements**. *Journal of NeuroEngineering and Rehabilitation*, 2010 DOI: 10.1186/1743-0003-7-13

http://www.sciencedaily.com/releases/2010/03/100315104034.htm

Nanoparticles Provide Targeted Version of Photothermal Therapy for Cancer



Infrared images made while tumors were irradiated with a laser show that in nanocage-injected mice (left), the surface of the tumor quickly became hot enough to kill cells. In buffer-injected mice (right), the temperature barely budged. This specificity is what makes photothermal therapy so attractive as a cancer therapy. (Credit: WUSTL)

ScienceDaily (Mar. 16, 2010) — In a lecture he delivered in 1906, the German physician Paul Ehrlich coined the term Zuberkugel, or "magic bullet," as shorthand for a highly targeted medical treatment.

Magic bullets, also called silver bullets, because of the folkloric belief that only silver bullets can kill supernatural creatures, remain the goal of drug development efforts today.

A team of scientists at Washington University in St. Louis is currently working on a magic bullet for cancer, a disease whose treatments are notoriously indiscriminate and nonspecific. But their bullets are gold rather than silver. Literally.

The gold bullets are gold nanocages that, when injected, selectively accumulate in tumors. When the tumors are later bathed in laser light, the surrounding tissue is barely warmed, but the nanocages convert light to heat, killing the malignant cells.

In an article just published in the journal *Small*, the team describes the successful photothermal treatment of tumors in mice.

The team includes Younan Xia, Ph.D., the James M. McKelvey Professor of Biomedical Engineering in the School of Engineering and Applied Science, Michael J. Welch, Ph.D., professor of radiology and developmental biology in the School of Medicine, Jingyi Chen, Ph.D., research assistant professor of biomedical engineering and Charles Glaus, Ph.D., a postdoctoral research associate in the Department of Radiology.

"We saw significant changes in tumor metabolism and histology," says Welch, "which is remarkable given that the work was exploratory, the laser 'dose' had not been maximized, and the tumors were 'passively' rather than 'actively' targeted."

Why the nanocages get hot

The nanocages themselves are harmless. "Gold salts and gold colloids have been used to treat arthritis for more than 100 years," says Welch. "People know what gold does in the body and it's inert, so we hope this is going to be a nontoxic approach."

"The key to photothermal therapy," says Xia, "is the cages' ability to efficiently absorb light and convert it to heat. "

Suspensions of the gold nanocages, which are roughly the same size as a virus particle, are not always yellow, as one would expect, but instead can be any color in the rainbow.

They are colored by something called a surface plasmon resonance. Some of the electrons in the gold are not anchored to individual atoms but instead form a free-floating electron gas, Xia explains. Light falling on these electrons can drive them to oscillate as one. This collective oscillation, the surface plasmon, picks a particular wavelength, or color, out of the incident light, and this determines the color we see.

Medieval artisans made ruby-red stained glass by mixing gold chloride into molten glass, a process that left tiny gold particles suspended in the glass, says Xia.

The resonance -- and the color -- can be tuned over a wide range of wavelengths by altering the thickness of the cages' walls. For biomedical applications, Xia's lab tunes the cages to 800 nanometers, a wavelength that falls in a window of tissue transparency that lies between 750 and 900 nanometers, in the near-infrared part of the spectrum.

Light in this sweet spot can penetrate as deep as several inches in the body (either from the skin or the interior of the gastrointestinal tract or other organ systems).

The conversion of light to heat arises from the same physical effect as the color. The resonance has two parts. At the resonant frequency, light is typically both scattered off the cages and absorbed by them.

By controlling the cages' size, Xia's lab tailors them to achieve maximum absorption.

Passive targeting

"If we put bare nanoparticles into your body," says Xia, "proteins would deposit on the particles, and they would be captured by the immune system and dragged out of the bloodstream into the liver or spleen."

To prevent this, the lab coated the nanocages with a layer of PEG, a nontoxic chemical most people have encountered in the form of the laxatives GoLyTELY or MiraLAX. PEG resists the adsorption of proteins, in effect disguising the nanoparticles so that the immune system cannot recognize them.

Instead of being swept from the bloodstream, the disguised particles circulate long enough to accumulate in tumors.

A growing tumor must develop its own blood supply to prevent its core from being starved of oxygen and nutrients. But tumor vessels are as aberrant as tumor cells. They have irregular diameters and abnormal branching patterns, but most importantly, they have thin, leaky walls.

The cells that line a tumor's blood vessel, normally packed so tightly they form a waterproof barrier, are disorganized and irregularly shaped, and there are gaps between them.

The nanocages infiltrate through those gaps efficiently enough that they turn the surface of the normally pinkish tumor black.

A trial run

In Welch's lab, mice bearing tumors on both flanks were randomly divided into two groups. The mice in one group were injected with the PEG-coated nanocages and those in the other with buffer solution. Several days later the right tumor of each animal was exposed to a diode laser for 10 minutes.

The team employed several different noninvasive imaging techniques to follow the effects of the therapy. (Welch is head of the oncologic imaging research program at the Siteman Cancer Center of Washington University School of Medicine and Barnes-Jewish Hospital and has worked on imaging agents and techniques for many years.)

During irradiation, thermal images of the mice were made with an infrared camera. As is true of cells in other animals that automatically regulate their body temperature, mouse cells function optimally only if the mouse's body temperature remains between 36.5 and 37.5 degrees Celsius (98 to 101 degrees Fahrenheit).

At temperatures above 42 degrees Celsius (107 degrees Fahrenheit) the cells begin to die as the proteins whose proper functioning maintains them begin to unfold.

In the nanocage-injected mice, the skin surface temperature increased rapidly from 32 degrees Celsius to 54 degrees C (129 degrees F).

In the buffer-injected mice, however, the surface temperature remained below 37 degrees Celsius (98.6 degrees Fahrenheit).

To see what effect this heating had on the tumors, the mice were injected with a radioactive tracer incorporated in a molecule similar to glucose, the main energy source in the body. Positron emission and computerized tomography (PET and CT) scans were used to record the concentration of the glucose lookalike in body tissues; the higher the glucose uptake, the greater the metabolic activity.

The tumors of nanocage-injected mice were significantly fainter on the PET scans than those of buffer-injected mice, indicating that many tumor cells were no longer functioning.

The tumors in the nanocage-treated mice were later found to have marked histological signs of cellular damage.

Active targeting

The scientists have just received a five-year, $2,129,873 grant from the National Cancer Institute to continue their work with photothermal therapy.

Despite their results, Xia is dissatisfied with passive targeting. Although the tumors took up enough gold nanocages to give them a black cast, only 6 percent of the injected particles accumulated at the tumor site.

Xia would like that number to be closer to 40 percent so that fewer particles would have to be injected. He plans to attach tailor-made ligands to the nanocages that recognize and lock onto receptors on the surface of the tumor cells.

In addition to designing nanocages that actively target the tumor cells, the team is considering loading the hollow particles with a cancer-fighting drug, so that the tumor would be attacked on two fronts.

But the important achievement, from the point of view of cancer patients, is that any nanocage treatment would be narrowly targeted and thus avoid the side effects patients dread.

The TV and radio character the Lone Ranger used only silver bullets, allegedly to remind himself that life was precious and not to be lightly thrown away. If he still rode today, he might consider swapping silver for gold.

Story Source:

Adapted from materials provided by Washington University in St. Louis.

Journal Reference:

1. Jingyi Chen, Charles Glaus, Richard Laforest, Qiang Zhang, Miaoxian Yang, Michael Gidding, Michael J. Welch, Younan Xia. **Gold Nanocages as Photothermal Transducers for Cancer Treatment**. *Small*, 2010; NA DOI: 10.1002/smll.200902216

http://www.sciencedaily.com/releases/2010/03/100312164701.htm

Super Supernova: White Dwarf Star System Exceeds Mass Limit

Cosmologists use Type Ia supernovae, like the one visible in the lower left corner of this galaxy, to explore the past and future expansion of the universe and the nature of dark energy. (Credit: High-Z Supernova Search Team, HST, NASA)

ScienceDaily (Mar. 16, 2010) — An international team led by Yale University has, for the first time, measured the mass of a type of supernova thought to belong to a unique subclass and confirmed that it surpasses what was believed to be an upper mass limit. Their findings, which appear online and will be published in an upcoming issue of the *Astrophysical Journal*, could affect the way cosmologists measure the expansion of the universe.

Cosmologists use Type Ia supernovae -- the violent explosions of dead cores of stars called white dwarfs -- as a kind of cosmic ruler to measure distances to the supernovae's host galaxies and, as such, to understand the past and future expansion of the universe and explore the nature of dark energy. Until recently, it was thought that white dwarfs could not exceed what is known as the Chandrasekhar limit, a critical mass equaling about 1.4 times that of the Sun, before exploding in a supernova. This uniform limit is a key tool in measuring distances to supernovae.

Since 2003, four supernovae have been discovered that were so bright, cosmologists wondered whether their white dwarfs had surpassed the Chandrasekhar limit. These supernovae have been dubbed the "super-Chandrasekhar" supernovae.

Now Richard Scalzo of Yale, as part of a collaboration of American and French physicists called the Nearby Supernova Factory, has measured the mass of the white dwarf star that resulted in one of these rare supernovae, called SN 2007if, and confirmed that it exceeded the Chandrasekhar limit. They also discovered that the unusually bright supernova had not only a central mass, but a shell of material that was ejected during the explosion as well as a surrounding envelope of pre-existing material. The team hopes this discovery will provide a structural model with which to understand the other supermassive supernovae.

Using observations from telescopes in Chile, Hawaii and California, the team was able to measure the mass of the central star, the shell and the envelope individually, providing the first conclusive evidence that the star system itself did indeed surpass the Chandrasekhar limit. They found that the star itself appears to have had a mass of 2.1 times the mass of the Sun (plus or minus 10 percent), putting it well above the limit.

Being able to measure masses for all parts of the star system tells the physicists about how the system may have evolved -- a process that is currently poorly understood. "We don't really know much about the stars that lead to these supernovae," Scalzo said. "We want to know more about what kind of stars they were, and how they formed and evolved over time."

Scalzo believes there's a good chance that SN 2007if resulted from the merging of two white dwarfs, rather than the explosion of a single white dwarf and hopes to study the other super-Chandrasekhar supernovae to determine whether they, too, could have involved a merger of two white dwarfs.

Theorists continue to explore how stars with masses above the Chandrasekhar limit, which is based on a simplified star model, could exist without collapsing under their own weight. Either way, a subclass of supernovae governed by different physics could have a dramatic effect on the way cosmologists use them to measure the expansion of the universe.

"Supernovae are being used to make statements about the fate of the universe and our theory of gravity," Scalzo said. "If our understanding of supernovae changes, it could significantly impact of our theories and predictions."

Other Yale authors of the paper include Charles Baltay and David Rabinowitz.

Story Source:

Adapted from materials provided by Yale University.

Journal Reference:

1. Authors: R. A. Scalzo, G. Aldering, P. Antilogus, C. Aragon, S. Bailey, C. Bongard, C. Buton, M. Childress, N. Chotard, Y. Copin, H. K. Fakhouri, A. Gal-Yam, E. Gangler, S. Hoyer, M. Kasliwal, S. Loken, P. E. Nugent, R. Pain, E. Pecontal, R. Pereira, S. Perlmutter, D. Rabinowitz, A. Rau, G. Rigaudier, K. Runge, G. Smadja, C. Tao, R. C. Thomas, B. Weaver, C. Wu. **Title: Nearby Supernova Factory Observations of SN 2007if: First Total Mass Measurement of a Super-Chandrasekhar-Mass Progenitor**. *Astrophysical Journal*, 2010; (forthcoming) DOI: http://arxiv.org/abs/1003.2217

http://www.sciencedaily.com/releases/2010/03/100315162049.htm

Babies Are Born to Dance, New Research Shows

Researchers have discovered that infants respond to the rhythm and tempo of music and find it more engaging than speech. (Credit: iStockphoto/Brian Palmer)

ScienceDaily (Mar. 16, 2010) — Researchers have discovered that infants respond to the rhythm and tempo of music and find it more engaging than speech.

The findings, based on the study of infants aged between five months and two years old, suggest that babies may be born with a predisposition to move rhythmically in response to music.

The research was conducted by Dr Marcel Zentner, from the University of York's Department of Psychology, and Dr Tuomas Eerola, from the Finnish Centre of Excellence in Interdisciplinary Music Research at the University of Jyvaskyla.

Dr Zentner said: "Our research suggests that it is the beat rather than other features of the music, such as the melody, that produces the response in infants.

"We also found that the better the children were able to synchronize their movements with the music the more they smiled.

"It remains to be understood why humans have developed this particular predisposition. One possibility is that it was a target of natural selection for music or that it has evolved for some other function that just happens to be relevant for music processing."

Infants listened to a variety of audio stimuli including classical music, rhythmic beats and speech. Their spontaneous movements were recorded by video and 3D motion-capture technology and compared across the different stimuli.

Professional ballet dancers were also used to analyse the extent to which the babies matched their movement to the music.

The findings are published March 15 in the journal *Proceedings of the National Academy of Sciences* Online Early Edition.

The research was part-funded by a grant from the Swiss National Science Foundation.

Story Source:

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

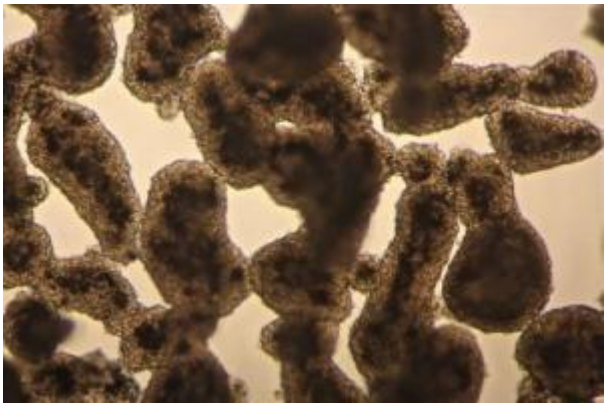
Journal Reference:

1. Marcel Zentner, Tuomas Eerola. **Rhythmic engagement with music in infancy**. *Proceedings of the National Academy of Sciences*, 2010; DOI: 10.1073/pnas.1000121107

http://www.sciencedaily.com/releases/2010/03/100315161925.htm

Making Cells Feel Right at Home, Suspended in Magnetic Fields

This is a 3-D cell culture grown with magnetic levitation. (Credit: G. Souza/N3D Biosciences)



ScienceDaily (Mar. 16, 2010) — The film "Avatar" isn't the only 3-D blockbuster making a splash this winter. A team of scientists from Houston's Texas Medical Center has unveiled a new technique for growing 3-D cell cultures, a technological leap from the flat petri dish that could save millions of dollars in drug-testing costs.

The research is reported in *Nature Nanotechnology*.

The 3-D technique is easy enough for most labs to set up immediately. It uses magnetic forces to levitate cells while they divide and grow. Compared with cell cultures grown on flat surfaces, the 3-D cell cultures tend to form tissues that more closely resemble those inside the body.

"There's a big push right now to find ways to grow cells in 3-D because the body is 3-D, and cultures that more closely resemble native tissue are expected to provide better results for preclinical drug tests," said study co-author Tom Killian, associate professor of physics at Rice. "If you could improve the accuracy of early drug screenings by just 10 percent, it's estimated you could save as much as $100 million per drug."

For cancer research, the "invisible scaffold" created by the magnetic field goes beyond its potential for producing cell cultures that are more reminiscent of real tumors, which itself would be an important advance, said co-author Wadih Arap, professor in the David H. Koch Center at The University of Texas M.D. Anderson Cancer Center.

To make cells levitate, the research team modified a combination of gold nanoparticles and engineered viral particles called "phage" that was developed in the lab of Arap and Renata Pasqualini, also of the Koch Center. This targeted "nanoshuttle" can deliver payloads to specific organs or tissues.

"A logical next step for us will be to use this additional magnetic property in targeted ways to explore possible applications in the imaging and treatment of tumors," Arap said.

The 3-D modeling raises another interesting long-term possibility. "This is a step toward building better models of organs in the lab," Pasqualini said.

The new technique is an example of the innovation that can result when experts come together from disparate fields. Killian studies ultracold atoms and uses finely tuned magnetic fields to manipulate them. He had been working with Rice bioengineer Robert Raphael for several years on methods to use magnetic fields to manipulate cells. So when Killian's friend Glauco Souza, then an Odyssey Scholar studying with Arap and Pasqualini, mentioned one day that he was developing a gel that could load cancer cells with magnetic nanoparticles, it led to a new idea.

"We wondered if we might be able to use magnetic fields to manipulate the cells after my gels put magnetic nanoparticles into them," said Souza, who left M.D. Anderson in 2009 to co-found Nano3D Biosciences (www.n3dbio.com), a startup that subsequently licensed the technology from Rice and M.D. Anderson.

The nanoparticles in this case are tiny bits of iron oxide. These are added to a gel that contains phage. When cells are added to the gel, the phage causes the particles to be absorbed into cells over a few hours. The gel is then washed away, and the nanoparticle-loaded cells are placed in a petri dish filled with a liquid that promotes cell growth and division.

In the new study, the researchers showed that by placing a coin-sized magnet atop the dish's lid, they could lift the cells off the bottom of the dish, concentrate them and allow them to grow and divide while they were suspended in the liquid.

A key experiment was performed in collaboration with Jennifer Molina, a graduate student in the laboratory of Maria-Magdalena Georgescu, an M.D. Anderson associate professor in neuro-oncology and also a co-author, in which the technique was used on brain tumor cells called glioblastomas. The results showed that cells grown in the 3-D medium produced proteins that were similar to those produced by gliobastoma tumors in mice, while cells grown in 2-D did not show this similarity.

Souza said that Nano3D Biosciences is conducting additional tests to compare how the new method stacks up against existing methods of growing 3-D cell cultures. He said he is hopeful that it will provide results that are just as good, if not better, than longstanding techniques that use 3-D scaffolds.

Raphael, a paper co-author, associate professor in bioengineering and a member of Rice's BioScience Research Collaborative, said, "The beauty of this method is that it allows natural cell-cell interactions to drive assembly of 3-D microtissue structures. The method is fairly simple and should be a good point of entry in 3-D cell culturing for any lab that's interested in drug discovery, stem cell biology, regenerative medicine or biotechnology."

Other co-authors include Daniel Stark and Jeyarama Ananta, both of Rice; Carly Levin of Nano3D Biosciences; and Michael Ozawa, Lawrence Bronk, Jami Mandelin, James Bankson and Juri Gelovani, all of M.D. Anderson.

The research was funded by M.D. Anderson's Odyssey Scholar Program, the Department of Defense's Breast Cancer Research Program, the National Science Foundation, the Packard Foundation, the Gillson-Longenbaugh Foundation, AngelWorks, the National Institutes of Health and the National Cancer Institute.

Story Source:

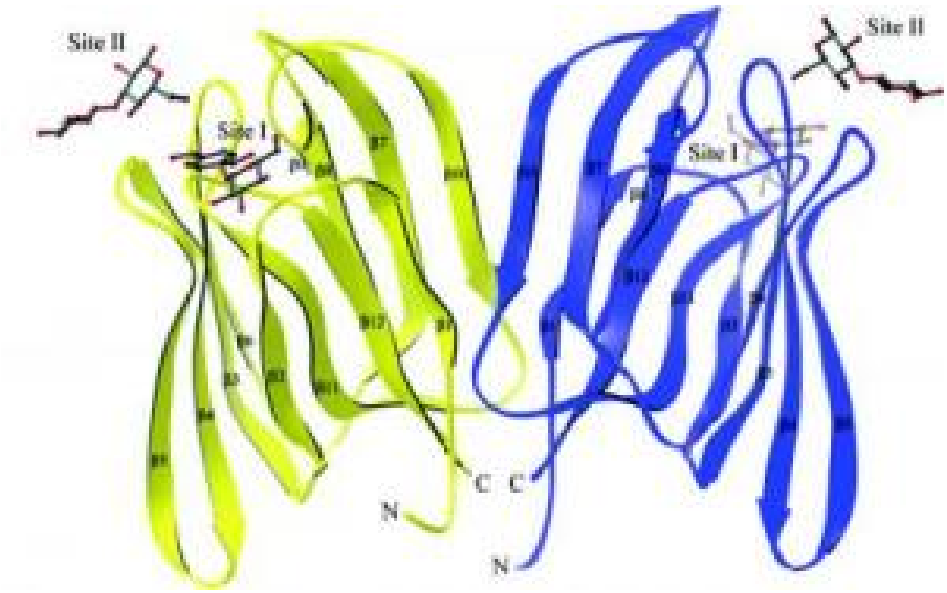
Adapted from materials provided by Rice University.

Journal Reference:

1. Glauco R. Souza, Jennifer R. Molina, Robert M. Raphael, Michael G. Ozawa, Daniel J. Stark, Carly S. Levin, Lawrence F. Bronk, Jeyarama S. Ananta, Jami Mandelin, Maria-Magdalena Georgescu, James A. Bankson, Juri G. Gelovani, T. C. Killian, Wadih Arap & Renata Pasqualini. **Three-dimensional tissue culture based on magnetic cell levitation**. *Nature Nanotechnology*, 2010; DOI: 10.1038/nnano.2010.23

http://www.sciencedaily.com/releases/2010/03/100315162056.htm

Chemical in Bananas Identified as Potent Inhibitor of HIV Infection



This is a 3-D structure of BanLec, a chemical isolated from bananas identified as a potent new inhibitor of HIV infection. (Credit: University of Michigan Medical School)

ScienceDaily (Mar. 16, 2010) — A potent new inhibitor of HIV, derived from bananas, may open the door to new treatments to prevent sexual transmission of HIV, according to a newly published University of Michigan Medical School study.

Scientists have an emerging interest in lectins, naturally occurring chemicals in plants, because of their ability to halt the chain of reaction that leads to a variety of infections.

In laboratory tests, BanLec, the lectin found in bananas, was as potent as two current anti-HIV drugs. Based on the findings published March 19 in the *Journal of Biological Chemistry,* BanLec may become a less expensive new component of applied vaginal microbicides, researchers say.

New ways of stopping the spread of the HIV are vitally needed. The rate of new infections of HIV is outpacing the rate of new individuals getting anti-retroviral drugs by 2.5 to1, and at present it appears an effective vaccine is years away.

"HIV is still rampant in the U.S. and the explosion in poorer countries continues to be a bad problem because of tremendous human suffering and the cost of treating it," says study senior author David Marvovitz, M.D., professor of internal medicine at the U-M Medical School.

Although condom use is quite effective, condoms are most successful in preventing infection if used consistently and correctly, which is often not the case.

"That's particularly true in developing countries where women have little control over sexual encounters so development of a long-lasting, self-applied microbicide is very attractive," Markovitz says.

Some of the most promising compounds for inhibiting vaginal and rectal HIV transmission are agents that block HIV prior to integration into its target cell.

The new research describes the complex actions of lectins and their ability to outsmart HIV. Lectins are sugar-binding proteins. They can identify foreign invaders, like a virus, and attach themselves to the pathogen.

The U-M team discovered BanLec, the lectin in bananas, can inhibit HIV infection by binding to the sugar-rich HIV-1 envelope protein, gp120, and blocking its entry to the body.

Co-authors Erwin J. Goldstein, Ph.D., professor emeritus of biological chemistry at U-M and Harry C. Winter, Ph.D., research assistant professor in biological chemistry at U-M, developed the biopurification method to isolate BanLec from bananas. Following their work, the U-M team discovered BanLec is an effective anti-HIV lectin and is similar in potency to T-20 and maraviroc, two anti-HIV drugs currently in clinical use.

Yet therapies using BanLec could be cheaper to create than current anti-retroviral medications which use synthetically produced components, plus BanLec may provide a wider range of protection, researchers say.

"The problem with some HIV drugs is that the virus can mutate and become resistant, but that's much harder to do in the presence of lectins," says lead author Michael D. Swanson, a doctoral student in the graduate program in immunology at the University of Michigan Medical School.

"Lectins can bind to the sugars found on different spots of the HIV-1 envelope, and presumably it will take multiple mutations for the virus to get around them," he says.

Swanson is developing a process to molecularly alter BanLec to enhance its potential clinical utility. Clinical use is considered years away but researchers believe it could be used alone or with other anti-HIV drugs as a vaginal microbicide that prevents HIV infection.

Authors say even modest success could save millions of lives. Other investigators have estimated that 20 percent coverage with a microbicide that is only 60 percent effective against HIV may prevent up to 2.5 million HIV infections in three years.

Story Source:

Adapted from materials provided by University of Michigan Health System.

Journal Reference:

1. Swanson et al. **A Lectin Isolated from Bananas Is a Potent Inhibitor of HIV Replication**. *Journal of Biological Chemistry*, 2010; 285 (12): 8646 DOI: 10.1074/jbc.M109.034926

http://www.sciencedaily.com/releases/2010/03/100315091303.htm

New Hand Bacteria Study Holds Promise for Forensics Identification

A new technique developed at CU-Boulder to identify individuals by the unique communities of hand bacteria they leave behind on objects they have handled may prove to be a valuable forensic tool in the future. (Credit: Steve Miller, CIRES)

ScienceDaily (Mar. 16, 2010) — Forensic scientists may soon have a valuable new item in their toolkits -- a way to identify individuals using unique, telltale types of hand bacteria left behind on objects like keyboards and computer mice, says a new University of Colorado at Boulder study.

The CU-Boulder study showed that "personal" bacterial communities living on the fingers and palms of individual computer users that were deposited on keyboards and mice matched the bacterial DNA signatures of users much more closely than those of random people. While the development of the technique is continuing, it could provide a way for forensics experts to independently confirm the accuracy of DNA and fingerprint analyses, says CU-Boulder Assistant Professor Noah Fierer, chief author on the study.

"Each one of us leaves a unique trail of bugs behind as we travel through our daily lives," said Fierer, an assistant professor in CU-Boulder's ecology and evolutionary biology department. "While this project is still in it's preliminary stages, we think the technique could eventually become a valuable new item in the toolbox of forensic scientists."

The study was published March 15 in the *Proceedings of the National Academy of Sciences*. Co-authors on the PNAS study included Christian Lauber and Nick Zhou of CU-Boulder's Cooperative Institute for Research in Environmental Sciences, or CIRES, Daniel McDonald of CU-Boulder's department of chemistry and biochemistry, Stanford University Postdoctoral Researcher Elizabeth Costello and CU-Boulder chemistry and biochemistry Assistant Professor Rob Knight.

Using powerful gene-sequencing techniques, the team swabbed bacterial DNA from individual keys on three personal computers and matched them up to bacteria on the fingertips of keyboard owners, comparing the results to swabs taken from other keyboards never touched by the subjects. The bacterial DNA from the keys matched much more closely to bacteria of keyboard owners than to bacterial samples taken from random fingertips and from other keyboards, Fierer said.

In a second test, the team swabbed nine keyboard mice that had not been touched in more than 12 hours and collected palm bacteria from the mouse owners. The team compared the similarity between the

owner's palm bacteria and owner's mouse with 270 randomly selected bacterial samples from palms that had never touched the mouse. In all nine cases, the bacterial community on each mouse was much more similar to the owner's hand.

The team sampled private and public computers at CU-Boulder, as well as hand bacteria collected from a variety of volunteers on campus. The study showed the new technique is about 70 to 90 percent accurate, a percentage that likely will rise as the technology becomes more sophisticated, said Fierer, who also is a CIRES fellow.

In an effort to see how persistent the bacteria colonies were, the team also swabbed the skin surfaces of two individuals, freezing one set of samples at minus 4 degrees Fahrenheit and leaving the other room temperature. The results showed room-temperature bacterial colonies remained essentially unchanged after two weeks, pointing up the technique's potential as a forensic tool. "That finding was a real surprise to us," said Fierer. "We didn't know just how hearty these creatures were."

Previous research by Fierer and his colleagues -- which indicated a typical hand carries about 150 bacterial species -- also showed only 13 percent of bacteria species found a single hand were shared by any two people. "The obvious question then was whether we could identify objects that have been touched by particular individuals," Fierer said.

The CU-Boulder team used a "metagenomic" survey to simultaneously analyze all of the bacteria on the fingers, palms and computer equipment, said Knight. The effort involved isolating and amplifying tiny bits of microbial DNA, then building complementary DNA strands with a high-powered sequencing machine that allowed the team to identify different families, genera and species of bacteria from the sample.

"This is something we couldn't have done even two years ago," said Fierer. "Right now we can sequence bacterial DNA from 450 samples at once, and we think the number will be up to 1,000 by next year. And as the cost of the technology continues to drop, even smaller labs could undertake these types of projects."

Another reason the new technique may prove valuable to forensic experts is that unless there is blood, tissue, semen or saliva on an object, it's often difficult to obtain sufficient human DNA for forensic identification, said Fierer. But given the abundance of bacterial cells on the skin surface, it may be easier to recover bacterial DNA than human DNA from touched surfaces, they said. "Our technique could provide another independent line of evidence."

More research needs to done on how human bacterial signatures adhere to different surfaces like metal, plastic and glass, said Fierer. But the new technique may be useful for linking objects to users in cases where clear fingerprints cannot be obtained -- from smudged surfaces, fabrics and highly textured materials, he said. The new technique would even be useful for identifying objects touched by identical twins, since they share identical DNA but they have different bacterial communities on their hands.

The new PNAS study was funded by the National Science Foundation, the National Institutes of Health, the Crohn's and Colitis Foundation of America and the Howard Hughes Medical Institute.

"This project is one example of why I got into science," said Fierer. "We go down a lot of different paths trying to answer research questions we have, some of which pan out and some that don't. This particular project is exciting for the whole team."

Fierer said the new technique brings up bioethical issues to consider, including privacy. "While there are legal restrictions on the use of DNA and fingerprints, which are 'personally-identifying', there currently are no restrictions on the use of human-associated bacteria to identify individuals," he said. "This is an issue we think needs to be considered."

In a related November 2009 CU study led by Knight, the team developed the first atlas of microbial diversity across the human body, charting wide variations in microbe populations from the forehead and feet to noses and navels of individuals. One goal of the human bacterial atlas project is to find out what is normal to healthy people to provide a baseline for studies looking at human disease states, said Knight.

Working with a $1.1 million NIH grant to develop new computational tools to better understand the composition and dynamics of microbial communities, Knight and his colleagues have been developing novel methods to tag DNA samples with error-correcting "barcodes" to obtain more accurate gene sequencing data.

In the 2008 hand bacteria study, the researchers detected and identified more than 4,700 different bacteria species across 102 human hands in the study, only five species of which were shared among all 51 participants. The study also showed that the diversity of bacteria on individual hands was not significantly affected by regular hand washing.

Story Source:

Adapted from materials provided by University of Colorado at Boulder.

Journal Reference:

1. Noah Fierer, Christian L. Lauber, Nick Zhou, Daniel Mcdonald, Elizabeth K. Costello, and Rob Knight. **Forensic identification using skin bacterial communities**. *Proceedings of the National Academy of Sciences*, 2010; DOI: 10.1073/pnas.1000162107

http://www.sciencedaily.com/releases/2010/03/100315161718.htm

Experimental blood pressure drug takes natural approach

Dual-acting compound tests well in large group of people with mild to moderate hypertension
By Nathan Seppa
Web edition : Tuesday, March 16th, 2010

A new drug that enhances the body's own blood pressure–lowering machinery has shown effectiveness in a large test, researchers reported online March 16 in the *Lancet*. The results have set the stage for a trial needed for regulatory approval in which the drug will be tested in heart failure patients, who are likely to benefit from its vessel-relaxing effects.

The drug is so new it still doesn't have a name, having been dubbed LCZ696 by its maker, Novartis, which funded the study.

"We look at this drug as augmenting the body's natural, intrinsically beneficial response" to circulatory disorders, whether caused by high blood pressure, stiff arteries or other problems, says study coauthor Martin Lefkowitz, a nephrologist at Novartis Pharmaceuticals in East Hanover, N.J.

Roughly 75 million U.S. adults have high blood pressure, according to the American Heart Association. The new findings could come as welcome news for many of them, says John Burnett, a cardiologist at the Mayo Clinic in Rochester, Minn., who didn't participate in the study.

In the study, the drug tested well in people with mild or moderate hypertension. "This new class of drugs has the potential of increasing the ability to control blood pressure, not only in this type of patient but in others," Burnett says. Researchers will need to test LCZ696 in people who have severe hypertension and those who are taking multiple medications, he says.

LCZ696 works in two ways. Part of it functions by blocking a protein called angiotensin-2 from binding to a receptor protein on cells, therefore lessening the ability of angiotensin-2 to constrict blood vessels and hike blood pressure.

In its other role, LCZ696 bottles up a compound called neprilysin that itself inhibits a natural protective substance called atrial natriuretic peptide. ANP is one of the body's own blood pressure controllers, inducing the kidneys to flush out salt and water and ease pressure on blood vessels. "It's the body's own natural diuretic, without the adverse effects that diuretic drugs have," Burnett says.

By inhibiting neprilysin, this portion of LCZ696 keeps more ANP in circulation, he says. "The heart makes ANP. This drug allows the heart to provide more of it."

Inhibiting neprilysin has been tried before. Starting in the 1990s, researchers tested a drug called omapatrilat that combined a neprilysin inhibitor with a commonly prescribed blood pressure drug called an ACE inhibitor. ACE inhibitors directly lower levels of angiotensin-2. But that dual-strategy drug failed because it caused side effects such as swelling in various parts of the body including the throat.

In the new study, 1,215 people with slightly elevated blood pressure were treated for eight weeks in 18 countries. Some were randomly assigned to get LCZ696 while others got a standard hypertension medicine called valsartan (sold as Diovan). Valsartan makes up half of the LCZ696 compound. Some participants received an experimental drug called AHU377, which constitutes the other half of LCZ696. A fourth group got inert pills.

After eight weeks, volunteers' blood pressure was recorded while they were sitting. LCZ696 and valsartan reduced blood pressure, but LCZ696 lowered diastolic blood pressure (the lower number) about two millimeters of mercury more on average than did valsartan and knocked about four millimeters more

off the systolic blood pressure (the higher number). Those receiving the placebo or AHU377 showed no improvement.

A larger fraction of people getting LCZ696 experienced a decline in their systolic blood pressure greater than 20 millimeters compared with people getting valsartan. LCZ696 also worked better than valsartan in blood pressure measurements taken while upright and walking.

"The new drug LCZ696 … has great potential," say Bernard Waeber and François Feihl of the University of Lausanne in Switzerland, writing in the same issue of the *Lancet*. In this study, people taking LCZ696 had no more side effects than those getting the placebo, they note.

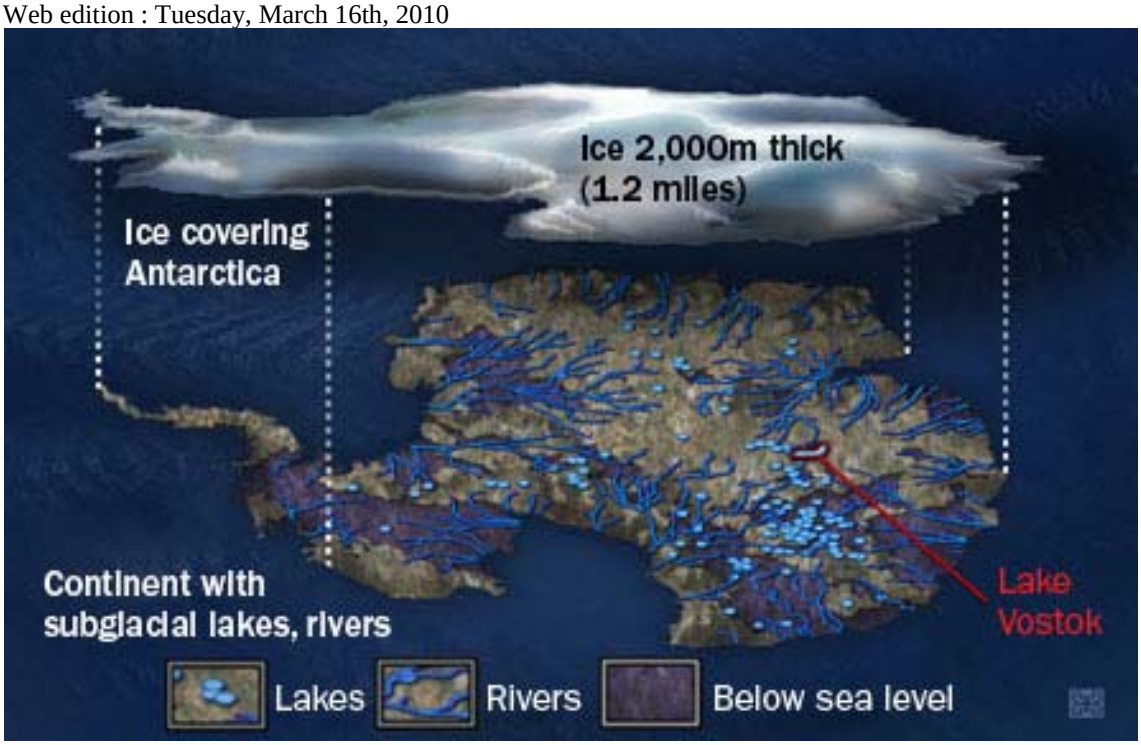
Lefkowitz says Novartis will first seek regulatory approval for LCZ696 as a drug for heart failure patients, whether they have high blood pressure or not. In heart failure, the heart struggles to pump enough blood out to meet the needs of the body. LCZ696, by relaxing vessels, could ease that burden, he says.

The company is currently recruiting thousands of people with chronic heart failure for a trial testing the benefits of LCZ696 against other medications. Lefkowitz expects results in three or four years.

http://www.sciencenews.org/view/generic/id/57358/title/Experimental_blood_pressure_drug_takes_natural_approach

Methane-making microbes thrive under the ice

Antarctica's ice sheets could hide vast quantities of the greenhouse gas
By Alexandra Witze
Web edition : Tuesday, March 16th, 2010



BrrrpAn intricate network of lakes and rivers below Antarctica's ice sheet could be home to lots of microbes churning out the greenhouse gas methane.Zina Deretsky/NSF

BALTIMORE — Microbes living under ice sheets in Antarctica and Greenland could be churning out large quantities of the greenhouse gas methane, a new study suggests.

In recent years scientists have learned that liquid water lurks under much of Antarctica's massive ice sheet, and so, they say, the potential microbial habitat in this watery world is huge. If the methane produced by the bacteria gets trapped beneath the ice and builds up over long periods of time — a possibility that is far from certain — it could mean that as ice sheets melt under warmer temperatures, they would release large amounts of heat-trapping methane gas.

Jemma Wadham, a geochemist at the University of Bristol in England, described the little-known role of methane-making microbes, called methanogens, below ice sheets on March 15 at an American Geophysical Union conference on Antarctic lakes.

Her team took samples from one site in Antarctica, the Lower Wright glacier, and one in Greenland, the Russell glacier. Trapped within the ice were high concentrations of methane, Wadham said, as well as methanogens themselves — up to 10 million cells per gram in the Antarctic sample and 100,000 cells per gram in Greenland. That's comparable to the concentration of methanogens found in deep-ocean sediments, she said. The species of microbes were also similar to those found in other polar environments, such as Arctic peat or tundra.

The team then put scrapings from both sites into bottles and incubated them with water to see which microbes might grow. For the Antarctic samples, Wadham said, "nothing happens for 250 days and then bam! You get tons of methane." The Greenland samples haven't been growing for as long and so far

don’t show much signs of giving off methane — but perhaps they just need more time, she reported at the meeting.

Other researchers have also recently found methanogens in icy settings. Mark Skidmore, a microbiologist at Montana State University in Bozeman, reported at the conference that his team has found methanogens in the Robertson glacier in the Canadian Rockies. “It underscores the importance of subglacial methanogenesis,” Skidmore said.

The studies flesh out a picture of Antarctica as a much more dynamic and watery environment than the frozen, static one once envisaged. At least 386 lakes have been identified buried beneath the ice sheet, scientists from the University of Edinburgh reported at the meeting. Plans for major drilling projects are underway for several of them.

http://www.sciencenews.org/view/generic/id/57353/title/Methane-making_microbes_thrive_under_the_ice

Vitamin D is a flu fighter

And new study hints at benefits for people with asthma.
By Janet Raloff
Web edition : Tuesday, March 16th, 2010

A little over three years ago, a San Francisco-area psychiatrist and several colleagues in other fields floated a provocative hypothesis: that a deficiency in vitamin D — the sunshine vitamin — might render people vulnerable to infections, including the flu. Now Japanese researchers offer tangible support for that idea. They show that vitamin D supplementation dramatically cut the incidence of seasonal flu among the children they followed.

Their double-blind, placebo-controlled trial was small. Only 334 children completed a three-month course of six pills per day — a dropout rate of almost one-quarter. Then again, that's a lot of pills to make kids take each day to get just 1,200 international units of the vitamin. (Especially since the teeny capsule I down contains almost twice that much.)

But the supplementation certainly looked promising. Incidence of influenza A was 10.8 percent among the 167 kids who received vitamin D pills. That's in contrast to a flu rate of 18.6 percent among an equal number of children getting identical looking inert pills. Doctors monitoring the trial confirmed flu cases using a test to assay for the influenza-A germ.

The study has just been published online, ahead of print, in the *American Journal of Clinical Nutrition*.

Children with asthma may have benefited especially. Two asthma attacks occurred during the trial among kids getting the vitamin, compared to 12 in the unsupplemented group. Then again, the study doesn't note how many kids with a history of asthma had been randomized into each arm of the trial. So it's therefore possible that a comparable number of susceptible kids had not been present in each group.

Incidence of another strain of infection — influenza B — did not vary by supplement group, according to team leader Mitsuyoshi Urashima of the Jikei University School of Medicine in Tokyo, and colleagues. Then again, these researchers argue that any benefits of the vitamin might have been dampened by the timing of its administration. The trial began in December 2008, after the flu season had begun, and the researchers acknowledge that it may take almost three months "to reach a steady state of vitamin D concentrations by supplementation. Thus, December might be theoretically too late to start [a flu prevention regimen]."

John Cannell, the doc who came up with the idea that vitamin D might trammel flu, reports in his Vitamin D Newsletter, which came out Sunday, that "I hear through the grapevine that the CDC [Centers for Disease Control and Prevention] has discovered that, of the 329 American children who have died so far from H1N1, vitamin D levels in the dead children were lower than in children who survived the swine flu." He offers no additional details.

Vitamin D — itself a misnomer since the active chemical is actually a hormone — seems to play a pivotal role in total body health. It not only helps build bone and muscle but has been linked to lower risk of gum disease, diabetes, chronic obstructive pulmonary disease, cancer and autoimmune disease. And the kicker: Most people in the developed world are chronically deficient. What's more, those who have heavily pigmented skin, are overweight or who live in high latitudes face an aggravated risk of deficiency.

Indeed, a second new study due to appear in the same journal — this one by a U.S. team of scientists — reports that among a random sample of more than 3,000 postmenopausal women, almost 60 percent were vitamin-D deficient.

http://www.sciencenews.org/view/generic/id/57335/title/Vitamin_D_is_a_flu_fighter

This exoplanet is so cool
Satellite finds first temperate planet outside solar system that can be studied in detail
By Ron Cowen
Web edition : 2:31 pm

Mini-eclipseThe extrasolar planet COROT-9b is shown with its sunlike parent star in the background of this artist's impression. The body is the first transiting planet cool enough to have a composition similar to Jupiter and Saturn, including a high layer of water clouds.Instituto de Astrofísica de Canarias

Extrasolar planet hunters are excited about a not-so-hot discovery. For the first time they've found a relatively cool extrasolar planet that they can study in detail.

The finding is a milestone, says study coauthor Hans Deeg of the Instituto de Astrofísica de Canarias in Tenerife, Spain, because it is the first time astronomers have found an extrasolar planet that not only is cool enough to be similar in composition and history to the familiar solar system gas giants Jupiter and Saturn, but also passes in front of the star it orbits.

Although a number of extrasolar planets with moderate temperatures have been discovered, only a planet that passes in front of — or transits — its star can be studied in depth. The starlight that filters through the atmosphere of the planet during each passage reveals the orb's composition, while the amount of starlight that is blocked outright indicates the planet's size.

The newly discovered extrasolar planet COROT-9B (shown as black dot) passes in front of its parent star in this drawing. The Jupiter-like planet orbits its star in 95 days at an average distance similar to Mercury's average separation from the sun.ESA

All the other transiting planets seen so far have been "weird — inflated and hot" because they orbit so close to their stars, notes study collaborator Didier Queloz of the Geneva Observatory in Sauverny, Switzerland. Deeg, Queloz, and their colleagues report their findings in the March 18 *Nature*.

The planet, found with the COROT satellite and dubbed COROT-9b, lies 1,500 light-years from Earth and never gets closer to its star than Mercury's average distance from the sun. That puts the surface temperature of the planet in a relatively temperate range, somewhere between 250 kelvins and 430

kelvins (-23˚ to 157˚ Celsius). Although the gaseous planet isn't expected to be habitable, its atmosphere could contain water vapor.

If this Jupiter-like planet has a moon, that satellite's rocky surface could be habitable, says Sara Seager of MIT. But a planetary system closer to Earth would offer a better chance of searching for the tiny gravitational tug of such a moon, Seager adds.

"This discovery adds weight to the fact that we know that planets often orbit in or close to the habitable zone, so we should not be surprised when the Kepler or COROT satellites or some ground-based search makes the claim for the first habitable Earth or super-Earth," comments Alan Boss of the Carnegie Institution for Science in Washington, D.C.

Nevertheless, finding such a planet is encouraging news, Seager says, because "where there is gold dust there might be a gold mine."

http://www.sciencenews.org/view/generic/id/57377/description/This_exoplanet_is_so_cool

Early balding 'cuts cancer risk'

A receding hairline can be a good thing, according to US scientists, who say men who go bald by 30 appear to be less likely to develop prostate cancer.

Researchers at the University of Washington School of Medicine studied 2,000 men aged between 40 and 47.

They were able to link high levels of the male hormone testosterone in those who lose their hair earlier with a lower risk of tumours.

The findings are published in the journal Cancer Epidemiology.

Half of the men in this study had suffered prostate cancer.

Researchers compared the rate of tumours in those who said their hair had thinned by the age of 30 with those who did not suffer hair loss.

Men who had started to develop bald spots on the top of their heads as well as receding hairlines had a 29% to 45% reduction in the risk of prostate cancer.

Roots of baldness

By age 30, approximately 25-30% of men will have some baldness, researchers believe. Half of all men suffer significant hair loss by the age of 50.

" **If these results are correct, they could be useful in providing us with a greater understanding of how testosterone behaves in the body** "
Dr Helen Rippon, The Prostate Cancer Charity

Baldness is caused when hair follicles become exposed to too much dihydrotestosterone (DHT). This is a chemical produced by the male hormone testosterone.

Experts believe that men with high levels of testosterone are more likely to lose their hair, especially if baldness runs in the family.

Prostate cancer sufferers are often given drugs to reduce testosterone levels because they can accelerate the growth of some tumours once they develop.

But this study suggests that high levels of testosterone from a young age might protect against the disease.

Dr Helen Rippon, head of research management at The Prostate Cancer Charity, says: "Clearly, the age at which a man begins to lose his hair is unfortunately not a risk factor for prostate cancer over which he has any control.

"However, if these results are correct, they could be useful in providing us with a greater understanding of how testosterone behaves in the body and how it can affect different tissues."

Dr Alison Ross of Cancer Research UK said the link between baldness and prostate cancer is still unknown because previous studies have found the opposite to this one.

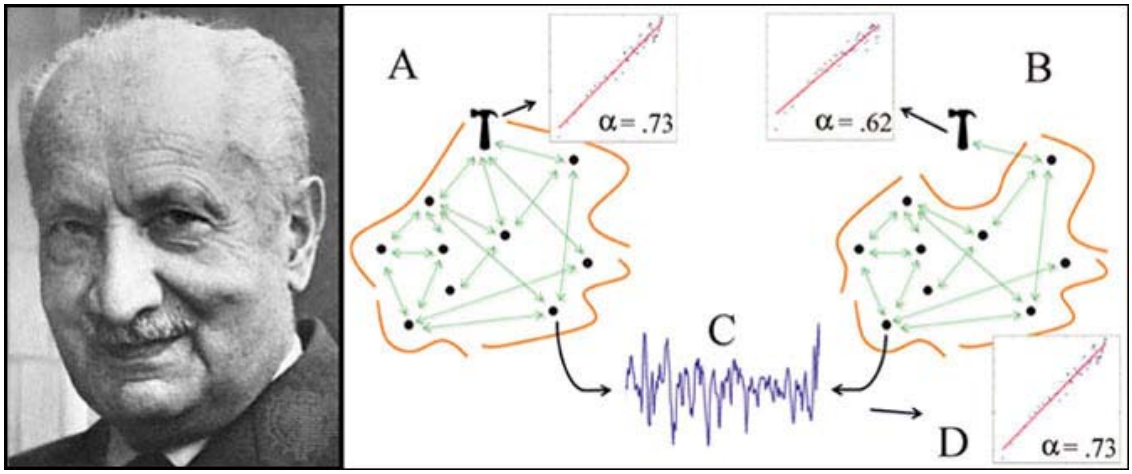
"The results hinge on asking men between ages 40 and 70 to remember whether their hair was thinning when they were 30, which does not provide a very reliable measurement," she added.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8569826.stm

Published: 2010/03/16 12:12:15 GMT

Your Computer Really Is a Part of You

- By Brandon Keim
- March 9, 2010 |



An empirical test of ideas proposed by Martin Heidegger shows the great German philosopher to be correct: Everyday tools really do become part of ourselves.

The findings come from a deceptively simple study of people using a computer mouse rigged to malfunction. The resulting disruption in attention wasn't superficial. It seemingly extended to the very roots of cognition.

"The person and the various parts of their brain and the mouse and the monitor are so tightly intertwined that they're just one thing," said Anthony Chemero, a cognitive scientist at Franklin & Marshall College. "The tool isn't separate from you. It's part of you."

Chemero's experiment, published March 9 in *Public Library of Science*, was designed to test one of Heidegger's fundamental concepts: that people don't notice familiar, functional tools, but instead "see through" them to a task at hand, for precisely the same reasons that one doesn't think of one's fingers while tying shoelaces. The tools are us.

This idea, called "ready-to-hand," has influenced artificial intelligence and cognitive science research, but without being directly tested.

In the new study, Chemero and graduate students Dobromir Dotov and Lin Nie tracked the hand movements of people using a mouse to guide a cursor during a series of motor tests. Part way through the tests, the cursor lagged behind the mouse. After a few seconds, it worked again. When Chemero's team analyzed how people moved the mouse, they found profound differences between patterns produced during mouse function and malfunction.

When the mouse worked, hand motions followed a mathematical form known as "one over frequency," or pink noise. It's a pattern that pops up repeatedly in the natural world, from universal electromagnetic wave fluctuations to tidal flows to DNA sequences. Scientists don't fully understand pink noise, but there's evidence that our cognitive processes are naturally attuned to it.

But when the researchers' mouse malfunctioned, the pink noise vanished. Computer malfunction made test subjects aware of it — what Heidegger called "unreadiness-at-hand" — and the computer was no longer part of their cognition. Only when the mouse started working again did cognition return to normal.

(One assumes, though the researchers didn't test the proposition, that cognition would also have returned to normal had test subjects stood up and stopped using the computer.)

The results demonstrate how people fuse with their tools, said Chemero.

"The thing that does the thinking is bigger than your biological body," he said. "You're so tightly coupled to the tools you use that they're literally part of you as a thinking, behaving thing."

Asked whether computer malfunction — say, the iPhone's notorious keyboard lag — could thusly be viewed as a discontinuity in our selves, Chemero said, "Yes, that's exactly what it is."

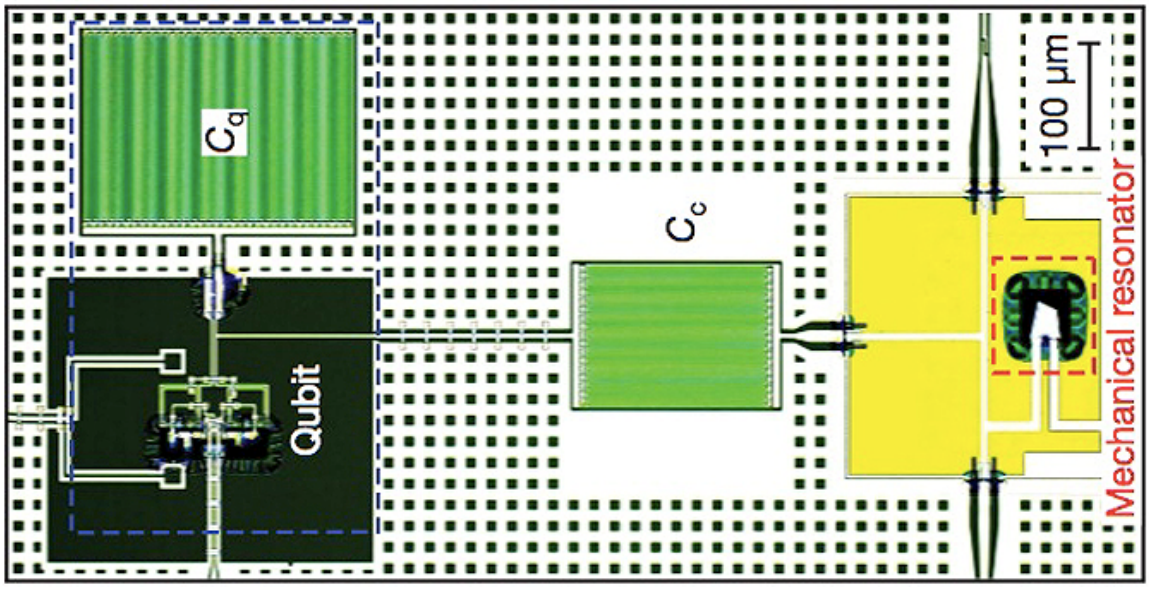
Image: At left, Martin Heidegger/WikiMedia Commons; at right, a schematic of the systemic interactions experienced while using (a) a functional tool and (b) a malfunctioning tool/PLoS ONE.

Citation: "A Demonstration of the Transition from Ready-to-Hand to Unready-to-Hand." By Dobromir G. Dotov, Lin Nie, Anthony Chemero. PLoS ONE, Vol. 5 No. 3, March 9, 2010.

http://www.wired.com/wiredscience/2010/03/heidegger-tools/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+wiredscience+%28Blog+-+Wired+Science%29

Quantum Physics Used to Control Mechanical System

- By Brandon Keim
- March 17, 2010 |



By using a quantum device to control a mechanical object, researchers have linked the mind-bending laws of quantum physics to the tangible, everyday world.

Until now, quantum physical behaviors were observed at atomic and subatomic scales, or in medium-sized molecules. Now they've been found in something that bumps and grinds, visible with nothing fancier than a high school lab-issue microscope.

"At the macroscopic scale we live in, we don't see quantum effects at all," said Andrew Cleland, a University of California, Santa Barbara, physicist. "The goal of the experiment was to see if we could see quantum mechanical effects in a large, mechanical object."

The mechanical object used in the experiment, published March 17 in *Nature* and led by Cleland and fellow UCSB physicists John Martinis and Aaron O'Connell, is a 0.0002 millimeter-square wafer of quartzlike material bracketed by metal plates. The wafer is a piezoelectric resonator, expanding and contracting in response to electrical voltages at a precise, extremely high frequency. Cleland likened its expansion and contraction to the inflation and deflation of a balloon.

The quantum device is a qubit, a term that generically refers to a kind of quantum transistor being used for quantum computation, in this case made from an ultrathin aluminum-based superconductor. At extremely cold temperatures, it goes quantum: It exists in an oscillating waveform spanning an excited state, an unexcited state, or both simultaneously, all controlled by electrical currents.

With their experiment, the researchers have not only fulfilled a two decade-old dream of controlling quantum motion in micrometer-sized system, but "opened the door for quantum control of truly macroscopic mechanical devices," wrote Aspelmeyer.

To do so, Cleland's team wired a qubit to a resonator, then cooled them to a fraction of a degree above absolute zero, the point at which all atomic motion nearly stops. At this temperature, the vibrations of the atoms in the qubit and resonator are small enough to prevent them from interfering with quantum measurements.

When the researchers sent a pulse of energy into the qubit, the resulting energy quantum was transferred to the resonator, which fluctuated accordingly. With extraordinarily acute vision, "you'd see it expanding and contracting. You'd see it vibrating. These are quantum vibrations," said Cleland.

In a study published in September in *Nature*, Cleland's team coupled two qubits in what's known as quantum entanglement, in which the oscillations of one were linked to the oscillations of the other, even when physically distant. That feat drew attention for demonstrating quantum properties in a large, visible system, but the properties themselves still belonged to electrons, in which quantum effects are routinely observed and controlled.

In a sense, it was the same old quantum physics. The latest results occur in a new world, one that quantum physicists have tried to enter for nearly two decades. In a commentary accompanying the paper, University of Vienna physicist Markus Aspelmeyer described the reaction of an audience of physicists to whom Cleland described the experiment's design. "Dead silence — and then roaring applause," he recalled.

One of the principles of quantum physics, illustrated by the Schrodinger's cat thought experiment, is that the act of measurement collapses an object's waveform into a single, observed state. To get around this conundrum, the researchers used a repetitive measurement, preparing the system and then measuring its waveform millions of times.

At a precise moment during one trial, the resonator might be both in its expanded and its contracted state; a single measurement forces it to "choose" which state to be in. The quantum nature of its behavior emerged from the accumulated readings. "If we do it enough times, we can assign a probability to the state at each point," said Cleland.

According to Aspelmeyer, the findings could inform the design of storage devices used in quantum computers. Cleland isn't sure the system will be reliable enough for that, but thinks it could be used in exploring how the subatomic rules of quantum physics are manifested at higher scales.

Schrodinger's cat experiment is likely impossible, because the cat itself is a measuring device, said Cleland. However, it might be possible with other large but inanimate objects linked to a quantum device.

"If you had a tuning fork and got it cold enough, maybe that could behave quantum mechanically," he said.

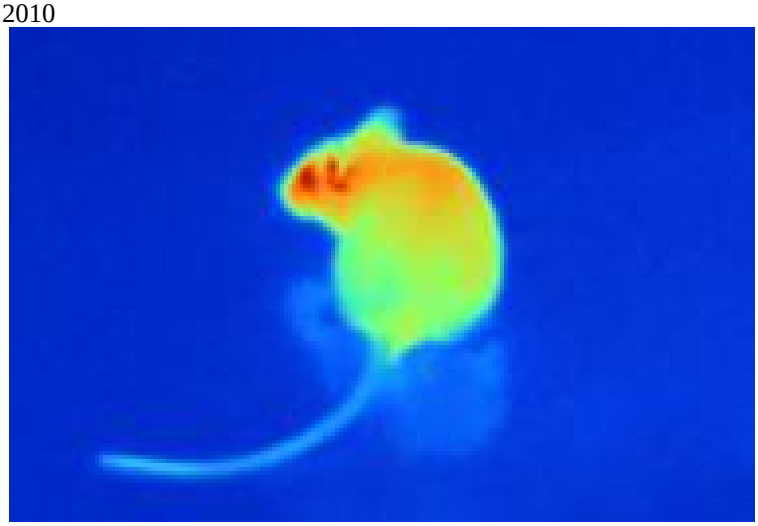
Image: Schematic of the resonator-qubit system./Nature

Citations: "Quantum ground state and single-phonon control of a mechanical resonator." By A. D. O'Connell, M. Hofheinz, M. Ansmann, Radoslaw C. Bialczak, M. Lenander, Erik Lucero, M. Neeley, D. Sank, H. Wang, M. Weides, J. Wenner, John M. Martinis & A. N. Cleland. Nature, March 18, 2010.

http://www.wired.com/wiredscience/2010/03/mechanically-quantum/

Pit vipers' night vision explained

Study finds protein responsible for sensing heat from prey
By Lisa Grossman
Web edition : Sunday, March 14th, 2010



Ssssseems deliciousScientists have nabbed the protein that lets snakes “see” heat from their prey, almost like an infrared image (shown).Julius Lab, UCSF

The molecule that lets snakes sense heat is the same one that makes wasabi feel fiery.

Scientists have known for decades that some snakes use specialized holes called pit organs to “see” the heat radiating from prey. Now, molecular biologists have pinpointed the protein that gives pit-bearing snakes — vipers, boas and pythons — this sixth sense. The culprit is called TRPA1, a protein whose human counterpart is known as the “wasabi receptor” for its role in sensing the potent condiment. The results are reported online March 14 in *Nature*.

“This is one of the first really interesting new findings in that species” in 20 years, comments snake-sense specialist Ken Catania of Vanderbilt University in Nashville, who was not associated with the study. “It’s the kind of paper that makes me have to go and revise my class lectures.”

Scientists had thought that snakes’ sensitivity to heat comes from the exceptionally thin tissue in pit organs. Just as it takes less heat to boil a cup of water than a pot, it takes less heat to stimulate pit organ tissue than a mammal’s skin. But what was happening on a molecular level had never been explored.

“We’ve been trying to address this question for a long time, several years,” says study coauthor David Julius of the University of California, San Francisco. “The technology wasn’t really right for us to do that until recently.” Recent advances in high-throughput genetic screening that can sift through hundreds of genes quickly made the study possible.

Julius and his colleagues had previously investigated the molecules that make chili peppers feel hot or menthol feel cool. They found that a family of proteins called TRP ion channels were in charge of sensing temperature and chemical irritants for creatures as complicated as humans or as simple as fruit flies.

The team noted that clumps of nerve cells called trigeminal ganglia in pit vipers’ heads were larger and more complex than the corresponding cells in mammals. The cells also sent most of their nerve fibers directly to the heat sensors. “It’s almost like a big pipe that just goes boom, right to the pit organ,” Julius says. So the researchers searched for genes that were expressed in the trigeminal ganglia but not in similar nerve cells in the snakes’ tails.

Although the researchers suspected that the TRP channels might be the heat sensors they sought in snakes, or at least an accomplice, they did a nearly blind search to avoid favoring their leading candidate.

To the team's surprise, only one gene stood out: the TRPA1 gene. The gene that produces the TRPA1 protein was 400 times more active in the nerves of the head than the nerves of the body.

"It was very pleasing to see that this one molecule was a member of the TRP channel family," Julius says, "but it wasn't exactly the channel we thought it would be."

To check that they had nabbed the right protein, Julius and his colleagues grew cells that expressed the TRPA1 gene in the lab. They then raised the temperature to see if the cells showed any electric or chemical response to heat.

In rattlesnakes, they found, the gene for TRPA1 kicked on at about 28 degrees Celsius, below typical body temperatures for mammals — or as snakes know them, prey. "That said yes, this definitely responds to heat," Julius says. In boas and pythons, whose heat sensors are known to be less sensitive than rattlesnakes', the proteins responded at about 30 degrees and 33 degrees, respectively.

Understanding how TRP channels work in different species could have implications for building thermal sensors for military uses or drugs to treat chronic pain, Julius says. "There are bioengineers who are interested in these processes, and drug companies who want to know how to modify these channels," he says.

http://www.sciencenews.org/view/generic/id/57262/title/Pit_vipers_night_vision_explained

Chemists pin down poppy's tricks for making morphine

Identifying enzymes involved in opiate synthesis could mean better ways to make painkillers
By Rachel Ehrenberg
Web edition : Sunday, March 14th, 2010

Flower powerResearchers have unraveled the critical final steps in the opium poppy's biochemical pathway for producing morphine. The discovery could help overcome economic and social barriers to making painkillers in many parts of the world.TeunSpaans / Wikimedia Commons

Opiates for the masses may not be far off. Scientists have figured out two of the final steps in the chain of chemical reactions that synthesize morphine in the opium poppy.

Pinpointing the cellular workhorses and the genes involved in making morphine may lead to new production methods for the drug and its chemical cousins such as codeine, oxycodone and buprenorphine, scientists report in a paper published online March 14 in *Nature Chemical Biology*.

Morphine and its relatives, widely used as painkillers in developed countries, are fairly expensive and are often taken for extended periods of time. The new research may lead to better ways of engineering yeast or other microbes to make these painkillers — perhaps skirting the social and political morass of agricultural poppy production, the source of heroin.

"Moving production of morphine and its metabolites such as codeine into a microbial system — if you could get yields up — could help lower costs," says bioengineer Christina Smolke of Stanford University, who was not involved in the research. Instead of having to purchase these opiates from other nations, "maybe countries could even do local synthesis," she says.

The new work identifies two enzymes — the proteins that cells use to build molecules and make reactions go — involved in turning the chemical precursors thebaine and codeine into morphine. Study coauthors Jillian Hagel and Peter Facchini of the University of Calgary in Canada also pinpointed the genes encoding each enzyme and verified this genetic role with poppy plant experiments.

"This is really terrific work," says Philip Larkin, head of the plant product metabolic engineering program at Australia's national science agency CSIRO in Canberra. "Having these genes in the hand gives you much greater versatility." For example, scientists could engineer high-yield plants by cranking up the activity of the morphine synthesis genes, Larkin says.

Scientists could also block morphine production with engineered viruses that shut down the genes. In theory, such viruses might be used to eradicate opium poppy crops in places such as Afghanistan. But narcotic control experts question the wisdom of such a maneuver.

"There are formidable tactical obstacles that would have to be addressed," says Charles S. Helling, former senior scientific advisor to the State Department's Bureau of International Narcotics and Law Enforcement Affairs. "But the even bigger problems are political," he adds. "It's a very difficult situation that is further complicated by the military situation."

Morphine is an alkaloid, a class of compounds characterized by a ringed molecular structure incorporating a bit of nitrogen. "Among all the natural products, alkaloids tend to display the most potent pharmacological effects," Facchini says. Plants produce roughly 12,000 kinds of alkaloids, including nicotine, strychnine, caffeine, mescaline, quinine and atropine.

A handful of very old plant groups, including the poppy and buttercup families, produce the class of alkaloids that morphine belongs to, called benzylisoquinoline alkaloids. The main building block for the roughly 2,500 alkaloids in this class is the amino acid tyrosine. A 15- to 20-step reaction pathway turns tyrosine into morphine. While questions remain about some of the very early reactions, pinning down the final morphine production steps is the key to unlocking a host of practical applications.

Years of research, gift plants, a bit of luck and the "Herculean effort" of then graduate student Hagel led to the discovery, says Facchini.The researchers began with three high-morphine varieties of opium poppy, *Papaver somniferum*, and a mutant plant that makes the morphine precursors thebaine and oripavine but can't make morphine itself. Hagel constructed an enormous DNA library from these plants, which the team used to determine which genes were turned on in the morphine-making poppies. She then compared this activity to that of the mutant plant that couldn't put morphine together.

After determining the genetic blueprints of the genes that differed, Hagel and Facchini checked those DNA sequences against a database to reveal the enzymes' identities. To verify the enzymes' role in making morphine, Hagel stuck one of the genes into the bacterium *E.coli*, put the critter in a flask with some thebaine, and left it overnight."When she came back the next morning, the thebaine was all gone," says Facchini. "That's when her eyes got big…. Finding it all had been turned into morphine — that gives a grad student a great sense of power, when they can make morphine." The scientists dubbed the enzymes thebaine 6-O-demethylase and codeine O-demethylase.

Both of the newly identified enzymes are in charge of the same structural task — removing a methyl group, a common chemical ornament comprising a carbon and three hydrogen atoms. But in the hunt for these morphine-synthesis enzymes, many scientists were led astray. There was an assumption that poppies used a methyl-removing enzyme similar to the one that the human liver uses to remove methyl groups. But poppies use enzymes from an entirely different class, the researchers report.

"These are enzymes that have eluded discovery for a long time," says MIT biochemist Sarah O'Connor. And they turned out to be enzymes that weren't really on the radar. "In plants, it's very hard to figure out the enzymatic steps of a pathway," she notes. "This is a beautiful example of how you can use modern molecular biology tools to solve this problem."

http://www.sciencenews.org/view/generic/id/57257/title/Chemists_pin_down_poppys_tricks_for_making_morphines

Bananas Aweigh

By: Caren Chesler | March 8, 2010 | 05:00 AM (PDT) |

The Navy looks at new technology for keeping produce fresh during lengthy voyages; see-through salad era may be over.

Justin Nassiri spent five years as an engineer in the Navy, living on submarines that would remain underwater for two or three months at a time. Although the Navy's cooks would make sure to stock enough supplies for the trip, after about two or three weeks, the bowls of fresh fruit would be down to just a couple of green apples. And the lettuce in the salads would begin to look translucent from having been frozen and thawed.

Nassiri says on long watches, during which he'd stare out at the water through a periscope for hours at a time, he and his colleagues would sometimes play a game in which they fantasized about what they missed most. Nassiri says his list always included sushi, fruit and vegetables.

"I'd actually have daydreams of fresh vegetables — celery, radishes, anything," Nassiri said. "It was really impressive what the cooks could do, but as ingenious as they were, you can't fight nature. After three weeks, the salad would be see-through."

Nassiri isn't the only one daydreaming. Naval officials have been working with food scientists for the last two years to find ways to make fresh fruits and vegetables last longer. It's not just about keeping sailors happy and healthy. It's about waste. A few years ago, one naval official said his service was spending about $26 million a year on fresh fruits and vegetables, and then throwing out about $3 million because it had spoiled.

Fruits and vegetables respire like human beings. But when humans use energy, they replenish their reserves by eating. Fresh fruits and vegetables, on the other hand, have been separated from the plants on which they grew and can't generate new energy reserves.

The trick to keeping fruits and vegetables alive longer, then, lies in slowing down the amount of energy they expend, and that is done by reducing their metabolism or respiration rate — the rate at which they take in oxygen and release carbon dioxide. That's usually achieved in two ways: by keeping the produce at a low temperature — 32 to 55 degrees Fahrenheit, depending on the fruit — or by modifying the atmosphere in which fruits and vegetables are stored.

Navy officials are working with a food technology company in California, Apio Inc., which has a product, BreatheWay, that controls the ratio of oxygen to carbon dioxide moving in and out of a package. The ratio is regulated via a membrane placed over a hole or window in the packaging. The membrane helps maintain an appropriate ratio of oxygen and carbon dioxide inside the package, depending on the type of fruit or vegetable being stored. The oxygen level in the air of an ordinary room, for instance, might be 20.8 percent, while the oxygen inside a modified-atmosphere package might be as low as 3 percent. The level of carbon dioxide inside the package might be 4 to 6 percent, while it might be near zero percent outside.

BreatheWay also has a temperature switch that increases or decreases permeability in the packaging, depending on the temperature at which the package is stored. By slowing down how quickly the produce uses its energy reserves, scientists can make it live longer. Keeping fruits and vegetables healthy also inhibits the growth of organisms that decay produce.

"When you harvest a fresh vegetable or fruit, it has a reaction to being separated from the sustaining tree or plant, and that wound makes it respire faster. It's panicking, if you will," says Cali Tanguay, business development manager at Apio. "You're trying to create an environment that's as moderate as possible."

In trying to determine which technology to use, the Navy conducted food-freshness tests on two aircraft carriers — the USS Ronald Reagan on the West Coast and the USS George H.W. Bush on the East Coast — in February and October of 2008, using broccoli crowns, cantaloupe, honeydew, iceberg and romaine lettuce, bananas and tomatoes. The Navy chose products that were in high demand by sailors, that seemed to respond well to the technologies being tested and that were not easy to replace with canned or frozen versions.

The results were a smashing success, naval officials said. The cases lined with Apio's product enabled the Navy to extend the shelf life of fresh fruits and vegetables greatly, according to Gerald Darsch, director of the Department of Defense's Combat Feeding Directorate. Lettuce, for instance, lasted 70 percent longer, cantaloupe 150 percent longer, and broccoli a whopping 300 percent, Darsch said.

"I traveled with one of my co-workers, and she got a big hug from the supply officer on the USS Reagan," Darsch said. "They noticed they had bananas to eat well into the deployment. In the past, they barely got away from the pier before the bananas were gone."

The Navy conducted another test in November on fruits and vegetables sent in commercial shipments to military bases in Guam. It created three scenarios: The first container was simply refrigerated, with nothing done to the atmosphere inside. The second container was refrigerated and filled with a specific mixture of oxygen and carbon dioxide. The third container was refrigerated, and the individual cases of produce were lined with Apio's product. At the end of 38 days, only 58 percent of the broccoli in the first container was usable. In the second container, 79 percent of the broccoli was good. And in third container, which used Apio's technology, 94 percent of the broccoli was edible.

But if early tests have been successful, logistics still have to be addressed. The military can be highly secretive about the locations of its ships and submarines. Naval officials wouldn't even disclose the locations of the aircraft carriers on which the produce technology was tested. Sometimes, officials don't know where a ship will be in a week.

It was just these kinds of logistical issues that made it difficult to test the technology on submarines, even though they're likely to be one of the biggest users of the products. The problem that makes it difficult for them to stock up on fresh produce — they move out of reach of ports and supply ships for extended periods of time — also made it difficult to get nonmilitary personnel on board for product testing, which is why the trials were conducted on aircraft carriers. There are also problems with space — particularly on submarines — and loading processes, which can result in produce being left to sit out on a hot dock for hours, losing valuable shelf life.

"The bottom line is, this all adds a step of complexity," Apio's Tanguay said.

The military has also been looking at technologies to remove ethylene gas from fruit and vegetable packaging. Produce gives off this gas naturally as it ripens, and ethylene signals fruits and vegetables to ripen; too much makes produce ripen too quickly and rot.

The Army has been testing a product developed by a Massachusetts-based company, Primaira LLC, which uses an electrical device to convert ethylene gas into water and carbon dioxide. The product was put into a shipping container with broccoli and apples, and after seven days, the broccoli had lost only 20 percent of its firmness, compared to a 60 percent loss without Primaira's technology, says Karen Benedek, managing partner at Primaira. Naval officials plan to test the Primaira device this year and hope to use it on aircraft carriers, where, if the new freshness technologies work, see-through salad will be deep-sixed, rather than eaten.

http://www.miller-mccune.com/health/bananas-aweigh-8585/

Federal Food Aid Diabetes' Best Friend?

By: Emily Badger | March 3, 2010 | 16:21 PM (PDT) |

Sen. Tom Coburn says it is. Even if that's not absolutely true, the U.S. government can do a much better job of encouraging better meals on its dime.

During the health care summit last week, Sen. Tom Coburn (R-Okla.) suggested that America needs to restructure some of the systemic culture that leads to poor health in the first place, and not just invest in costly treatment of people once they're sick. In particular, he mentioned a pair of intriguing culprits.

"We actually create more diabetes through the food stamp program and the school lunch program than probably any other thing," he said, precisely because we're not incentivizing people to eat well.

Coburn's literal claim is hard to fact-check; there are no statistics (nor would it be possible to obtain them) comparing the complex contributing factors of diabetes in America. But the senator – a doctor by background – makes a solid point, if not an oversimplified one.

Low-income shoppers on a constrained budget, the very group these programs target, often make the rational decision in the supermarket to buy the most energy-dense foods limited dollars can afford. And, in the American supermarket, it just so happens that you get more calories per dollar from soft drinks than fruit juice, from refined grains than whole grains, from frozen french fries than fresh broccoli.

"In other words, the foods, beverages, snacks or diets said to promote obesity were, in every case, inexpensive," Adam Drewnowski, director of the Center for Obesity Research at the University of Washington, wrote in a 2007 article in *Epidemiologic Reviews*. "What epidemiologic research seems to have shown, fairly consistently, is that obesity is most closely associated with habitual consumption of low-cost foods."

The food stamp and school lunch programs aren't exactly instructing people to eat unhealthy foods. But the reality is that unhealthy food is what limited funds can buy in America.

"To my mind, saying to a low-income person, 'Why don't you choose to eat a healthy, nutritious diet?' is not much different from saying 'Why don't you choose to live on Park Avenue?'" Drewnowski wrote in an e-mail. "Choice has little to do with it."

The fundamental dynamic that makes this true has nothing to do with how federal food aid programs are structured. The problem is more deeply rooted in U.S. farm policy in which subsidies to vast monocultures of corn and soybean commodity crops have created an array of processed ingredients like high-fructose corn syrup that are cheaper than raw vegetables. (It also turns out that processed foods typically have higher profit margins than fresh foods do, feeding a web of interests vested in the status quo.)

This much – that a box of sugared cereal costs less than a pound of apples – is unlikely to change anytime soon. But as Coburn suggested, perhaps we could do more to enable people in the food stamp and school lunch programs to buy healthier foods. The programs don't currently encourage people to pick potato chips, but they also don't encourage them to take home raw potatoes.

Both programs were born in the 1930s. The problem then was that some people simply weren't getting enough to eat, not that they weren't eating nutritiously enough. Food stamps were more an anti-poverty program than a healthy-eating one. Shifting to a greater consciousness around nutrition is difficult, in part because food stamp advocates are wary of any policy that smells of paternalism — telling poor people what they can and cannot eat.

So if the federal government doesn't want to tell people their food stamps or free lunch won't cover junk food, could it at least create something like the frequent-shopper incentives that get you two bananas for the price of one? Or is that also a step down the road to condescension? Food stamps are now electronically administered with the equivalent of a debit card. It doesn't seem like such a stretch that that card could now be used to communicate to the cash register that the recipient gets certain discounts (subsidized by the government) on healthy foods, just as other shoppers get regular deals.

Another suggestion, at the state level where all food stamp programs are administered, is to open recipients to more options, such as farmers markets, where fresh produce can be cheaper than it is at the supermarket. Several states are also now allowing food stamps to be used at restaurants, although an ambiguous cast of commercial alternatives has stepped forward to participate. They include Subway, but also Dominos and Popeye's.

These are precisely the places where you can get a full, hot meal for well under five bucks, and it's hard to fault a hungry person who takes that deal. But this is probably not what Tom Coburn had in mind, underscoring another dilemma: If health care reform is tied up in the American diet, and the American diet is tied up in industrial-scale food policy, how are we supposed to change all of it?

http://www.miller-mccune.com/health/federal-food-aid-diabetes-best-friend-10349/

The Cannabis and Schizophrenia Conundrum

By: Marcia Meier | March 1, 2010 | 15:36 PM (PDT) |

There's a connection between marijuana and schizophrenia, and as scholars tease out the chicken-and-egg genetic aspect, they counsel teen tokers to take heed.

For years it's been a classic chicken-or-egg riddle: Does smoking marijuana lead to schizophrenia, or are those with schizophrenia who use cannabis simply seeking the calming effects of the drug?

Researchers have suspected a link since the 1960s, and study after study has hinted that use of marijuana may trigger schizophrenia, a serious mental illness that affects one in 100 people.

Recent studies, however, provide evidence strong enough to give public health officials — not to mention parents and educators — pause, especially as legalization efforts pick up steam. The latest to weigh in is research to appear in the May issue of the *Archives of General Psychiatry*. Scientists in Australia followed nearly 4,000 young adults born between 1981 and 1984 at the 21-year mark, and found that the longer study participants had used marijuana, the higher the risk of psychosis-related outcomes. Those who had experienced hallucinations early were more likely to have smoked or used marijuana longer and more frequently.

The study's authors said there is significant complexity in the relationship: Essentially, those who were vulnerable to psychosis were more likely to use cannabis, which in turn could contribute to an increased risk of developing mental illness.

"The research is conflicting, but the preponderance of the evidence shows that something is there," said Ken Duckworth, the medical director of the National Alliance on Mental Illness.

If you are a teenager and you smoke marijuana, you put yourself at risk, he said, especially if you have the gene or genes suspected of predisposing one to schizophrenia.

Marijuana is the most used, and abused, illicit drug in the United States, with more than 4.2 million people over the age of 12 reporting substance abuse or dependence in 2008. That is more than twice the number of people who abuse or are dependent on pain relievers, (1.7 million) and cocaine, (1.4 million), the second and third most widely abused drugs in this country.

It is also the most widely used drug among those who have been diagnosed with schizophrenia. In the early 1970s, there was speculation cannabis helped dim the voices and other hallucinations typical with schizophrenia. But researchers started to look at it from the other direction, surmising that marijuana use, particularly heavy marijuana use, may contribute to the onset of schizophrenia symptoms.

In a large study reported in 1987, cannabis use in late adolescence was associated with an increased risk of a subsequent diagnosis of schizophrenia. Studies over the past five years have pinpointed direct connections between brain abnormalities and THC (tetrahydrolcannabinol), the primary psychoactive ingredient in marijuana.

In 2005, researchers at New York's Albert Einstein College of Medicine used a brain imaging technique called diffusion tensor imaging to study the brains of groups of adolescents for a year. They included healthy non-drug users, heavy marijuana users (daily use for at least a year) and schizophrenic patients. They found that repeated exposure to cannabis resulted in abnormalities in a critical fiber pathway in the brain related to higher aspects of language and auditory functions.

Two years later, in 2007, scientists at Cardiff University's School of Medicine in Wales found that regular cannabis use among young people increased their risk of developing a psychotic illness later in life by more than 40 percent. And the more they smoked marijuana, the higher the risk. Those who smoked most frequently were more than twice as likely to develop psychosis. Similar results were uncovered by Spanish researchers.

American researchers confirmed those findings in 2009. Emory University doctors reported that teenagers who progressed to daily marijuana consumption experienced psychotic and pre-psychotic symptoms of schizophrenia at earlier ages.

Scientists have known for years that schizophrenia runs in families. Now scientists can point to specific genes, including dysbindin-1, which affects glutamate synaptic function in the hippocampal function area of the brain. The genes neuregulin 1, G72, D-amino acid oxidase, and regulator of G protein signaling 4, or RGS4, have also been implicated.

David A. Lewis, director of the Translational Neuroscience Program at the University of Pittsburgh School of Medicine, and his research team were one of several groups to identify the RGS4 gene in studies of the prefrontal cortex as susceptible for schizophrenia.

In subsequent research Lewis and his colleagues found that gamma-aminobutyric acid, which is an important neurotransmitter required for cognitive processes such as working memory, is impaired by the cannabinoid 1 receptor, which is where THC is activated. In simpler terms, marijuana use impairs the brain's ability to perform intellectual tasks.

Both of these findings suggest a prefrontal cortex disruption that affects working memory, which is deficient in individuals with schizophrenia, according to Lewis. He hopes further study will ultimately result in drug therapies that will replace the loss of gamma-aminobutyric acid in schizophrenic patients and reduce hallucinations and other symptoms.

But here's the thing, NAMI's Duckworth said, once you develop symptoms of the disease, there's no going back. So why toss the dice by using marijuana?

"It's quite a chance to take. The uncertainty in the scientific knowledge should not be confused with the risk," Duckworth said.

Schizophrenia, characterized by serious hallucinations and delusions, is estimated to be the fourth most important cause of life-years lost through disability in the world. And it is irreversible, Duckworth said.

If marijuana consumption continues after a diagnosis, drug addiction is coupled with mental illness and is known in the mental health community as dual diagnosis.

Duckworth said the system is ill-prepared to deal with mentally ill people who are also drug abusers. The mental health system doesn't know how (or doesn't want) to treat the drug problem, and the substance abuse health system is ill-equipped to help the mentally ill. Duckworth said he has patients who have been told at drug counseling meetings to go off their psychiatric medications.

"Policymakers are realizing more and more that the [treatment] silos need to be blended," Duckworth said. But funding comes from varying places, and so coordination is difficult. Sadly, it is the patients who suffer more.

"The dually diagnosed have the worst outcomes," Duckworth said. They spend the most time in jail, they are the heaviest users of public health and social welfare services, and they die younger than any other cohort, he said.

http://www.miller-mccune.com/health/the-cannabis-and-schizophrenia-conundrum-10218/

Harlan' Documentary Examines Nazi-Era Film Director

By: Lewis Beale | March 6, 2010 | 10:00 AM (PDT) |

A documentary examining the life of Veit Harlan, a film director responsible for films favored by Nazis, provides back story for a new and controversial feature film.

If *Jud Suss — Rise and Fall*, recently shown at the Berlin Film Festival, takes the story of the most notorious anti-Semitic film ever made and paints it in melodramatic terms, then *Harlan: In the Shadow of Jew Suss*, a documentary currently opening around the country, is its historical antidote.

Directed by Felix Moeller, the film is the mesmerizing story of Veit Harlan, the most famous director of the Nazi era, whose rabidly anti-Jewish 1940 film *Jew Suss* was not only a huge European hit, but was required viewing for all S.S. soldiers and has left a legacy that his children and grandchildren are still dealing with.

Filled with the usual archival clips and talking heads, Moeller's picture shows how Harlan, whose talent was for kitschy romances and overblown spectacle, was handpicked by Joseph Goebbels to direct a film about a cunning and ruthless 18th-century Jewish financier who takes over a German province and lusts after pure Aryan maidens.

Seen today, Jew Suss looks bizarre, wildly over-acted and ludicrous — it could almost be called anti-Semitic camp — so it's hard to understand why it was such a box-office success at the time. But of course, the world of 1940 was another universe entirely.

Besides, *Harlan: In the Shadow of Jew Suss*, does not intend to act as a critical review of Harlan's oeuvre (the clips from his films say all you need to know about Harlan's talent, or lack of same), but means to explore why Harlan made the film, and how it has affected his family. Was Harlan an opportunist, a dedicated Nazi, or forced to do it? He always claimed the latter, but his protests come across as utterly unconvincing, especially when the documentary points out that even though the director lived until 1964, he never apologized for the film.

A sense of remorse seems to have been left to his children, most of whom have tried, in one way or another, to distance themselves from Harlan's legacy. One became a Nazi hunter. Another, convinced by the rise of Nazism that bad things happen when people do not speak out early enough, has become an environmental activist.

Two of Harlan's daughters married Jews (one converted to Judaism), and another changed her last name so she could pursue an acting career. Their responses to Jew Suss — except for one son who refuses to discuss "private" matters — range from outrage to embarrassment to a sort of bemused distress, as they wonder why such a "cheesy" film could become so notorious.

It is up to one of Harlan's granddaughters, a Jew whose paternal grandparents died in the Holocaust, to make the ultimate statement about *Jew Suss* — that one of her grandfathers made a film justifying the murder of the other. It is a chilling comment in a brilliant, and thoughtful, documentary.

http://www.miller-mccune.com/culture-society/harlan-documentary-examines-nazi-era-film-director-10443/

After Cancer, Removing a Healthy Breast

By TARA PARKER-POPE

Stuart Bradford

For decades, advocates have fought to protect women from disfiguring breast cancer surgery, arguing that it was just as effective to remove only the cancerous tissue rather than the whole breast.But today, a growing number of women with breast cancer are pushing surgeons in a startling new direction. Not only do they want the cancerous breast removed, but they also want the healthy breast cut off.

“I just didn’t want to worry about it,” explained Liliana Holtzman, 50, an art director in Ann Arbor, Mich., who had both breasts removed after a cancer diagnosis five years ago. “It was for my own peace of mind. I wanted to do everything I could.”

The percentage of women asking to remove both breasts after a cancer diagnosis has more than doubled in recent years. Over all, about 6 percent of women undergoing surgery for breast cancer in 2006 opted for the procedure, formally known as contralateral prophylactic mastectomy. Among women in their 40s who underwent breast cancer surgery, one in 10 opted to have both breasts removed, according to a University of Minnesota study presented last week in St. Louis at the annual meeting of the Society of Surgical Oncology.Surprisingly, the practice is also more popular among women with the earliest, most curable forms of cancer. Among women who had surgery for ductal carcinoma in situ, sometimes called Stage 0 cancer or precancer, the rate of double mastectomy rose to 5.2 percent in 2005, from 2.1 percent in 1998, according to a 2009 study in The Journal of Clinical Oncology.

Women with a known genetic risk for breast cancer can lower the chances of developing it by having both breasts removed before cancer appears. But for most women given a diagnosis of breast cancer, cutting off a healthy breast does not improve the odds of survival.

A new study in The Journal of the National Cancer Institute reviews data on 108,000 women who underwent mastectomy, including 9,000 who chose to remove a healthy breast along with the cancerous one. It found that for most women, having a healthy breast removed after a cancer diagnosis had no effect on long-term survival.

The study found a slight survival benefit among a small subset of breast cancer patients — women under 50 with early stage estrogen-receptor-negative tumors, which don't respond to risk-lowering drugs like Tamoxifen.

"A lot of patients coming into my clinic are asking for it," said Dr. Isabelle Bedrosian, a surgical oncologist at M. D. Anderson Cancer Center in Houston, who conducted the new study. "Part of the reason women are frightened is we haven't given them good information. Part of my hope with this study is to tell most breast cancer patients that it's O.K. not to do this."The data are confusing, because a diagnosis of breast cancer or ductal carcinoma in situ does carry a slightly higher risk (about 0.6 to 1 percent a year) of developing a new, unrelated cancer in the second breast — although many women wrongly believe this means their cancer has "spread" to the other breast. And because of more vigilant screening among breast cancer survivors, second breast cancers are more likely to be detected at an early, more curable stage. As a result, the higher risk for a second cancer does not mean a higher risk of dying.

Doctors say that the highest risk to a woman is not from a future cancer, but from the potential spread of the cancer she already has. Removing a second healthy breast doesn't change those odds.

"Women say the reason they're going to have both breasts removed is because they want to see their children graduate or watch their grandchildren grow up," said Dr. Todd M. Tuttle, chief of surgical oncology at the Masonic Cancer Center at the University of Minnesota. "But having that other breast removed doesn't help them at all in being able to survive another 10 or 20 years."

But women who have opted for the procedure say it's not about the statistics. Once they receive a breast cancer diagnosis, they never again want to experience the stress of a mammogram or biopsy.

"Why would you want to risk getting cancer a second time?" asked a 46-year-old marketing executive in New York City who had both breasts removed last year after learning she had early stage breast cancer. (She asked that her name not be used to protect her privacy.)

"I think the risks were pretty well presented to me, but I didn't care," she continued. "I told the doctor, 'Just take them.' "

Patients also say they opt for a double mastectomy to make sure that their breasts after reconstruction surgery are more symmetrical. Even so, many women don't realize that reconstruction surgery is not like getting cosmetic implants. After a traditional mastectomy and reconstruction, women lose all sensation across their chest.

"When you're lying next to someone, skin on skin, it's sort of sad," the New York woman said. "It's not implants, and you have to make sure people understand that. But I wouldn't do it differently."

Dr. Susan Love, the breast surgeon and women's health advocate who wrote the best-selling "Dr. Susan Love's Breast Book" (Da Capo, 2000), fears that women are making decisions about prophylactic mastectomy without having all the facts.

Compounding the issue, she said, plastic surgeons usually prefer to remove both breasts. So they tend not to argue with women who ask to have a healthy breast removed as well. Dr. Love emphasized that doctors needed to listen to women's reasons for choosing the more aggressive surgery.

"To a certain degree, women are right, because it's their choice," she said. "They need to choose the one that feels right for them."

http://well.blogs.nytimes.com/2010/03/08/after-cancer-women-remove-healthy-breast/?nl=health&emc=healthupdateema1

Reaching for the Stars When Space Was a Thrill

By DENNIS OVERBYE

It was “Mad Men” meets “Flash Gordon.”

The years from 1957 to 1962 were a golden age of science fiction, as well as paranoia and exhilaration on a cosmic scale. The future was still the future back then, some of us could dream of farms on the moon and heroically finned rockets blasting off from alien landscapes. Others worried about Russian moon bases.

Scientists debated whether robots or humans should explore space. Satellites and transistors were jazzy emblems of postwar technology, and we were about to unravel the secrets of the universe and tame the atom (if it did not kill us first).

Some of the most extravagant of these visions of the future came not from cheap paperbacks, but from corporations buffing their high-tech credentials and recruiting engineering talent in the heady days when zooming budgets for defense and NASA had created a gold rush in outer space.

In the pages of magazines like Aviation Week, Missiles and Rockets and even Fortune, companies, some famous and some now obscure, were engaged in a sort of leapfrog of dreams. And so, for example, Republic Aviation of Farmingdale, N.Y. — “Designers and Builders of the Incomparable Thundercraft” — could be found bragging in Aviation Week and Space Technology magazine in 1959 about the lunar gardening experiments it was doing for a future Air Force base on the moon.

Or the American Bosch Arma Corporation showing off, in Fortune, its “Cosmic Butterfly,” a solar-powered electrically propelled vehicle to ferry passengers and cargo across the solar system.

Most Americans never saw these concoctions, but now they have been collected and dissected by Megan Prelinger, an independent historian and space buff, in a new book, “Another Science Fiction: Advertising the Space Race 1957-1962.” It is being published on May 25 by Blast Books.

Ms. Prelinger and her husband, Rick, operate the Prelinger Library, a private research library in San Francisco with a heavy emphasis on media, technology and landscape history.

In an e-mail message, Ms. Prelinger said she had grown up "on a cultural diet of science fiction and space," memories of the moon landings and "Star Trek" merging in her mind. "As a result," she said, "I grew up believing that I was a junior member of an advanced technological society."

The book, she said, was inspired by a shipment of old publications to the library, including Aviation Week & Space Technology and Missiles and Rockets. "I little expected that the advertising in their pages would seize my attention more than the articles themselves," she writes in the introduction to her book.

The ads are chock-full of modernist energy and rich in iconography in ways Ms. Prelinger is happy to elaborate on.

The late '50s were also the years of the Organization Man. The cover illustration, from an insurance ad, shows a man in a gray flannel suit who is a dead ringer for the existentially confused Don Draper of "Mad Men," floating alarmed and bewildered among the planets and stars. Time and again, the mountains and valleys of the moon, for example, are portrayed as if they were the mountains, canyons and deserts of the American West, making the space program just another chapter in the ongoing narrative of Manifest Destiny.

In one illustration, the hands of God and Adam from Michelangelo's Sistine Chapel ceiling have been transformed into a giant pair of space gloves reaching for each other. In another, the silhouette of a spaceship forms a cross.

"These images suggest that the furthest reach of what humankind hoped to find in space was in fact the very essence of infinity," Ms. Prelinger writes.

Leafing through this book is a walk down my own memory lane. I grew up in Seattle, which was a one-company town dominated by Boeing. Almost everybody worked there sooner or later. My best friend's father helped design the Saturn V rocket that lifted humans to the moon. After limping out of M.I.T. with a physics degree in the late '60s, I, too, worked there for a year, playing a kind of space war — shooting high-speed aluminum balls at sheets of aluminum arrayed to simulate the structures of aircraft or spacecraft, to see what the damage would be under various conditions. At the end of the day, my desk was buried in piles of sharp dented and charred sheets of aluminum. I had to count all the holes.

It's hard to know what to be more nostalgic about, all those childhood dreams of space opera or the optimism of an era in which imagination and technology were booming and every other ad ended with a pitch to come work for the thriving company of the future. "To advance yourself professionally, you should become a member of one these teams. Write to N. M. Pagan," reads a typical notice from the Martin Company, now part of Lockheed Martin.

You don't hear that much these days.

Back then, you, too, sitting at a drafting table or in a cubicle, designing antennas or self-locking nuts among acres of such boards and cubicles — "Reaching for the Moon, Mr. Designer?" reads a Kaylock ad — could be a space hero.

And of course it was almost exclusively men depicted in the ads. One exception was an ad from the National Cash Register Company for a new electronic machine for posting checks. "And what the POST-TRONIC does *electronically* the operator cannot do wrong — because she doesn't do it at all!" says the ad showing a woman floating in space at the machine's console.

Naturally, there was a hook to those recruitment ads, as Ms. Prelinger points out. The real business of most of those aerospace companies was not the space program but defense — building fighters, bombers, missiles and other implements of the cold war, not to mention commercial airliners. For many of these

places, the space program was more of a hindrance than a boost to the bottom line, a sort of prestigious loss leader to attract cutting-edge talent.

Occasionally, as Ms. Prelinger reports, the darker side of this work bled through into the trade press and the ads, like when the Marquardt Corporation, which made small control rockets for satellites, showed a spy satellite aiming its lens down at Earth.

If the space fever began in 1957 with Sputnik, it cooled by 1962, when the basic plan for the Apollo moon missions was set and there was no more space for imaginations to run wild. Also, by then NASA's budget was leveling off. Ms. Prelinger said that during this period about half a million engineers, scientists, draftsmen and other people followed the clarion call to blend their talents into the new age, swelling the ranks of aerospace workers to more than a million.

Some of them might have wound up like me. When the "impact mechanics" group was downsized, I was sent to the "weights and measures" group. Our job was to scrutinize rocket blueprints to determine the position and weight of every nut, bolt, washer and any other item on a small upper-stage booster that was to deliver an unknown payload to orbit. The information could be entered into a computer program that would calculate the center of gravity and other dynamical properties of the rocket package.

It was essential but brain-numbing work, and I learned a lot about shooting rubber bands from the wars that broke out every day after lunch.

But it was men and women like these, working in cubicles, who saved the astronauts of Apollo 13 in 1969, by figuring out how to bring them back from the moon alive in a crippled spacecraft.

In the wake of the moon landings and then the end of the cold war, many of those jobs, exciting or not, disappeared, as did many of the companies that advertised them. What has not disappeared in all these years and decades is the yearning and arguing about space.

We're still fighting about what NASA should do as far as human exploration of the universe is concerned, collectively looking more and more like that bewildered advertising man floating in space on the cover of Ms. Prelinger's fascinating book. The argument has been going on for my whole life. Since those advertisements appeared, the United States invaded Vietnam and left; the Soviet Union crumbled and China rose; the whole nation stopped smoking.

We never did find the essence of infinity — at least not yet.

http://www.nytimes.com/2010/03/09/science/space/09space.html?ref=science

Doctor Leads Quest for Safer Ways to Care for Patients

By CLAUDIA DREIFUS

Dr. Peter J. Pronovost, 45, is medical director of the Quality and Safety Research Group at Johns Hopkins Hospital in Baltimore, which means he leads that institution's quest for safer ways to care for its patients. He also travels the country, advising hospitals on innovative safety measures. The Hudson Street Press has just released his book, "Safe Patients, Smart Hospitals: How One Doctor's Checklist Can Help Us Change Health Care from the Inside Out," written with Eric Vohr. An edited version of a two-hour conversation follows.

Q. WHAT GOT YOU STARTED ON YOUR CRUSADE FOR HOSPITAL SAFETY?

A. My father died at age 50 of cancer. He had lymphoma. But he was diagnosed with leukemia. When I was a first-year medical student here at Johns Hopkins, I took him to one of our experts for a second opinion. The specialist said, "If you would have come earlier, you would have been eligible for a bone marrow transplant, but the cancer is too advanced now." The word "error" was never spoken. But it was crystal clear. I was devastated. I was angry at the clinicians and myself. I kept thinking, "Medicine has to do better than this."

A few years later, when I was a physician and after I'd done an additional Ph.D. on hospital safety, I met Sorrel King, whose 18-month-old daughter, Josie, had died at Hopkins from infection and dehydration after a catheter insertion.

The mother and the nurses had recognized that the little girl was in trouble. But some of the doctors charged with her care wouldn't listen. So you had a child die of dehydration, a third world disease, at one of the best hospitals in the world. Many people here were quite anguished about it. And the soul-searching that followed made it possible for me to do new safety research and push for changes.

Q. What exactly was wrong here?

A. As at many hospitals, we had dysfunctional teamwork because of an exceedingly hierarchal culture. When confrontations occurred, the problem was rarely framed in terms of what was best for the patient. It was: "I'm right. I'm more senior than you. Don't tell me what to do." With the thing that Josie King died from — an infection after a catheter insertion, our rates were sky high: about 11 per 1,000, which, at the time, put us in the worst 10 percent in the country.

Catheters are inserted into the veins near the heart before major surgery, in the I.C.U., for chemotherapy and for dialysis. The C.D.C. estimates that 31,000 people a year die from bloodstream infections contracted at hospitals this way. So I thought, "This can be stopped. Hospital infections aren't like a disease there's no cure for." I thought, "Let's try a checklist that standardizes what clinicians do before catheterization." It seemed to me that if you looked for the most important safety measures and found some way to make them routine, it could change the picture.The checklist we developed was simple: wash your hands, clean your skin with chlorhexidine, try to avoid placing catheters in the groin, if you can, cover the patient and yourself while inserting the catheter, keep a sterile field, and ask yourself every day if the benefits of catheterization exceed the risks.

Q. WASH YOUR HANDS? DON'T DOCTORS AUTOMATICALLY DO THAT?

A. National estimates are that we wash our hands 30 to 40 percent of the time. Hospitals working on improving their safety records are up to 70 percent. Still, that means that 30 percent of the time, people are *not* doing it.

At Hopkins, we tested the checklist idea in the surgical intensive care unit. It helped, though you still needed to do more to lower the infection rate. You needed to make sure that supplies — disinfectant, drapery, catheters — were near and handy. We observed that these items were stored in eight different places within the hospital, and that was why, in emergencies, people often skipped steps. So we gathered all the necessary materials and placed them together on an accessible cart. We assigned someone to be in charge of the cart and to always make sure it was stocked. We also instituted independent safeguards to make certain that the checklist was followed.

We said: "Doctors, we know you're busy and sometimes forget to wash your hands. So nurses, you are to make sure the doctors do it. And if they don't, you are empowered to stop takeoff on a procedure."

Q. HOW DID THAT FLY?

A. You would have thought I started World War III! The nurses said it wasn't their job to monitor doctors; the doctors said no nurse was going to stop takeoff. I said: "Doctors, we know we're not perfect, and we can forget important safety measures. And nurses, how could you permit a doctor to start if they haven't washed their hands?" I told the nurses they could page me day or night, and I'd support them. Well, in four years' time, we've gotten infection rates down to almost zero in the I.C.U.

We then took this to 100 intensive care units at 70 hospitals in Michigan. We measured their infection rates, implemented the checklist, worked to get a more cooperative culture so that nurses could speak up. And again, we got it down to a near zero. We've been encouraging hospitals around the country to set up similar checklist systems.

Q. IN YOUR BOOK, YOU MAINTAIN THAT HOSPITALS CAN REDUCE THEIR ERROR RATES BY EMPOWERING THEIR NURSES. WHY?

A. Because in every hospital in America, patients die because of hierarchy. The way doctors are trained, the experiential domain is seen as threatening and unimportant. Yet, a nurse or a family member may be with a patient for 12 hours in a day, while a doctor might only pop in for five minutes.

When I began working on this, I looked at the liability claims of events that could have killed a patient or that did, at several hospitals — including Hopkins. I asked, "In how many of these sentinel events did someone know something was wrong and didn't speak up, or spoke up and wasn't heard?"

Even I, a doctor, I've experienced this. Once, during a surgery, I was administering anesthesia and I could see the patient was developing the classic signs of a life threatening allergic reaction. I said to the surgeon, "I think this is a latex allergy, please go change your gloves." "It's not!" he insisted, refusing. So

I said, “Help me understand how you’re seeing this. If I’m wrong, all I am *is* wrong. But if you’re wrong, you’ll kill the patient.” All communication broke down. I couldn’t let the patient die because the surgeon and I weren’t connecting.

So I asked the scrub nurse to phone the dean of the medical school, who I knew would back me up. As she was about to call, the surgeon cursed me and finally pulled off the latex gloves.

Q. WHAT CAN CONSUMERS DO TO PROTECT THEMSELVES AGAINST HOSPITAL ERRORS?

A. I’d say that a patient should ask, “What is the hospital’s infection rate?” And if that number is high or the hospital says they don’t know it, you should run. In any case, you should also ask if they use a checklist system.

Once you’re an in-patient, ask: “Do I really need this catheter? Am I getting enough benefit to exceed the risk?” With anyone who touches you, ask, “Did you wash your hands?” It sounds silly. But you have to be your own advocate.

http://www.nytimes.com/2010/03/09/science/09conv.html?ref=science

Speed Reading of DNA May Help Cancer Treatment

By NICHOLAS WADE

Researchers at Johns Hopkins University have developed a way to monitor the progress of a patient's cancer treatment using a new technique for rapidly sequencing, or decoding, large amounts of DNA.

In the process, they have shaken up the textbook doctrine that everyone has a single version of the DNA in their mitochondria, the numerous energy-providing machines inside each cell. Besides the mutations, or changes, in DNA found in cancer patients, even healthy people turned out to have several variants in their mitochondrial DNA, though mostly in small proportions.

The finding, reported in the current issue of Nature, is part of a program by Dr. Bert Vogelstein, Kenneth W. Kinzler and colleagues to monitor the presence of cancer cells through the fragments of mutated DNA they shed into the blood. Such an approach was out of the question until the development a few years ago of methods for sequencing very large amounts of DNA at low cost.

A cell becomes cancerous when the genes that stop runaway growth are sabotaged by mutations. Once the cell's anticancer defenses are destroyed, genetic mayhem ensues, with further mutations and wholesale rearrangements of DNA in the chromosomes.

If these altered bits of DNA could be picked up in a patient's bloodstream, they would serve as a direct and sensitive marker of cancer. A surgeon could check if he had successfully removed all of a tumor, and chemotherapists could monitor the success of any treatment by testing for the reappearance of cancer cells.

But it is an open question, given all the genetic damage in a cancer cell, as to which type of damage would be the best marker of a tumor's presence. Last month, Rebecca J. Leary and Dr. Victor E. Velculescu, colleagues of Dr. Vogelstein's, reported they could reliably detect rearrangements of the DNA by sequencing DNA fragments floating in the blood.

The DNA rearrangements are unique to cancer cells, making them a very specific marker. But testing each patient required sequencing billions of units of DNA and cost $5,000.

Dr. Vogelstein, Yiping Le, Nickolas Papadopoulos and other colleagues have now explored another possible marker of cancerous cells, that of mitochondrial DNA. Mitochondria are former bacteria that were enslaved eons ago to generate energy for larger cells. They lie outside the nucleus that houses the main human genome, and because there may be hundreds of them in each cell, their DNA is particularly easy to detect.

Dr. Vogelstein's team found that more than 80 percent of cancers had mutations in their mitochondrial DNA. These changes are easy to identify because the mitochondrial DNA genome is so small — just 16,000 units — compared with the three billion units of the genome in the cell's nucleus.

The method his colleagues reported last month is more thorough, since the rearrangement is likely to occur in every cancer cell in the patient's body. But it requires sequencing a patient's entire genome. The mitochondrial DNA test is less expensive and so sensitive that a mutation can be picked up from a much smaller sample of blood.

Both methods are in the research stage and require the cost of the DNA sequencing to drop even further before they could be considered for the clinic. But Dr. Vogelstein said DNA-based markers of cancer could become a better diagnostic than the present methods, which depend on detecting cancer-linked proteins. "There is no question from a research point of view that this approach has the potential to track patients and tumors better than with the conventional approach," he said.

Michael Melner, scientific program director of the American Cancer Society, said the society had a "huge interest" in DNA-based methods of tracking cancer and that Dr. Vogelstein's mitochondrial DNA analysis was the most comprehensive to date.

In the course of scanning patients for cancer-related mutations in mitochondrial DNA, the Johns Hopkins team realized there was much more variation than expected in healthy people's mitochondrial DNA — seven out of eight people had small proportions of variant mitochondrial DNA in addition to their main type.

Testing members of families, they confirmed, as expected, that none of a father's mitochondria are passed on to his children. The sperm's mitochondria are thought to be destroyed after it has penetrated the egg. Some of the variants were detectable in subjects' mothers, and so must have been inherited via the egg. The body seems to have some system for eliminating mutations that crop up in mitochondrial DNA, so that most people have a single dominant type, but evidently the system is not completely efficient.

Dr. Vogelstein's team found that the proportion of variant mitochondrial DNA in healthy people tended to vary quite widely from one kind of tissue to another. This, they note, could lead a forensic analyst to reject a true match between two samples that came from different tissues of the same individual. They suggest that a suspect should be sampled from the same kind of tissue, whether hair or blood, say, as the tissue taken in evidence.

Terry Melton, chief executive of Mitotyping Technologies, a forensic testing company in State College, Pa., said it was well known among forensic analysts that individuals often had more than one type of mitochondrial DNA, with hair being a particularly variable tissue — some 12 percent of hair samples have more than one kind of mitochondrial DNA.

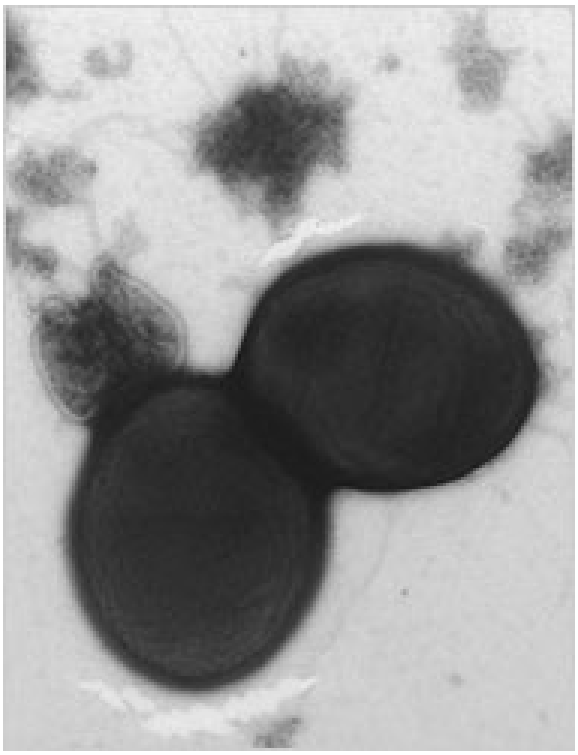
If two mitochondrial DNA sequences differ by a single unit, current guidelines require the analyst to report the comparison as inconclusive. "While this could result in a false exclusion, more importantly it could not result in a false inclusion, which is the appropriately conservative legal stance," Dr. Melton said.

But the Johns Hopkins findings may encourage forensic labs to do further testing in such cases to find out what is really going on, she said.

http://www.nytimes.com/2010/03/09/science/09gene.html?ref=science

Infection Defense May Spur Alzheimer's

By GINA KOLATA



For years, a prevailing theory has been that one of the chief villains in Alzheimer's disease has no real function other than as a waste product that the brain never properly disposed of.

The material, a protein called beta amyloid, or A-beta, piles up into tough plaques that destroy signals between nerves. When that happens, people lose their memory, their personality changes and they stop recognizing friends and family.

But now researchers at Harvard suggest that the protein has a real and unexpected function — it may be part of the brain's normal defenses against invading bacteria and other microbes.

Other Alzheimer's researchers say the findings, reported in the current issue of the journal PLoS One, are intriguing, though it is not clear whether they will lead to new ways of preventing or treating the disease.

The new hypothesis got its start late one Friday evening in the summer of 2007 in a laboratory at Harvard Medical School. The lead researcher, Rudolph E. Tanzi, a neurology professor who is also director of the genetics and aging unit at Massachusetts General Hospital, said he had been looking at a list of genes that seemed to be associated with Alzheimer's disease.

To his surprise, many looked just like genes associated with the so-called innate immune system, a set of proteins the body uses to fight infections. The system is particularly important in the brain, because antibodies cannot get through the blood-brain barrier, the membrane that protects the brain. When the brain is infected, it relies on the innate immune system to protect it.

That evening, after the lab's usual end-of-the-week beer hour, Dr. Tanzi wandered into the office of a junior faculty member, Robert D. Moir, and mentioned what he had seen. As Dr. Tanzi recalled, Dr. Moir turned to him and said, "Yeah, well, look at this."

He handed Dr. Tanzi a spreadsheet. It was a comparison of A-beta and a well-known protein of the innate immune system, LL-37. The likenesses were uncanny.

Among other things, the two proteins had similar structures. And like A-beta, LL-37 tends to clump into hard little balls.

In rodents, the protein that corresponds to LL-37 protects against brain infections. People who make low levels of LL-37 are at increased risk of serious infections and have higher levels of atherosclerotic plaques, arterial growths that impede blood flow.

The scientists could hardly wait to see if A-beta, like LL-37, killed microbes. They mixed A-beta with microbes that LL-37 is known to kill — listeria, staphylococcus, pseudomonas. It killed 8 out of 12.

“We did the assays exactly as they have been done for years,” Dr. Tanzi said. “And A-beta was as potent or, in some cases, more potent than LL-37.”

Then the investigators exposed the yeast Candida albicans, a major cause of meningitis, to tissue from the hippocampal regions of brains from people who had died of Alzheimer’s and from people of the same age who did not have dementia when they died.

Brain samples from Alzheimer’s patients were 24 percent more active in killing the bacteria. But if the samples were first treated with an antibody that blocked A-beta, they were no better than brain tissue from nondemented people in killing the yeast.

The innate immune system is also set in motion by traumatic brain injuries and strokes and by atherosclerosis that causes reduced blood flow to the brain, Dr. Tanzi noted.

And the system is spurred by inflammation. It is known that patients with Alzheimer’s disease have inflamed brains, but it has not been clear whether A-beta accumulation was a cause or an effect of the inflammation. Perhaps, Dr. Tanzi said, A-beta levels rise as a result of the innate immune system’s response to inflammation; it may be a way the brain responds to a perceived infection.

But does that mean Alzheimer’s disease is caused by an overly exuberant brain response to an infection?

That’s one possible reason, along with responses to injuries and inflammation and the effects of genes that cause A-beta levels to be higher than normal, Dr. Tanzi said. However, some researchers say that all the pieces of the A-beta innate immune systems hypothesis are not in place.

Dr. Norman Relkin, director of the memory disorders program at NewYork-Presbyterian/Weill Cornell hospital, said that although the idea was “unquestionably fascinating,” the evidence for it was “a bit tenuous.”

As for the link with infections, Dr. Steven T. DeKosky, an Alzheimer’s researcher who is vice president and dean of the University of Virginia School of Medicine, noted that scientists have long looked for evidence linking infections to Alzheimer’s and have come up mostly empty-handed.

But if Dr. Tanzi is correct about A-beta being part of the innate immune system, that would raise questions about the search for treatments to eliminate the protein from the brain.

“It means you don’t want to hit A-beta with a sledgehammer,” Dr. Tanzi said. “It says what we need is the equivalent of a statin for the brain so you can dial it down but not turn it off.” (Dr. Tanzi is a co-founder of two companies, Prana Biotechnology and Neurogenetic Pharmaceutical, that are trying to dial down A-beta.)

Dr. Relkin said that even if A-beta were not part of the innate immune system, it might not be a good idea to remove it all, along with the hard balls of plaque it makes in the brain.

In the past, Dr. Relkin said, scientists assumed "that the pathology *was* the plaque." Now, he likens removing plaque to digging up bullets at the Gettysburg battlefield.

The more bullets in an area, the more intense the fighting was. But "digging up bullets will not change the outcome of the battle," he said. "Most of us don't believe that removing plaque from the brain is the end-all."

But other scientists not connected with the discovery said they were impressed by the new findings.

"It changes our thinking about Alzheimer's disease," said Dr. Eliezer Masliah, who heads the experimental neuropathology laboratory at the University of California, San Diego. "I don't think we ever thought about that possibility for A-beta."

Dr. Masliah is intrigued by the idea that aggregates of A-beta may be killing bacteria and brain cells by the same mechanism. He noted that Dr. Tanzi had a track record of coming up with unusual ideas about Alzheimer's disease that later turn out to be correct.

"I think he's onto something important," Dr. Masliah said.

http://www.nytimes.com/2010/03/09/health/09alzh.html?ref=science

A Little Black Box to Jog Failing Memory

By YUDHIJIT BHATTACHARJEE

PITTSBURGH — On a cold, wet afternoon not long ago, Aron Reznick sat in the lounge of a home for the elderly here, his silver hair neatly combed, his memory a fog. He could not remember Thanksgiving dinner with his family, though when he was given a hint — "turkey" — it came back to him, vaguely, like a shadow in the moonlight.

Two years ago, Mr. Reznick, who has early-stage Alzheimer's disease and is now 82, signed up for an experiment intended to help people with Alzheimer's and other memory disorders. The concept was simple: using digital pictures and audio to archive an experience like a weekend visit from the grandchildren, creating a summary of the resulting content by picking crucial images, and reviewing them periodically to awaken and strengthen the memory of the event.

The hardware is a little black box called the Sensecam, which contains a digital camera and an accelerometer to measure movement. Worn like a pendant around the neck, it was developed at Microsoft's research lab in Cambridge, England.

Vicon, a British company that has licensed the technology, wants to market it to young people interested in logging their lives and posting the results to Web sites like Facebook and YouTube. For the elderly, though, it could herald a new kind of relationship between mind and machine: even as plaque gets deposited on the brain, everyday experience is deposited on silicon, then retrieved.

Researchers say the technology could benefit not just patients but also family and friends, helping them avoid the routine of repeating conversations over and over.

In Pittsburgh, researchers had Mr. Reznick go on three excursions with a Sensecam around his neck, and a voice recorder in his shirt pocket and a GPS unit. On one trip, he went to an exhibition of glass sculptures with his wife, Sylvia, his son and a granddaughter.

The Sensecam takes hundreds of pictures in a short period. When researchers began exploring it as a memory aid a few years ago, they had patients and caregivers look at all the pictures together.

Although the exercise helped improve retention of an experience, it was evident that a better way would be to focus on a few key images that might unlock the memories related to it. The interactive nature of that approach would give patients a greater sense of control over their recollections, and allow them to revisit past experiences rather than simply know they had happened.

To find the best memory cues for Mr. Reznick's experiences, the researchers — Anind K. Dey, a computer science professor at Carnegie Mellon University, and Matthew Lee, a graduate student — considered the types of images that had proved the most effective in previous Sensecam studies.

They soon realized that the capriciousness of memory made answers elusive. For one subject, a donkey in the background of a barnyard photo brought back a flood of recollections. For another, an otherwise unremarkable landscape reminded the subject of a snowfall that had not been expected.

Still, the researchers came up with some broad rules for identifying and retrieving images likely to serve as memory triggers. For a people-based experience like a family reunion, the system selects photographs in which faces are clearly discernible; for a location-based experience like a visit to a museum, it uses geographical positions provided by GPS and accelerometer data to judge what images might be most salient — for example, when a subject might be hovering at one spot, like in front of a painting.

Research groups elsewhere are experimenting with other techniques to summarize and make use of Sensecam data. Alan Smeaton and colleagues at Dublin City University in Ireland are comparing images to categorize them by activity — shopping, for example — so the system can put together a visual summary of the day. At the University of Toronto, a group led by Ronald M. Baecker is investigating the usefulness of complementing Sensecam images with an audio narrative created by a loved one.

Once the system selects some photos from the hundreds taken, the caregiver winnows down the candidates, adding cues like audio from the voice recorder, verbal narration and brief text captions. The final product is a multimedia slide show on a tablet computer that allows the patient to dig deeper into highlighted parts of some images by tapping on the screen. The first tap plays audio, the second shows captions.

"The design is intended to give the patient the ability to engage actively with the experience instead of simply flipping through some pictures," said Mr. Lee, the graduate student. Testing the system with the Reznicks and two other couples, he and Dr. Dey found that it helped patients recall events more vividly and with greater confidence than when they simply went through all of the images.

Other Sensecam studies — also financed by Microsoft — have produced encouraging results, but plans to market the device as a memory aid have not been announced.

In December, Mr. Reznick clicked through the slide show of his trip to the museum, more than 18 months after the event. His eyes flickered with recognition at a few of the images. When he came upon a picture annotated by his wife, showing bricks engraved with donor names, he nodded and said, "I remember that."

Then he handed the tablet back with a smile. In the haze of his past, a candle had been lit, however briefly.

http://www.nytimes.com/2010/03/09/health/09memory.html?ref=science

The Blobs Aren't Talking
By NICK STILLMAN

TAOS, N.M.

THE mottled, multicolored surfaces of Ken Price's sculptures glimmer with an almost paranormal glow, so it's revealing to witness their humble origin as heaps of brown clay. In his studio and home in the mountains of Taos, Mr. Price has an arsenal of small tools resembling dental instruments that he uses to finesse the material into shapes resembling slugs or — recently — human feet with curlicue ankles. Demonstrating the process last month, he scraped and scrubbed a just-birthed form of fired clay for a moment before tossing the instrument he was using down, ambling over to another lump of clay and changing the subject; although he taught ceramics at the University of Southern California during the 1990s, technical demonstrations aren't his ideal day's work.

When it comes to discussing what these oddball shapes might mean, Mr. Price is notoriously elusive, so one infers what one can. The ideas for the shapes that become Ken Price sculptures begin with drawings, "but the same drawing might make all of these forms," he said, gesturing toward six works in progress poised on a tabletop. Not much about the new works — their shape, their color — is predetermined. In an era when most contemporary artists produce elaborate statements to justify their works' being and explain the intent, Mr. Price operates in a state of chosen uncertainty. "I don't really know what I'm going for," he said with a touch of defiance.

Despite a recent battle with tongue and throat cancer that has left him having to relearn how to speak and unable to swallow (although the cancer is now gone), he remains a remarkably productive sculptor and renderer of graphic, cartoonlike drawings. Born in Los Angeles in 1935, Mr. Price was a dynamic force in the city's close-knit community of surfer artists of the 1960s, a group that included Ed Ruscha, Billy Al Bengston, Robert Irwin and Larry Bell. Aside from Mr. Ruscha, perhaps no Los Angeles artist of his generation has been so prolific, though Mr. Price's name, unlike Mr. Ruscha's, tends to elicit only vague recognition — or blank stares.

Mr. Price's almost indescribable ceramics are revered by fellow artists for dissolving the chasm between art and craft, while his lumpy, blobby, sluglike new sculptures are quintessential examples of biomorphic or formless art. He is considered a crucial link between post-minimalism and postmodernism, yet he has

been the subject of just a single retrospective, which traveled from the Menil Collection in Houston to the Walker Art Center in Minneapolis in 1992. Mr. Price has never really had his "moment."

Judging from the ubiquity of his work in New York this season, that might be changing.

A solo show of his new sculptures is on view at Matthew Marks's main space on West 22nd Street in Manhattan until April 17, and his earlier sculpture is being exhibited at Nyehaus Gallery on West 20th Street until June. At the same time Mr. Price's work is part of a two-man exhibition with Josef Albers at the Brooke Alexander Gallery on Wooster Street (also until June). And — in perhaps the most unconventional show devoted to his work — the Franklin Parrasch Gallery on West 57th Street is, through April 21, featuring Price-related ephemera like prints he did for poetry books by Harvey Mudd and Charles Bukowski, an album cover for Ry Cooder's "Chicken Skin Music" that features his drawings and several Del Maguey tequila bottle labels also emblazoned with Price drawings. Perhaps most notable, however, are some future plans: a major retrospective of Mr. Price's sculptures from the late 1950s until the present will open at the Los Angeles County Museum of Art in the fall of 2012 before traveling to the Nasher Sculpture Center in Dallas in 2013 and landing at the Metropolitan Museum of Art later that year.

A partial explanation for this onslaught is a more general fascination with Mr. Price's generation of 1960s artists from Los Angeles. David Zwirner's recent exhibition, "Primary Atmospheres: Works from California, 1960 to 1970," provided a comprehensive review of the crowd Mr. Price once ran with, featuring artists like Mr. Irwin and Mr. Bell, whose works emphasize surface and light. Nyehaus Gallery has notably been giving priority to solo exhibitions by California artists associated with "finish fetish" and "light and space" aesthetics like Peter Alexander, Craig Kauffman and Laddie John Dill.

But Mr. Price's work has never neatly fit in, not even with that of his closest peers and friends. "There are problems of classification for him," said Franklin Parrasch, whose gallery has been showing Mr. Price since 1993 when Mr. Parrasch wrote him a fan letter telling him he was obsessed with his work. "The work is about creation, evolution, connections to otherworldly phenomena," Mr. Parrasch said. "How do you put that into art historical discussion?"

During the 1960s and '70s, when most object-related work was trending toward the drab and monochromatic, Mr. Price's sculptures shined with color: toxic greens, cloying pinks. He exploded out of a ceramics background and onto the Los Angeles art scene with egg-shaped objects that he showed at the fabled Ferus Gallery in his debut solo exhibition in 1960. Their exteriors blazed with color, and Mr. Price often created an orifice inside where wormlike shapes were painted with dark, foreboding colors. "Those eggs and dome-shaped ceramics were psycho-erotic," Mr. Ruscha said. "They made you scratch your palms."

Prodding the invisible barrier between functional art and fine art inherent in ceramics, he then turned to making mugs and cups off and on until the early 1990s. They often have absurdist handles in the shape of animals. ("That was when I thought, my God, this guy is terrific," the artist Vija Celmins said of initially seeing the mugs.) When an animal's shape proved too fragile to function as a handle — as with hermit crabs — Mr. Price simply made drawings of hypothetical mugs.

In 1972 Mr. Price embarked on a six-year, never-finished ur-project of pottery, posters, weavings, painted dishware and installations he called death shrines, all inspired by the colors and craftsmanship of the pre-1950 folk pottery he saw in Mexico during surf trips. Taking his cue from a curio store and bar in Taos selling Mexican ceramics in the attic, he hatched a plan to rent a storefront, make his own billboards and fill the space with his own riffs on the ceramics he loved. The project, titled "Happy's Curios," occupied him for much of the 1970s, was displayed at the Los Angeles County Museum of Art in 1978 and is one of the more ambitious and bizarre pursuits in recent American art history.

After he moved to Taos in 1971 he began to incorporate elements of New Mexico's dramatic, jagged landscape into his sculptures, making the work even harder to define. He also passed through an extended

period in the 1970s and ’80s of making geometric constructions with suggestive slotlike orifices that he ultimately found “really unpleasurable to make” and led him into formlessness in the 1990s.

Classification issues aren’t likely to change with his new sculptures, which can look like a stack of soft internal organs, a gorgeous extracted tumor or a glittering lump of dung. The dialectic of attraction and repulsion is their motor. Charles Long, an artist and the chairman of the art department at the University of California, Riverside, emphasized that the works should be considered crystallizations of specific mental states: “Each piece isn’t just a weird shape. It’s a moment.”

In his studio Mr. Price described how he achieves the shimmering effect for the surface of his new sculptures. Near each work in progress is a small color chart with a spectrum that becomes brightest near the top; black is always at the bottom. This represents the order — from the bottom up — of colors to be applied to the sculpture’s surface. Each color is applied in five coats before the next color can be applied; each sculpture is painted with 14 different colors. “Something like 70 coats of paint,” Mr. Price said with a sigh.

Jackson Price, Mr. Price’s son and helping hand in the studio, emphasized the importance of thin and even coats of acrylic paint, as it is he who executes the delicate next step of the process. Once painted, the overall surface of each piece is carefully scrubbed with sandpaper to reveal the depth of colors underneath; the effect is what gives a Price sculpture its characteristic brilliance. The process is dependent on chance, with some controls. “The first coat of paint is always black,” Ken Price explained, “so that when you sand all the way through, there’s a little black circle around the white areas. That’s so it looks good rather than bad.”

This salty dryness is typical of the artist, who would rather discuss jazz or the Dodgers than his technique or implicit meanings in his work. He warns that the search for explicit social or political content in his work is fruitless. “What I’m shooting for is for something to look right,” he said with a shrug.

The diversity and lack of real-world referents are probably what has prevented Mr. Price’s work from being broadly appreciated sooner. But Mr. Long, for one, is glad that Mr. Price didn’t diverge from the unique and sometimes obscure path he carved out in the mountains of Taos: “What I hope he’s remembered as is a keeper of the fire for faith in experience. When topicality isn’t there in art, people tend to be at a loss. That’s probably why it’s been such a long haul for him. But he didn’t change, and I’m really grateful for that.”

http://www.nytimes.com/2010/03/07/arts/design/07price.html?ref=design

Street Art That's Finding a New Address
By JOHN STRAUSBAUGH

FOR the current fifth-anniversary exhibition at his New York gallery Jonathan LeVine has filled it with works by 35 artists, most of whom he represents. The space is in Chelsea, but there's no cerebral conceptualism, cool abstraction or painterly gesture on view.

Instead this work, variously labeled Lowbrow Art, Pop Surrealism and perhaps most accurately Pop Pluralism, is the skateboarding, graffiti-tagging, sometimes bratty and rebellious younger sibling of the art shown in most of the neighborhood's locations. Still, the art in the Jonathan LeVine Gallery seems at home in Chelsea in a way it did not five years ago. After years on the fringes of the art world, "we've come to a turning point," Mr. LeVine said recently. "The mainstream is embracing this work."

Many artists in the show, who are mostly in their 30s and 40s, were schooled in fine art. But their hearts and minds belong to punk rock and hip-hop, "Star Wars" and "Star Trek," cartoons and tattoos. Their work is typically figurative and often narrative, in a populist, accessible vein. Giant robots stride across Jeff Soto's spray-painted landscapes. Scott Musgrove's six-foot bronze statue depicts a cartoonish imaginary creature. Kathy Staico Schorr's paintings strand Halloween witches, clowns and Popeye in menacing Surrealist settings. The mosaics of Invader, who took his name from Atari's Space Invaders game, recreate his favorite album-cover art with tiles from deconstructed Rubik's Cubes.

Unlike Pop Art, which drew on similar sources to comment on art and culture, "for this generation, who grew up on TV, pop-culture imagery is their language," Mr. LeVine said. "Their culture is pop culture."

The art establishment was slow to warm to these artists, and vice versa. In the 1980s and '90s they created their own scene, more youth culture than high art. They illegally postered and painted city walls or hung their work in hip, funky spaces like Psychedelic Solution, a storefront gallery on West Eighth Street in Greenwich Village, and La Luz de Jesus, above a pop merchandise shop on Melrose Avenue in Los Angeles. The first shows Mr. LeVine organized in the mid-'90s were in clubs and bars like CBGB and Max Fish in Manhattan and Maxwell's in Hoboken, N.J. The movement even had (and still has) a magazine of its own, Juxtapoz, founded in 1994.

But in the last decade the genre gradually found more acceptance in the art world. Influential dealers like Jeffrey Deitch, Tony Shafrazi and Earl McGrath now represent some of the artists, and institutions from the Museum of Modern Art and the Whitney to Fondation Cartier in Paris show their work. Corporate marketers, meanwhile, line up to enlist them in their branding efforts.

Despite such successes, though, the artists still tend to speak in anti-elitist terms about their work. "This movement, whatever it's called, is very blue collar in a way," said Mr. Soto, 35, who grew up in Orange County in California, majored in illustration at the Art Center College of Design in Pasadena and supplements his fine-art income by illustrating magazine covers, rock posters and advertisements.

The artists who first inspired him "were designing the skateboards I looked at in the mid to late '80s," he said, "just guys working for studios trying to make cool images." He sees the appeal of his own art and other work represented in the LeVine show as largely a matter of how easily it can be grasped: "People who like fine art can get into it, but also people who don't know anything about high art, because it tells a story and it's interesting to look at." Adam Wallacavage, a Philadelphia photographer and sculptor who created the humorous octopus-armed chandelier that hangs in the show, echoed Mr. Soto. "I don't like making things that are inaccessible," he said. He made his first chandelier for his own dining room a decade ago and said he likes that some its descendants now hang in nonart spaces like the clothing shops Mishka in Williamsburg, Brooklyn, and RVKA in Haight-Ashbury in San Francisco, "where anybody can see them."

"The typical gallery scene is too egotistical and creepy for me," Mr. Wallacavage, 40, added. "Art is treated like a sacred object. Openings are like weird religious services where the artist is a messiah. Ew. No, you're not."

The genre's roots reach back to the West Coast of the 1960s, where Robert Williams, now its elder statesman at 67, created hot rod illustrations, psychedelic rock posters and underground comics. That background in demotic, countercultural imagery remains evident in his trippy paintings of crashing hot rods and miniskirted vixens in psychedelic landscapes, which he began describing as Lowbrow Art in the late 1970s. The term celebrated what he calls the work's "devil-may-care vulgarity" and its contrast to the "snobby, blobby, gobby stuff" of much high art at the time. It came to be applied to artists and illustrators of a similar aesthetic, including Robert Crumb, Gary Panter, Ron English and Josh Agle (who signs his work Shag).

But as the genre was passed down to a generation that draws from a wider spectrum of pop iconography, the Lowbrow label has largely fallen out of use. "It's too limiting," Mr. LeVine said. "The work is far too diverse now."

Several artists in his show began as artists. Shepard Fairey, for example, combined his training at the Rhode Island School of Design with his experiences in the graffiti and skateboard cultures to create a widely seen series of stickers and posters in the early 1990s. One of the most ubiquitous pictured the wrestler Andre the Giant above the legend "Obey" — a reference to the sci-fi film "They Live." During the 2008 presidential campaign this design morphed into Mr. Fairey's famous image of Barack Obama over the word "Hope," now in the permanent collection of the National Portrait Gallery. (The Obama poster is also the subject of a lawsuit brought against Mr. Fairey by The Associated Press because, the suit claims, he based it without permission on an A.P. photograph.)

Mr. Fairey, 40, now has a solo exhibition at the Contemporary Arts Center in Cincinnati, and last year he had one at the Institute of Contemporary Art in Boston, where he was arrested, on his way to an opening event for the show, on outstanding warrants in connection with graffiti. In May he is scheduled to be the last artist shown at Deitch Projects, the prominent SoHo gallery.

Mr. Deitch, its proprietor, who is moving to Los Angeles to become director of the Museum of Contemporary Art there, also represents the street artists Barry McGee and Swoon (who is now in the permanent collection of the MoMA) and mounted a group show of skateboard art, complete with a replica skating bowl, in 2002. He said he sees this work as extending a legacy that goes back through Keith Haring and Jean-Michel Basquiat to Andy Warhol.

"The people in the more establishment side of the art world are just beginning to get it," he said. "They still have no idea how huge street art is."

Eddy Desplanques, who calls himself W K and signs his work with a fingerprint, began as a street artist in France; he is one of three French artists in the LeVine show, along with Invader and Blek le Rat. He moved to New York in the early 1990s and soon, working late at night, was painting stark black-and-

white figures on walls all over Lower Manhattan. “It was totally illegal, very not appropriate,” Mr. Desplanques recalled. But it also earned him instant notoriety, and within a couple of years, he said, “all these brands started contacting me and other street artists because we were trendy, and they wanted to be part of what was going on.” He has created murals, window displays and other public works for Nike, Adidas, Commes des Garçons and other clients.

“At first some other artists picked on me and said I sold out,” he said. “Then everybody did it.”

Mr. Desplanques, 41, said he began showing in galleries about a decade ago, “but the art for me was on the street. I didn’t really want to go to the gallery because it was too much a certain type of people, and not enough people.” Today, besides Mr. LeVine’s gallery, he shows in galleries in London and Paris and said his work sells for $10,000 to around $50,000.

He still puts work up on city walls too and said he was recently caught by the police as he postered a wall in Chinatown at 3 a.m. “I got lucky. The cops knew my work.” They still confiscated the posters, he added.

Even Mr. Williams, the godfather of Lowbrow, is not quite the consummate outsider his reputation suggests. Tony Shafrazi Gallery has shown his work since 1990; he just had a show there last fall. (A review by Ken Johnson in The New York Times called him an “uncommonly inventive, albeit often puerile image maker.”) And he has six watercolors in the current Whitney Biennial.

“Robert’s always had a huge following, but it was outside the art world,” Mr. Shafrazi said. “He never got the recognition he deserved. Curators have always been reluctant to deal with the subversive. Now the time seems right for him. He’s still not as celebrated as Jeff Koons or whoever, but it’s happening.”

Mr. LeVine came to the movement the same way his artists did. He grew up in Trenton and earned a degree in sculpture, but he was less attracted to fine art than he was to underground comics, punk and hip-hop, “anything subculture and edgy.” With a loan from his parents, he opened his first small art gallery in New Hope, Pa., in 2001. After two years he moved the gallery into Philadelphia, and two years later, in 2005, “I spent every dime I had to move to Chelsea. I wanted to try to take it to the next level I felt it deserved.”

Mr. LeVine, who is 41, said his typical collector is between 35 and 45, “my generation, people who grew up on television and collect popular-culture imagery that resonates with them.”

Madonna, Marilyn Manson and the Nike chief executive, Mark Parker, have bought work from him, he said, adding that “my bread and butter is doctors, lawyers, real estate people, a pretty cool bunch who maybe have a little more money to spend than the average person.”

http://www.nytimes.com/2010/03/07/arts/design/07lowbrow.html?ref=design

The World as Their Canvas
By STEVEN HELLER

There's nothing like sitting by the fire with a good book, except maybe sitting by the fire with a good map — or better yet, a good book about maps. I've noticed an upsurge in cartographic interest these days, especially for maps' value as conceptual artwork. They can be maps of the designer's mind as well as maps of terrain, concerned not just with topography but with typography too. Some maps have gone down in design history as milestones of visual erudition, like Harry C. Beck's London Underground map (1931-33) or Herbert Bayer's World Geo-Graphic Atlas (1953), an exemplary marriage of information, art and design. But many maps are made only as art for art's sake. In recent years, various exhibitions, catalogs and books have been devoted to assaying the cartographic arts and crafts. Four new books cover all aspects of maps and mapping, from navigation to contemplation, and two others touch on maps as well.

The most beautiful among them is Caroline and Martine Laffon's MAPPING THE WORLD: Stories of Geography (Firefly, $39.95). It would be hard for the book not to be beautiful, given how the exotic and fantastical antique maps reveal their makers "daydreaming about the world" (as one chapter is subtitled). Of course, maps are not always geographically accurate. Although a map must take on a certain recognizable form, its content is sometimes in the eye of the beholder (or discoverer). "Mapping the World" shows both the precision and the disorder underscoring the evolution of mapmaking, and how mistakes altered and confused perception, depending on where the maps were made. For instance, the Chinese, who had long been reassured by their maps that they occupied the "middle kingdom," were "extremely exasperated," the authors write, "when they discovered . . . that they had been relegated to the right edge of a map prepared by the Jesuits."

Some of the most alluring maps are found in the section titled "Battle Plans." A map of the Crusades, based on a 17th-century Ottoman manuscript, displays in vivid color and luscious rendering the attack routes of European ships against the Ottoman cavalry. In the following section, "Organizing the Resistance," an image shows a Portuguese fort guarding the Arabian Peninsula; the illustration of the stockade and the traders (or bad guys) who may have threatened it is primitive, like a child's naïve drawing. In addition to the more imaginative maps, the earliest-known "modern" maps are included. For example, the authors say that " 'Britannia,' published in England during the 17th century, is considered

the first road 'atlas.' " It was created by John Ogilby, and it recorded 7,500 miles of routes "with a precision unknown until its time."

But my favorite maps are those of unknown worlds, like the 17th-century "Selenography," a description of the moon by Johannes Hevelius. None of the common man-in-the-moon or green-cheese fluff for Hevelius: his magnificent orb is replete with seas and islands, as well as craters of all descriptions.

The book ends with contemporary aerial photographs, which at first seem out of place among the vintage documents. Yet the picture of Gironde, France, with geometrically cut fields and intersecting roadways, looks as though it were copied right from those centuries-old maps.

"There has always been art in cartography," Katharine Harmon writes in THE MAP AS ART: Contemporary Artists Explore Cartography (Princeton Architectural Press, $45), but when exactly the first modern artist employed the map as a muse is not clear. "Since the 1960s there has been an exponential increase in artists working with maps," she adds, using Jasper Johns's "Map," from 1963, by way of example.

My first encounter with the map metaphor came in 1976, when Saul Steinberg's New York-centric view of the world graced the cover of The New Yorker. This artwork does not appear in the book, but plenty of others do, running the gamut from Pollock-like abstraction (Ingrid Calame's 2006 "Tracings Up to the L.A. River Placed in the Clark Telescope Dome, Lowell Observatory, Flagstaff, AZ") to sartorial delight (Peter Clark's 2007 "Sunny Side of the Street," a collage of maps making up a suit of clothes).

Maps come in all shapes and sizes. Abigail Reynolds's "Mount Fear, East London: Police Statistics for Violent Crimes 2002-3," from 2003, is a massive 3-D installation — a topological chart made from Styrofoam and corrugated cardboard — that tracks felony data. It is just one of many distinctive maps analyzing information of all sorts. Then there is Jeannie Thib's "Geographia" (1995), for which fragments of early maps of Canada were screen-printed onto the kinds of "white kid gloves" that English ladies used to wear. And Greg Colson's "Oildale" (2006) is a street map of a California town, made from wood and metal.

These maps cover a wide conceptual expanse too: Christian Nold's "San Francisco Emotion Map" (2007) turns an abstract image of a brain into a metaphorical street map tracing scores of people's everyday experiences of love and hate, fear and joy, carefully marking where they occurred. And in Noriko Ambe's "Flat File Globe Red Tank A" (2007), drawers filled with undulating typographical layers of cut paper are meant to convey the artist's "nuances of emotions, habits and biorhythms" — without resorting to Google maps. Yet, as is the case with some catalog-style anthologies in which so many artists are represented, the concept of the book trumps the quality of the work. Frankly, despite all their differences, the maps here can become monotonous.

The Paris Métro is known for its sinuous Art Nouveau entrances by Hector Guimard. But as Mark Ovenden makes perfectly clear in PARIS UNDERGROUND: The Maps, Stations, and Design of the Métro (Penguin, paper, $25), the maps for this complex transportation network are just as emblematic. And those who ride Le Métropolitain would be lost without one.

Ovenden, the author of "Transit Maps of the World," certainly knows the value of a well-designed map. Although "Paris Underground" is a general history of the city's various lines, he dwells on the evolution of the Métro map from its early-20th-century origins to the most contemporary iterations. While the goal of designers is to make subway maps as accessible as possible, the intricacy of the Paris guides can be daunting. To condense Paris and its environs so they fit nicely onto one map, it is necessary to use optical tricks, a technique also employed for other systems. Ovenden shows all the successes and all the failures.

For those who love Paris, this book is worth a look. But Ovenden's obsessive technical detail (long, -information-packed captions detract from the quality of the book's design) makes this definitive history more appropriate for die-hard subway and map devotees.

How often has a map been the problem, not the solution? "A word of warning," Frank Jacobs writes in STRANGE MAPS: An Atlas of Cartographic Curiosities (Viking Studio, paper, $30). "This is the most improbable, incomplete and incorrect atlas you're ever likely to hold in your hands. But it's also — hopefully — one of the funniest, most surprising collections of maps ever to be contained within the covers of a book." This particular book is the result of a blog, also called Strange Maps, that was started by Jacobs and is devoted to "cartographic curiosa." It was meant for "fellow map geeks" but grew into a sounding board for those bruised or amused by inaccurate and satirical atlases. By March 2009, the blog had received more than 10 million hits.

So what makes a map strange? Total mistakes, for one thing. "One of the most famous misconceptions in cartographic history is of California as an island," Jacobs writes. This error derives from a romantic novel written in 1510 that stated, "There is an island called California very close to the side of the Terrestrial Paradise." Though it is possible, Jacobs adds, given the activity of tectonic plates, that California may someday become an island.

And what makes a map surprising? When it sets out to record a real world, but in doing so has to go beyond reality. The artist Chris Wayan created an (almost) entirely new world. "Welcome to planet Dubia, a strangely familiar place," Jacobs notes. "It's what our planet could look like if you add a millennium's worth of global warming."

Finally, what makes a map funny? Let's cite an example. My favorite is the urban rail map that shows how you can get from Oslo to Pyongyang "without changing trains." (That map, incidentally, served as a promotion piece for Ovenden's "Transit Maps of the World.")

This book is well worth your time and money. It's filled with notable blunders and intentional absurdities. But most important, the stories behind them are a pleasure to read.

In 1972, Massimo Vignelli created a radically new kind of map for the New York City subway system that was diagrammatic, like Beck's London Underground map, rather than traditionally cartographic. The boroughs were rendered as reductive abstract shapes, mere background shadows enabling the brightly colored bars used to delineate the respective subway lines to stand out. According to Jan Conradi in UNIMARK INTERNATIONAL: The Design of Business and the Business of Design (Lars Müller, paper, $64.90), "users complained because when they exited the subway, they found it too difficult to reconcile the physical liberties taken in Vignelli's map with the actual geography of the city." The map was replaced by one that was "less graphically distinct but more geographically true." Vignelli's valiant effort is celebrated in the design collection of the Museum of Modern Art.

Unimark International, the firm Vignelli helped found, was responsible for the flawed map and the redesigned navigational subway sign system. The company was incorporated in 1965 and lasted for about 15 years. It was made up of European and American designers who applied Bauhaus-inspired modernism to the identities and design systems of many American businesses; its signature analysis of corporate "problems" and "solutions" had an enormous influence on design throughout the latter part of the 20th century. Unimark's designers (many of whom wore white lab coats), often using Helvetica type, were responsible for changing the looks of companies like J. C. Penney, American Airlines, Target and Knoll International.

Some say they were responsible for the Helveticization of American business. But modernizing and universalizing typography was only part of their approach to making global design. This book, the first history of the legendary (among designers, that is) company, is not for everyone. But for those interested

in the practice of corporate “branding” before the term became as widespread as it is today, this is an early missing link.

Although not all of them are maps, some Afghan and Pakistani “war rugs” look like the illustrative maps discussed in “Mapping the World.” Among them are primitive world maps, or so-called geographic rugs. Narrative rugs and tapestries are abundant in Central Asia and the Middle East. War rugs document protest, dissent, revolt and foreign aggression, and employ the symbols of warfare on both sides, including tanks, helicopters, grenades and Kalashnikovs woven through the tableaus. This may not seem like the kind of thing one might use to decorate a home, yet at a time when Afghans were being slaughtered by Soviet guns, Afghan women were producing and selling these graphic memorials to the war.

In WAR RUGS: The Nightmare of Modernism (Skira, paper, $42), Enrico Mascelloni chronicles the history of these eerily beautiful, decidedly disturbing objects, which, curiously enough, can be found at flea markets in New York. Mascelloni, who has written about art from Africa and Central Asia as well as Western avant-garde movements, looks at these rugs, produced in different tribal workshops and refugee camps, through the lens of modernism — aesthetic and philosophical. The tension between modernism (represented by mechanized war) and traditional craftsmanship provides the underpinning for his thesis.

Yet this is also something of a collectors’ guide, since reference is often made to the marketing and provenance of the goods. “When you buy a war rug,” Mascelloni writes, “the only real certainty in its dating is your date of purchase.” For those interested in this charged form of visual commentary, the book is profusely illustrated with seductive artifacts. Still, when images of heavy weaponry show up in a decorative border or a repetitive pattern, it is disconcerting. Even more so are the rugs memorializing or propagandizing the 9/11 attack on the World Trade Center, which can also be found at New York flea markets.

http://www.nytimes.com/2010/03/07/books/review/Heller-t.html?ref=design

Reviving the Exotic to Critique Exoticism

By BENJAMIN GENOCCHIO

"Lalla Essaydi: Les Femmes du Maroc," an exhibition at the Jane Voorhees Zimmerli Art Museum, draws attention to one of the most interesting if puzzling developments in contemporary art: a revival of exotic, often historical imagery of people from faraway places in the name of a critique of exoticism.

Ms. Essaydi is a Moroccan-born, New York-based photographer who has risen to prominence for her beautiful, striking imagery dealing with the role of women in Islamic societies. But much like Shirin Neshat, Shahzia Sikander and other successful expatriate female artists from Muslim nations, she trades in stereotypes, reflecting back at us our own misconceptions and prejudices.

The current exhibition of work by Ms. Essaydi, a touring show from the DeCordova Sculpture Park and Museum, in Lincoln, Mass., consists of 17 color photographs of Moroccan women dressed up and arranged into staged scenes appropriated from 19th-century European and American Orientalist paintings. Among her sources are paintings by well-known artists like Jean-Léon Gérôme, Eugène Delacroix, John Singer Sargent and Frederic Leighton.

The artist has scrawled Arabic calligraphy on her photographs. It is written in henna, which is used by women in South Asia and in some Islamic countries to decorate the hands, feet and body for marriage and other ceremonies. The calligraphy, loosely applied, is largely obscured by its presentation; for the most part it is illegible, even to those who read Arabic.

Though this is not a big show, the visual elegance of the works is overwhelming. They are beautiful and alluring; my immediate reaction on walking into the show was "Wow." The impact can be attributed partly to the fetishistic and sometimes openly sexual aspects of the Orientalist originals, and partly to the decorative use of the calligraphy, which adds a pleasing patina of age.

Those who have studied art history will probably recognize several of the source images. "Les Femmes du Maroc: Grande Odalisque" (2008), showing a naked woman wrapped in a sheet on a bed, is an appropriation of Jean August-Dominique Ingres's iconic painting "The Great Odalisque" (1819). Ms. Essaydi's figure seems remote and unavailable to the viewer, unlike Ingres's temptress.

While Ms. Essaydi changes her source images, stripping them of their luminous colors, removing male figures or replacing them with women, and covering up the nudity, I am not sure that she always transforms them enough. Too often her photographs look like an exercise in voyeurism, replicating rather than revising the stereotypical imagery she is working with.

Take, for example, "Les Femmes du Maroc #1" (2005), based on a Delacroix painting, "Algerian Women in Their Apartment" (1834), depicting three Arab women as slaves imprisoned in an exotic and secluded harem. Ms. Essaydi simplifies the setting by eliminating the colorful draperies and props, but her picture still retains some of the languorous sensuality of the original Orientalist painting.

My problem with these photographs is that Ms. Essaydi, by retaining the basic compositions, gestures and general style of dress of the original paintings, often leaves her women stuck in the same Orientalist fantasy that she purports to critique. Instead of changing the way in which we see Arab women, these photographs revive old-fashioned stereotypes.

"Les Femmes du Maroc #4" (2005) is an instantly striking photograph based on "The Slave Market" (circa 1867), one of Gérôme's best and most famous paintings, which shows a slave woman having her teeth inspected by some prospective buyers. It depicts a degrading scene, the woman reduced to a piece of property. Nothing about Ms. Essaydi's photographic copy changes this.

In the exhibition catalog, Nick Capasso, the show's curator, argues that Ms. Essaydi presents us with images of women who are "empowered." That's the party line on these photographs. Sometimes I think it makes sense, as with "Les Femmes du Maroc: Grande Odalisque," but at other times it just doesn't work. I don't see how there can be anything empowering about images of women as sex slaves.

No doubt the use of text on the images is meant to give these women a voice, to show them as more than just passive bodies. But given that the text is mostly illegible, it becomes just another decorative element enhancing the aesthetic appeal of what are essentially clichéd images of the East seen through the lens of Western desire.

"Lalla Essaydi: Les Femmes du Maroc," Jane Voorhees Zimmerli Art Museum, 71 Hamilton Street, New Brunswick, through June 6; (732) 932-7237 or zimmerlimuseum.rutgers.edu.

http://www.nytimes.com/2010/03/07/nyregion/07artsnj.html?ref=design

'Charles Addams's New York'
The Perverse Pleasures Underneath the Ordinary

By EDWARD ROTHSTEIN

Who could resist such an invitation? The city street is dark and deserted. The buildings are empty. There are no witnesses. A lone man carrying a briefcase, after a long day at the office perhaps, approaches a subway staircase. Out of the subterranean gloom, a giant human hand protrudes, its index finger beckoning the office worker, inviting him into the depths. His eyes are wide with astonishment, his face showing the hint of a grin, as if the bizarre, illicit invitation were not entirely unwelcome.

That is the Charles Addams cartoon that the Museum of the City of New York has blown up to a wall-size poster at the entrance to the main gallery of its new show devoted to the cartoonist, "Charles Addams's New York." The huge hand could be Addams's own. Come in, it urges. And abandon all hope, ye who enter here — all hope, that is, if your tastes lean toward the inverted universe of Addams's most famous characters, Morticia, Gomez and their clan, who welcome grim unpleasantness and rarely crack a smile except when doing serious mischief. What they hope for, you don't get here.

Instead Addams, in his mischief, makes the illicit an enchanting, almost whimsical aspect of daily life; we descend into his realm with the same half grin as that doomed office worker, our darker natures finding pleasure in allusions to misery. We enter a world so perverse even wind-up toys commit suicide, bitter matrons ask in department stores to be directed to "blunt instruments," and beams of light bearing divine illumination stream from the heavens only to shine on television antennas.

One of the strange characteristics of contemporary bourgeois life is the sheer pleasure we take in inverting it. Uncomfortable with its promised comforts and disbelieving its reassurances, we maintain its manners but stand it on its head. That sensibility helped give Addams's family of blood-drained ghouls celebrity status in a television sitcom in the mid-1960s. (The exhibition shows some of them transmuted into canvas and papier-mâché masks, used by the Ringling Brothers and Barnum & Bailey circus in 1965.) The characters first came to life in scattered cameo New Yorker cartoons, but the television series turned them into the cartoonists' blood relations as the Addams Family and gave them all proper names.

But their characters were formed early. In one 1947 cartoon here, the as yet unnamed Morticia is genuinely pleased when a gentleman from Railway Express appears with two pet carriers; she calls upstairs: “It’s the children, darling, back from camp.”

Such charms made for an enduring career; in the 1990s they went on to display their macabre middle-class family values in two films and an animated series.

Now a book tracing their development, supplemented with Addams’s character descriptions, “The Addams Family: An Evilution,” is being published (by Pomegranate). And next week a musical comedy about the family’s escapades will begin previews on Broadway, after a reworking of that musical’s script — a step judged necessary during a pre-Broadway run in Chicago to assure Morticia, Gomez, Uncle Fester, Lurch and the others some prospect of an enduring life in New York, the city where Addams dwelt for 50 years. But as this exhibition makes clear, there is no sign that Addams himself, who died in 1988, might require any similar doctoring. His afterlife is secure.

It turns out — who knew?— that the Museum of the City of New York has a major collection of Addams drawings. It began in 1948 when the museum’s curator of prints, Grace M. Mayer, wrote to the cartoonist, soliciting an image, shown in the new exhibition: an American Indian on a psychiatrist’s couch learns that his neurosis stems from the foolish ancestral sale of Manhattan Island. In the 1950s Addams’s first solo show was at the museum, and in the ’60s he donated an additional 60 drawings and sketches to its collection.

That material is supplemented by loans from the Tee and Charles Addams Foundation and a private collector; the exhibition’s sponsors also include the new Broadway show. On display, along with original drawings, are book jackets and advertisements created by Addams; his accounting notebook from the 1930s, when The New Yorker paid him by the square inch; his drawing desk; and a selection of the creepy paraphernalia he collected (including a reproduction of a medieval German executioner’s ax) to tease his visitors into thinking he was really like — well, himself.

Addams had plenty of company. A stark 1947 photo that Irving Penn took for Vogue, shown here, displays The New Yorker’s cartoon stable — artists who look so gaunt and mordant they could pass for Addams familial relations. And wasn’t the return of the repressed a shared preoccupation in some of their jests? William Steig’s Shrek could have been Morticia’s childhood playmate.

But in keeping with the setting, the curator, Sarah Henry, who worked with H. Kevin Miserocchi, the director of the Addams Foundation, shaped the exhibition not around the family (which still gets a dedicated gallery) but around images of New York City. That city, the wall text points out, was “the explicit or implied setting of many of his cartoons.” It is even a “character in his work.”

When Addams was learning his craft he would his skip his classes at art school to ride around in buses, sketching the city’s buildings. His colleague and friend Saul Steinberg, we are told, said that in Addams’s work, “modern architecture was drawn seriously and intelligently for the first time in a cartoon.”

But architecture, of course, was not really the main point. You can recognize the old Hayden Planetarium here (though the monstrous transformations of a visitor’s face as the sky-show Moon goes through its phases provide the main interest); you can see the top of the Chrysler Building (which, like an ancient ruin, is being uncovered in an archaeological dig); and you can even make out Wall Street at night on the anniversary of the 1929 crash. (There are ghosts jumping out of windows.) Steinberg well knew Addams had things other than aesthetics on his mind: we see the friend’s inscription “To Charlie/Merry Christmas and Happy 1953/Saul” written on the belly of a stuffed armadillo (not unlike the species Morticia enjoyed cooking).

Some Addams characters, it seems, even have the power to twist the city in their own image. Uncle Fester, in one drawing, is eagerly prepared to open the “Special Barbecue” window at a Horn & Hardart Automat. A special barbecue indeed: a bearded man’s head nestled in a bed of small potatoes.

But even those of us with more traditional tastes will find in Addams’s city a kind of theater: on sidewalks and in public spaces the most extraordinary sights proliferate, and the commonplace turns extreme. Chess players in a wintry park are frozen, caked with ice, a parody of their typically contemplative pace. A passenger waiting to board a charter bus labeled “Styx” confesses it’s not quite how he imagined that journey.

“You go home without me, Irene,” says the middle-aged businessman to his wife as they stop beside a scrawny, sickly, beaded tambourine player promising salvation. “I’m going to join this man’s cult.”

The public realm is where private fears and unruly desires erupt, usually for the shock and delectation of observers. And here too are the city’s office buildings, in which workers are moved about like file cabinets and risk their lives with overexposure to tedium. “Please Hold Rail,” warns one ordinary corridor sign; a dazed worker, wearily ignoring it as he walks down the hall, is about to step off a precipice. These cartoons are clichés of the alienated working life, but they jab at all the sore spots.

“This is your life!” Addams seems to shout again and again. But he does it, the exhibition points out, by sketching a scene that seems perfectly mundane, until we notice a tiny detail that suddenly overturns our expectations; our anticipation turns into dread. One sketch shows the popular television show of that name from the 1950s. “And now, George Pembrook,” the M.C. announces to the hapless man whose life is being celebrated, “here is the wife you haven’t seen in eighteen years!” She is emerging, scowling, from behind a curtain. Then we notice she holds a gun.

In some cases such turning points are almost too subtle or dated: a second-floor restaurant in a Brooklyn neighborhood is labeled “Windows on Bay Ridge,” but the allusion to the once-famous World Trade Center dining spot went over my head.

In others, a delayed interpretation adds to the thrust. “I don’t know his sleeve length,” the sturdy, fearsome woman says to the clerk in a store, “but his neck” — she is making a small circle with her large hands — “is about like that.”

One Halloween drawing shows a moonlit skyline of New York being invaded. On the East River a canoe, a submarine, a raft, a rowboat and a witch’s broom bear Lurch, Uncle Fester, Morticia and other denizens of Addams’s underworld to our civilized shores. But we know better: they are already among us. Look around.

“Charles Addams’s New York” is on view through May 16 at the Museum of the City of New York, Fifth Avenue at 103rd Street; (212) 534-1672, mcny.org.

http://www.nytimes.com/2010/03/05/arts/design/05addams.html?ref=design

Probe may have found cosmic dust

By Paul Rincon
Science reporter, BBC News, The Woodlands, Texas

Scientists may have identified the first specks of interstellar dust in material collected by the US space agency's Stardust spacecraft.

A stream of this dust flows through space; the tiny particles are building blocks that go into making stars and planets.

The Nasa spacecraft was primarily sent to catch dust streaming from Comet Wild 2 and return it to Earth for analysis.

But scientists also set out to capture particles of interstellar dust.

The material was gathered by the Stardust probe in a seven-year, 4.8-billion-km (2.9 billion miles) interplanetary voyage.

" **So far this particle is unique... if we drop it on the floor, it will cost $300m to get another one** "
Dr Andrew Westphal, University of California, Berkeley

It extended a retractable device containing cells filled with a material called aerogel, a porous substance designed to trap dust molecules.

A capsule containing the precious samples was then returned to Earth in January 2006.

Team members have now reported the possible discovery of two contemporary interstellar dust grains in the Stardust Interstellar Dust Collector (SIDC) deployed during the mission.

Dr Andrew Westphal, from the University of California, Berkeley, announced the find at the Lunar and Planetary Science Conference (LPSC) in The Woodlands, Texas.

'Cautiously excited'

The discovery was made by a member of the public, using the Stardust@Home internet application, which invited participants to search the aerogel collection medium for tiny particles of the dust.

"There are two particles, but they are in the same track. So when they hit the aerogel, they were together - they are two components of the same particle," Dr Westphal told BBC News.

"But they are very different from each other. That in itself is interesting, because if this does turn out to be interstellar dust, then it is a bit more heterogeneous than people thought."

" **All the heavy atoms in this room were in interstellar dust** "
Don Brownlee, University of Washington

The initial speck, known as particle 30, was spotted by Bruce Hudson, from Ontario in Canada. Under the agreement made between the science team and participants in Stardust@Home, Mr Hudson was allowed to choose a name for the particle; he called it Orion.

After preliminary analyses, the scientists found another grain upstream, which Bruce Hudson named Sirius.

But Dr Westphal stressed that the find "could be a false alarm".

"The right way to say it is we're cautiously excited," he told me.

"We have very limited data on it so far and the reason is deliberate. The analyses we are doing have the potential to do some minor damage to the particles. We don't think it will and we'll be careful to limit our analyses.

"So far this particle is unique... if we drop it on the floor, it will cost $300m to get another one."

Heavy atoms

Scientists have identified 28 definite impact "tracks" in the interstellar dust collector. But most of these come from angles indicating they are little particles of debris from impacts with the spacecraft's solar panels. However, particle 30 is one of seven with ambiguous trajectories.

Interstellar dust is formed when gas is ejected from stars and condenses to form grains. This dust then has to survive in the interstellar medium - the matter which exists between stars - where it is battered by cosmic radiation and shock processes.

It carries with it the heavy atoms that go into making the stars and planets. Our own Solar System was also constructed with these building blocks.

The possible dust grains were collected as Stardust travelled with the interstellar dust stream which passes through our Solar System.

The spacecraft's chief scientist, Dr Don Brownlee from the University of Washington in Seattle, told BBC News: "All the heavy atoms in this room were in interstellar dust... so we want to know what this stuff is."

He added: "This dust, once it's formed, and once it's heated or changed [initially] it is set for billions of years.

Dr Westphal told BBC News: "It is very fine-grained material, which is what you'd expect for interstellar dust. It has an elemental composition which is consistent with what you would expect for interstellar dust. And it has a composition for other elements which are not inconsistent, but a bit surprising."

The researchers have so far analysed magnesium, aluminium, iron, chromium, manganese, nickel, copper and gallium from the particles.

A new mineral found in a type of particle known as interplanetary dust has recently been named Brownleeite after Dr Brownlee, who is regarded as a founder of the field of cosmic dust research. The discovery has been published in the journal American Mineralogist.

Though highly prized by Stardust's team, interstellar dust can be a nuisance in optical astronomy, because it can obscure objects in regions of the sky targeted for observation.

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Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8550924.stm

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Internet access 'a human right'

Almost four in five people around the world believe that access to the internet is a fundamental right, a poll for the BBC World Service suggests.

The survey - of more than 27,000 adults across 26 countries - found strong support for net access on both sides of the digital divide.

Countries such as Finland and Estonia have already ruled that access is a human right for their citizens.

International bodies such as the UN are also pushing for universal net access.

"The right to communicate cannot be ignored," Dr Hamadoun Toure, secretary-general of the International Telecommunication Union (ITU), told BBC News.

"The internet is the most powerful potential source of enlightenment ever created."

He said that governments must "regard the internet as basic infrastructure - just like roads, waste and water".

"We have entered the knowledge society and everyone must have access to participate." The survey, conducted by GlobeScan for the BBC, also revealed divisions on the question of government oversight of some aspects of the net.

Web users questioned in South Korea and Nigeria felt strongly that governments should never be involved in regulation of the internet. However, a majority of those in China and the many European countries disagreed.

In the UK, for example, 55% believed that there was a case for some government regulation of the internet.

Rural retreat

The finding comes as the UK government tries to push through its controversial Digital Economy Bill.

As well as promising to deliver universal broadband in the UK by 2012, the bill could also see a so-called "three strikes rule" become law. This rule would give regulators new powers to disconnect or slow down the net connections of persistent illegal file-sharers. Other countries, such as France, are also considering similar laws.

A season of reports from 8-19 March 2010 exploring the extraordinary power of the internet, including:

Digital giants - top thinkers in the business on the future of the web Recently, the EU adopted an internet freedom provision, stating that any measures taken by member states that may affect citizen's access to or use of the internet "must respect the fundamental rights and freedoms of citizens".

In particular, it states that EU citizens are entitled to a "fair and impartial procedure" before any measures can be taken to limit their net access. The EU is also committed to providing universal access to broadband. However, like many areas around the world the region is grappling with how to deliver high-speed net access to rural areas where the market is reluctant to go.

Analysts say that is a problem many countries will increasingly have to deal with as citizens demand access to the net.

The BBC survey found that 87% of internet users felt internet access should be the "fundamental right of all people". More than 70% of non-users felt that they should have access to the net.

Overall, almost 79% of those questioned said they either strongly agreed or somewhat agreed with the description of the internet as a fundamental right - whether they currently had access or not.

Free speech

Countries such as Mexico, Brazil and Turkey most strongly support the idea of net access as a right, the survey found. More than 90% of those surveyed in Turkey, for example, stated that internet access is a fundamental right - more than those in any other European Country.

South Korea - the most wired country on Earth - had the greatest majority of people (96%) who believed that net access was a fundamental right. Nearly all of the country's citizens already enjoy high-speed net access. The survey also revealed that the internet is rapidly becoming a vital part of many people's lives in a diverse range of nations. In Japan, Mexico and Russia around three-quarters of respondents said they could not cope without it.

Most of those questioned also said that they believed the web had a positive impact, with nearly four in five saying it had brought them greater freedom.

However, many web users also expressed concerns. The dangers of fraud, the ease of access to violent and explicit content and worries over privacy were the most concerning aspects for those questioned.

A majority of users in Japan, South Korea and Germany felt that they could not express their opinions safely online, although in Nigeria, India and Ghana there was much more confidence about speaking out.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/8548190.stm

Action urged on pregnancy deaths

By Jane Dreaper
BBC News health correspondent

Pregnant women in developing countries face the same risk of death as women in the UK did 100 years ago, according to a coalition of campaign groups.

They are using International Women's Day to call for more action to reduce deaths among women during pregnancy.

They say improving mothers' health is "the most off-target" of the UN's eight Millennium Development Goals.

For every 100,000 live births in developing countries, 450 women die during pregnancy or labour.

The coalition, which includes White Ribbon Alliance, Amnesty International and Oxfam, says that in 1910, 355 women died per 100,000 live births in England and Wales.

In Scotland and the Irish Republic, the rate was higher - at 572 and 531 respectively.

In Ghana today the rate of pregnancy-related deaths is 560, while in Chad it is 1,500. The rate in the UK is now 14 deaths per 100,000.

" **There still remains a long way to go for the protection and security of pregnant women and their newborn children** "
Brigid McConville, Director of White Ribbon Alliance

The comparison has been drawn because it was 100 years ago that International Women's Day was established.

The UN says although it is difficult to get accurate figures on maternal mortality, very little progress has been made in sub-Saharan Africa - and deaths in southern Asia "remain unacceptably high".

Brigid McConville, the director of White Ribbon Alliance, which campaigns for safe motherhood, said: "There still remains a long way to go for the protection and security of pregnant women and their newborn children."

Monday is the official launch of a week of events. Campaigners will march at the Millennium Bridge in London and lay white roses outside Parliament.

Preventable deaths

Some countries have made progress in improving women's health - most notably Nepal and Rwanda.

In Mongolia, reduced deaths were achieved by educating women about the signs of complications in pregnancy and by helping them travel to special homes where they could wait to give birth.

Many of the medical problems are easily preventable if, for example, women have access to skilled health workers who can treat infections and use drugs to prevent haemorrhage.

The Millennium Development Goal also envisages preventing deaths that result from complications after unsafe abortions and allowing women access to contraception - to prevent riskier births in teenage mothers and to allow them to space their children.

The issue has become politically more significant in recent years, with the backing of the British Prime Minister's wife Sarah Brown, who is patron of the White Ribbon Alliance.

The Women Deliver conference in Washington DC in June aims to put increased pressure on world leaders to tackle the problems.

Amnesty International's UK director Kate Allen said: "It's clearly been possible to cut back on the rate of maternal deaths here in the UK.

"We need to demonstrate that same level of commitment worldwide."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8551481.stm

Published: 2010/03/08 00:59:21 GMT

Premature brain 'wash out' hope

A technique that "washes out" the brains of severely ill premature babies may aid survival, a study suggests.

Bleeding in the brain is one of the most feared complications for the most premature babies as it can lead to brain damage or death.

The Bristol University study of 77 babies found the technique - involving draining the brain while introducing new fluid - could reduce the risk.

It is thought the technique could benefit about 100 babies a year.

The therapy, pioneered at Bristol's Southmead Hospital, is carried out over a couple of days and requires close monitoring to ensure the pressure in the baby's brain does not rise too high, researchers say.

Experts have described the findings as encouraging.

It would be used only on the most premature babies with large haemorrhages, which cause the brain and head to expand excessively - a condition called hydrocephalus.

Standard treatment currently involves repeatedly inserting needles into the head or spine to remove the build up of fluid over a number of months before a shunt is inserted to drain fluid into the abdomen.

But the study, published in the Pediatrics journal, found the new treatment called Drift was more effective.

Of the 39 babies to receive the treatment, by the age of two 54% had died or were severely disabled, compared with 71% who were given the standard treatment.

" **This is the first time that any treatment anywhere in the world has been shown to benefit these very vulnerable babies** "
Ian Pople, lead researcher

Paediatric neurosurgeon Ian Pople, one of the lead researchers, said he hoped the technique would soon be used in the NHS.

"This is the first time that any treatment anywhere in the world has been shown to benefit these very vulnerable babies."

One of the first babies to be given the treatment before the study took place was nine-year-old Isaac Walker-Cox, from Yate, near Bristol.

He was given a 1% chance of survival when he was born 13 weeks early.

His mother, Rebekah Walker-Cox, said that while he has mild paralysis on the left-side of his body, he is living a normal childhood.

"Mentally he has no problems at all, he has an above average reading age and is very good with computers. He just gets on with life and is an outgoing, happy little boy."

Andy Cole, of Bliss, the premature baby charity, said: "This is a very interesting piece of new research and we always welcome anything that has the potential to improve outcomes for babies born sick and premature.

"The early results of this technique are encouraging and we look forward to seeing how these findings might be translated into treatments that could ensure better outcomes for these vulnerable babies."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8552575.stm

Published: 2010/03/08 00:19:54 GMT

DNA test 'may predict best diet'

A simple DNA test may predict whether someone is more likely to lose weight on a low fat or a low carbohydrate diet, say US researchers.

The results from the small preliminary study of 101 women showed those on the best diet for their genes lost two to three times more weight than the rest.

The results are being presented at an American Heart Association conference.

Experts said the findings tied in with previous studies, but further work should be carried out.

Cheek swab

The emerging field of "nutrigenomics" looks at how food interacts with genes.

It has long been known that people react to certain nutrients differently according to their genetic makeup.

Lactose intolerance, for example, is more common among Asians and Africans than of people of North European descent.

" **This is a very intriguing study - though very small** "
Prof Christine Williams, University of Reading

This study looked at how well people with different genes fared on different weight-loss diets.

The researchers, from Stanford University, analysed data from 101 white Caucasian women who provided DNA from a swab of their cheek cells.

The women had different diets for a year. The diets were very low carbohydrate, low carbohydrate/high protein, and low or very low fat.

The researchers divided the group into three genotypes which they described as low carbohydrate diet responsive, low fat diet responsive and a balanced diet responsive genotype.

They found that those on a diet which matched their genotype lost 2-3 times more weight over 12 months compared with those on the "wrong" diet.

The researchers said their findings were preliminary, and need much more confirmation before they could be used commercially.

'**Intriguing**'

British experts pointed out that the study had looked at a very small number of people and did not make clear what genes were involved.

Prof Christine Williams, from the University of Reading, said: "This is a very intriguing study - though very small."

She said it would be useful to get a better understanding of what genes were involved.

"It fits pretty well with some of our own studies which show that certain genotypes are more responsive than others to certain types of fats, eg diets high in omega-3 fatty acids," she added.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8550091.stm

Published: 2010/03/05 00:59:10 GMT

Sex health frankness 'milestone'

Young people think frank conversations about their sex lives signal that a relationship will last, says a survey.

The government-funded Populus poll of more than 1,200 15 to 24-year-olds cited talking about sexual infections and a person's sexual past as key.

They even thought this was a better sign of a relationship getting serious than meeting parents.

But 73% admitted that they did not talk about sexually transmitted diseases before having sex with a new partner.

And 30% said they felt uncomfortable asking a new partner to use a condom.

Relationship milestones

The research, which was conducted on behalf of the government's "Sex. Worth Talking About" campaign, provides a snapshot of the milestones that this generation think important for a lasting relationship.

" **These findings reveal much about the modern relationship game** "
Dr Catherine Hood, spokesperson for the "Sex. Worth Talking About" campaign

Top of the list was "talking openly together about sexual history and discussing sexually transmitted infections tests together", which 70% thought important.

This was ahead of "meeting the parents", which was thought significant by 66%, and "not always having to wear make-up", cited by 47%.

Much lower down were "meeting friends", 40%, and "being given space in the cupboard to leave clothes", 30%.

Too embarrassing

The survey showed that while young people valued openness about sexual diseases, many were too embarrassed to talk frankly with their partners.

While half of respondents thought that a new partner who was unwilling to discuss these topics would not be around for long, a quarter confessed they were too embarrassed to talk to their partner about safe sex, sexually transmitted infections and contraception.

Paula Hall, from the relationship charity Relate, said she was not surprised that people thought openness about sexual health was important for the success of a relationship.

"If people are not intimate enough to be open about this, the relationship is unlikely to go far."

She said the findings were both "encouraging" and "depressing".

"The fact that discussion of sexual infection is so high up young peoples' agenda is really good," she said.

But she said it was "worrying that this is still an embarrassing topic, even among today's generation of kids who expect a high degree of openness in their relationships".

Modern relationships

Dr Catherine Hood, spokesperson for the "Sex. Worth Talking About" campaign, said: "These findings reveal much about the modern relationship game.

"While many young couples realise the significance of being able to talk openly about accepting tests for sexually transmitted infections, sheer embarrassment is preventing them from doing so, and potentially risking their sexual health as well as the future of their relationship."

She stressed the importance of young people being tested for chlamydia, a sexually transmitted infection which often doesn't have any symptoms.

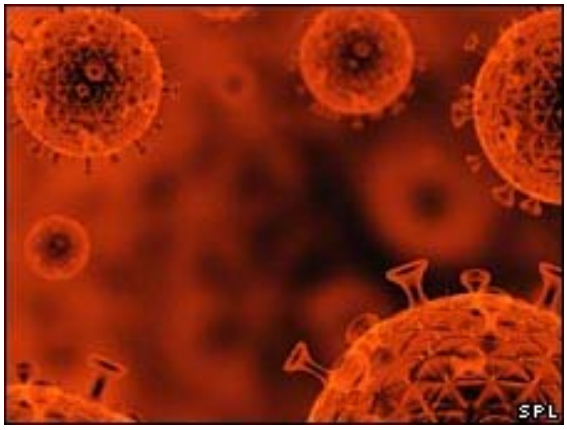
"If left untreated, chlamydia can lead to infertility and other serious health problems, and so it's vital that new couples take responsibility for their own sexual health by talking openly about safe sex," she added.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8549476.stm

Published: 2010/03/05 08:26:00 GMT

Aids 'key cause of female death'

HIV has become the leading cause of death and disease among women of reproductive age worldwide, the UN programme on HIV/Aids says.



At the start of a 10-day conference in New York, UNAids launched a five-year action plan addressing the gender issues which put women at risk.

One of the key issues, it says, is that up to 70% of women worldwide have been forced to have unprotected sex.

UNAids says such violence against women must not be tolerated.

"By robbing them of their dignity, we are losing the opportunity to tap half the potential of mankind to achieve the Millennium Development Goals," said Executive Director Michel Sidibe.

"Women and girls are not victims, they are the driving force that brings about social transformation," he said.

The agency says that experiencing violence hampers women's ability to negotiate safe sex.

It warns that, nearly 30 years from the beginning of the epidemic, HIV services do not respond to the specific needs of women and girls.

Women, it says, continue to be disproportionately affected by HIV/Aids.

In sub-Saharan Africa, 60% of those living with HIV are women and in Southern Africa, for example, young women are about three times as likely to be infected with HIV than young men of the same age.

The programme - which will include improving data collection and analysis of how the epidemic affects women, and ensuring the issue of violence against women is integrated into HIV prevention programmes - will be rolled out in countries including Liberia.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8546655.stm

Published: 2010/03/03 01:32:35 GMT

Lizard Moms Choose the Right Genes for the Right Gender Offspring

The male of this species can be two to three times the mass of the female, but the females seem to be in control of the genetic destiny. (Credit: Photo by Joseph Mehling '69)

ScienceDaily (Mar. 10, 2010) — Two Dartmouth biologists have found that brown anole lizards make an interesting choice when deciding which males should father their offspring. The females of this species mate with several males, then produce more sons with sperm from large fathers, and more daughters with sperm from smaller fathers. The researchers believe that the lizards do this to ensure that the genes from large fathers are passed on to sons, who stand to benefit from inheriting the genes for large size.

The study is published in the March 4 issue of *Science* Express, the advance online publication of the journal *Science*.

"This species has figured out a clever way to pass on genes with gender-specific effects on fitness," said Bob Cox, the lead author on the paper and a post-doctoral researcher at Dartmouth in Hanover, N.H. "Usually, when natural selection pulls genes in different directions for each gender, the species faces an evolutionary dilemma. But these lizards have solved this puzzle, they've figured out how to get the right genes into the right gender."

Cox's co-author is Ryan Calsbeek, an assistant professor of biological sciences at Dartmouth.

By manipulating opportunities for females to mate with males of different sizes, the researchers determined that females prefer larger males. But, when the choice of partners was limited to small males, females minimized the production of sons.

The researchers explain that the genes that make males more fit are often different from the genes that benefit females, which presents a conundrum because males and females share most of their DNA. The valuable traits for one gender are not always the same for the other. "In an evolutionary sense, what's good for the goose is not always good for the gander," said Cox.

In these lizards, however, mothers can enhance the fitness of their offspring by manipulating their gender depending on the size of the father. To demonstrate this, Cox and Calsbeek measured the survival rates of sons and daughters over eight months when released to their natural habitat in The Bahamas.

"As we predicted, the survival of the male offspring increased if they had large fathers," said Calsbeek. "But, we found that the survival of the daughters was not influenced by the size of the father. This suggests that the genetic benefits of large size are specific to sons."

How do females control the gender of their progeny? "That's the big question at this point," said Cox. The researchers will continue their studies to learn more about the mechanisms involved in this most fundamental of all evolutionary processes, the struggle to pass on advantageous genetic material.

Story Source:

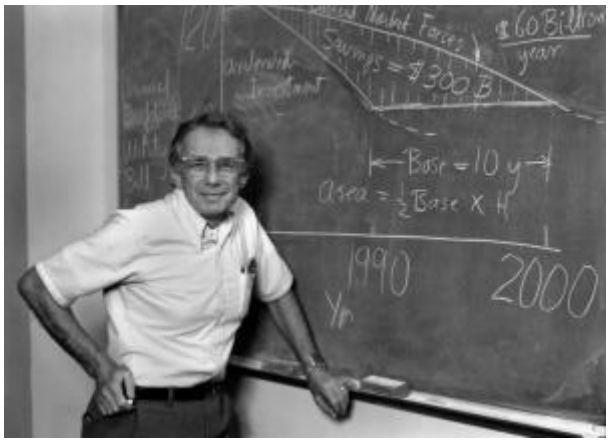
Adapted from materials provided by Dartmouth College.

Journal Reference:

1. Robert M. Cox, Ryan Calsbeek. **Cryptic Sex-Ratio Bias Provides Indirect Genetic Benefits Despite Sexual Conflict**. *Science*, 2010; DOI: 10.1126/science.1185550

http://www.sciencedaily.com/releases/2010/03/100304142245.htm

'The Rosenfeld' Named After California's Godfather of Energy Efficiency



Art Rosenfeld started working on energy issues at Berkeley Lab in 1974 and is often credited with being personally responsible for billions of dollars in energy savings. (Credit: Image courtesy of DOE/Lawrence Berkeley National Laboratory)

ScienceDaily (Mar. 10, 2010) — Pioneering French physicists Marie and Pierre Curie have the curie, a unit of radioactivity, named after them. Renowned inventor Nikola Tesla is honored with the tesla, which measures a magnetic field. And now, the Rosenfeld, proposed as a unit for electricity savings, will be named after the man seen by many people as the godfather of energy efficiency, Arthur Rosenfeld.

"In keeping with the tradition among scientists of naming units in honor of the person most responsible for the discovery and widespread adoption of the underlying scientific principle in question," a group of scientists propose in a refereed article in *Environmental Research Letters* to define the Rosenfeld as electricity savings of 3 billion kilowatt-hours per year, the amount needed to replace the annual generation of a 500 megawatt coal-fired power plant.

That definition, explains lead author Jonathan Koomey, a Lawrence Berkeley National Laboratory (Berkeley Lab) scientist and consulting professor at Stanford University who was once a graduate student of Rosenfeld's, is classic Rosenfeld. "Power plants are what Art uses most often to explain to policy makers how much electricity can be saved by efficiency investments," Koomey said.

With a decades-long career in energy analysis and standards, Rosenfeld is often credited with being personally responsible for billions of dollars in energy savings. He started his career at UC Berkeley and Berkeley Lab in the 1950s as a physicist in the Nobel Prize-winning particle physics group of Luis Alvarez. However, in 1974, he decided to switch his focus to energy and the environment. He founded the Center for Building Science at Berkeley Lab in 1975, where a broad range of energy efficiency standards and technologies were developed over the next 20 years.

Having just completed two five-year terms on the California Energy Commission, Rosenfeld will be returning to Berkeley Lab this spring to continue championing scientific solutions for society's most urgent environmental problems.

"He recognized early on, earlier than anyone else I think, that really great gains will come from energy efficiency, that there's an enormity to be gained by this approach," said fellow physicist Richard Muller, who took a graduate course from Rosenfeld in 1965, then went on to work with him in Alvarez' group.

Indeed, he already has a term named after him: the "Rosenfeld effect" explains why California's per capital electricity usage has remained flat since the mid-1970s while U.S. usage has climbed steadily and is now 50 percent higher than it was 40 years ago. Low-emissivity "smart windows," electronic ballasts that led to compact fluorescent lamps and energy standards for appliances and buildings were Berkeley

Lab innovations that made the Rosenfeld effect possible. The term has been popularized by U.S. Secretary of Energy Stephen Chu, who has called Rosenfeld a hero of his.

He is also behind "Rosenfeld's Law," which states that the amount of energy required to produce one dollar of economic output has decreased by about 1 percent per year since 1845.

Published online, the paper proposing the Rosenfeld unit of measurement has 54 co-authors representing 26 institutions from around the world, including more than a dozen from Berkeley Lab.

Ashok Gadgil, acting director of Berkeley Lab's Energy and Environmental Technologies Division and one of the co-authors, said it's the right unit at the right time. "We're launching this definition at a time when we're on the cusp, I think, from not worrying about carbon emissions to worrying like crazy about carbon emissions. It's also a very practical way to think about energy resources."

Rosenfeld himself is not sure whether to take the whole thing too seriously. "I'm honored that Jon Koomey got 53 of my oldest friends to join together on such a nice thought," he said. He added that he has always tried to explain energy savings in terms that people can grasp, such as the energy use of a home, a car or a power plant. "This nice article is really the result of the early usefulness of using cars, homes and power plants as an example of savings from energy efficiency," he said.

Not everyone is supporting the new unit. Muller, for one, says there are already too many units for measuring energy, such as joules, quads or BTUs, and he would rather see Rosenfeld given an even higher honor. "I believe Art Rosenfeld deserves the Nobel Peace Prize more than many people who've received it," Muller said. "Energy conservation has prevented conflict around the world."

Regardless of whether Rosenfeld the unit catches on, Rosenfeld the man has not slowed down. "He'll continue to work on things that catch his imagination, which is the whole world," said Gadgil. "You can't box this guy in."

Story Source:

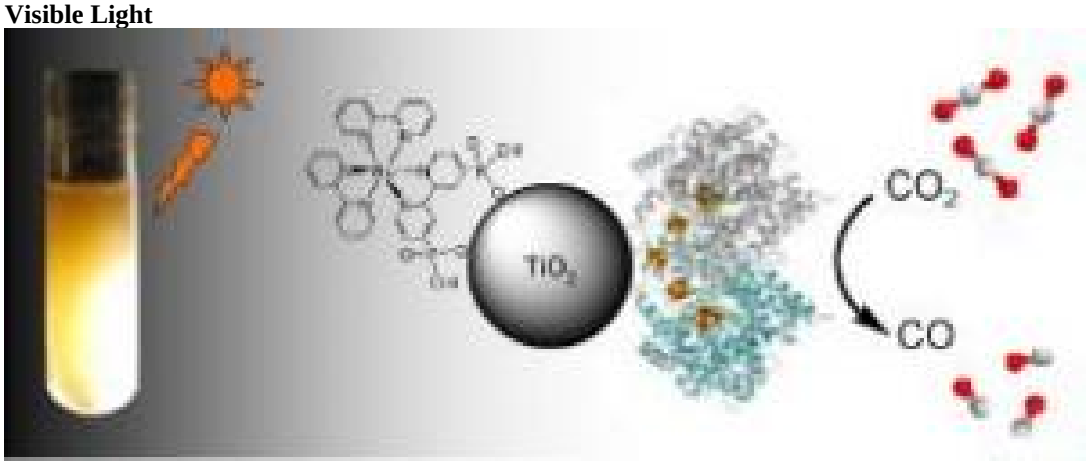
Adapted from materials provided by DOE/Lawrence Berkeley National Laboratory.

Journal Reference:

1. Jonathan Koomey, Hashem Akbari, Carl Blumstein, Marilyn Brown, Richard Brown, Chris Calwell, Sheryl Carter, Ralph Cavanagh, Audrey Chang, David Claridge, Paul Craig, Rick Diamond, Joseph H Eto, William Fulkerson, Ashok Gadgil, Howard Geller, José Goldemberg, Chuck Goldman, David B Goldstein, Steve Greenberg, David Hafemeister, Jeff Harris, Hal Harvey, Eric Heitz, Eric Hirst, Holmes Hummel, Dan Kammen, Henry Kelly, Skip Laitner, Mark Levine, Amory Lovins, Gil Masters, James E McMahon, Alan Meier, Michael Messenger, John Millhone, Evan Mills, Steve Nadel, Bruce Nordman, Lynn Price, Joe Romm, Marc Ross, Michael Rufo, Jayant Sathaye, Lee Schipper, Stephen H Schneider, James L Sweeney, Malcolm Verdict, Diana Vorsatz, Devra Wang, Carl Weinberg, Richard Wilk, John Wilson and Ernst Worrell. **Defining a standard metric for electricity savings**. *Environmental Research Letters*, 2010; DOI: 10.1088/1748-9326/5/1/014017

http://www.sciencedaily.com/releases/2010/03/100309161838.htm

Learning from Nature: Scientists Break Down Carbon Dioxide Into Carbon Monoxide Using Visible Light



Ragsdale and his associates succeeded in using an enzyme-modified titanium oxide to get carbon dioxide's electrons excited and willing to jump to the enzyme, which then catalyzes the reduction of carbon dioxide to carbon monoxide. A photosensitizer that binds to the titanium allows the use of visible light for the process. The enzyme is more robust than other catalysts, willing to facilitate the conversion again and again. The trick: It can't come near oxygen. (Credit: Image courtesy of University of Michigan)

ScienceDaily (Mar. 10, 2010) — A recent discovery in understanding how to chemically break down the greenhouse gas carbon dioxide into a useful form opens the doors for scientists to wonder what organism is out there -- or could be created -- to accomplish the task.

University of Michigan biological chemist Steve Ragsdale, along with research assistant Elizabeth Pierce and scientists led by Fraser Armstrong from the University of Oxford in the U.K., have figured out a way to efficiently turn carbon dioxide into carbon monoxide using visible light, like sunlight.

The results are reported in the recent online edition of the *Journal of the American Chemical Society.*

Not only is it a demonstration that an abundant compound can be converted into a commercially useful compound with considerably less energy input than current methods, it also is a method not so different from what organisms regularly do.

"This is a first step in showing it's possible, and imagine microbes doing something similar," Ragsdale said. "I don't know of any organism that uses light energy to activate carbon dioxide and reduce it to carbon monoxide, but I can imagine either finding an organism that can do it, or genetically engineering one to channel light energy to coax it to do that."

In this collaboration between Ann Arbor and Oxford, Ragsdale's laboratory at the U-M Medical School does the biochemistry and microbiology experiments and Armstrong's lab performs the physical- and photochemical applications.

Ragsdale and his associates succeeded in using an enzyme-modified titanium oxide to get carbon dioxide's electrons excited and willing to jump to the enzyme, which then catalyzes the reduction of carbon dioxide to carbon monoxide. A photosensitizer that binds to the titanium allows the use of visible light for the process. The enzyme is more robust than other catalysts, willing to facilitate the conversion again and again. The trick: It can't come near oxygen.

"By using this enzyme, you put it into a solution that contains titanium dioxide in the presence of a photosensitizer," he said. "We looked for a way that seems like nature's way of doing it, which is more

efficient." Armstrong notes that "essentially it shows what is possible were we to be able to mass-produce a catalyst with such properties."

The direct product -- carbon monoxide -- is a desirable chemical that can be used in other processes to produce electricity or hydrogen. Carbon monoxide also has significant fuel value and readily can be converted by known catalysts into hydrocarbons or into methanol for use as a liquid fuel. Although carbon monoxide serves as a source of energy and biomass for microbes, it is toxic for animals and this risk needs to be managed when it is generated or used in chemical reactions.

Research in Ragsdale's lab was funded by the National Institute of General Medical Sciences at the National Institutes of Health.

Ragsdale, a professor of biological chemistry at the U-M Medical School, is a fellow of the Michigan Memorial Phoenix Energy Institute, which develops, coordinates and promotes multidisciplinary energy research and education at U-M.

Story Source:

Adapted from materials provided by University of Michigan.
http://www.sciencedaily.com/releases/2010/03/100308095840.htm

Skin Transplant Offers New Hope to Vitiligo Patients

Skin Transplant for Vitiligo -- Top: Vitiligo before MKTP surgery. Bottom: Vitiligo after MKTP surgery. (Credit: Henry Ford Hospital)

ScienceDaily (Mar. 10, 2010) — In the first study of its kind in the United States, Henry Ford Hospital showed that skin transplant surgery is safe and effective for treating vitiligo.

Henry Ford researchers followed 23 patients for up to six months after surgery and found that the treated area regained on average 52 percent of its natural skin color. In eight patients with a specific type of vitiligo, the treated area regained on average 74 percent of its natural skin color.

The surgery involves using skin cells taken from normally-pigmented areas of the body and transferring them to the damaged area of skin. It is performed under local anesthesia.

"This surgery offers hope to vitiligo patients," says Iltefat Hamzavi, M.D. a senior staff physician in Henry Ford's Department of Dermatology and the study's senior author and principal investigator. "The results achieved in our study were of obvious significance to our patients."

The study are being presented at the 68th annual American Academy of Dermatology meeting in Miami.

While the initial results are preliminary and the procedure is still investigational, Dr. Hamzavi says Henry Ford hopes to offer the surgery as part of its treatment portfolio this fall. He says for some patients the surgery is more effective than standard treatments like light therapy and topical medications.

"Patients of color and those with vitiligo on one side of the body and in one area of the body may benefit most from this procedure," Dr. Hamzavi says.

Vitiligo is a skin disease that causes the skin to lose color and develop white patches that vary in size and location. It affects about 1 in every 200 people in the United States, and is more noticeable in people with darker skin.

Vitiligo develops when cells called melanocytes are killed by the body's immune system, causing the area of skin to turn white because the cells no longer make pigment. While there is no cure, vitiligo can be treated and managed with light therapy, creams and topical medications.

The surgery is known as melanocyte-keratinocyte transplantation or MKTP, and is performed in Europe, Asia and Middle East. It was performed at Henry Ford using the same technique developed by MKTP pioneer Sanjeev Mulekar, M.D., of the National Vitiligo Center in Saudi Arabia. Henry Ford is the first to perform MKTP in North America.

In Henry Ford's study, 32 patients (18 male, 14 female) underwent surgery and ranged in age from 18 to 60. A total of 40 MKTP procedures were performed and researchers analyzed the outcomes of 29 of them. A procedure lasted 30 minutes to two hours and patients returned home the same day.

Of the 32 surgery patients, 23 were followed for up to six months after surgery. Eighteen patients received one treatment, four patients received two and one patient received three. The ethnicity of patients was Caucasian, South Asian, African American and Hispanic.

During MKTP, melanocyte cells, which produce pigment in the skin, hair and eyes, are harvested from an area of healthy skin and separated to make a skin cell mixture. This mixture then is applied to the treatment area and covered with a specially developed adhesive biologic dressing.

Treated areas included the hands, arms, legs, feet, face and stomach. The average size of the treated area during each procedure covered an area of 46 cm2, or roughly the size of a credit card.

The study was a collaboration with the National Center for Vitiligo, Riyadh, Saudi Arabia, and funded by the Shahani Foundation based in Michigan.

Story Source:

Adapted from materials provided by Henry Ford Health System.
http://www.sciencedaily.com/releases/2010/03/100309142749.htm

Cancer Mortality Has Declined Since Initiation of 'War on Cancer'

A new study finds a downturn in cancer death rates since 1990 results mostly from reductions in tobacco use, increased screening allowing early detection of several cancers, and modest to large improvements in treatment for specific cancers. (Credit: iStockphoto/Stuart Burford)

ScienceDaily (Mar. 9, 2010) — A new American Cancer Society study finds progress in reducing cancer death rates is evident whether measured against baseline rates in 1970 or in 1990. The study appears in the open access journal *PLos ONE,* and finds a downturn in cancer death rates since 1990 results mostly from reductions in tobacco use, increased screening allowing early detection of several cancers, and modest to large improvements in treatment for specific cancers.

Temporal trends in death rates are the most reliable measure of progress against cancer, reflecting improvements in prevention, early detection, and treatment. Although age-standardized cancer death rates in the U.S. have been decreasing since the early 1990s, some reports have cited limited improvement in death rates as evidence that the "war on cancer," which was initiated in 1971, has failed. Many of these analyses fail to account for the dominant and dramatic increase in cancer death rates due to tobacco-related cancers in the latter part of the 20th century.

To investigate further, researchers led by American Cancer Society epidemiologist Ahmedin Jemal, Ph.D., used nationwide cancer mortality data for the years 1970 through 2006 from the SEER*Stat database, which defines major cancer sites consistently over time in order to facilitate reporting of long term mortality trends. They found for all cancers combined, death rates (per 100,000) in men increased from 249.3 in 1970 to 279.8 in 1990, and then decreased to 221.1 in 2006, yielding a relative decline of 21% from 1990 (peak year) and a drop of 11% since 1970 (baseline year). Similarly, the death rate from all-cancers combined in women increased from 163.0 in 1970 to 175.3 in 1991, and then decreased to 153.7 in 2006, a relative decline of 12% and 6% from the 1991 (peak year) and 1970 rates, respectively.

The researchers also calculated years of potential life lost (YPLL) due to cancer before age 75 for 2006 as additional measure for the impact of declining cancer death rates on population health. They compared this to the YPLL that would have been expected had the 1970 age-specific cancer death rates continued to apply in 2006. For persons under age 75, the decrease in cancer death rates during the 36 years time interval (1970-2006) resulted in about 2.0 million years of potential life gained.

"Contrary to the pessimistic news from the popular media, overall cancer death rates have decreased substantially in both men and women whether measured against baseline rates in 1970/71 when the National Cancer Act was signed by President Nixon or when measured against the peak rates in 1990/91.," write the authors. Despite those gains, the authors caution against complacency. "Continued and increased investment in cancer prevention and control, access to high quality health care, and research could accelerate this progress," they conclude.

Story Source:

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

Journal Reference:

1. Jemal A, Ward E, Thun M. **Declining Death Rates Reflect Progress against Cancer**. *PLoS ONE*, 2010; 5 (3): e9584 DOI: 10.1371/journal.pone.0009584

http://www.sciencedaily.com/releases/2010/03/100309151505.htm

Earthquake in Chile: A Complicated Fracture

Installation of a Creepmeter of the Plate-Boundary Observatory Chile, which meassures a hundredth milimeter of tektonic motions along a fault zone. (Credit: Copyright GFZ)

ScienceDaily (Mar. 9, 2010) — The extremely strong earthquake that struck Chile Feb. 27 was a complicated rupture process, as scientists of the GFZ German Research Centre for Geosciences found out. Quakes with such magnitude virtually penetrate the entire Earth's crust.

After closer analysis of the seismic waves radiated by this earthquake during the first 134 seconds after start of the rupture, the researchers came to the conclusion that only the region around the actual epicentre was active during the first minutes. In the second minute the active zone moved north towards Santiago. After that the region south of Concepción became active for a short time. This rupturing trend agrees well with the distribution of the aftershocks during the following three days, as observed by the GEOFON-measuring network of the GFZ up to 03.03.2010.

In the year 1960, the strongest earthquake measured at all to date, with a magnitude of M=9.5, had its origin at Valdivia, south of the region affected now. "The quake of 27 February connects directly to the rupture process of Valdivia," explains Professor Jochen Zschau, Director of the Earthquake Risk and Early Warning Section at the GFZ. "With this, one of the last two seismic gaps along the west coast of South America might now be closed. With the exception of one last section, found in North Chile, the entire earth crust before the west coast of South America has been ruptured within the last 150 years."

The underlying plate tectonic procedure is such that the Nazca-Plate as part of the Pacific Ocean Floor moves eastwards with approximately seventy millimetres per year, collides with South America and thereby pushes under the continent. The hereby developing earthquakes belong to the strongest world-wide. In the course of about one century, the Earth's ruptures completely in a number of strong quakes

from Patagonia in the South to Panama in the North. Even Darwin reported, in his diary, of the strong earthquake in Concepción on 20 February 1835 and the resulting Tsunami.

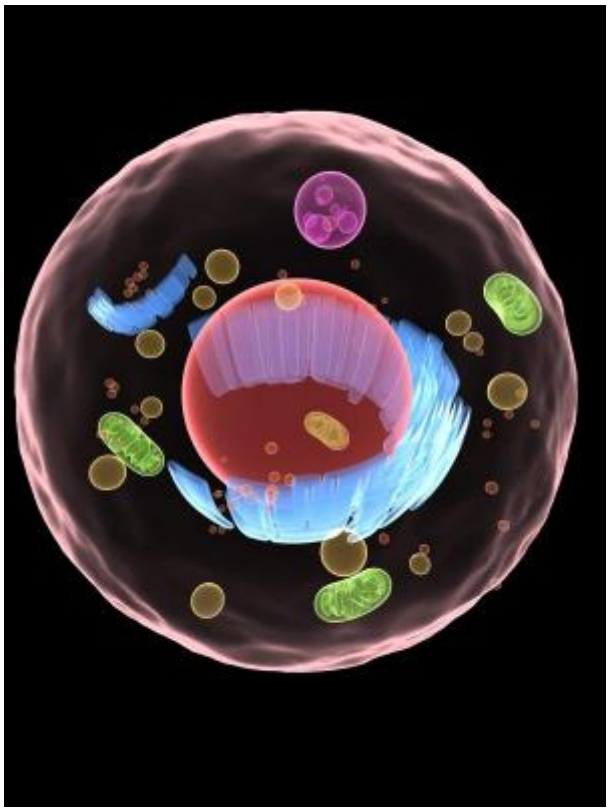
In order to examine the aftershock activity in the now fractured seismic gap, scientists from the GFZ are travelling to Chile on March 13, 2010 where, together with the Chilean Seismological Service, they will set-up a seismological-geodetic network in the area of Concepción-Santiago. Partners from Germany (IFM Geomar, Kiel; Free University of Berlin) and from abroad (Institut de Physique du Globe, Paris; University of Liverpool; United States Geological Survey; IRIS) are also taking part in this measuring campaign. The mission will last about three months. The results, one expects, will be able to provide an insight into the mechanisms of the fracture in the Earth's crust. This activity is financed on the German side by the GFZ.

Scientists from the GFZ have been examining the collision of the Nazca plate and the South American continent since 1994. As a result of numerous expeditions and measuring campaigns in this area this Potsdam Helmholtz Centre avails of the probably the most dense data record on such a subduction zone. "Within the framework of the DFG Priority Programme "Deformation processes in the Andes", and with the Geotechnology Project TIPTEQ we have just been able to collect a unique data record for the southern part of the Andes" says Professor Onno Oncken, Director of the Department Geodynamics and Geomaterials at the GFZ, and leader of these studies. "The current quake puts us in the position to precisely compare the tectonics before and afterwards, a unique situation both internationally and in Earth science."

Story Source:

Adapted from materials provided by Helmholtz Centre Potsdam - GFZ German Research Centre for Geosciences.
http://www.sciencedaily.com/releases/2010/03/100309083656.htm

How ATP, Molecule Bearing 'the Fuel of Life,' Is Broken Down in Cells



Artist's rendering of basic cell structure. (Credit: iStockphoto/Sebastian Kaulitzki)

ScienceDaily (Mar. 9, 2010) — Researchers at the Louisiana State University Health Sciences Center have figured out how ATP is broken down in cells, providing for the first time a clear picture of the key reaction that allows cells in all living things to function and flourish.

Discovered some 80 years ago, adenosine triphosphate is said to be second in biological importance only to DNA. Each cell in the human body contains about a billion ATP molecules, and the power derived from the breakdown of them is used to deliver substances to their cellular homes, build needed complex molecules and even make muscles contract.

"ATP is the fuel of life. It's an energy currency molecule -- the most important source of chemical and mechanical energy in living systems," explains Sunyoung Kim, the associate professor who oversaw the research published Feb. 19 in the *Journal of Biological Chemistry*.

Scientists for decades have worked to understand the critically important reaction but, until now, did not know how proteins in a cell extract and use the energy from ATP.

In its original form, an ATP molecule has three phosphate groups. While it has been known for some time that, for ATP breakdown to occur, the third phosphate group must be attacked by a hydroxide, or a water molecule that has lost one of its protons, it was unknown what actually stripped away that proton, allowing the release of ATP's stores.

The team chose to investigate one particular family of protein machines that break down ATP -- the kinesins.

Kinesins are tiny biological machines that work a lot like car engines, Kim says, travelling up and down cellular roadways in support of several functions, such as cellular division and cargo transport.

"We picked kinesins because they're the simplest known motor proteins. Usually, proteins that break down ATP are very large and have a lot of moving parts for mechanical work." Kim says. "The simpler and the smaller the system is, the more likely you can capture information about it in detail."

The team narrowed its study further to the human kinesin Eg5, which is essential for cell division -- normal and abnormal -- and is touted as an attractive target for next-generation cancer drugs. Inhibition of Eg5 kinesin, by disrupting its ability to break down ATP, may be able to block cancer progression, and a number of Eg5 inhibitors are in clinical trials.

To get a clear picture of how the kinesin and ATP interact, the team set out to use X-ray crystallography to develop a three-dimensional structure that would detail all the bonds and atomic contacts, explains assistant professor David Worthylake, one of the co-authors.

The challenge, though, was trapping the protein in the middle of the energy-releasing chain of events by coaxing it to hold onto a chemical mimic of ATP, in which the final phosphate cannot be removed as usual, and examining the "jammed" protein up close.

According to Courtney Parke, a graduate student and the first author of the team's paper, successfully trapping an ATP mimic is quite difficult. Before her team achieved it, only three other attempts had been successful. Still, all those successes were a bit unsatisfying, she says, because they didn't show how that first step in ATP breakdown occurred.

Further complicating matters, purified kinesin proteins typically are found bound to product of ATP breakdown, adenosine diphosphate, or ADP.

"We said, `You know what? We don't think that you can just insert the mimic of ATP into this purified protein with ADP already bound to it. We think ADP has to be taken out first. That's what the protein does naturally,'" Kim says. "So, instead of forcing the protein out of its normal sequence of steps in breaking down ATP, we pulled out the ADP first and then asked the Eg5 kinesin to bind the ATP mimic. And, lo and behold, we got the answer."

The surprising result was that the protein uses a string of water molecules to harness the energy of the reaction.

"Conventional wisdom pointed toward the reactive agent that starts the ATP breakdown process as being something in the protein, such as an amino acid," notes Edward Wojcik, an assistant professor and another co-author on the paper.

But, it wasn't an amino acid at all: It was a second water molecule that pulled the proton off the first water molecule.

"Each of these water molecules is attached to different part of the protein. And, normally, they hold tightly to each other as well, keeping two very distant parts of the protein connected by a molecular bridge," Kim explains. "Our data show, when the second water molecule takes the proton from the first one, the proton is transferred across this bridge. This causes the two different parts of the protein that the bridge holds together to unfurl, and you have motion in the protein."

That internal motion propels the nanomachine along its assigned roadway, allowing it to do its assigned duties.

"For such a relatively simple molecule, water still has some tricks to teach us, and I am still amazed that we found it to play such a pivotal role in the motor protein machinery," Wojcik says.

The team hopes that, with a clearer understanding of how these biological machines work, scientists will better understand how and why things are moved around inside cells, allowing them to figure out how to turn things on and off at will with novel drugs to help combat diseases.

"We believe many, if not all, proteins that use the energy from ATP breakdown may work the same way," Kim says.

The project was supported by funding from the Louisiana Board of Regents and from the National Institutes of Health. By being named a "Paper of the Week" by the *Journal of Biological Chemistry*, the team's article has been categorized in the top 1 percent of papers reviewed by the editorial board in terms of significance and overall importance.

It also has been named a "Must Read" by the Faculty of 1000 Biology, an online research service that reviews the most interesting papers published in the biological sciences, based on the recommendations of leading researchers.

Story Source:

Adapted from materials provided by American Society for Biochemistry and Molecular Biology, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Courtney L. Parke, Edward J. Wojcik, Sunyoung Kim, and David K. Worthylake. **ATP Hydrolysis in Eg5 Kinesin Involves a Catalytic Two-water Mechanism**. *Journal of Biological Chemistry*, 2010; 285: 5859-5867 DOI: 10.1074/jbc.M109.071233

http://www.sciencedaily.com/releases/2010/03/100301091428.htm

Preventing or Reversing Inflammation After Heart Attack, Stroke May Require Two-Pronged Approach

ScienceDaily (Mar. 9, 2010) — Researchers at Albany Medical College are releasing results of a study this week that they say will help refocus the search for new drug targets aimed at preventing or reversing the devastating tissue inflammation that results after heart attack and stroke.In the March 5 issue of the *Journal of Biological Chemistry*, lead author Alejandro P. Adam and his colleagues at the college's Center for Cardiovascular Science are reporting that vascular cells' ability to properly regulate fluid movement is not necessarily affected solely by the activity of an enzyme that for years has been in the crosshairs of scientists and pharmaceutical developers.

"Learning the mechanisms of inflammation is a key step in the development of new and better therapies to improve the outcome of widespread pathologies, such as stroke, heart attack, septic shock and pulmonary edema," said Adam, a postdoctoral fellow at the cardiovascular center. "To determine which are the best targets for treatment, we need to understand exactly what role each molecule is playing in the regulation of the vessel walls, and we found that the enzyme Src may be needed to get changes in barrier function but by itself is not sufficient."Blood vessels, which form a tight barrier between blood and the surrounding tissues, are composed of endothelial cells that act as gatekeepers, controlling how, when and where molecules of water, solutes and blood cells pass through them into the body's tissues.

Previous studies have shown blocking the enzyme Src altered the structure of a protein known to hold the endothelial cells together, thus, keeping their barriers tight and limiting tissue damage caused by fluid accumulation, or edema."We found that Src indeed adds several phosphates to this protein, but this addition of the phosphates did not alter barrier function of the endothelial cells," explained professor Peter A. Vincent, who oversaw the team's research. "These findings suggest other pathways are needed for Src to change permeability and open the door to future studies to determine what these other signals are."There are many "adhesion molecules" involved in holding endothelial cells together and many signaling molecules that tell the adhesion molecules when to hold onto or release each other. Vincent's team is moving forward with what he calls a "two-hit model" -- the idea that endothelial cells require two different signals to open up cell-cell connections and allow the passage of fluids."Many factors lead to a complex array of signals inside the endothelial cells to promote this loss of barrier function," Adam said. "A two-hit model would explain much better than a single-hit model the regulation of the vascular permeability. On the pharmacological side, it would allow us to propose other drug targets to prevent or reverse inflammation and edema."

By being named a "Paper of the Week" by the *Journal of Biological Chemistry*, the article by Adam and Vincent, graduate student Amy L. Sharenko and associate professor Kevin Pumiglia has been categorized in the top 1 percent of papers reviewed by the journal's editorial board in terms of significance and overall importance.

Story Source:

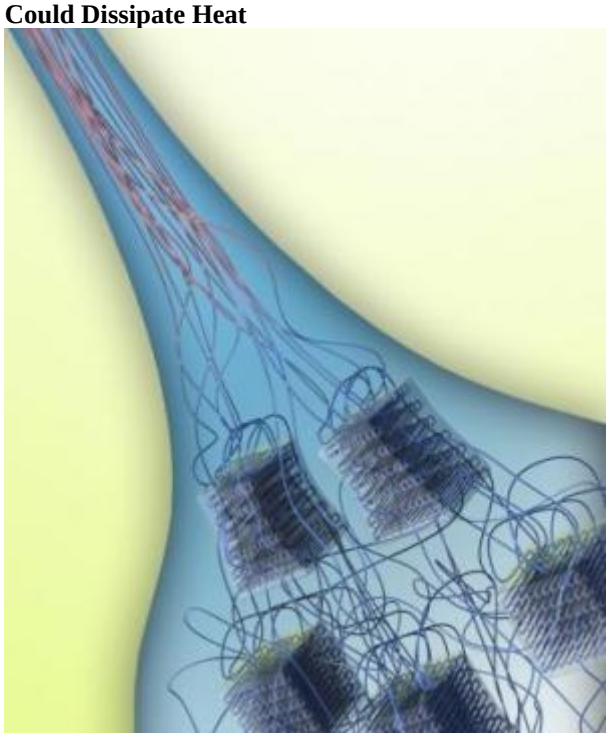
Adapted from materials provided by American Society for Biochemistry and Molecular Biology, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Alejandro P. Adam, Amy L. Sharenko, Kevin Pumiglia, and Peter A. Vincent. **Src-induced Tyrosine Phosphorylation of VE-cadherin Is Not Sufficient to Decrease Barrier Function of Endothelial Monolayers**. *Journal of Biological Chemistry*, 2010; 285: 7045-7055 DOI: 10.1074/jbc.M109.079277

http://www.sciencedaily.com/releases/2010/03/100301091425.htm

Insulators Made Into Conductors: Polymers Coaxed to Line Up, Transformed Into Materials That Could Dissipate Heat



The new method involves pulling a thin thread of material (top) from a liquid solution (bottom), and in the process the individual polymer filaments, which start out as a tangled mass, become very highly aligned. (Credit: Illustration courtesy of Gang Chen)

ScienceDaily (Mar. 9, 2010) — Most polymers -- materials made of long, chain-like molecules -- are very good insulators for both heat and electricity. But an MIT team has found a way to transform the most widely used polymer, polyethylene, into a material that conducts heat just as well as most metals, yet remains an electrical insulator.

The new process causes the polymer to conduct heat very efficiently in just one direction, unlike metals, which conduct equally well in all directions. This may make the new material especially useful for applications where it is important to draw heat away from an object, such as a computer processor chip. The work is described in a paper published on March 7 in *Nature Materials*.

The key to the transformation was getting all the polymer molecules to line up the same way, rather than forming a chaotic tangled mass, as they normally do. The team did that by slowly drawing a polyethylene fiber out of a solution, using the finely controllable cantilever of an atomic force microscope, which they also used to measure the properties of the resulting fiber.

This fiber was about 300 times more thermally conductive than normal polyethylene along the direction of the individual fibers, says the team's leader, Gang Chen, the Carl Richard Soderberg Professor of Power Engineering and director of MIT's Pappalardo Micro and Nano Engineering Laboratories.

The high thermal conductivity could make such fibers useful for dissipating heat in many applications where metals are now used, such as solar hot water collectors, heat exchangers and electronics.

Chen explains that most attempts to create polymers with improved thermal conductivity have focused on adding in other materials, such as carbon nanotubes, but these have achieved only modest increases in conductivity because the interfaces between the two kinds of material tend to add thermal resistance. "The interfaces actually scatter heat, so you don't get much improvement," Chen says. But using this new

method, the conductivity was enhanced so much that it was actually better than that of about half of all pure metals, including iron and platinum.

Producing the new fibers, in which the polymer molecules are all aligned instead of jumbled, required a two-stage process, explains graduate student Sheng Shen, the lead author of the paper. The polymer is initially heated and drawn out, then heated again to stretch it further. "Once it solidifies at room temperature, you can't do any large deformation," Shen says, "so we heat it up twice."

Even greater gains are likely to be possible as the technique is improved, says Chen, noting that the results achieved so far already represent the highest thermal conductivity ever seen in any polymer material. Already, the degree of conductivity they produce, if such fibers could be made in quantity, could provide a cheaper alternative to metals used for heat transfer in many applications, especially ones where the directional characteristics would come in handy, such as heat-exchanger fins (like the coils on the back of a refrigerator or in an air conditioner), cell-phone casings or the plastic packaging for computer chips. Other applications might be devised that take advantage of the material's unusual combination of thermal conductivity with light weight, chemical stability and electrical insulation.

So far, the team has just produced individual fibers in a laboratory setting, Chen says, but "we're hoping that down the road, we can scale up to a macro scale," producing whole sheets of material with the same properties.

Ravi Prasher, an engineer at Intel, says that "the quality of the work from Prof. Chen's group has always been phenomenal," and adds that "this is a very significant finding" that could have many applications in electronics. The remaining question, he says, is "how scalable is the manufacturing of these fibers? How easy is it to integrate these fibers in real-world applications?"

Story Source:

Adapted from materials provided by Massachusetts Institute of Technology. Original article written by David Chandler, MIT News Office.

Journal Reference:

1. Shen S, Henry A, Tong J, Zheng R, Gang Chen G. **Polyethylene nanofibres with very high thermal conductivities**. *Nature Materials*, 7 March 2010 DOI: 10.1038/nmat1502

http://www.sciencedaily.com/releases/2010/03/100307215542.htm

Natural Antioxidants Give Top Barn Swallows a Leg on Competitors

A new University of Colorado at Boulder study led by Assistant Professor Rebecca Safran, shown here, indicates barn swallows that maintain a positive level of antioxidants outperform their peers in reproduction. (Credit: Kevin Stearns)

ScienceDaily (Mar. 9, 2010) — A new University of Colorado at Boulder study indicates North American barn swallows outperform their peers in reproduction -- the "currency" of evolutionary change -- by maintaining a positive balance of antioxidants commonly sold in health food stores.

The study is the first to track concentrations of carotenoids, which are naturally occurring plant pigments, in a wild bird or animal species over the course of the grueling breeding season. Carotenoids can offer the benefits associated with over-the-counter nutritional supplements that protect cells from free radical damage, said CU-Boulder Assistant Professor Rebecca Safran.

Since American barn swallows migrate thousands of miles to their breeding grounds annually and immediately commence courtship, nesting and reproductive activities, many lose significant amounts of weight and become physiologically compromised during the intense spring activities, said Safran, lead study author. But the new study indicates some individuals can bear such costs better than others, she said.

While other studies have looked at carotenoid levels in captive birds at a single point in time, the new study is the first to monitor carotenoids within wild individuals as they feed, mate, nest, and rear young, said Safran of CU-Boulder's ecology and evolutionary biology department. "Our results indicate the concentrations of these molecules are highly variable within individuals over time," she said. "The

season-long balance, rather than a sample at a single point in time, indicates which birds are the top performers as parents and mates."

A paper on the subject appears in the Feb. 25 issue of *PLoS ONE*, a journal of the Public Library of Science. Co-authors on the study included Arizona State University Associate Professor Kevin McGraw, CU-Boulder doctoral students Matthew Wilkins and Joanna Hubbard and project volunteer Julie Marling.

"By monitoring wild populations of barn swallows during the breeding season, we determined how individual birds managed their own health while enduring the costs of parental care," said Safran. "Individuals who maintain a positive balance in their nutritional status through the breeding and nesting season are those with the greatest reproductive performance and tend to be darker in color and larger in body mass."

Safran and her team, which included dozens of CU-Boulder students and volunteers from the community, trapped scores of barn swallows with mist nets in rural sites around Boulder County, measuring and weighing them and taking blood and feather samples before releasing them back into the wild. Each bird was sampled between two and four times over the breeding season. The blood analysis tests took place in McGraw's Arizona State University lab.

The three carotenoids measured in the study -- leutin, zeaxanthin and beta cryptozanthin -- all are antioxidants that are sold in health food stores around the world. The swallows obtain carotenoids from insects that feed on plants rich in the nutrients.

Since the barn swallow reproductive season lasts about four months, it makes sense that individuals should be able to signal their abilities as parents and mates over time, rather than at the beginning of the season when pair formation takes place, she said. "The swallows that maintained high levels of carotenoids throughout the summer got more reproductive attempts and produced more offspring," Safran said.

Many of the high-quality barn swallow pairs, which weighed more than their peers during the breeding season, produced two clutches of eggs rather than one, producing a greater number of young that fledged, she said.

"Nutritional status is a 24-hour game, because many nutrients don't carry over beyond the next day," she said. The "top" barn swallows appear to be very efficient at foraging and dealing with the costs of reproductive success on a day-by-day basis, which includes guarding the nest and feeding the young, both of which are physiologically taxing activities, Safran said.

"Our findings in this study contradict the prevailing scientific views regarding the immense physiological costs of reproduction in birds," Safran said. "While evolutionary theory says individuals that pay the greatest cost in parental care do so at the expense of self-preservation, we found some individuals are good at doing it all -- maintaining their own nutritional status while bearing the costs of reproduction."

The researchers also found that barn swallows carrying more carotenoids had deeper red breasts -- a sign of healthy, robust individuals -- and that those individuals darker in color had greater circulating levels of carotenoids at the start of the breeding season. Previous studies by Safran and her colleagues suggest females are more attracted to males with deep red breasts and that they "cheat" less on their male partners than other females. The breast coloring appears to be an indication of status, performance, testosterone and nutrition, she said.

The study was funded in part by the National Science Foundation, the Howard Hughes Medical Institute and CU-Boulder's Undergraduate Research Opportunities Program and the Biosciences Undergraduate Research Skills and Training. Both CU-Boulder programs offer undergraduates hourly wages or stipends to work with faculty members on innovative research projects.

"One of the most exciting things that I do in my job is train students both in the field and in the lab," said Safran. "Because this work requires many hands, it would be impossible to do these kinds of studies without them."

A 2008 study by Safran and her colleagues showed the testosterone of male North American barn swallows skyrocketed early in the breeding season when their breast colors were artificially enhanced to the deep red most attractive to females. The birds likely had more testosterone racing through their bodies because of amorous interactions with the opposite sex and more run-ins with competing males.

Story Source:

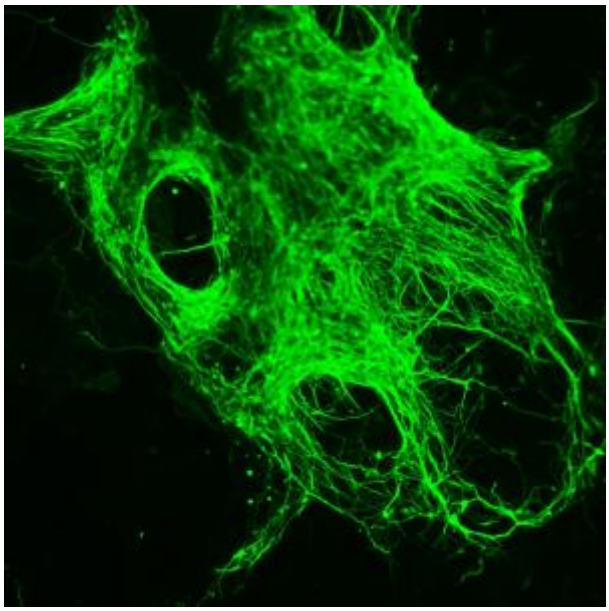
Adapted from materials provided by University of Colorado at Boulder.

Journal Reference:

1. Rebecca J. Safran, Kevin J. McGraw, Matthew R. Wilkins, Joanna K. Hubbard, Julie Marling. **Positive Carotenoid Balance Correlates with Greater Reproductive Performance in a Wild Bird**. *PLoS ONE*, 2010; 5 (2): e9420 DOI: 10.1371/journal.pone.0009420

http://www.sciencedaily.com/releases/2010/02/100224205832.htm

Stem Cells of Humans and Mice Differ More Strongly Than Suspected



Neural differentiation of mouse epiblast stem cells by inactivating the FGF signalling pathway. Molecular mechanisms to differentiate human and mouse stem cells may be similar but may also vary substantially on occasion. (Credit: Boris Greber)

ScienceDaily (Mar. 9, 2010) — They are considered to be the most important model organism for research into human biology: mice may look totally different, but they are in many ways similar to Homo sapiens on a fundamental level. For instance, an impressive 99 per cent of the mouse genes are matched by a corresponding sequence in the human genome. That is also why the law in this part of the world only permits scientists to conduct research on human embryo stem cells when they have "clarified in advance" their specific questions by using animal cells as far as possible.

However, such tests are often pointless -- and sometimes even misleading, as a recent study by scientists working with Hans Schöler at the Max Planck Institute for Molecular Biomedicine in Münster demonstrates.

For years scientists have puzzled over to what extent the findings of studies on the embryonic stem cells (ES cells) of mice are transferable to humans. It is certainly true that human and mouse ES cells are both pluripotent. That means they are capable of forming any of the body's cell types, numbering more than 200 in all. And both types of cells have an active Oct4 transcription factor, for example. This is the gene that is essential for maintaining pluripotency, and is what makes egg cells, as well as embryonic stem cells and early embryos, potentially immortal.

In other aspects, though, as scientists have known for some time now, human and mouse ES cells differ enormously. Certain signalling substances that can be used to turn mouse cells into liver, nerve or muscle cells, for instance, produce either no effect or totally different effects in human ES cells.

The reasons for this are still uncertain. However, in 2007 two research teams succeeded in isolating a promising new type of pluripotent cells from mice embryos (see Brons et al., Nature 448, 2007). Known as epiblast stem cells (EpiSC), these cells are also pluripotent. However, they stem from a later stage of embryonic development: unlike 'traditional' ES cells, which are harvested from a few-days-old embryo in the blastocyst stage, these are harvested from an embryo that has just lodged itself in the uterus and which is referred to as an epiblast.

The astonishing thing about it is that although epiblast stem cells are actually a step ahead in their development, they appear to be more similar to human ES cells than 'classic' mouse ES cells are. For example, both epiblast stem cells and human ES cells can, with the addition of a certain hormone, the FGF2 growth factor, be grown and held in a state in which they can turn into any tissue at all. "Epiblast stem cells from mice are therefore more-or-less equated with human ES cells in the general scientific discussion," says Boris Greber, the lead author of the study.

Differing effects of signal molecules

But Greber, a biochemist, wanted to know more. In their latest study, he and his fellow scientists therefore looked at how mouse epiblast and human embryonic stem cells react to different growth factors and inhibitors -- and they found that the two types of cells do, in fact, differ on a crucial point. Whereas the FGF growth factor actively supports the self-renewal of human ES cells, this is not the case with mouse epiblast cells.

"Ultimately, what this means is that many preliminary tests on animal cells -- particularly in medically relevant projects -- may not only be useless, but the findings from this kind of early testing may even be misleading," explains Hans Schöler, who goes on to say that human ES cells will therefore continue to be absolutely essential for stem cell research in the future. "The recent successes in reprogramming mature human somatic cells sometimes make it look as though tests using human ES cells are nowadays redundant. But appearances are deceptive." Neither the technologies for reprogramming nor those for purposefully differentiating cells are as yet fully-developed.

Human stem cells remain indispensable

Only a fraction of the cells that the scientists treat with their formulas go on to display the right attributes. And only through elaborate, time-consuming tests can the successfully transformed cells be picked out from among the large numbers of cells that failed to be completely reprogrammed. "Our latest study demonstrates that animal model systems are inadequate for a great many tests of this kind," says Schöler. "Particularly when we're talking about developing safe and effective stem cell therapies, we will still need human ES cells as the gold standard against which to compare everything else. In such cases, lengthy preliminary testing on animal cells risks wasting valuable time and resources."

Story Source:

Adapted from materials provided by Max-Planck-Gesellschaft.

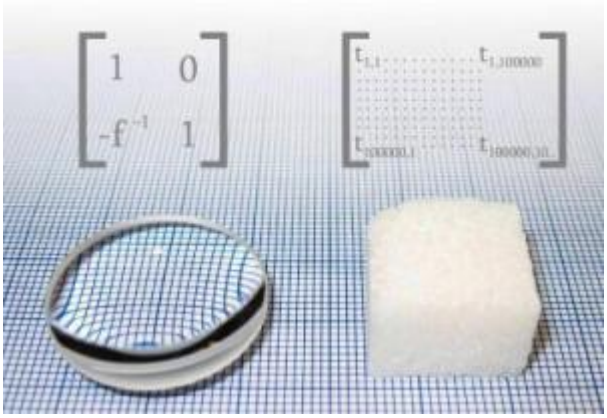
Journal Reference:

1. Greber et al. **Conserved and Divergent Roles of FGF Signaling in Mouse Epiblast Stem Cells and Human Embryonic Stem Cells**. *Cell Stem Cell*, 2010; 6 (3): 215 DOI: 10.1016/j.stem.2010.01.003

http://www.sciencedaily.com/releases/2010/03/100308095445.htm

Physicists Find Way to See Through Paint, Paper, and Other Opaque Materials

Knowing enough about the way light is scattered through materials would allow physicists to see through opaque substances, such as the sugar cube on the right. In addition, physicists could use information characterizing an opaque material to put it to work as a high quality optical component, comparable to the glass lens show on the left. (Credit: American Physical Society)



ScienceDaily (Mar. 9, 2010) — Materials such as paper, paint, and biological tissue are opaque because the light that passes through them is scattered in complicated and seemingly random ways. A new experiment conducted by researchers at the City of Paris Industrial Physics and Chemistry Higher Educational Institution (ESPCI) has shown that it's possible to focus light through opaque materials and detect objects hidden behind them, provided you know enough about the material.

The experiment is reported in the current issue of *Physical Review Letters*, and is the subject of Viewpoint in *APS Physics* by Elbert van Putten and Allard Mosk of the University of Twente.

In order to demonstrate their approach to characterize opaque substances, the researchers first passed light through a layer of zinc oxide, which is a common component of white paints. By studying the way the light beam changed as it encountered the material, they were able to produce a numerical model called a transmission matrix, which included over 65,000 numbers describing the way that the zinc oxide layer affected light. They could then use the matrix to tailor a beam of light specifically to pass through the layer and focus on the other side. Alternatively, they could measure light emerging from the opaque material, and use the matrix to assemble of an image of an object behind it.

In effect, the experiment shows that an opaque material could serve as a high quality optical element comparable to a conventional lens, once a sufficiently detailed transmission matrix is constructed. In addition to allowing us to peer through paper or paint, and into cells, the technique opens up the possibility that opaque materials might be good optical elements in nano-scale devices, at levels where the construction of transparent lenses and other components is particularly challenging.

Story Source:

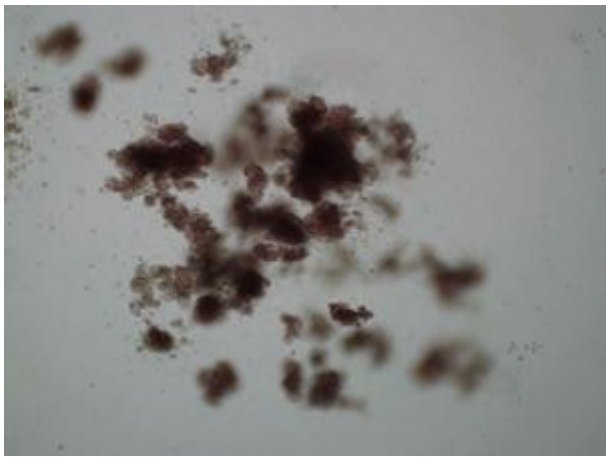
Adapted from materials provided by American Physical Society, via EurekAlert!, a service of AAAS.

Journal References:

1. S. M. Popoff, G. Lerosey, R. Carminati, M. Fink, A. C. Boccara, and S. Gigan. **Measuring the Transmission Matrix in Optics: An Approach to the Study and Control of Light Propagation in Disordered Media**. *Physical Review Letters*, 2010; DOI: 10.1103/PhysRevLett.104.100601
2. Elbert G. van Putten and Allard P. Mosk. **The information age in optics: Measuring the transmission matrix**. *Physics*, 2010; 3 (22) DOI: 10.1103/Physics.3.22

http://www.sciencedaily.com/releases/2010/03/100308132052.htm

Bone Marrow Can Harbor HIV-Infected Cells



Antiviral drugs have reduced AIDS to more of chronic disease rather than a death sentence, but why is the disease so hard to cure? New research shows that bone marrow, previously thought to be resistant to the virus, can contain latent forms of the infection. (Credit: Image courtesy of University of Michigan Health System)

ScienceDaily (Mar. 9, 2010) — University of Michigan scientists have identified a new reservoir for hidden HIV-infected cells that can serve as a factory for new infections. The findings, which appear online March 7 in *Nature Medicine*, indicate a new target for curing the disease so those infected with the virus may someday no longer rely on AIDS drugs for a lifetime.

"Antiviral drugs have been effective at keeping the virus at bay. However once the drug therapy is stopped, the virus comes back," says senior author of the study Kathleen L. Collins, M.D., Ph.D., associate professor of both internal medicine and microbiology and immunology at the U-M Medical School.

In people infected with HIV (human immunodeficiency virus), the virus that causes AIDS, there's an unsolved problem with current anti-viral drugs. Though life-saving, they cannot root the virus out of the body. Infected cells are able to live on, undetected by the immune system, and provide the machinery for the virus to reproduce and spread.

Important new research by U-M has discovered that bone marrow, previously thought to be resistant to the virus, can contain latent forms of the infection. They are not affected by current anti-HIV drug regimens.

"This finding is important because it helps explain why it's hard to cure the disease," Collins says. "Ultimately to cure this disease, we're going to have to develop specific strategies aimed at targeting these latently infected cells."

"Currently people have to take anti-viral drugs for their entire life to control the infection," she says. "It would be easier to treat this disease in countries that don't have the same resources as we do with a course of therapy for a few months, or even years. But based on what we know now people have to stay on drugs for their entire life."

Using tissue samples, U-M researchers detected HIV genomes in bone marrow isolated from people effectively treated with antiviral drugs for more than six months.

While further studies are needed to demonstrate that stem cells can harbor the HIV virus, the study results confirm that HIV targets some long-lived progenitor cells, young cells that have not fully developed but

mature into cells with special immune functions. When active infection occurs the toxic effects of the virus kill the cell even as the newly made viral particles spread the infection to new target cells.

"Our finding that HIV infects these cells has clear ramifications for HIV disease because some of these cells may be long-lived and could carry latent HIV for extended periods of time," she says. "These HIV cell reservoirs can be induced to generate new infections."

The new research gives a broader view of how HIV overwhelms the body's immune system and devastates its ability to regenerate itself.

Globally more than 30 million people are infected with HIV, including millions of children. Improvements have been made since the 1990s in the way the disease is treated that has led to an 85 percent to 90 percent reduction in mortality.

"Drugs now available are effective at treating the virus, making HIV more of a chronic disease than a death sentence," Collins says. "This has made a huge impact in quality of life, however only 40 percent of people worldwide are receiving anti-viral drugs and unfortunately that means that not everybody is benefiting."

Additional authors: Christoph C. Carter, Adewunmi Onafuwa-Nuga, Lucy A. McNamara, James Riddell IV, and Dale Bixby, all of U-M; and Michael R. Savona, University of Texas Health Science Center, San Antonio, Texas, formerly of U-M Heath System.

Funding was provided by the National Institutes of Health. The work of first author Carter was supported by the Wellcome Foundation, U-M Molecular Mechanisms in Microbial Pathogenesis Training Grant and a Rackham Predoctoral Fellowship, and McNamara's work was supported by a National Science Foundation Predoctoral Fellowship and a Bernard Maas Fellowship.

Story Source:

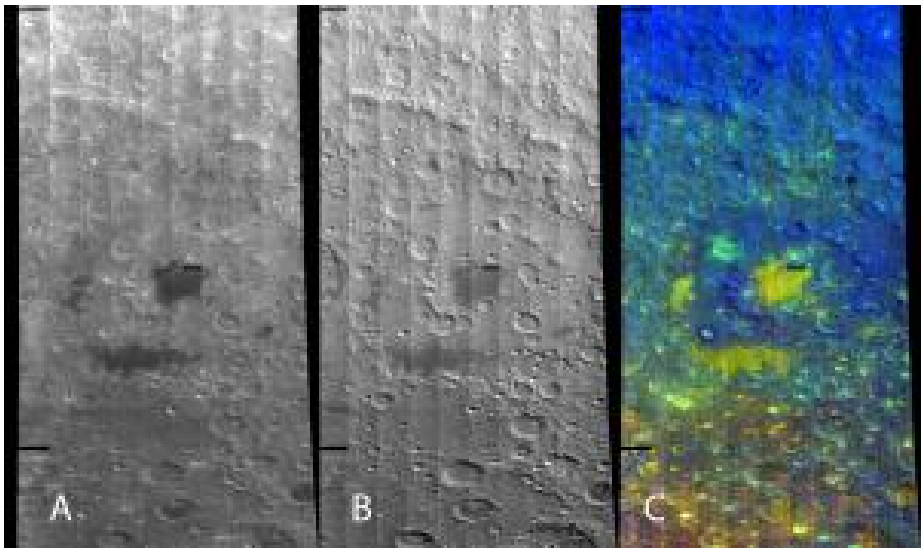
Adapted from materials provided by University of Michigan Health System.

Journal Reference:

1. Carter et al. **HIV-1 infects multipotent progenitor cells causing cell death and establishing latent cellular reservoirs**. *Nature Medicine*, 2010; DOI: 10.1038/nm.2109

http://www.sciencedaily.com/releases/2010/03/100308132045.htm

Biggest, Deepest Crater Exposes Hidden, Ancient Moon



Three views of the Apollo Basin taken with NASA's Moon Mineralogy Mapper instrument on board India's Chandrayaan-1 spacecraft. The false-color image on the right reveals composition; the blues indicate surfaces that don't have as much iron in them (highlands crusts which are low in iron in blue); other colors (teals, yellows, and oranges) indicate more iron-bearing minerals. (Credit: NASA/Indian Space Research Organization)

ScienceDaily (Mar. 9, 2010) — Shortly after the Moon formed, an asteroid smacked into its southern hemisphere and gouged out a truly enormous crater, the South Pole-Aitken basin, almost 1,500 miles across and more than five miles deep.

"This is the biggest, deepest crater on the Moon -- an abyss that could engulf the United States from the East Coast through Texas," said Noah Petro of NASA's Goddard Space Flight Center in Greenbelt, Md. The impact punched into the layers of the lunar crust, scattering that material across the Moon and into space. The tremendous heat of the impact also melted part of the floor of the crater, turning it into a sea of molten rock.

That was just an opening shot. Asteroid bombardment over billions of years has left the lunar surface pockmarked with craters of all sizes, and covered with solidified lava, rubble, and dust. Glimpses of the original surface, or crust, are rare, and views into the deep crust are rarer still.

Fortunately, a crater on the edge of the South Pole-Aitken basin may provide just such a view. Called the Apollo Basin and formed by the later impact of a smaller asteroid, it still measures a respectable 300 miles across.

"It's like going into your basement and digging a deeper hole," said Petro. "We believe the central part of the Apollo Basin may expose a portion of the Moon's lower crust. If correct, this may be one of just a few places on the Moon where we have a view into the deep lunar crust, because it's not covered by volcanic material as many other such deep areas are. Just as geologists can reconstruct Earth's history by analyzing a cross-section of rock layers exposed by a canyon or a road cut, we can begin to understand the early lunar history by studying what's being revealed in Apollo."

Petro presents his result March 4 during the Lunar and Planetary Science meeting in Houston, Texas.

Petro and his team made the discovery with the Moon Mineralogy Mapper (M3), a NASA instrument on board India's Chandrayaan-1 lunar-orbiting spacecraft. Analysis of the light (spectra) in images from this

instrument revealed that portions of the interior of Apollo have a similar composition to the impact melt in the South Pole-Aitken (SPA) basin.

As you go deeper into the Moon, the crust contains minerals have greater amounts of iron. When the Moon first formed, it was largely molten. Minerals containing heavier elements, like iron, sank down toward the core, and minerals with lighter elements, like silicon, potassium, and sodium, floated to the top, forming the original lunar crust.

"The asteroid that created the SPA basin probably carved through the crust and perhaps into the upper mantle. The impact melt that solidified to form the central floor of SPA would have been a mixture of all those layers. We expect to see that it has slightly more iron than the bottom of Apollo, since it went deeper into the crust. This is what we found with M3. However, we also see that this area in Apollo has more iron than the surrounding lunar highlands, indicating Apollo has uncovered a layer of the lunar crust between what is typically seen on the surface and that in the deepest craters like SPA," said Petro.

The lower crust exposed by Apollo survived the impact that created SPA probably because it was on the edge of SPA, several hundred miles from where the impact occurred, according to Petro.

Both SPA and Apollo are estimated to be among the oldest lunar craters, based on the large number of smaller craters superimposed on top of them. As time passes, old craters get covered up with new ones, so a crater count provides a relative age; a crater riddled with additional craters is older than one that appears relatively clean, with few craters overlying it. As craters form, they break up the crust and form a regolith, a layer of broken up rock and dust, like a soil on the Earth.

Although the Apollo basin is ancient and covered with regolith, it still gives a useful view of the lower crust because the smaller meteorite impacts that create most of the regolith don't scatter material very far.

"Calculations of how the regolith forms indicate that at least 50 percent of the regolith is locally derived," said Petro. "So although what we're seeing with M3 has been ground up, it still mostly represents the lower crust."

It's likely Earth wasn't spared the abusive asteroid bombardment experienced by the Moon. Giant craters on other worlds across the solar system, including Mercury and Mars, indicate the rain from the heavens was widespread. However, on Earth, the record of these events was rubbed out long ago. The crust gets recycled by plate tectonics and weathered by wind and rain, erasing ancient impact craters.

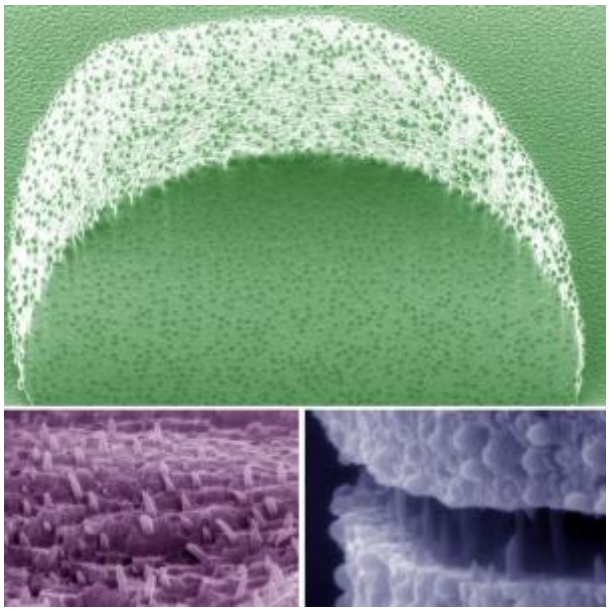
"The Apollo and SPA basins give us a window into the earliest history of the Moon, and the Moon gives us a window into the violent youth of Earth," said Petro.

The research was funded by NASA's Discovery program, which conducts lower-cost, highly focused planetary science investigations designed to enhance our understanding of the solar system. M3 is managed by NASA's Jet Propulsion Laboratory, Pasadena, Calif. Petro's team includes researchers from NASA Goddard, the University of Maryland, College Park, Brown University, Providence, R.I., Analytical Imaging and Geophysics, LLC, Boulder, Colo., the University of Tennessee, Knoxville, the Defense Advanced Research Projects Agency, Arlington, Va., and the Johns Hopkins University Applied Physics Laboratory, Laurel, Md.

Story Source:

Adapted from materials provided by NASA/Goddard Space Flight Center.
http://www.sciencedaily.com/releases/2010/03/100304165918.htm

Synthetic 'Sea Shells' Made from Chalk and Materials Used in Disposable Coffee Cups



Calcite crystals with polymer inclusions (artificially coloured). (Credit: Image courtesy of University of Manchester)

ScienceDaily (Mar. 9, 2010) — Scientists have made synthetic 'sea shells' from a mixture of chalk and polystyrene cups -- and produced a tough new material that could make our homes and offices more durable.

A team of materials scientists and chemists have taken inspiration from sea shells found on the beach to create a composite material from dissimilar 'ingredients'.

Their technique could be used to make ceramics with high resistance to cracking -- which could in turn be used in crack-resistant building materials and bone replacements.

Writing in the journal *Advanced Materials*, scientists from The University of Manchester and The University of Leeds report that they have successfully reinforced calcium carbonate, or chalk, with polystyrene particles that are used to make drinks cups.

They have developed an effective method of combining calcite crystals with polystyrene particles -- and have found this makes the material more ductile compared to its original brittle form.

They report that the polystyrene also acts as a toughening agent, assisting the prevention of the growth of cracks.

Scientists also observed that when the reinforced material cracked, the polymer lengthened within the cracks -- a well-known mechanism for absorbing energy and enhancing toughness.

Researchers say their method allows the properties of the new material to be tweaked by selecting particles of different shapes, sizes and composition.

Dr Stephen Eichhorn from The School of Materials at The University of Manchester, said: "The mechanical properties of shells can rival those of man-made ceramics, which are engineered at high temperatures and pressures. Their construction helps to distribute stress over the structure and control the spread of cracks.

"Calcium carbonate is the main ingredient of chalk, which is very brittle and breaks easily when force is applied. But shells are strong and resistant to fracturing, and this is because the calcium carbonate is combined with proteins which bind the crystals together, like bricks in a wall, to make the material stronger and sometimes tougher.

"We have replicated nature's addition of proteins using polystyrene, to create a strong shell-like structure with similar properties to those seen in nature.

"Further research and testing is still needed but our research potentially offers a straightforward method of engineering new and tough chalk-based composite materials with a wide range of useful applications."

The research was funded by grants from the Engineering and Physical Sciences Research Council (EPSRC) and was conducted in collaboration with Professor Fiona Meldrum in the School of Chemistry at the University of Leeds.

Story Source:

Adapted from materials provided by University of Manchester.

Journal Reference:

1. Kim et al. **Bio-Inspired Synthesis and Mechanical Properties of Calcite-Polymer Particle Composites**. *Advanced Materials*, 2010 DOI: 10.1002/adma.200903743

http://www.sciencedaily.com/releases/2010/03/100308095449.htm

Exposure to Letters A or F Can Affect Test Performance

A new study finds that seeing the letter A before an exam can improve a student's exam result while exposure to the letter F may make a student more likely to fail. (Credit: iStockphoto/Stacey Newman)

ScienceDaily (Mar. 9, 2010) — Seeing the letter A before an exam can improve a student's exam result while exposure to the letter F may make a student more likely to fail.

The finding is published in the *British Journal of Educational Psychology* in March 2010.

The study, carried out by Dr Keith Ciani and Dr Ken Sheldon at the University of Missouri, USA, investigated whether exposing students to the letters A or F before a test affected how they performed. Dr Ciani said: "The letters A and F have significant meaning for students, A represents success and F, failure. We hypothesised that if students are exposed to these letters prior to an academic test it could affect their performance through non-conscious motivation."

A total of 131 students took part in three separate experiments. In the first, 23 undergraduates were asked to complete a number of analogies in a classroom setting. All of the tests were the same, however half of the tests were labelled 'Test Bank ID: A', and the other half 'Test Bank ID: F'. Before starting the test the participants were asked to write their Test Bank ID letter in the top right hand corner of each sheet.

Each participant's analogy tests were scored and compared between the groups. A significant difference between the two groups was found, with the A group performing significantly better than the F group; A scoring on average 11.08 correct out of 12, and F only 9.42 correct on average.

In the second study, the experiment was repeated with 32 students, but as well as Test Bank ID: A' and 'Test Bank ID: F' groups, some of the students were given 'Test Bank ID: J' -- a letter without performance meaning. Again, participants in the A group performed significantly better on the analogy test than participants on the F group, while participants given the letter J performed better than F, but worse than A.

Dr Keith Ciani said: "These findings suggest that exposure to letters A and F, even without any explicit reference to success or failure, significantly affected the students' performance on the tests.

"We believe that the meanings inherent in the evaluative letters were enough to influence their performance through the motivational state that they produced. Exposure to the letter A made the students non-consciously approach the task with the aim to succeed, while exposure to letter F made the students non-consciously want to avoid failure. Research suggests that when people approach tasks with the desire to succeed they perform better than when striving to avoid failure.

"During the debriefing process, participants could recall their letter but were unaware of its role in the study. These findings support our hypothesis that the effect occurred outside of participants' conscious awareness."

The findings were also replicated in a third experiment in which 76 undergraduate students were asked to complete an anagram test in a laboratory setting, after being exposed to either A, F or J 'presented as Subject ID'. Participants in the condition A scored on average 6.02 correct out of 7, but F scored only 3.65 on average.

"We believe the primary implication from this research is that students are vulnerable to evaluative letters presented before a task. Teachers should be careful not to use identification systems that map onto assessment systems. For example, in a course with letter grading, teachers should avoid identifying different test forms using letters from the grading scale. Doing so may inadvertently prime students to do better or worse than their ability and preparation would predict. Conversely, this effect may be desired by savvy teachers. Adorning classrooms with symbols of achievement, such as A+ and other success-oriented words and phrases may activate effort, pride, and the intention to perform well in standardized testing situation. It is important to note that the external validity of our research remains to be demonstrated."

Story Source:

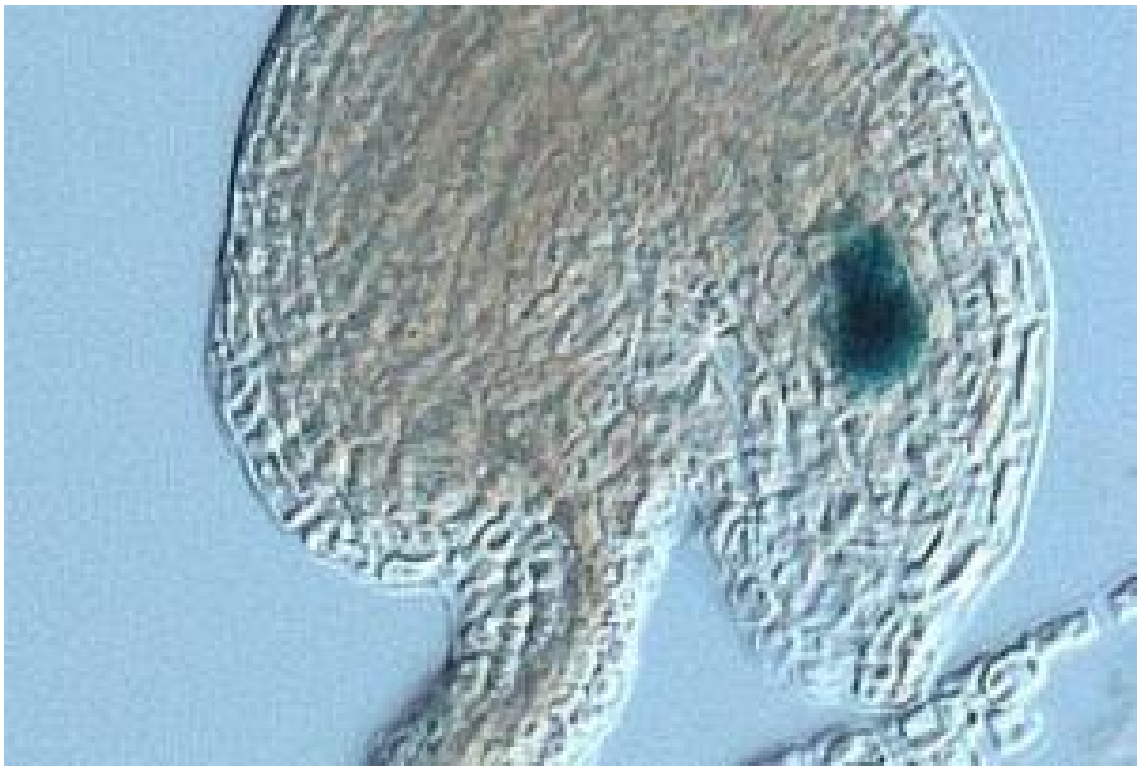
Adapted from materials provided by British Psychological Society (BPS), via AlphaGalileo.

Journal Reference:

1. Ciani, Keith D.; Sheldon, Kennon M. **A versus F: The effects of implicit letter priming on cognitive performance**. *British Journal of Educational Psychology*, 2010; 80 (1): 99 DOI: 10.1348/000709909X466479

http://www.sciencedaily.com/releases/2010/03/100308203306.htm

Asexual Plant Reproduction May Seed New Approach for Agriculture



Arabidopsis thaliana, a small flowering mustard plant, normally reproduces sexually. But Jean Philippe Vielle-Calzada and his colleagues have show that silencing a protein called Argonaute 9 causes the plant to begin reproducing asexually instead. The blue shading shows the area involved in gamete formation that is disrupted when Argonaute 9 is silenced. (Credit: Jean Philippe Vielle-Calzada)

ScienceDaily (Mar. 9, 2010) — Farmers throughout the world spend an estimated $36 billion a year to buy seeds for crops, especially those with sought after traits such as hardiness and pest-resistance. They can't grow these seeds themselves because the very act of sexual reproduction erases many of those carefully selected traits. So year after year, farmers must purchase new supplies of specially-produced seeds.

This problem is sidestepped by some plants -- such as dandelions and poplar trees -- that reproduce asexually by essentially cloning themselves. Jean-Philippe Vielle-Calzada, a Howard Hughes Medical Institute (HHMI) international research scholar, wondered whether he could learn enough about the genetics of asexual reproduction to apply it to plants that produce sexually. In an advance online publication in *Nature* on March 7, 2010, Vielle-Calzada and his colleagues report that they have moved a step closer to turning sexually-reproducing plants into asexual reproducers, a finding that could have profound implications for agriculture.

"Agricultural companies and farmers around the world have a tremendous interest in this method," says Vielle-Calzada, a plant researcher at the Center for Research and Advanced Studies of the National Polytechnic Institute in Irapuato, Mexico. "It would allow them to simplify the labor-intensive cross-hybridization methods they now use to produce hearty seeds with desirable traits."

As with animals, sexually-reproduction in plants involves the generation of male and female gametes that each carry half of the organism's genes. Flowering plants exhibit the most advanced form of sexual plant reproduction, producing pollen-derived sperm cells that join with egg cells to produce seeds. Each seed, then, is genetically unique. There are several types of asexual reproduction in plants, but all produce the same result: genetically identical daughter plants.

Vielle-Calzada's quest to develop an asexual seed began a decade ago, when he decided to investigate apomixis, a specific type of asexual reproduction. Many species of plants use apomixis to generate viable seeds without the fusion of sperm and egg. This method of asexual reproduction results in the formation of seeds that are essentially clones of the main plant and has great potential for crop improvement. In apomixis, reproductive cells retain the full complement of chromosomes, rather than losing half their genes via meiosis, as happens in sexual reproduction. About 350 families of flowering plants rely on apomixis to reproduce, but nearly all plants used for food reproduce sexually.

Vielle-Calzada studied apomixis in *Arabidopsis thaliana*, a small flowering mustard plant with a compact and well understood genome. *Arabidopsis* was also selected because it does not reproduce asexually. "We've been trying to induce apomixis in a species that doesn't practice it," he says.

In the research reported in *Nature*, Vielle-Calzada and scientists from Mexico, France, and the United States homed in on a reproductive structure of *Arabidopsis* called the ovule. Each tiny ovule produces a single female gamete, which, when fertilized, grows into a seed. The team used a genetic screen to identify genes that are active in the ovule -- reasoning that measuring gene activity would lead to important insights into which proteins are essential for guiding asexual reproduction.

The researchers netted a number of interesting genes in their screen, but one in particular, Argonaute 9, caught their attention immediately. The large family of Argonaute proteins has gained widespread attention among researchers because the proteins control which gene products -- either RNA or proteins -- a cell makes. Argonautes do this by slicing up messenger RNA before it can be translated into proteins. The identification of Argonaute activity in the ovule was all the more interesting, says Vielle-Calzada, because Argonaute proteins had never been seen in *Arabidopsis* reproductive cells before.

Next, Vielle-Calzada and his colleagues mutated the Argonaute 9 gene and watched what happened next. The results were swift and provocative. Instead of producing a single gamete, most of the ovules with the disrupted Argonaute gene produced several gametes, which were abnormal. Instead of carrying half of the species' chromosomes, they carried the full complement of genetic material -- implying that they had not undergone meiosis.

"By cutting off the function of Argonaute, we caused a 'schizophrenic' reaction of the cells in the ovule, which were not supposed to become gametes," Vielle-Calzada says. "It looks like Argonaute normally prevents those cells from being transformed into gamete precursors." That suggested that Argonaute 9 prevents the initiation of apomixis in *Arabidopsis*.

The finding raises the possibility that many -- or maybe even all -- plants have the ability to reproduce through apomixis, but that potential is suppressed by Argonaute 9. "It's possible that plants have a very old memory that allows them to reproduce asexually," Vielle-Calzada says.

The team then searched inside the ovule to look for the pieces of RNA that Argonaute 9 degraded. They found that Argonaute chewed up 2,600 snippets of RNA. The experiment "was a complete tour de force for the lab," Vielle-Calzada says. "It required a lot of ovules and a lot of fiddling."

After mapping those RNA sequences back to the *Arabidopsis* genome, the team discovered that more than half were produced by transposons. Transposons, also called "jumping genes," are mobile genetic elements that copy and insert themselves throughout the genome. Their function remains somewhat mysterious, although some evidence suggest they are important in controlling gene expression.

"It seems that Argonaute 9 silences transposons in the ovule of Arabidopsis," Vielle-Calzada says. "The open question now is, 'Why?'" His working hypothesis is that squelching the transposons prevents apomixis, but his lab is working to prove the connection. "These results are exciting because they suggest for the first time that transposons could be controlling early development in plants," he says.

Though he has made great progress, Vielle-Calzada is still working toward creating a fully asexual *Arabidopsis* plant. His current mutants do not develop completely asexual seeds. But by highlighting the role of Argonaute 9 in plant reproduction, Vielle-Calzada has moved a step closer to a slew of agricultural possibilities. "Now we just need to discover how to trigger the second and final step of making sexual plants asexual," he says.

Story Source:

Adapted from materials provided by Howard Hughes Medical Institute.

Journal Reference:

1. Vianey Olmedo-Monfil, Noé Durán-Figueroa, Mario Arteaga-Vázquez, Edgar Demesa-Arévalo, Daphné Autran, Daniel Grimanelli, Keith Slotkin, Robert A. Martienssen and Jean-Philippe Vielle-Calzada. **Control of female gamete formation by a non-cell-autonomous small RNA pathway in Arabidopsis**. *Nature*, 2010 DOI: 10.1038/nature08828

http://www.sciencedaily.com/releases/2010/03/100308132035.htm

New Method to Grow Arteries Could Lead to 'Biological Bypass' for Heart Disease

Researchers are reporting a new method of growing arteries could lead to a "biological bypass" -- or a non-invasive way to treat coronary artery disease. (Credit: iStockphoto/Sebastian Kaulitzki)

ScienceDaily (Mar. 9, 2010) — A new method of growing arteries could lead to a "biological bypass" -- or a non-invasive way to treat coronary artery disease, Yale School of Medicine researchers report with their colleagues in the April issue of *Journal of Clinical Investigation.*

Coronary arteries can become blocked with plaque, leading to a decrease in the supply of blood and oxygen to the heart. Over time this blockage can lead to debilitating chest pain or heart attack. Severe blockages in multiple major vessels may require coronary artery bypass graft surgery, a major invasive surgery.

"Successfully growing new arteries could provide a biological option for patients facing bypass surgery," said lead author of the study Michael Simons, M.D., chief of the Section of Cardiology at Yale School of Medicine.

In the past, researchers used growth factors -- proteins that stimulate the growth of cells -- to grow new arteries, but this method was unsuccessful. Simons and his team studied mice and zebrafish to see if they could simulate arterial formation by switching on and off two signaling pathways -- ERK1/2 and P13K.

"We found that there is a cross-talk between the two signaling pathways. One half of the signaling pathway inhibits the other. When we inhibit this mechanism, we are able to grow arteries," said Simons. "Instead of using growth factors, we stopped the inhibitor mechanism by using a drug that targets a particular enzyme called P13-kinase inhibitor."

"Because we've located this inhibitory pathway, it opens the possibility of developing a new class of medication to grow new arteries," Simons added. "The next step is to test this finding in a human clinical trial."

Other authors on the study included Bin Ren, Yong Den, Arpita Mukhopadhyay, Anthony A. Lanahan, Zhen W. Zhuang, Karen L. Moodie, Mary Jo Mulligan-Kehoe, Tatiana V. Byzova, and Randall T. Peterson

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Story Source:

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

Journal Reference:

1. Bin Ren, Yong Deng, Arpita Mukhopadhyay, Anthony A. Lanahan, Zhen W. Zhuang, Karen L. Moodie, Mary Jo Mulligan-Kehoe, Tatiana V. Byzova, Randall T. Peterson and Michael Simons. **ERK1/2-Akt1 crosstalk regulates arteriogenesis in mice and zebrafish**. *Journal of Clinical Investigation*, 2010; DOI: 10.1172/JCI39837

http://www.sciencedaily.com/releases/2010/03/100308182507.htm

Superweed predator to be released

By Rebecca Morelle
Science reporter, BBC News

A tiny Japanese insect that could help the fight against an aggressive superweed has been given the go-ahead for a trial release in England.

Since Japanese knotweed was introduced to the UK it has rapidly spread, and the plant currently costs over £150m a year to control and clear.

But scientists say a natural predator in the weed's native home of Japan could also help to control it here.

The insect will initially be released in a handful of sites this spring.

This is the first time that biocontrol - the use of a "natural predator" to control a pest - has been used in the EU to fight a weed.

Wildlife Minister Huw Irranca-Davies said: "These tiny insects, which naturally prey on Japanese Knotweed, will help free local authorities and industry from the huge cost of treating and killing this devastating plant."

Alien invaders

Japanese knotweed was introduced to the UK by the Victorians as an ornamental plant, but it soon escaped from gardens and began its rampant spread throughout the UK.

It grows incredibly quickly - more than one metre a month - and rapidly swamps any other vegetation in its path.

It is so hardy that it can burst through tarmac and concrete, causing costly damage to pavements, roads and buildings.

But removal is difficult and expensive; new estimates suggest it costs the UK economy £150m a year.

However, in Japan, the plant is common but does not rage out of control like it does in the UK, thanks to the natural predators that keep it in check.

Scientists at Cabi - a not-for-profit agricultural research organisation - used this as their starting point to track down a potential knotweed solution.

They looked at the superweed's natural predators - nearly 200 species of plant-eating insects and about 40 species of fungi - with the aim of finding one with an appetite for Japanese knotweed and little else.

After testing their candidates on 90 different UK plant species, including plants closely related to Japanese knotweed such as bindweeds and important crops and ornamental species, they discovered a psyllid called *Aphalara itadori* was the best control agent.

The little insect feeds on the sap of the superweed, stunting its growth.

Dr Dick Shaw, the lead researcher on the project from Cabi, told BBC News: "Safety is our top priority. We are lucky that we do have an extremely specific agent - it just eats invasive knotweeds."

Following peer review by the Advisory Committee on Releases to the Environment and a public consultation, the UK government has now given the go-ahead for release of *Aphalara itadori* , under licence, in England.

The Welsh Assembly is expected to announce its decision on the psyllid soon.

The insects will initially be released on a handful of sites.

These will be isolated and, in addition to as having the superweed present, will also have UK species that are closely related to Japanese knotweed planted there to check that the psyllid only targets the invasive species.

Dr Shaw said: "In the early stages, a contingency plan is in place so that should, in the unlikely event, any unintended consequences be detected, we will be able to do something about it.

"Insecticide and herbicide treatment will be on standby for rapid response."

If this phase is successful, the insect will be released at further sites, where it will undergo an intensive monitoring programme over the next five years.

Dr Shaw said: "On the localised sites, I would expect to see damaged knotweed this season.

"However, biocontrol is a long-term strategy - it could take five to 10 years to have a real impact."

The government believes that if the plan is successful it will reduce the costs to the building and engineering industries of clearing the plant.

However, some critics say that it is impossible to be certain that the Japanese insect will only target the superweed and could attack other species once in the wild.

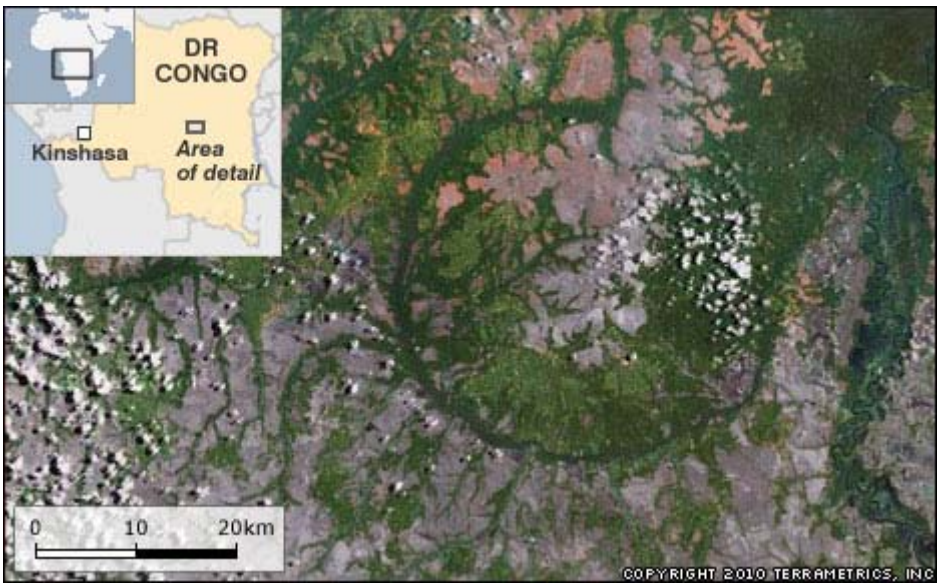
Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8555378.stm

Published: 2010/03/09 00:25:22 GMT

Ring may be giant 'impact crater'

By Paul Rincon
Science reporter, BBC News, The Woodlands, Texas

Deforestation has revealed what could be a giant impact crater in Central Africa, scientists say.



The 36-46km-wide feature, identified in DR Congo, may be one of the largest such structures discovered in the last decade.

Italian researchers considered other origins for the ring, but say these are unlikely.

They presented their findings at the recent Lunar and Planetary Science Conference in Texas, US.

The ring shape is clearly visible in the satellite image by TerraMetrics Inc reproduced on this page.

Only about 25 terrestrial impact craters are of comparable size or larger, according to the web-based Earth Impact Database.

Giovanni Monegato, from the University of Padova, said the feature was revealed only after trees were cleared from the area over the last decade.

The Unia River flows around the ring structure, underlining its round shape. The central part of the Wembo-Nyama feature is irregular and about 550m in elevation.

This is about 50-60m higher than the depression where the river flows. Although this might sound counter-intuitive, experts say that impact craters can sometimes lift up dense rocks. The surrounding rocks may subsequently erode, leaving a dome.

Confirmation needed

The putative crater lacks a well-defined outer ridge, though the University of Padova team says this could be explained by deep weathering and erosion in the tropical climate.

They add that the drainage pattern in the ring is very similar to those found in large impact craters in humid environments.

LARGEST IMPACT CRATERS
The Chicxulub crater is buried under Mexico's Yucatan Peninsula
Vredefort: S Africa, 300km-wide, 2 billion years old
Sudbury: Canada, 250km-wide, 1.8 billion years old
Chicxulub: Mexico, 170km-wide, 65 million years old
Popigai: Russia, 100km-wide, 35.7 million years old
Manicouagan: Canada, 100km-wide, 214 million years old

Mr Monegato said the team would now have to travel to the region to carry out field studies. Researchers would examine rocks from the site for tell-tale signs associated with space impacts.

These might include shocked quartz - a form of the mineral which occurs where rocks have been hit suddenly by a massive force. It is found only at nuclear explosion sites and at asteroid impact sites.

Finding such evidence will be crucial to confirm an impact origin over other processes which might explain the structure.

The researchers have considered whether volcanism or salt diapirism (a process where evaporite minerals intrude vertically into surrounding rock, forming dome-like structures on the surface) could be responsible for the annulus.

But Mr Monegato and his colleagues say the known geology of the region - along with other features of the structure (for example, no known salt diapirs reach such a great size) - appear to rule out such explanations.

"I am quite optimistic about an impact crater origin for this ring," Mr Monegato told BBC News.

If it is an impact structure, the scientists estimate it could have been punched into the crust by a space rock measuring about 2km across.

Further studies will be required to accurately determine an age for the ring, but it appears to post-date the Jurassic Period.

Paul.Rincon-INTERNET@bbc.co.uk

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8526093.stm

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Ancient eggshell yields its DNA

By Pallab Ghosh
Science correspondent, BBC News

Researchers have found that eggshells of extinct bird species are a rich source of preserved DNA.

An international team isolated the delicate DNA molecules of species including the massive "elephant birds" of the genus *Aepyorni* .

The Proceedings of the Royal Society B research demonstrated the approach also on emu, ducks and the extinct moa.

The team says that the technique will enable researchers to learn more about ancient birds and why they died out.

"Researchers have tried unsuccessfully to isolate DNA from a fossil eggshell for years," said Charlotte Oskam at Murdoch University in Western Australia, who authored the research.

"It just turned out that they were using a method designed for bone that was not suitable for a fossil eggshell."

The team has obtained DNA from the shells of a variety of species, most notably the elephant bird *Aepyornis* , which at half a tonne was heaviest bird to have ever existed.

Aepyornis looked like an outsized ostrich, standing three metres tall; most of them died out 1,000 years ago.

Archaeologist Mike Parker Pearson at the University of Sheffield hopes that an analysis of the bird's DNA will shed more light on why the bird became extinct.

The extinction coincided with humans arriving at *Aepyornis* 's natural habitat in Madagascar.

The mystery, according to Professor Parker Pearson, is that there's no evidence that the bird was hunted by humans.

"There's not even evidence that they ate the eggs - even though each one could make omelettes for 30 people," he told BBC News.

The elephant bird may be at the root of legends about giant birds. Marco Polo claimed erroneously that these giant birds could fly. There are also tales of birds that could pick up elephants in 1001 Arabian Nights.

There are complete skeletons of the elephant bird, but by analysing its DNA researchers hope to build up a more detailed picture of the creature and discover why it went extinct.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8558683.stm

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'No proof' acupuncture helps IVF

There is no evidence acupuncture or Chinese herbal medicine increase the chance of getting pregnant through IVF, fertility experts say in new guidance.

The methods are increasingly offered as a way of boosting the chances of a baby, but the British Fertility Society suggests couples may be wasting money.

They analysed 14 trials involving 2,670 people before issuing the new guidance.

But a leading practitioner said that better designed trials would show that the methods could help some couples.

All the trials involved acupuncture, in which needles were inserted into different areas of the body at different stages in the in vitro fertilisation (IVF) cycle.

No matter at what stage of the process acupuncture was used, it had no impact on the pregnancy or live birth rate, the BFS researchers found.

“ **"Fertility focused acupuncture treatment has been found to help increase blood flow to the reproductive organs, balance hormone levels, regulate the menstrual cycle and help improve the lining of the uterus and quality of eggs released** ”
British Acupuncture Council

They did however also find it caused no harm, with no difference in miscarriage rates.

There were no published trials on the use of Chinese herbs which were rigorous enough for inclusion, so the team concluded that there was "currently no evidence to support the use of this in fertility treatments".

As more couples seek IVF, there has been a growth in accompanying complementary therapies, and acupuncture has benefited.

It is the most popular option for patients because it is thought to improve blood flow and increase the chance of an embryo implanting.

Trial and error

But this sometimes comes at a cost which could buy a couple a further cycle of IVF.

Professor Adam Balen, head of BFS's policy and practice committee, said patients needed to be aware of the lack of evidence on acupuncture and herbs before signing up to a course of treatment.

There was a "a great deal of discrepancy", he added, in the way in which the trials were designed and the type of acupuncture used.

"Any future randomised controlled trials in this area need to ensure that they use a standardised acupuncture method, have a large sample size and include adequate controls to account for any placebo effects."

" **Infertile women have been misled for some time now to think that traditional Chinese medicine can help them getting pregnant** "
Professor Edzard Ernst Pensinsula Medical School

One high-profile practitioner, Dr Xiao-Ping Zhai, of The Zhai Fertility Treatment Clinic, said there were indeed problems with the way in which these trials were designed and that different analysis would show the benefits.

"Certainly for those with unexplained fertility problems in particular, we know acupuncture and traditional Chinese medicine can be beneficial. What matters is both the expertise and experience of the practitioner, but most of all the treatment of the patient as an individual. It is the tailored treatment which is key.

"We need clinical trials that take this into account."

A statement from the British Acupuncture Council noted: "Fertility focused acupuncture treatment has been found to help increase blood flow to the reproductive organs, balance hormone levels, regulate the menstrual cycle and help improve the lining of the uterus and quality of eggs released.

"BACC practitioners recognise that there are many factors which may cause infertility such as stress, irregular hormone levels and disrupted menstrual cycles. As a holistic therapy, acupuncture helps to identify underlying health issues which may cause disruption to the body's natural balance, resulting in symptoms such as infertility."

But one of the country's leading experts on the efficacy of complementary medicine, Professor Edzard Ernst of Pensinsula Medical School, described the new guidelines as "long overdue clarification".

"Infertile women have been misled for some time now to think that traditional Chinese medicine (TCM) can help them getting pregnant. This analysis shows two things very clearly: the totality of the acupuncture trials does not support this notion, and for Chinese herbs, we have no evidence at all.

"This will help infertile women not to waste their money or get disappointed by TCM practitioners who behave less than responsibly when recommending these treatments."

Story from BBC NEWS:
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'Problem kids' risk future pain

Children with behavioural problems are twice as likely to suffer chronic pain as adults than others, say researchers.

Scientists at Aberdeen University, who followed the lives of more than 19,000 children, think faulty hormone signals in the brain may play a key role.

Bad early life experiences may harm this brain system, causing both behavioural problems in childhood and chronic widespread pain in adulthood.

The findings, spanning 45 years, are published in the journal Rheumatology.

All of the children in the study were born in 1958, and mostly in the UK.

" **It is becoming clear that events that happen early in childhood are important** "
Dr John McBeth of Manchester University

Throughout the study, up until the age of 16, parents and teachers assessed the children's behaviour looking for any "problem" signs such as poor ability to make friends, disobedience, stealing, thumb sucking and nail biting, lying, bullying and truanting.

When the children had grown up and reached the age of 42 they completed a questionnaire asking about psychological distress. At the age of 45 they completed another one about pain.

From this the researchers found that children with severe behavioural problems had double the risk of chronic widespread pain.

Dr Dong Pang, lead author of the work and a researcher at the University of Aberdeen, said: "We know already that severe adverse events in childhood such as hospitalisation after a road traffic accident and separation from mothers are linked to chronic widespread pain in adulthood."

But, until now, it was unknown whether maladjusted behaviour in children was a long-term marker for this type of pain.

"Our study shows that it is," he said.

Abnormal stress response

The researchers say that it is not just chronic widespread pain that is associated with bad behaviour in childhood.

Other adult problems associated with childhood behavioural problems include long-term psychiatric problems such as depression, anxiety and substance abuse.

They say that all these problems may be outcomes of the chain of events set in motion by the dysfunctioning "hypothalamic-pituitary-adrenal" or HPA axis - the system in the brain that controls hormones to help regulate the body's response to stressful situations.

If further research proves this to be the case, then it might be possible to intervene in early life to prevent these problems occurring later.

Professor Gary Macfarlane, who also worked on the study, said changing a person's lifestyle may help alter the pattern, including increasing the amount of exercise someone takes as well as watching out for signs of psychological distress and behavioural problems in childhood.

Dr John McBeth, a pain expert at Manchester University, said: "While the factors associated with developing chronic widespread pain are slowly being revealed, it is becoming clear that events that happen early in childhood are important.

He said the next challenge was to determine if problems with stress response system were operating in children.

"If the answer is yes, these studies offer exciting opportunities to develop early interventions to alleviate symptoms including chronic pain disorders in adulthood."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8555892.stm

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US school soda deal 'cuts sugar'

The US soft drinks industry says it has dramatically cut the number of high-calorie soft drinks sold in US schools as part of a drive to tackle obesity.

The American Beverage Association said shipments of full-calorie drinks to schools were down 95%.

Nearly one in three children and teenagers in the US are overweight or obese and health experts say sugary drinks are part of the problem.

Several US states and cities are considering taxing soft drinks.

The reduction in sugary soft drinks in schools formed part of a deal between the major companies and the Alliance for a Healthier Generation, a joint initiative of the American Heart Association and the Clinton Foundation.

Under the voluntary guidelines, in place since 2006, full-calorie soft drinks were removed from school canteens and vending machines. Lighter drinks, including low-fat milk, diet sodas, juices, flavoured waters and teas were promoted in their place.

"There's been a dramatic shift toward lower calorie and more nutritious beverages in schools, it could lay the foundation for broader changes in our society," former US President Bill Clinton told a news conference on Monday.

Soda tax

Independent consulting firm Keybridge Research looked at what changes the guidelines had brought about and found that:

- the total beverage calories shipped to schools between the first half of the 2004-05 school year and the first half of the 2009-10 school year has decreased by 88%
- there had been a dramatic shift toward lower-calorie and higher nutrient beverages in schools, including waters, 100% juices, and portion-controlled sports drinks
- shipment volumes of full-calorie drinks were 95% lower in the first half of the 2009-10 school year compared with the first half of the 2004-05 school year.

The soft drinks industry has been a main target of critics who say the sugary beverages they sell are a key factor in the levels of childhood obesity in the US.

The state of California and the city of Philadelphia have introduced legislation to tax soft drinks, while both the New York Governor David Paterson and New York City Mayor Michael Bloomberg are also pushing for such a tax.

"In these tough economic times, easy fixes to our problems are hard to come by," said Mr Bloomberg at the weekend. "But the soda tax is a fix that just makes sense, it would cut rising health costs."

Susan Neely of the American Beverage Association, which includes major firms like Coca Cola, PepsiCo and Dr Pepper Snapple Group, said such a tax would not solve "a complex problem like obesity".

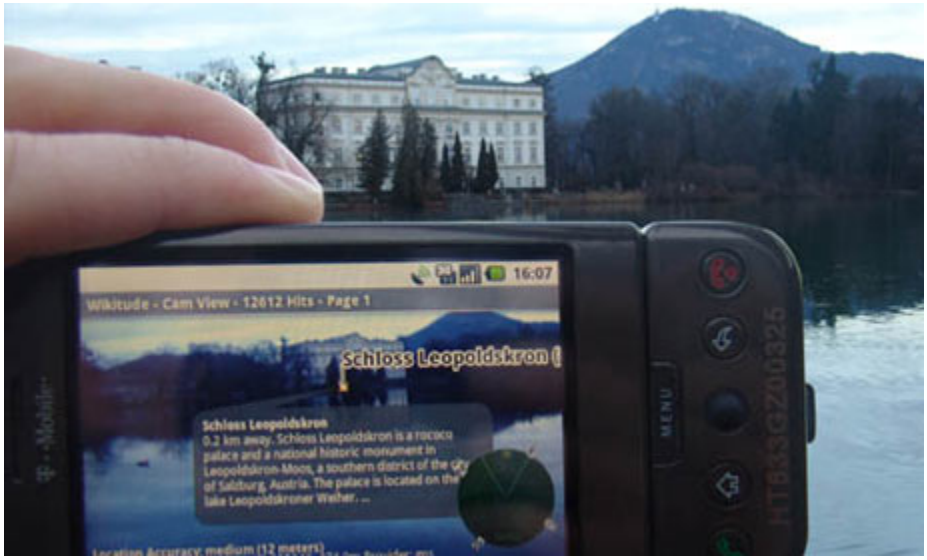
Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/americas/8557195.stm

Published: 2010/03/09 11:36:40 GMT

Mobiles move from cannibal to creator

I've lost count of the number of products that mobile phones have replaced – but now they're bringing new ones into being

- Victor Keegan
- guardian.co.uk, Friday 5 March 2010 11.19 GMT



The new new thing: augmented reality on an Android smartphone

The march of the mobile goes on and on but it is now taking off in a new direction with goodness knows what consequences. Until recently, the mobile phone's distinguishing feature was its ability to gobble up competing products in a way that no other consumer product ever has. I used to keep a tally of all the products that could have been sold separately but which have been cannibalised by the mobile: cameras, calculators, books, video cameras, music players, satellite navigation and so on. When the list reached 60, I gave up, because the arrival of the iPhone and iPod Touch made the list of extra products grow exponentially.

Now the mobile is moving into new terrain. Having satiated its ravenous appetite for existing products, it is creating services that only exist because of its unique technology. For those who don't have one of the new smartphones boasting augmented reality – say 99% of all the people on the planet – it might be helpful to imagine the screen of your mobile as a radar device. When you are looking at the screen as if you are about to take a photo the "radar" (a mixture of wireless, satellite positioning and cellphone triangulation) picks up whatever data there is within whatever distance you choose. If you are looking at the screen using, say, Google's Layar, and rotating yourself 360 degrees, you might find dozens of messages left by twitterers less than a mile away, photos from websites, relevant data from the Wikipedia or whatever. One new iPhone app, Worksnug, gives you a panoramic view of all the public Wi-Fi hotspots around you: the idea is to build up a community of people working in public spaces. If you point Google's Goggles app on its new Nexus One phone at a picture of, say, the Mona Lisa on a computer it immediately recognises what it is and comes up with all sorts of relevant information. Google's SkyMap app enables you to see current patterns of stars in the sky. Owners of these smartphones in effect have a CCTV camera in their pockets, only with a far wider range than the static ones libertarians complain about. The only difference is that in this case people have (mostly) given their permission for the data they generate to be monitored, even if they are often unaware of what they have let themselves in for. We are only at the very beginning of a new era in the application of mobiles where the sky is literally the limit.

Notice I have been writing about apps for once without much mention of the iPhone. This isn't because the landscape has suddenly changed. The iPhone family is still galaxies ahead in the popularity of its apps. But the arrival of Google is suddenly a big, big threat which helps to explain why Apple is suing HTC, the manufacturer of Google's Nexus One phone, for infringement of patents. Apple's own augmented reality screen can see a huge threat from Google looming over the horizon.

Why? It is partly because Google apps are based on open source – balm for the bedroom coder – rather than being behind Apple's beautiful though closed wall. But it is mainly because Google controls the world's information. If data is the gold dust of the new era, then Google will own the deepest mine. If, like me, you are willingly immersed in a snowstorm of Google products from GMail to mapping and Google Earth, then a phone like the Nexus One (sold from Google's website) which has access to everything about me is both a potentially awesome product in its own right and a huge threat to my liberty if Google misuses that information. It may be of significance that my cameraphone comparison site – which reached a peak of more than 21,000 views a day this week – shows a far higher level of initial interest in Google's Nexus One phone than in any previous one. Apple, be warned.

Google is nicking one of the secrets of Apple's success: the more you can control, the better user experience you can give. This is very bad for individual freedom and for the openness of the web but it probably won't worry most users if it delivers a great experience: you can always change your phone every 18 months or sooner on pay-as-you go. But what if years from now Google's monopoly of search is extended to the phone itself? Or what if Nokia – which has been agonisingly slow to get its apps store together but still has a claimed 37% of the global market for phones – exploits its latent strength with more vertical integration? There may not be any danger to the world economy as a whole if there are a cluster of vertically integrated silos as long as one – whether Apple, Google, Nokia orSamsung or HTC – doesn't become as powerful as Google is in search and Microsoft in operating systems. There is a kind of underlying paradox at work: the greater the user experience, the worse the dangers of an unacceptable monopoly developing.

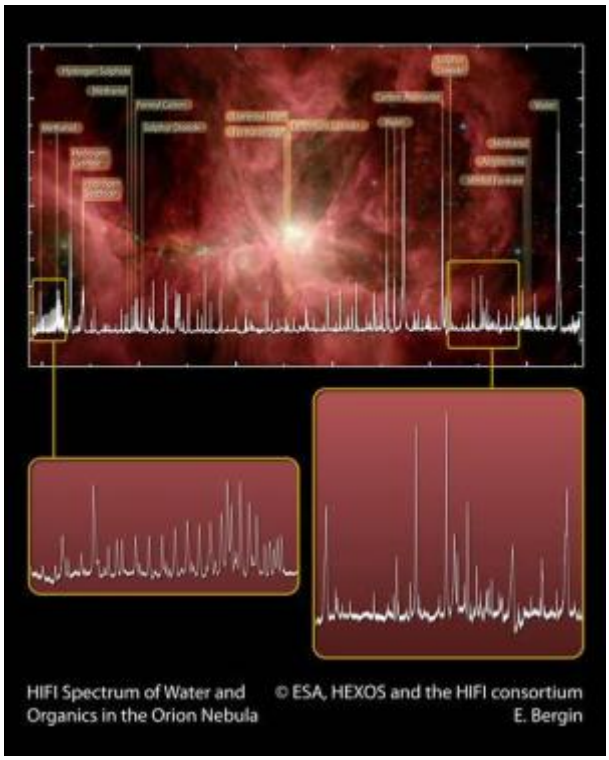
While on the subject of economics, the profession, distracted by the credit crunch, has a lot of work to do to understand the impact of phones on economic growth. There is evidence that the explosion of mobiles is a stimulant to GDP (gross domestic product) particularly in developing countries such as India, as a recent report funded by Vodafone showed.

But what about the huge number of products not now being purchased because they are bundled into your mobile – let alone the thousands of products that come free? Since mobile devices are still falling in price in real terms, it is certain that far less is being spent on mobiles than would have been on the products they absorbed.

Of course, GDP is not necessarily affected, because not having to purchase so many different products will leave more money in our pockets to buy other things. But it is almost certainly the case that GDP has fallen compared with what would otherwise have been the case while our personal satisfaction – with having so many products in a single device – will have gone sharply up. The disruptive power of the mobile knows no end.

http://www.guardian.co.uk/technology/blog/2010/mar/05/smartphones-cannibal-creator

Precursors of Life-Enabling Organic Molecules in Orion Nebula Unveiled by Herschel Space Observatory



The HIFI spectrum of the Orion Nebula, superimposed on a Spitzer image of Orion. A characteristic feature is the spectral richness: among the organic molecules identified in this spectrum are water, carbon monoxide, formaldehyde, methanol, dimethyl ether, hydrogen cyanide, sulphur oxide, sulphur dioxide and their isotope analogues. It is expected that new molecules will also be identified. This spectrum is the first glimpse at the spectral richness of regions of star and planet formation. It harbours the promise of a deep understanding of the chemistry of space once the complete spectral surveys are available. (Credit: ESA, HEXOS and the HIFI consortium)

ScienceDaily (Mar. 5, 2010) — ESA's Herschel Space Observatory has revealed the chemical fingerprints of potential life-enabling organic molecules in the Orion Nebula, a nearby stellar nursery in our Milky Way galaxy. This detailed spectrum -- obtained with the Heterodyne Instrument for the Far Infrared (HIFI), one of Herschel's three innovative instruments -- demonstrates the gold mine of information that Herschel-HIFI will provide on how organic molecules form in space.

Several German Institutes contributed essential parts to the HIFI instrument: the Universität zu Kölkn and the Max-Planck-Institute für Radioastronmie, Bonn, und für Sonnensystemforschung, Lindau.

Striking features in the HIFI spectrum include a rich, dense pattern of "spikes," each representing the emission of light from a specific molecule in the Orion Nebula. This nebula is known to be one of the most prolific chemical factories in space, although the full extent of its chemistry and the pathways for molecule formation are not well understood. By sifting through the pattern of spikes in this spectrum, astronomers have identified a few common molecules that appear everywhere in the spectrum. The identification of the many other emission lines is currently ongoing.

By clearly identifying the lines associated with the more common molecules, astronomers can then begin to tease out the signature of particularly interesting molecules that are the direct precursors to life-enabling molecules. A characteristic feature of the Orion spectrum is the spectral richness: among the molecules that can be identified in this spectrum are water, carbon monoxide, formaldehyde, methanol,

dimethyl ether, hydrogen cyanide, sulphur oxide, sulphur dioxide and their isotope analogues. It is expected that new organic molecules will also be identified.

"This HIFI spectrum, and the many more to come, will provide a virtual treasure trove of information regarding the overall chemical inventory and on how organics form in a region of active star formation. It harbours the promise of a deep understanding of the chemistry of space once we have the full spectral surveys available," said Edwin Bergin of the University of Michigan, principal investigator of the HEXOS Key Programme on Herschel.

Unprecedented high resolution

HIFI was designed to provide extremely high-resolution spectra and to open new wavelength ranges for investigation, which are inaccessible to ground-based telescopes. "It is astonishing to see how well HIFI works," said Frank Helmich, HIFI principal investigator of SRON Netherlands Institute for Space Research. "We obtained this spectrum in a few hours and it already beats any other spectrum, at any other wavelength, ever taken of Orion. Organics are everywhere in this spectrum, even at the lowest levels, which hints at the fidelity of HIFI. The development of HIFI took eight years but it was really worth waiting for."

Identification of the many spectral features visible in the Orion spectrum with transitions of particular molecular species requires sophisticated tools such as the Colgone Database of Molecular Spectroscopy (CDMS), which collect the laboratory data of several hundred moelcular species and precise line predictions. "The high spectral resolution of HIFI shows the breath-taking rechness of molecular species, which are present, despite of the hostile environment, in the stellar nurseries and sites for planet formation," says Jürgen Stutzki, HIFI-co-principle investigator at the Universität zu Köln.

ESA project Herschel

Herschel is one of ESAs cornerstone missions, a space observatory with science instruments provided by European-led Principal Investigator consortia, with important contributions from NASA on the US side. One of the three instruments on board Herschel is HIFI, the Heterodyne Instrument for the Far-Infrared, an ultra-sensitive, high resolution spectrometer designed and built by a nationally-funded consortium led by SRON Netherlands Institute for Space Research.

The consortium includes partners from 25 institutes and 13 different nations. German institutes have provided key components for HIFI: the local oscillator, built at the MPI für Radioastronomie, Bonn, superconducting detectors with sensitivity close to the fundamental quantum limit, built at the Universität zu Köln. HIFI carries the classical radio frequency technique of heterodyne-mixing into a for orders of magnitude higher fequency regime, namely the Far-Infrared spectral range. A further essential component, the Acousto Optical Spectrometer (AOS), was developed in collaboration between the Universität zu Köln and the Max Planck Institut für Sonnensystemforschung, Lindau.

Story Source:

Adapted from materials provided by University of Cologne - Universitaet zu Koeln.
http://www.sciencedaily.com/releases/2010/03/100304102320.htm

For California Vintners, It's Not Easy Being Green

Rows of hillside vineyards above Napa Valley. (Credit: iStockphoto/Hilary Brodey)

ScienceDaily (Mar. 5, 2010) — "Green" labels do not pack the same wallop for California wines that they do for low-energy appliances, organically grown produce and other environmentally friendly products, but it's not because there's anything wrong with the wine, a new UCLA-led study has found.

In fact, wines made with organically grown grapes actually rate higher on a widely accepted ranking, said Magali Delmas, a UCLA environmental economist and the study's lead author. And these wines tend to command a higher price than their conventionally produced counterparts, so long as wineries don't use the word "organic" on their labels.

But when wineries do use eco-labels, prices plummet.

"You've heard of the French paradox?" quipped Delmas, associate professor of management at UCLA's Institute of the Environment and the UCLA Anderson School of Management. "Well, this is the American version. You'd expect anything with an eco-label to command a higher price, but that's just not the case with California wine."

The anomaly points to a marketing conundrum for environmentally friendly vintners and a buying opportunity for oenophiles, say Delmas and her co-author, Laura E. Grant, a Ph.D. candidate in environmental science and management at the University of California, Santa Barbara.

"Wine made with organic grapes -- especially if it has an eco-label -- is a really good deal," Grant said. "For the price of conventional wine, you get a significantly better quality wine."

The findings appear in the current issue of the peer-reviewed scholarly journal Business and Society, the official organ of the International Association for Business and Society. The organization is devoted to research on corporate social responsibility and sustainability issues.

Delmas, an economist and sociologist by training, specializes in analyzing incentives that induce companies to engage in environmentally beneficial practices. Grant, also an economist, is married to a sommelier.

The researchers studied 13,426 wines from 1,495 California wineries. Vintages ranged from 1998 to 2005, and more than 30 varietals and 25 appellations were represented.

First, Delmas and Grant tracked down each wine's rating from Wine Spectator, a prominent wine publication. Then they tabulated the number of wines made with grapes that had been certified by a third party as organically grown, a grueling and expensive process that obligates the vineyard to devote considerably more time and effort to cultivating grapes than conventional agricultural methods, which rely on chemical herbicides, pesticides and fertilizers.

The researchers also looked at whether wineries chose to label their certified wines as organically grown or whether they chose to keep their efforts to themselves.

Certification and eco-labels had no impact on pricing or ratings for cheaper wines, the researchers found. But using organically grown grapes proved be a double-edged sword for wines that cost more than $25.

So long as they didn't carry eco-labels, these wines commanded a 13-percent higher price than conventionally produced wines of the same varietal, appellation and year. Their ratings on Wine Specator's 100-point scale, in which wines tend to range between the mid-50s and high 90s, were also higher. Wines made from organically grown grapes averaged one point higher than their conventionally produced counterparts.

While the higher Wine Spectator scores still prevailed when producers slapped eco-labels on their bottles, the financial rewards for going to the trouble of making certified wine evaporated. The "made from organically grown grapes" label not only wiped out the price premium for using certified grapes but actually drove prices 7 percent below those for conventionally produced wines, the researchers found.

The average price for a wine with an eco-label was $37.65. By contrast, a certified wine without an eco-label commanded an average price of $40.54.

While the researchers don't have an easy explanation for the price drop associated with eco-labeling, they aren't stumped when it comes to the higher price that certified wines are able to commend.

"Wine made with organically grown grapes is higher quality," Delmas said. "Growers have to devote more time and attention and take better care of organically certified vines than conventional vines, and our results show that these efforts are apparent in the product."

In addition to being less pure, grapes grown with pesticides, herbicides and inorganic fertilizers interfere with a vine's ability to absorb naturally occurring chemicals in soil, according to vintners quoted in the study. As a result, wines made with organically grown grapes are more likely absorb these chemicals, which are said to provide the distinctive flavor of the site where the grapes were grown -- a wine's much-prized "terroir."

Still, the researchers believe vintners will be surprised at the magnitude of the impact that certification has on price and quality. Delmas and Grant suspect that the price-penalty associated with eco-labels will be less surprising for vintners. In their study, the researchers found that only one-third of vintners using organically certified grapes advertised the fact on wine labels.

"Producers of two-thirds of these wines must suspect that consumers, for whatever reason, wouldn't appreciate the use of organically grown grapes," Delmas said. "Otherwise, why would they refrain from drawing attention to this benefit on their labels?"

As for the reasons that eco-labels drive down prices, the researchers have a number of theories. Many have to do with confusion in consumers' minds over the difference between wine made with organically grown grapes and organic wine, which is made without the benefit of such chemical preservatives as sulfites. Preservatives can be used in certified wine.

"Organic wine earned its bad reputation in the '70s and '80s," Grant said. "Considered 'hippie wine,' it tended to turn to vinegar more quickly than non-organic wine. This negative association still lingers."

Even today, the absence of sulfites reduces the shelf-life of organic wines, making them less stable, the researchers said.

"Without added sulfites, the wine turns into vinegar after a while, and you're likely to lose out on the opportunity for your wine to mature into something considerably richer than when purchased, which is the promise of fine wine," Delmas said. "So while no-sulfites-added is fine for white wines such as Chardonnay that you usually drink 'young,' it is not good for a red wine like a Cabernet Sauvignon that you want to keep to drink in a year or two."

Moreover, the benefits of wine from organically grown grapes may not be as clear to consumers as the benefits from other environmentally friendly products. Researchers who have looked into the motives of consumers of green products have found that benefitting the environment is only one incentive, and probably not the strongest one. Generally, green consumers are primarily motivated by some kind of personal benefit.

"Consumers buy organically grown food because they think it is going to improve their health," Delmas said. "That motivation doesn't go a long way with wine. If consumers want to drink something healthy, they'll reach for wheat grass, not an alcoholic beverage."

That all could change once consumers realize that wine made with organic grapes actually holds the prospect of another compelling personal benefit: a better-tasting product.

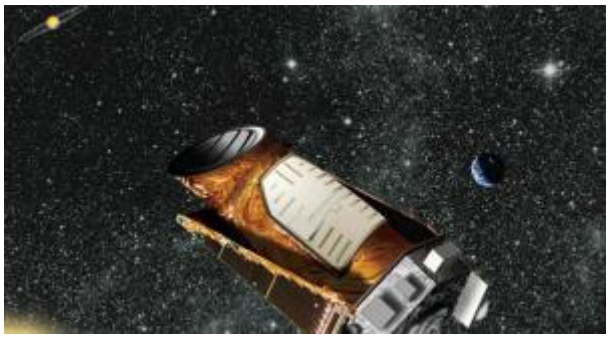
"Vintners and regulators really need to communicate better what wine with organically grown grapes means and the potential impact on quality," Delmas said. "I don't think they've done that, and I think it's too bad. It's a real missed opportunity."

Story Source:

Adapted from materials provided by University of California - Los Angeles. Original article written by Meg Sullivan.

http://www.sciencedaily.com/releases/2010/03/100304184546.htm

NASA's Kepler Mission Celebrates One Year in Space



Artist's concept of Kepler in the distant solar system. Image credit: (Credit: NASA/JPL)

ScienceDaily (Mar. 5, 2010) — One year ago this week, NASA's Kepler mission soared into the dark night sky, leaving a bright glow in its wake as it began to search for other worlds like Earth.

"It was a stunning launch," recalled former Kepler Project Manager James Fanson of NASA's Jet Propulsion Laboratory, Pasadena, Calif.

Following Kepler's spectacular nocturnal launch from Cape Canaveral Air Force Station, Fla., aboard a United Launch Alliance Delta II rocket at 7:49 p.m. Pacific Time (10:49 p.m. Eastern Time on Friday, March 6, 2009, science team members whooped with joy.

"Now the fun begins," quipped an ecstatic William Borucki, Kepler's science principal investigator of NASA's Ames Research Center, Moffett Field, Calif.

Since the search began, NASA's plucky exoplanet hunter has achieved significant success in its quest to answer the timeless question: "Are we alone in our galaxy?" Two months ago today, Kepler scientists jubilantly announced the discovery of five large exoplanets (planets located beyond our solar system) named Kepler 4b, 5b, 6b, 7b and 8b.

The Kepler Mission is designed to observe more than 150,000 stars continuously and simultaneously for signs of Earth-size planets until at least November 2012. Some of the planets are expected to orbit in a star's "habitable zone," a warm region where liquid water could pool on the surface.

Kepler is a NASA Discovery mission. Kepler is managed and operated by NASA Ames, and Ames is the home organization of the Science Principal Investigator. Kepler development was managed by NASA's Jet Propulsion Laboratory, Pasadena, Calif. Ball Aerospace & Technologies Corp., Boulder, Colo., developed the Kepler flight system. Ball Aerospace and the Laboratory for Atmospheric and Space Physics at the University of Colorado in Boulder, support mission operations. The final data archive is located at the Space Telescope Science Institute in Baltimore, Md.

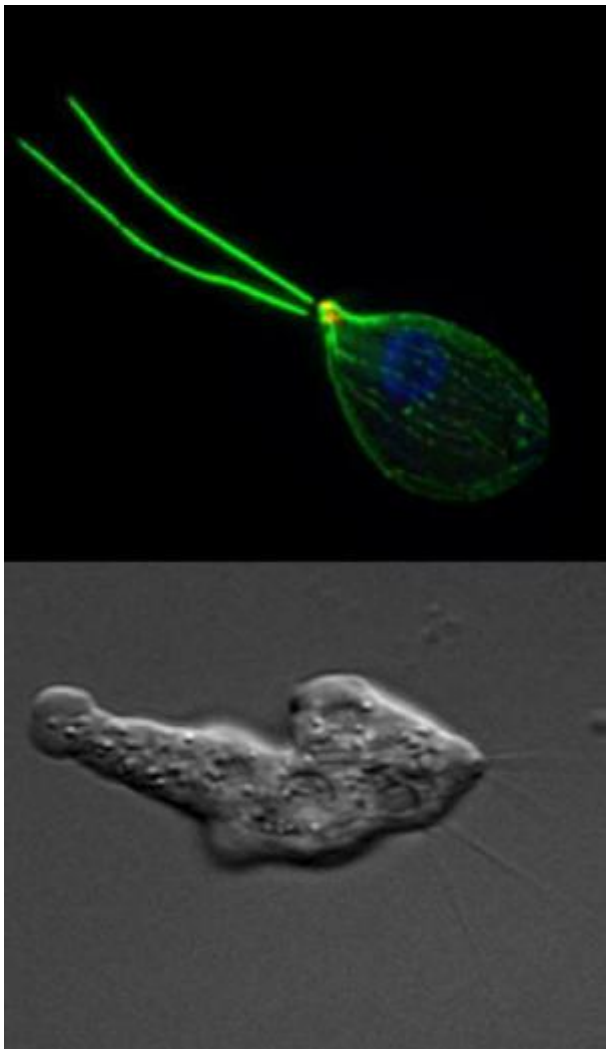
More information is online at http://www.nasa.gov/kepler and http://www.kepler.nasa.gov.

Read more at http://www.nasa.gov/mission_pages/kepler/news/one_year_anniv.html

Story Source:

Adapted from materials provided by NASA/Jet Propulsion Laboratory.
http://www.sciencedaily.com/releases/2010/03/100304184427.htm

Naegleria Genome Sheds Light on Transition from Prokaryotes to Eukaryotes



Top: N. gruberi flagellate-stage (microtubules are highlighted in green, basal bodies in red, and DNA is stained blue). Bottom: N. gruberi, amoeba-stage. (Credit: Photos by Lillian Fritz-Laylin, UC Berkeley)

ScienceDaily (Mar. 5, 2010) — In the long evolutionary road from bacteria to humans, a major milestone occurred some 1.5 billion years ago when microbes started building closets for all their stuff, storing DNA inside a nucleus, for example, or cramming all the energy machinery inside mitochondria.

Scientists have now sequenced the genome of a weird, single-celled organism called *Naegleria gruberi* that is telling biologists about that transition from prokaryotes, which function just fine with all their proteins floating around in a soup, to eukaryotes, which neatly compartmentalize those proteins?

The sequence, produced by the Department of Energy Joint Genome Institute (JGI), and an analysis by scientists from the University of California, Berkeley, Lancaster University in the United Kingdom and institutions elsewhere in the United States and the U.K. are published in the March 5 issue of the journal *Cell*.

"In a sense, analyzing the *Naegleria* genome shows us what it would be like to be on this planet more than a billion years ago, and what kind of organisms were around then and what they might have looked like," said Simon E. Prochnik, a JGI and UC Berkeley bioinformaticist and coauthor of the *Cell* paper.

Naegleria is a common soil amoeba -- the sequenced organism was isolated from the mud in a grove of eucalyptus trees on the UC Berkeley campus -- that, under stress, quickly grows two flagella, like sperm tails, that it uses to swim around. It has a third identity, a hard cyst, that can persist in the soil until conditions become damp and warm enough for it to turn into an amoeba.

"This one-celled organism hunts and eats bacteria as an amoeba, swims around looking for a better environment as a flagellate, and then hunkers down and waits for good times as a cyst," Prochnik said. "It is a very rare process to go from amoeba to flagellate like this."

Not surprisingly, the organism is packed with genes that help support these three personalities, he said. He and his colleagues report that this amoeboflagellate contains 15,727 genes coding for proteins, while humans have 23,000 protein-coding genes.

"*Naegleria* has a lot of genes because it has a complicated lifestyle; most single-celled organisms -- in particular, parasites -- have a simpler lifestyle, and therefore have fewer genes," Prochnik said. "These single-celled organisms are highly versatile, containing all the genetic information necessary to survive in a wide range of environments and under a wide range of stresses."

The researchers compared the *Naegleria* genome to the genomes of 16 other eukaryotes, ranging from humans and fungi to green plants and other unicellular eukaryotes, shedding light on the set of perhaps 4,000 genes that may have been part of the first, most primitive eukaryotes, according to UC Berkeley graduate student Lillian Fritz-Laylin, first author of the paper. The number of genes surprised the researchers, because previous genome comparisons that included parasites came up with a much lower number. That may be because parasites live off their host and have been able to shed many genes that are critical for a free-living organism, they said.

"Now that our analysis focuses on data from free-living organisms, including *Naegleria*, that haven't lost all these genes and functions, we can make a broader comparison, and we find a lot more proteins were probably present in the eukaryotic ancestor than we previously thought," Fritz-Laylin said.

"This is the first genome comparison that includes not only *Naegleria*, but representatives of all six sequenced groups of eukaryotes," Prochnik said. *Naegleria* is part of a diverse group that includes a cousin, *Naegleria* fowleri, that can fatally infect swimmers. The other eurkaryotic groups are animals and fungi; plants and green algae; chromalveolata, which include diatoms, red tide and malaria; amoebozoa, which include various single-celled amoebae; and the diverse group that includes parasites like giardia.

Among other things, *Naegleria*'s genes shed light on how cells move, how they signal one another and how they metabolize nutrients.

As an amoeba, *Naegleria* pushes out little feet, called pseudopods, that propel it in its hunt for food. Yet, once the food disappears, the amoeba creates flagella from scratch and uses them to swim about in search of new hunting grounds.

What is interesting, Fritz-Laylin said, is that pseudopods and flagella use different proteins for movement. Amoebae make use of actin, which provides the internal scaffolding for the cell and for the pseudopods that help amoebae explore their environment. Flagella, on the other hand, are made mostly of the protein tubulin. Because *Naegleria* has both types of movement, the organism can help scientists understand the origins of these parallel systems during the evolution of eukaryotes.

Scientists can starve populations of *Naegleria* in its amoeba form and have seen it switch quickly and simultaneously to its flagellar form. This suggests that the switch from an actin-based system to a microtubule-based system of movement is very highly regulated and synchronized across a population.

"The sequence helped us identify the genes associated with each type of motility," she said. "Although this has been done for flagellar motility, it had not been done for amoeboid motility."

The genome also reveals versatility in how *Naegleria* produces energy. The organism can use oxygen to burn nutrients -- glucose, amino acids or fatty acids -- for energy or, in the absence of oxygen, utilize other nutrients and possibly produce hydrogen as a byproduct.

Like the recently sequenced, free-living alga Chlamydomonas, *Naegleria* likely uses its metabolic flexibility to survive the intermittent hypoxia common to muddy environments, the researchers concluded. Prochnik suggests that *Naegleria* could help biologists understand hydrogen production that, in other organisms, might be used to produce energy.

Fritz-Laylin noted that, while the genome will be a boon to the small number of biologists who study the organism, it also will help in understanding the evolution of more complicated organisms.

"By comparing diverse organisms like *Naegleria* from all over the family tree of eukaryotes we can begin to understand where we come from," she said.

Other co-authors of the paper are Michael L. Ginger of the School of Health and Medicine at Lancaster University; Meredith L. Carpenter, Alex Paredez, W. Zacheus Cande and Daniel S. Rokhsar of UC Berkeley; Rochak Neupane of UC Berkeley's Center for Integrative Genomics; Alan Kuo, Jarrod Chapman, Shengqiang Shu, Asaf Salamov, Erika Lindquist, Hank Tu, Harris Shapiro, Susan Lucas and Igor V. Grigoriev of JGI; Joel B. Dacks of the University of Alberta Edmonton in Alberta, Canada; Jonathan Pham, Michael Cipriano and Scott C. Dawson of UC Davis; Joel Mancuso of Gatan Inc. in Pleasanton, Calif.; Mark C. Field of the University of Cambridge, U.K.; and Chandler Fulton of Brandeis University in Waltham, Mass.

Rokhsar is the program head for computational genomics at JGI and a professor of molecular and cell biology and of physics at UC Berkeley.

Funding for the project came primarily from the Department of Energy.

Story Source:

Adapted from materials provided by University of California - Berkeley. Original article written by Robert Sanders, Media Relations.

Journal Reference:

1. Fritz-Laylin et al. **The Genome of Naegleria gruberi Illuminates Early Eukaryotic Versatility**. *Cell*, 2010; 140 (5): 631-642 DOI: 10.1016/j.cell.2010.01.032

http://www.sciencedaily.com/releases/2010/03/100304121542.htm

NASA Mars Orbiter Speeds Past Data Milestone

This view of an inverted crater in the Arabia Terra region of Mars is among the images taken by NASA's Mars Reconnaissance Orbiter in early 2010 as the spacecraft approached the 100-terabit milestone in total data returned. (Credit: NASA/JPL-Caltech/University of Arizona)

ScienceDaily (Mar. 5, 2010) — NASA's newest Mars orbiter, completing its fourth year at the Red Planet next week, has just passed a data-volume milestone unimaginable a generation ago and still difficult to fathom: 100 terabits.

That 100 trillion bits of information is more data than in 35 hours of uncompressed high-definition video. It's also more than three times the amount of data from all other deep-space missions combined -- not just the ones to Mars, but every mission that has flown past the orbit of Earth's moon.

"What is most impressive about all these data is not the sheer quantity, but the quality of what they tell us about our neighbor planet," said Mars Reconnaissance Orbiter Project Scientist Rich Zurek, of NASA's Jet Propulsion Laboratory, Pasadena, Calif. "The data from the orbiter's six instruments have given us a much deeper understanding of the diversity of environments on Mars today and how they have changed over time."

The spacecraft entered orbit around Mars on March 10, 2006, following an Aug. 12, 2005, launch from Florida. It completed its primary science phase in 2008 and continues investigations of Mars' surface, subsurface and atmosphere.

The orbiter sports a dish antenna 3 meters (10 feet) in diameter and uses it to pour data Earthward at up to 6 megabits per second. Its science instruments are three cameras, a spectrometer for identifying minerals, a ground-penetrating radar and an atmosphere sounder.

The capability to return enormous volumes of data enables these instruments to view Mars at unprecedented spatial resolutions. Half the planet has been covered at 6 meters (20 feet) per pixel, and nearly 1 percent of the planet has been observed at about 30 centimeters (1 foot) per pixel, sharp enough to discern objects the size of a desk. The radar, provided by Italy, has looked beneath the surface in 6,500 observing strips, sampling about half the planet.

Among the mission's major findings is that the action of water on and near the surface of Mars occurred for hundreds of millions of years. This activity was at least regional and possibly global in extent, though possibly intermittent. The spacecraft has also observed that signatures of a variety of watery environments, some acidic, some alkaline, increase the possibility that there are places on Mars that could reveal evidence of past life, if it ever existed.

JPL, a division of the California Institute of Technology, Pasadena, manages the Mars Reconnaissance Orbiter for NASA's Science Mission Directorate, Washington. Lockheed Martin Space Systems, Denver, is the spacecraft development and integration contractor for the project and built the spacecraft.

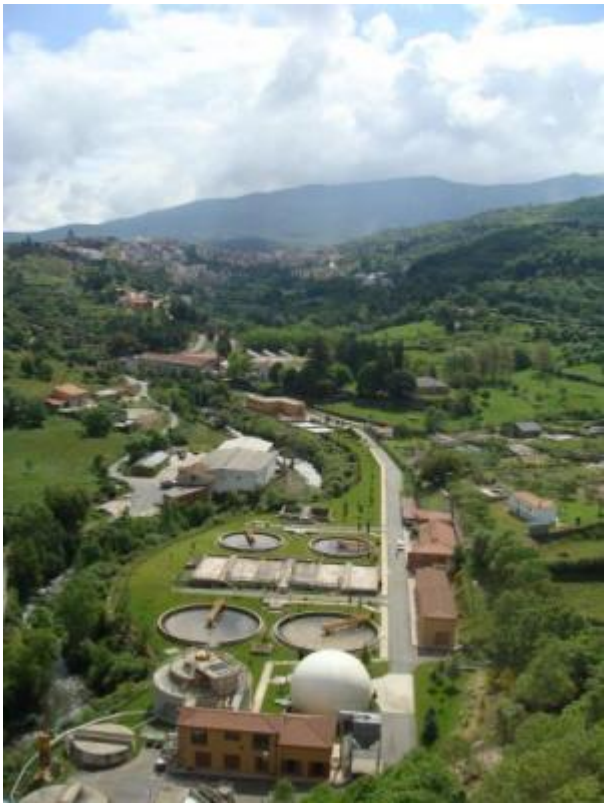
The Shallow Radar instrument was provided by the Italian Space Agency, and its operations are led by the InfoCom Department, University of Rome "La Sapienza." Thales Alenia Space Italia, in Rome, is the Italian Space Agency's prime contractor for the radar instrument. Astro Aerospace of Carpinteria, Calif., a business unit of Los Angeles-based Northrop Grumman Corp., developed the instrument's antenna as a subcontractor to Thales Alenia Space Italia.

Story Source:

Adapted from materials provided by NASA/Jet Propulsion Laboratory.
http://www.sciencedaily.com/releases/2010/03/100304184315.htm

Waste Could Generate Up to 7 Percent of Electricity in Spain

This is a sewage treatment plant of Monfragüe (Cáceres, Spain). (Credit: Naturaleza Fragüe.)



ScienceDaily (Mar. 5, 2010) — Researchers from the University of Zaragoza (UNIZAR) have calculated the energy and economic potential of urban solid waste, sludge from water treatment plants and livestock slurry for generating electricity in Spain. These residues are alternative sources of renewable energy, which are more environmentally friendly and, in the case of solid urban waste, more cost effective.

Using waste to generate electricity has economic and environmental advantages. "It gives added value to waste, because it can be seen as a type of fuel with zero cost, or even a negative cost if taxes are paid to collect it," says Norberto Fueyo, lead author of the study and a researcher at the Fluid Mechanics Group of the UNIZAR.

According to the researcher, generating electricity from waste avoids "pernicious" impacts. Waste in landfill sites releases methane and other polluting gases, so incinerating solid urban waste will reduce the volume of waste that reaches the landfill sites in the first places, as well as the implicit risks of landfills themselves (possible emission of methane into the atmosphere).

The study, published in the latest issue of the journal *Renewable Energy*, has shown that waste in Spain could generate between 8.13 and 20.95 TWh (terawatt hours). "This electricity generation was 7.2% of electricity demand in 2008," says Fueyo.

The researchers stress that the amount of methane generated from different kinds of residues is equivalent to 7.6% of gas consumption in 2008.

In terms of the economic cost, "solid urban waste is the most cost-effective," according to the researcher, because local authorities carry out the waste collection and local inhabitants pay for it. Since the waste is transported to large landfill sites or waste treatment plants, installing electricity generation systems "could take advantage of economies of scale due to the large volumes involved."

Cost depends on the heat generated

According to the study, incineration of waste and degasification of landfill sites are the electricity generation technologies with lowest financial cost. Producing electric energy through anaerobic digestion (a biological process in which organic matter decomposes into biogas in the absence of oxygen and through the action of a group of specific bacteria) is much more expensive.

"However, its profitability relies on being able to get value out of the heat generated during the process," explains Fueyo, who says this technique is "not competitive, but makes use of the heat to offset the costs of generation." However, the researchers point out that "directly applying this waste to agricultural land as fertiliser could contaminate groundwater with nitrates."

In order to evaluate the potential and the cost of generating electricity, the researchers applied the methodology in municipal areas (in the case of solid urban waste and sludge from water treatment plants) and regional areas (for livestock slurry) throughout the whole of Spain.

The work shows that the centre and south of the Iberian Peninsula, the Balearic and Canary Islands have the "greatest interest" in putting technologies into place to use solid urban waste.

In terms of using water treatment plant sludge, the coastal areas of Galicia. Valencia and Alicante, as well as central and southern Spain, were also areas of interest. The study also shows that certain areas of Aragon, Castilla-La-Mancha, Castilla-y-León, Extremadura, Galicia and Andalusia "would be effective" for using livestock slurry.

The EU 20-20-20 package

The research into electricity generation comes in response to the European Union (EU) objective to fulfil the 20-20-20 package for the year 2020, in other words to substitute 20% of the total energy consumed in Spain for energy from renewable resources, reduce CO2 emissions by 20% in comparison with 1990 figures, increase biofuels used in transport by 10%, and achieve energy savings of 20%. "For Spain, each one of these targets alone is a challenge, which becomes much bigger when they are all taken together," underscores the scientist.

Norberto Fueyo says the most problematic objective is that relating to increasing the amount of biofuels used in transport by 10%. "It is not achievable and is socially and environmentally questionable, because of the amount of land it requires and because it means using foodstuffs to produce fuel."

Even if the figure of 10% of biofuels in transport is achieved, "there will need to be an increase of around 45% in the contribution of renewables (including hydroelectric energy) to electricity generation in order to achieve a figure of 20% of renewable energy within total consumption," the expert says. The scientist adds that, in order to achieve the objective, it will be "essential" to promote energy saving and efficiency "and consider all possible sources of renewable energy, including waste."

Story Source:

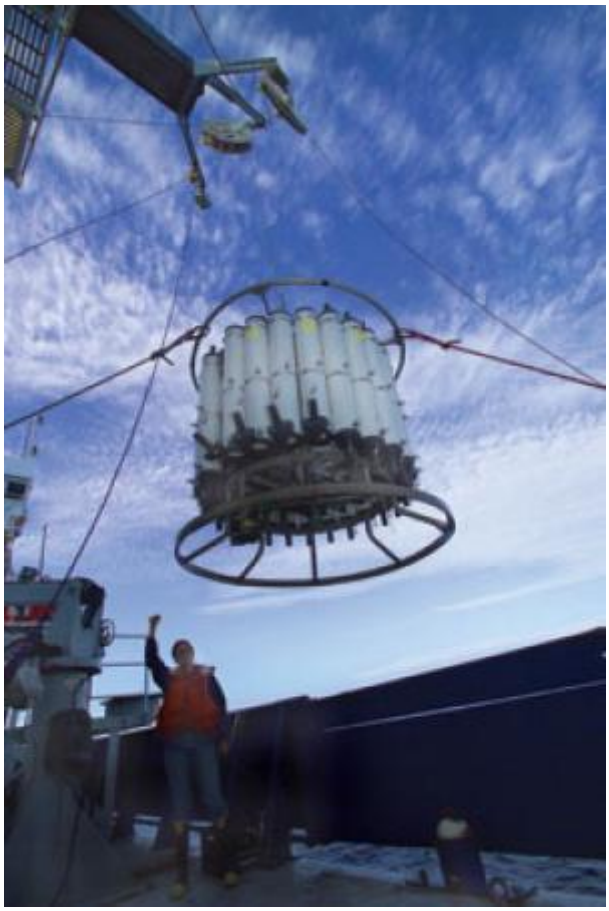
Adapted from materials provided by FECYT - Spanish Foundation for Science and Technology, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Gómez, Antonio; Zubizarreta, Javier; Rodrígues, Marcos; Dopazo, César; Fueyo, Norberto. **Potential and cost of electricity generation from human and animal waste in Spain**. *Renewable Energy*, 2010; 35 (2): 498 DOI: 10.1016/j.renene.2009.07.027

http://www.sciencedaily.com/releases/2010/02/100223100706.htm

Tracking of 2010 El Niño Reveals Marine Life Reductions



CalCOFI CTD seawater sampling such as this is augmented by data from satellites, research buoys and robotic gliders to track the physical and biological response to El Niño. (Credit: Scripps Institution of Oceanography, UC San Diego)

ScienceDaily (Mar. 4, 2010) — The ongoing El Niño of 2010 is affecting north Pacific Ocean ecosystems in ways that could affect the West Coast fishing industry, according to scientists at NOAA and Scripps Institution of Oceanography, UC San Diego.

Researchers with the California Cooperative Oceanic Fisheries Investigations (CalCOFI) at Scripps and NOAA's Southwest Fisheries Science Center report a stronger than normal northward movement of warm water up the Southern California coast, a high sea-level event in January and low abundances of plankton and pelagic fish -- all conditions consistent with El Niño.

Sea surface temperatures along the entire West Coast are 0.5 to 1 degree Celsius (0.9 to 1.8 degrees Fahrenheit) warmer than normal and at points off Southern California are as much as 1.6 degrees Celsius (2.9 degrees Fahrenheit) higher than normal. The most unusually high temperatures were mapped around Catalina and San Clemente islands. While strong winter storms caused an increase in coastal sea levels, scientists are investigating whether the higher sea levels are primarily a result of El Niño, a cyclical phenomenon characterized by warming eastern equatorial Pacific Ocean waters.

"Based on our previous experience of El Niño in California, it is likely to reduce ocean production below normal, with possible effects extending to breeding failure of seabirds, and much lower catches in the market squid fishery," said Sam McClatchie, a fisheries oceanographer at NOAA's Southwest Fisheries.

"However, predictions are never certain, and CalCOFI and NOAA ocean-observing systems will continue to provide essential monitoring of the situation."

A combination of satellite remote sensing and field measurements is offering scientists a broader view of the evolution of this El Niño that was not available during previous El Niños, which were especially strong in 1982-83 and 1997-98. Internet technology aboard CalCOFI research vessels is delivering that information faster.

"You can post data the same day it's collected," said CalCOFI information manager Jim Wilkinson of Scripps Oceanography. "It used to take six months to work up some of the data and interpret it."

NOAA Southwest Fisheries oceanographer Frank Schwing said scientists' analytical tools provide better ways to assess the strength of anomalies such as warming that are associated with El Niño.

"We're taking a much more ecosystem-based approach to managing the system," said Schwing. "Because we are more on top of the observations, we can give a more timely heads-up to scientists and managers who are interested in the effects of El Niño."

The two research centers use data collected by satellites and buoy-mounted instruments to measure sea surface temperature. CalCOFI researchers embark on quarterly cruises off the California coast to collect vertical temperature profiles in the upper reaches of the water column. They also count eggs of commercially important fishes such as sardines and anchovies as well as measure plankton volumes to estimate the amount of "production" available to marine organisms. NOAA's Advanced Survey Technologies Group assesses fish populations through acoustic surveys. In contrast with the last major El Niño, Scripps now deploys Spray gliders, diving robots that now gather ocean temperature and other data along transects between CalCOFI stations.

The NOAA and CalCOFI scientists have observed a drop in biological abundance, or productivity, that appears to be related to the northward movement of warm water from the equator. The flow arrives in pulsing Kelvin waves that are detected by sea level and altimeter monitors and coastal tidal gauges. The layer of warm water often stifles the upwelling of nutrients from lower ocean depths that sustain larger populations of fishes and invertebrates.

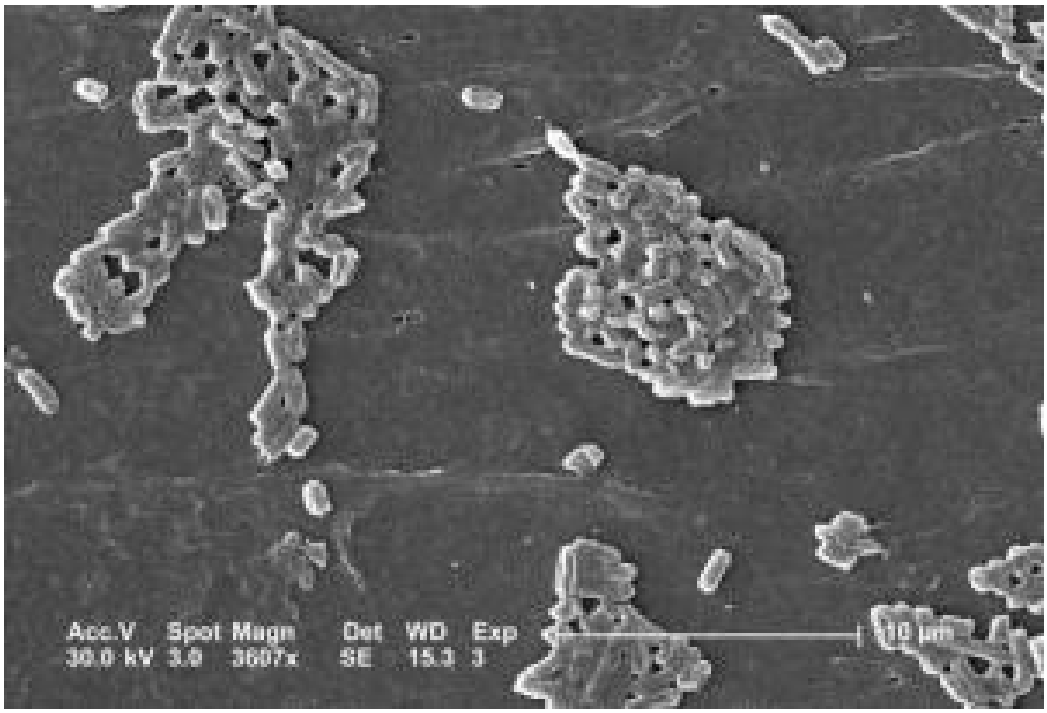
The researchers reported finding fewer hake and anchovy eggs than usual in the most recent CalCOFI surveys. Sanddab and flounder eggs dominated the samples. Most were collected in a small area east of the Channel Islands.

The scientists added that if El Niño conditions continue, they are likely to be characterized by weaker than normal upwelling and lower biological production. El Niño conditions are forecast to persist into spring. If so, greater biological anomalies than have already been observed may develop.

Story Source:

Adapted from materials provided by Scripps Institution of Oceanography / University of California - San Diego.
http://www.sciencedaily.com/releases/2010/03/100303162856.htm

Microbial Genes in Gut Outnumber Genes in Human Body



This scanning electron micrograph (SEM) depicts a number of rod-shaped Escherichia coli bacteria -- one of the many species of microbes that live in the intestines of humans and animals. (Credit: CDC/Evangeline Sowers, Janice Carr)

ScienceDaily (Mar. 4, 2010) — The thousands of bacteria, fungi and other microbes that live in our gut are essential contributors to our good health. They break down toxins, manufacture some vitamins and essential amino acids, and form a barrier against invaders. A study published in *Nature* shows that, at 3.3 million, microbial genes in our gut outnumber previous estimates for the whole of the human body.

Scientists at the European Molecular Biology Laboratory (EMBL) in Heidelberg, Germany, working within the European project MetaHIT and in collaboration with colleagues at the Beijing Genomics Institute at Shenzhen, China, established a reference gene set for the human gut microbiome -- a catalogue of the microbe genes present in the human gut. Their work proves that high-throughput techniques can be used to sequence environmental samples, and brings us closer to an understanding of how to maintain the microbial balance that keeps us healthy.

"Knowing which combination of genes is necessary for the right balance of microbes to thrive within our gut may allow us to use stool samples, which are non-invasive, as a measure of health," says Peer Bork, whose group at EMBL took part in the analysis. "One day, we may even be able to treat certain health problems simply by eating a yoghurt with the right bacteria in it."

This catalogue of the microbial genes harboured by the human gut will also be useful as a reference for future studies aiming to investigate the connections between bacterial genetic make-up and particular diseases or aspects of people's lifestyles, such as diet.

To gain a comprehensive picture of the microbial genes present in the human gut, Bork and colleagues turned to the emerging field of metagenomics, in which researchers take samples from the environment they wish to study and sequence all the genetic material contained therein. They were the first to employ a high-throughput method called Illumina sequencing to metagenomics, dispelling previous doubts over the feasibility of using this method for such studies.

From a bacterium's point of view, the human gut is not the best place to set up home, with low pH and little oxygen or light. Thus, bacteria have had to evolve means of surviving in this challenging environment, which this study now begins to unveil. The scientists identified the genes that each individual bacterium needs to survive in the human gut, as well as those that have to be present for the community to thrive, but not necessarily in all individuals, since if one species produces a necessary compound, others may not have to. This could explain another of the scientists' findings, namely that the gut microbiomes of individual humans are more similar than previously thought: there appears to be a common set of genes which are present in different humans, probably because they ensure that crucial functions are carried out. In the future, the scientists would like to investigate whether the same or different species of bacteria contribute those genes in different humans.

The research was conducted within the European project MetaHIT, coordinated by Dusko Ehrlich at the Institut National de la Recherche Agronomique, in France, with genetic sequencing carried out by Jun Wang's team at the Beijing Genomics Institute at Shenzhen, China.

Story Source:

Adapted from materials provided by European Molecular Biology Laboratory (EMBL), via AlphaGalileo.

Journal Reference:

1. Qin et al. **A human gut microbial gene catalogue established by metagenomic sequencing**. *Nature*, 2010; 464 (7285): 59 DOI: 10.1038/nature08821

http://www.sciencedaily.com/releases/2010/03/100304075703.htm

Evidence of Increasing Antibiotic Resistance in Soil Microbes

A team of scientists in the United Kingdom and the Netherlands are reporting disturbing evidence that soil microbes have become progressively more resistant to antibiotics over the last 60 years. (Credit: iStockphoto/Maria Toutoudaki)

ScienceDaily (Mar. 4, 2010) — A team of scientists in the United Kingdom and the Netherlands are reporting disturbing evidence that soil microbes have become progressively more resistant to antibiotics over the last 60 years. Surprisingly, this trend continues despite apparent more stringent rules on use of antibiotics in medicine and agriculture, and improved sewage treatment technology that broadly improves water quality in surrounding environments.

Their report appears in ACS' journal *Environmental Science and Technology*.

David Graham and colleagues note that, although scientists have known for years that resistance was increasing in clinical situations, this is the first study to quantify the same problem in the natural environment over long time-scales. They express concern that increased antibiotic resistance in soils could have broad consequences to public health through potential exposure through water and food supplies. Their results "imply there may be a progressively increasing chance of encountering organisms in nature that are resistant to antimicrobial therapy."

The study involved an analysis of 18 different antibiotic resistance genes (ARGs) to four different classes of antibiotics in soil samples collected in the Netherlands from 1940 to 2008. ARGs are genes chosen to assess potential changes in resistance in microbes. Using data from sites around the Netherlands, the scientists found increasing levels in 78 percent of the ARG tested, clearly indicating increased potential for resistance over time. Because soil samples were only collected from the Netherlands, the scientists conclude their report by suggesting that further studies need be performed around the world so that the scope and possible ramifications of their results can be better understood.

Story Source:

Adapted from materials provided by American Chemical Society.

Journal Reference:

1. Knapp et al. **Evidence of Increasing Antibiotic Resistance Gene Abundances in Archived Soils since 1940**. *Environmental Science & Technology*, 2010; 44 (2): 580 DOI: 10.1021/es901221x

http://www.sciencedaily.com/releases/2010/03/100303114003.htm

Safety Data Favor Norepinephrine Over Dopamine for Shock

ScienceDaily (Mar. 4, 2010) — Physicians treating patients with shock should consider norepinephrine instead of dopamine as a tool for stabilizing blood pressure, according to an editorial in the March 4, 2010, issue of the *New England Journal of Medicine* (NEJM).

Jerrold Levy, MD, FAHA, professor and deputy chair for research, Department of Anesthesiology, Emory University School of Medicine, and co-director of cardiothoracic anesthesiology, Emory Healthcare, authored the editorial.The editorial accompanies a report in the same issue of NEJM on a European clinical trial evaluating dopamine and norepinephrine in shock patients. The randomized trial, led by Daniel De Backer, MD, PhD, at Erasme University Hospital in Belgium, compared 28-day mortality in 1679 patients treated for shock with dopamine or norepinephrine in Austria, Belgium and Spain between 2003 and 2007.

"Dopamine has been commonly used as a first-line therapy for shock at many hospitals for years, partially because of the widespread perception that norepinephrine is associated with adverse events," Levy says. "The current study supports the concept that shock from any cause carries a high risk of death, and raises significant concerns about the safety of dopamine."Shock, or dangerously low blood pressure, can occur as a result of sepsis (severe inflammation resulting from bacterial infection), heart failure (cardiogenic), hemorrhage (severe blood loss) or anaphylaxis. Most of the patients (62.2 percent) in the European trial had septic shock, 16.7 percent had heart failure and 15.7 percent hemorrhage.

The authors of the clinical study reported no overall difference in death rates at 28 days. However, heart arrhythmias were almost twice as common in the dopamine group (24.1 percent vs 12.4 percent) and mortality was higher for patients with cardiogenic shock treated with dopamine.A previous observational study showed that dopamine's use in intensive care units added to the risk of death, and rapid heart rate is known to be a frequent side effect of dopamine, Levy notes.Norepinephrine has been used to stabilize patients' blood pressure during cardiac and non cardiac surgery, and in intensive care units after surgery. Vasopressin, although not studied in the European clinical trial, is also a viable alternative treatment for shock, Levy says.

The hormones dopamine and norepinephrine have functions in the brain, helping neurons communicate, as well as in the body to maintain vascular tone. In an emergency situation, they both can increase blood pressure by constricting blood vessels. Dopamine is the precursor to norepinephrine in the sympathetic nervous system, and thus acts indirectly."The data challenge consensus guidelines that recommend dopamine as the initial vasopressor for increasing arterial pressure in the case of septic shock or cardiogenic shock," Levy writes in the editorial."In addition, norepinephrine needs to be considered as an initial therapeutic agent for patients in circulatory shock. … The results of the study by De Backer et al should also put an end to the outdated view that the use of norepinephrine increases the risk of death."

Story Source:

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

Journal Reference:

1. De Backer, Daniel, Biston, Patrick, Devriendt, Jacques, Madl, Christian, Chochrad, Didier, Aldecoa, Cesar, Brasseur, Alexandre, Defrance, Pierre, Gottignies, Philippe, Vincent, Jean-Louis, the SOAP II Investigators. **Comparison of Dopamine and Norepinephrine in the Treatment of Shock**. *New England Journal of Medicine*, 2010; 362 (9): 779 DOI: 10.1056/NEJMoa0907118

http://www.sciencedaily.com/releases/2010/03/100303192442.htm

'Tunnel Anxiety' Can Be Reduced

From the Qinling Zhongnan tunnel in China, where artistic lighting and the "Oasis with palms and clouds on the roof" design transformed an originally rather dry and monotonous tunnel environment. (Credit: Image courtesy of SINTEF)

ScienceDaily (Mar. 4, 2010) — Many people feel insecure when they drive in tunnels. However, their anxiety can be reduced.

"Driving in tunnels is actually twice as safe as driving in the open air, when all factors are taken into account," says SINTEF scientist Gunnar Jensen.

However, a rough estimate suggests that as many as 10 -- 20 percent of the population feel uncomfortable or very uncomfortable driving in tunnels. Older people in particular tend to feel insecure.

In a previous study carried out by SINTEF, as many as 40 percent of the older age-group said that they felt extremely insecure driving in tunnels. They spoke of walls and road lanes that seemed to shrink, and of a feeling of being completely exhausted when they eventually reached the end of the tunnel.

Gunnar Jenssen believes that this may be due to the fact that elderly people tend to have poorer vision than younger people. This means that lighting conditions in tunnels play a decisive role in determining how people experience tunnels, he believes.

Design can reduce discomfort

On this background, SINTEF transport researchers have been studying the use of various ranges of colour, lighting and patterns, as well as the use of cavern spaces in tunnels. The group's driving simulator has been and still is a very aid in testing out lighting designs.

"The cavern in the tunnel is one measure that is high on our list. The trumpet-like widenings of the caverns' entrances and exits are a way of breaking up the impact of long tunnels. The 24.5 km-long Lærdal Tunnel has three well-lit caverns designed according to proposals submitted by the Kadabra Produktdesign company, researchers and the artists Arild Juul and Brit Dyrnes.

Norwegian breathing spaces in Chinese tunnel

In 2007, the lighting design from Trondheim was exported to China, and Gunnar Jenssen was project manager for "Safety and Lighting Design" when that country inaugurated the world's longest twin-tube tunnel, the Qinling Zhongnan Mountain Tunnel, in which the monotony is broken by huge caverns excavated at intervals of three to seven kilometres.

"The tunnel is 18x2 kilometres long, and to begin with it was a dry, monotonous tunnel, which was then developed in collaboration with Norwegian artists and designers into an oasis with palm-trees and clouds on the roof ," says Jenssen.

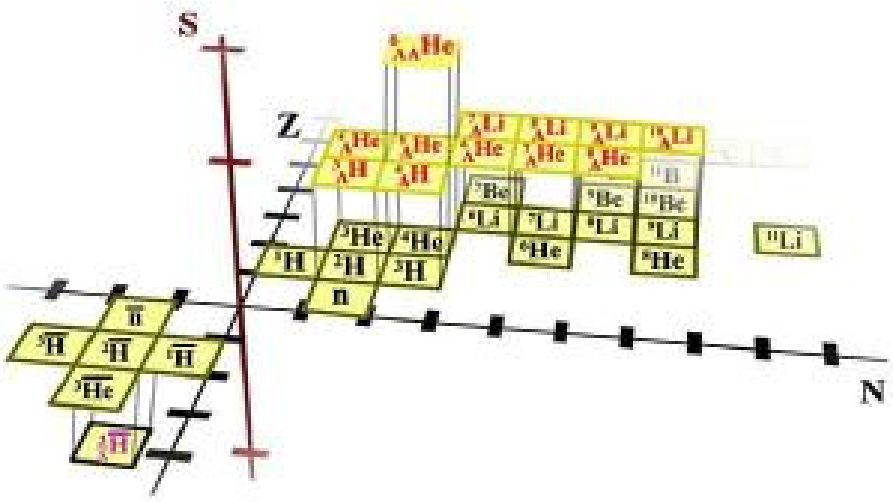
Lighting for safety

The main point is to obtain a good distribution of light, in conjunction with the use of artistic lighting, which turns out to give drivers a feeling of space and of greater security. Modern lighting systems, with two rows of lamps, light sources that illuminate the opposite direction and driving lane, are beginning to be quite common in new Chinese tunnels, and they have also been installed in the tunnel that forms part of the Øresund Link between Denmark and Sweden.

Story Source:

Adapted from materials provided by SINTEF, via AlphaGalileo.
http://www.sciencedaily.com/releases/2010/03/100304075712.htm

Heaviest Known Antinucleus Heralds New Frontier in Physics



The diagram above is known as the 3-D chart of the nuclides. The familiar Periodic Table arranges the elements according to their atomic number, Z, which determines the chemical properties of each element. Physicists are also concerned with the N axis, which gives the number of neutrons in the nucleus. The third axis represents strangeness, S, which is zero for all naturally occurring matter, but could be non-zero in the core of collapsed stars. Antinuclei lie at negative Z and N in the above chart, and the newly discovered antinucleus (magenta) now extends the 3-D chart into the new region of strange antimatter. (Credit: Image courtesy of DOE/Brookhaven National Laboratory)

ScienceDaily (Mar. 4, 2010) — An international team of scientists studying high-energy collisions of gold ions at the Relativistic Heavy Ion Collider (RHIC), a 2.4-mile-circumference particle accelerator located at the U.S. Department of Energy's (DOE) Brookhaven National Laboratory, has published evidence of the most massive antinucleus discovered to date.

The new antinucleus, discovered at RHIC's STAR detector, is a negatively charged state of antimatter containing an antiproton, an antineutron, and an anti-Lambda particle. It is also the first antinucleus containing an anti-strange quark. The results are published online by *Science Express* on March 4, 2010.

"This experimental discovery may have unprecedented consequences for our view of the world," commented theoretical physicist Horst Stoecker, Vice President of the Helmholtz Association of German National Laboratories. "This antimatter pushes open the door to new dimensions in the nuclear chart -- an idea that just a few years ago, would have been viewed as impossible."

The discovery may help elucidate models of neutron stars and opens up exploration of fundamental asymmetries in the early universe.

New nuclear terrain

All terrestrial nuclei are made of protons and neutrons (which in turn contain only *up* and *down* quarks). The standard Periodic Table of Elements is arranged according to the number of protons, which determine each element's chemical properties. Physicists use a more complex, three-dimensional chart to also convey information on the number of neutrons, which may change in different isotopes of the same element, and a quantum number known as "strangeness," which depends on the presence of strange quarks (see diagram). Nuclei containing one or more strange quarks are called hypernuclei.

For all ordinary matter, with no strange quarks, the strangeness value is zero and the chart is flat. Hypernuclei appear *above* the plane of the chart. The new discovery of strange *anti*matter with an *anti*strange quark (an antihypernucleus) marks the first entry *below* the plane.

This study of the new antihypernucleus also yields a valuable sample of normal hypernuclei, and has implications for our understanding of the structure of collapsed stars.

"The strangeness value could be non-zero in the core of collapsed stars," said Jinhui Chen, one of the lead authors, a postdoctoral researcher at Kent State University and currently a staff scientist at the Shanghai Institute of Applied Physics, "so the present measurements at RHIC will help us distinguish between models that describe these exotic states of matter."

The findings also pave the way towards exploring violations of fundamental symmetries between matter and antimatter that occurred in the early universe, making possible the very existence of our world.

Collisions at RHIC fleetingly produce conditions that existed a few microseconds after the Big Bang, which scientists believe gave birth to the universe as we know it some 13.7 billion years ago. In both nucleus-nucleus collisions at RHIC and in the Big Bang, quarks and antiquarks emerge with equal abundance. At RHIC, among the collision fragments that survive to the final state, matter and antimatter are still close to equally abundant, even in the case of the relatively complex antinucleus and its normal-matter partner featured in the present study. In contrast, antimatter appears to be largely absent from the present-day universe.

"Understanding precisely how and why there's a predominance of matter over antimatter remains a major unsolved problem of physics," said Brookhaven physicist Zhangbu Xu, another one of the lead authors. "A solution will require measurements of subtle deviations from perfect symmetry between matter and antimatter, and there are good prospects for future antimatter measurements at RHIC to address this key issue."

The STAR team has found that the rate at which their heaviest antinucleus is produced is consistent with expectations based on a statistical collection of antiquarks from the soup of quarks and antiquarks generated in RHIC collisions. Extrapolating from this result, the experimenters believe they should be able to discover even heavier antinuclei in upcoming collider running periods. Theoretical physicist Stoecker and his team have predicted that strange nuclei around double the mass of the newly discovered state should be particularly stable.

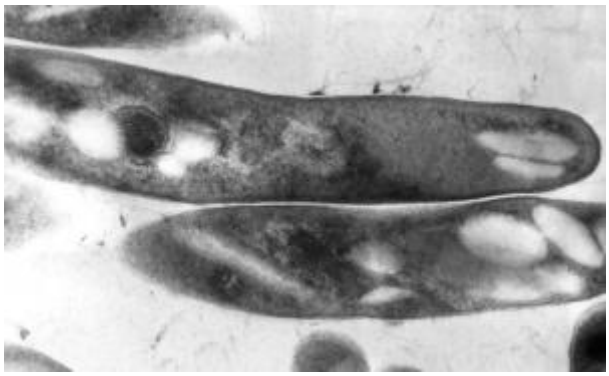
RHIC's STAR collaboration is now poised to resume antimatter studies with greatly enhanced capabilities. The scientists expect to increase their data by about a factor of 10 in the next few years.

The STAR collaboration is composed of 54 institutions from 13 countries. Research at RHIC is funded primarily by the U.S. Department of Energy's Office of Science and by various national and international collaborating institutions.

Story Source:

Adapted from materials provided by DOE/Brookhaven National Laboratory.
http://www.sciencedaily.com/releases/2010/03/100304142300.htm

Genetic Variant Offers Protection Against Tuberculosis and Leprosy



This thin section transmission electron micrograph (TEM) depicted the ultrastructural details displayed by a number of Gram-positive Mycobacterium tuberculosis bacilli, the causative agent for tuberculosis. (Credit: CDC/Elizabeth "Libby" White)

ScienceDaily (Mar. 4, 2010) — When people get exposed to the mycobacterium responsible for tuberculosis (TB), some will become sick with a disease that is a major cause of mortality around the world while others simply don't. Now, researchers reporting in the March 5th issue of the journal *Cell*, a Cell Press publication, can point to one important reason for this variation in susceptibility or resistance: genetic differences among individuals in levels of an immune enzyme (LTA4H) that is involved in the production of leukotriene B, a pro-inflammatory fatty acid immune signaling molecule.

It turns out individuals who are heterozygous for LTA4H, meaning they carry two versions of the enzyme-encoding gene and produce an average amount of the enzyme (not too little or too much), are less likely to succumb to tuberculosis. They also appear to gain protection against leprosy, a disease which is also caused by mycobacterial infection.

"TB is obviously a big problem," said Lalita Ramakrishnan of the University of Washington. "There isn't a good vaccine, notwithstanding the fact that the TB vaccine has been administered to more people than any other. On top of that, it requires long-term treatment for cure and there is an epidemic of drug-resistant TB. Increasingly, people are becoming infected with strains that are resistant to every antibiotic. On this backdrop, it made sense to go back to the drawing board and try to understand the pathogenesis of the disease."

In the new study, Ramakrishnan and her colleague David Tobin did just that, in an unbiased screen for TB susceptibility genes in the zebrafish. They then collaborated with University of Washington human geneticists Jay Vary, Thomas Hawn and Mary-Claire King and others in Vietnam and Nepal to validate their findings in human populations.

A second study in the same issue of Cell approached the question in another way. Kanury Rao and his colleagues at the International Centre for Genetic Engineering and Biotechnology in India used a genome-wide analysis to produce what now becomes a resource for TB researchers everywhere. They uncovered all of the "cellular machinery" within human macrophages -- the cells primarily targeted by TB -- that interact with the infectious mycobacteria and allow the infection to stably persist.

Rao's team uncovered 275 players within host cells that interact with each other to form a dense network. That picture allowed the researchers to make a detailed molecular-level description of what he refers to as "functional modules" within host cells that are engaged and perturbed by TB infection. Interestingly, they showed that the shape of that interaction varies depending on which isolated strain of TB one considers, suggesting that the different strains rely on somewhat different tactics for successful infection.

Rao's findings offer new leads in the fight against TB, he says. "We identify a core set of molecules which can be targeted through drug development efforts to treat both drug sensitive and multiple drug resistant forms of TB infection. Rather than targeting the pathogen itself, our studies highlight an alternate strategy wherein the host factors required to support pathogen survival can be used as targets for TB therapy."

The discovery of LTA4H as a TB susceptibility gene may have clinical implications too, even if it doesn't offer a direct path to a better vaccine, Ramakrishnan says. For one thing, the finding that medium activity of the immune enzyme is best when it comes to TB might help to explain something that has been known but not well understood in clinical circles: people with hard-to-treat TB sometimes improve when they are given anti-inflammatory, immunosuppressive therapies along with more standard drug treatments alone.

Ramakrishnan also notes that the same polymorphisms in LTA4H they uncovered were earlier linked to heart disease. That suggests that drugs that target this pathway in heart disease might be useful in the context of TB, she says.

The connection between infectious disease and heart disease also has implications for understanding the evolution of the immune system's inflammatory responses. "In general, people have thought that inflammation is a positive when it comes to fighting infection, but then it can cause modern-day disease," Ramakrishnan says. The finding that it is heterozygotes -- with intermediate activity of the immunity enzyme -- who fare best in the context of TB and leprosy suggests that in these infections also, inflammation has to be finely tuned for optimal protection.

The researchers include David M. Tobin, University of Washington, Seattle, WA; Jay C. Vary, Jr., University of Washington, Seattle, WA; John P. Ray, University of Washington, Seattle, WA; Gregory S. Walsh, Howard Hughes Medical Institute and Division of Basic Science, Fred Hutchinson Cancer Research Center, Seattle, WA; Sarah J. Dunstan, Oxford University Clinical Research Unit, Hospital for Tropical Diseases, Ho Chi Minh City, Vietnam, Oxford University, Oxford, UK; Nguyen D. Bang, Pham Ngoc Thach Hospital for Tuberculosis and Lung Disease, Ho Chi Minh City, Vietnam; Deanna A. Hagge, Mycobacterial Research Laboratory, Anandaban Hospital, Kathmandu, Nepal; Saraswoti Khadge, Mycobacterial Research Laboratory, Anandaban Hospital, Kathmandu, Nepal; Mary-Claire King, University of Washington, Seattle, WA; Thomas R. Hawn, University of Washington, Seattle, WA; Cecilia B. Moens, Howard Hughes Medical Institute and Division of Basic Science, Fred Hutchinson Cancer Research Center, Seattle, WA; and Lalita Ramakrishnan, University of Washington, Seattle, WA.

Story Source:

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

Journal References:

1. Tobin et al. **The lta4h Locus Modulates Susceptibility to Mycobacterial Infection in Zebrafish and Humans**. *Cell*, 2010; 140 (5): 717-730 DOI: 10.1016/j.cell.2010.02.013
2. Kumar et al. **Genome-wide Analysis of the Host Intracellular Network that Regulates Survival of Mycobacterium tuberculosis**. *Cell*, 2010; 140 (5): 731-743 DOI: 10.1016/j.cell.2010.02.012
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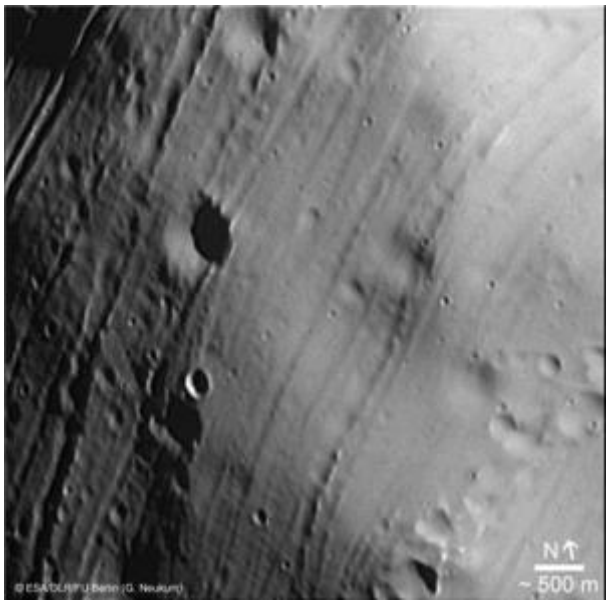
http://www.sciencedaily.com/releases/2010/03/100304121534.htm

Mars Express Phobos Flyby a Success: Unlocking Mystery of 'Second Generation' Moons



This image of Phobos's surface was obtained by the Super Resolution Channel (or SRC, a part of the High Resolution Stereo Camera experiment) on board ESA's Mars Express on 3 August 2008 (orbit 5889). The distance from the moon's centre was 656 km, and the image resolution is 6 m/pixel. The original image has been corrected for mirror distortion. (Credit: ESA/ DLR/ FU Berlin (G. Neukum))

ScienceDaily (Mar. 4, 2010) — Mars Express encountered Phobos March 3, smoothly skimming past at just 67 km, the closest any man-made object has ever approached Mars' enigmatic moon. The data collected could help unlock the origin of not just Phobos but other 'second generation' moons.

Something is not right about Phobos. It looks like a solid object but previous flybys have shown that it is not dense enough to be solid all the way through. Instead, it must be 25-35% porous. This has led planetary scientists to believe that it is little more than a 'rubble pile' circling Mars. Such a rubble pile would be composed of blocks both large and small resting together, with possibly large spaces between them where they do not fit easily together.

The flyby was close enough to give scientists their most exquisite data yet about the gravitational field of Phobos. Mars Express locked onto the radio signal from Earth at around 21:20 CET (20:20 UT). The radio frequency oscillators on the ground are 100 000 times more stable than those on the spacecraft, so for this experiment, which required the best precision possible, the signal was sent up to Mars Express and then returned by the spacecraft to the ground.

The radio waves travel at the speed of light and took 6 minutes 34 seconds to travel from Earth to the spacecraft. So the round trip time was 13 minutes 8 seconds. Once the signal was received back at Earth, it was clearly strong and good. So strong that radio amateurs were also able to lock onto the signal, although their equipment would not be able to detect the subtle variations induced by the gravity of Phobos.

Now that the data are all collected, the analysis can begin. First will be an estimate of the density variation across the moon. This will tell scientists just how much of Phobos' interior is likely to be composed of voids.

"Phobos is probably a second-generation Solar System object," says Martin Pätzold, Universitat Koln, Cologne, Germany, and Principal Investigator of the Mars Radio Science (MaRS) experiment. Second generation means that it coalesced in orbit after Mars formed, rather than forming concurrently out of the

same birth cloud as the Red Planet. There are other moons around other planets where this is thought to have been the case too, such as Amalthea around Jupiter.

Whatever the precise origin, Phobos will eventually crumble back into this disrupted state. It is gradually spiralling towards Mars and will eventually be pulled apart. "It came from debris, it will return to debris," says Pätzold. In the meantime, it is there to be studied and explored.

The flyby was just one of a campaign of 12 Mars Express flybys taking place in February and March 2010. For the previous two, the radar was working, attempting to probe beneath the surface of the moon, looking for reflections from structures inside. In the coming flybys, the Mars Express camera will take over, providing high resolution pictures of the moon's surface.

Story Source:

Adapted from materials provided by European Space Agency.
http://www.sciencedaily.com/releases/2010/03/100304112239.htm

First of Missing Primitive Stars Found

The newly discovered red giant star S1020549 dominates this artist's conception. The primitive star contains 6,000 times less heavy elements than our Sun, indicating that it formed very early in the Universe's history. Located in the dwarf galaxy Sculptor some 290,000 light-years away, the star's presence supports the theory that our galaxy underwent a "cannibal" phase, growing to its current size by swallowing dwarf galaxies and other galactic building blocks. (Credit: David A. Aguilar / CfA)

ScienceDaily (Mar. 4, 2010) — Astronomers have discovered a relic from the early universe -- a star that may have been among the second generation of stars to form after the Big Bang. Located in the dwarf galaxy Sculptor some 290,000 light-years away, the star has a remarkably similar chemical make-up to the Milky Way's oldest stars. Its presence supports the theory that our galaxy underwent a "cannibal" phase, growing to its current size by swallowing dwarf galaxies and other galactic building blocks.

"This star likely is almost as old as the universe itself," said astronomer Anna Frebel of the Harvard-Smithsonian Center for Astrophysics, lead author of the *Nature* paper reporting the finding.

Dwarf galaxies are small galaxies with just a few billion stars, compared to hundreds of billions in the Milky Way. In the "bottom-up model" of galaxy formation, large galaxies attained their size over billions of years by absorbing their smaller neighbors.

"If you watched a time-lapse movie of our galaxy, you would see a swarm of dwarf galaxies buzzing around it like bees around a beehive," explained Frebel. "Over time, those galaxies smashed together and mingled their stars to make one large galaxy -- the Milky Way."

If dwarf galaxies are indeed the building blocks of larger galaxies, then the same kinds of stars should be found in both kinds of galaxies, especially in the case of old, "metal-poor" stars. To astronomers, "metals" are chemical elements heavier than hydrogen or helium. Because they are products of stellar evolution, metals were rare in the early Universe, and so old stars tend to be metal-poor.

Old stars in the Milky Way's halo can be extremely metal-poor, with metal abundances 100,000 times poorer than in the Sun, which is a typical younger, metal-rich star. Surveys over the past decade have failed to turn up any such extremely metal-poor stars in dwarf galaxies, however.

"The Milky Way seemed to have stars that were much more primitive than any of the stars in any of the dwarf galaxies," says co-author Josh Simon of the Observatories of the Carnegie Institution. "If dwarf galaxies were the original components of the Milky Way, then it's hard to understand why they wouldn't have similar stars."

The team suspected that the methods used to find metal-poor stars in dwarf galaxies were biased in a way that caused the surveys to miss the most metal-poor stars. Team member Evan Kirby, a Caltech astronomer, developed a method to estimate the metal abundances of large numbers of stars at a time, making it possible to efficiently search for the most metal-poor stars in dwarf galaxies.

"This was harder than finding a needle in a haystack. We needed to find a needle in a stack of needles," said Kirby. "We sorted through hundreds of candidates to find our target."

Among stars he found in the Sculptor dwarf galaxy was one faint, 18th-magnitude speck designated S1020549. Spectroscopic measurements of the star's light with Carnegie's Magellan-Clay telescope in Las Campanas, Chile, determined it to have a metal abundance 6,000 times lower than that of the Sun; this is five times lower than any other star found so far in a dwarf galaxy.

The researchers measured S1020549's total metal abundance from elements such as magnesium, calcium, titanium, and iron. The overall abundance pattern resembles those of old Milky Way stars, lending the first observational support to the idea that these galactic stars originally formed in dwarf galaxies.

The researchers expect that further searches will discover additional metal-poor stars in dwarf galaxies, although the distance and faintness of the stars pose a challenge for current optical telescopes. The next generation of extremely large optical telescopes, such as the proposed 24.5-meter Giant Magellan Telescope, equipped with high-resolution spectrographs, will open up a new window for studying the growth of galaxies through the chemistries of their stars.

In the meantime, says Simon, the extremely low metal abundance in S1020549 study marks a significant step towards understanding how our galaxy was assembled. "The original idea that the halo of the Milky Way was formed by destroying a lot of dwarf galaxies does indeed appear to be correct."

Story Source:

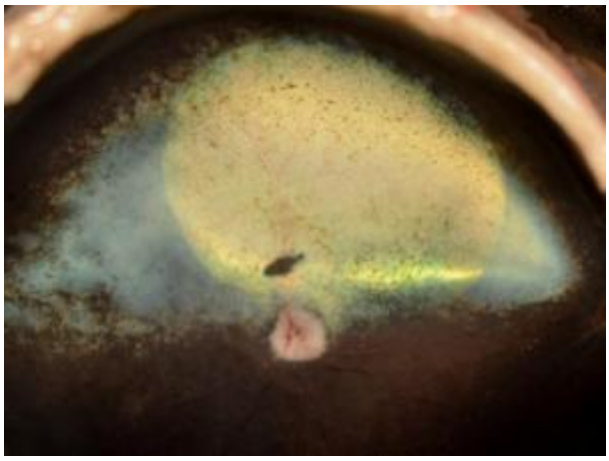
Adapted from materials provided by Harvard-Smithsonian Center for Astrophysics.

Journal Reference:

1. Anna Frebel, Evan N. Kirby & Joshua D. Simon. **Linking dwarf galaxies to halo building blocks with the most metal-poor star in Sculptor**. *Nature*, 2010; 464 (7285): 72 DOI: 10.1038/nature08772

http://www.sciencedaily.com/releases/2010/03/100303131658.htm

Second Dose of Gene Therapy for Inherited Blindness Proves Safe in Animal Studies



This is a canine retina two years post-injection. Retinal photograph taken more than two years after subretinal injection of AAV2-hRPE65v2 in the second eye of a dog model of Leber's congenital amaurosis due to RPE65 mutations. The AAV-exposed portion of the retina, with the overlying inner retinal blood vessels, appears yellow due to reflective changes in the underlying tapetum. (Credit: Daniel Chung, PhD, University of Pennsylvania School of Medicine; Science Translational Medicine)

ScienceDaily (Mar. 4, 2010) — Gene therapy for a severe inherited blindness, which produced dramatic improvements last year in 12 children and young adults who received the treatment in a clinical trial, has cleared another hurdle. The same research team that conducted the human trial now reports that a study in animals has shown that a second injection of genes into the opposite, previously untreated eye is safe and effective, with no signs of interference from unwanted immune reactions following the earlier injection.

These new findings suggest that patients who benefit from gene therapy in one eye may experience similar benefits from treatment in the other eye for Leber's congenital amaurosis (LCA), a retinal disease that progresses to total blindness by adulthood. Researchers had exercised caution by treating only one eye in the human trial.

In the current study, the study team found no evidence of toxic side effects in the blood or the eyes of the 10 animals -- six dogs and four monkeys -- that received the gene therapy. Each animal received an injection first in the right eye, then in the left eye 14 days later. All six dogs, which had been specially bred to have congenital blindness, had improved vision, in addition to showing no toxic effects from the gene therapy.

Researchers from the University of Pennsylvania School of Medicine and The Children's Hospital of Philadelphia, and colleagues from two other institutions published their study March 3 in the journal *Science Translational Medicine*. The first authors are Defne Amado, of the F.M. Kirby Center for Molecular Ophthalmology at Penn, and Federico Mingozzi, Ph.D., of the Center for Cellular and Molecular Therapeutics at Children's Hospital.

"We designed this study to investigate the immunological consequences of administering the gene therapy injection to the second eye after treating the first one," said corresponding author Jean Bennett, M.D., Ph.D., F.M. Kirby professor of Ophthalmology at Penn. "The good news is that in animals, the second injection, like the first, is benign."

As in the human trials of this gene therapy, the researchers packaged a normal version of the gene that is missing in LCA inside a genetically engineered vector, adeno-associated virus (AAV). The vector delivers the gene to cells in the retina, where the gene produces an enzyme that restores light receptors. Although the virus used does not cause human disease, it previously set off an immune response that cut

short the initial benefits of gene therapy, notably in a 2002 human trial of gene therapy for the bleeding disorder hemophilia.

"Our current study in large animals provides encouraging indications that immune responses will not interfere with human gene therapy in both eyes," said co-author Katherine A. High, M.D., a pioneer in gene therapy who helped lead the hemophilia trial. "Like humans, monkeys generate neutralizing antibodies against both naturally occurring and injected AAV, but these antibodies did not prevent the injected gene from producing the desired enzyme." High is director of the Center for Cellular and Molecular Therapeutics (CCMT) at Children's Hospital, which manufactured the vector used in the current study and the previous human trial for LCA.

In the human trial for LCA reported last year, the CHOP/Penn researchers, led by Bennett, High and retina specialist Albert M. Maguire, M.D., associate professor of Opthalmology at Penn, injected the vector into only one eye in each of their 12 patients. Because the treatment was experimental, researchers left one eye untreated in the event of unexpected complications. After the subjects experienced partially restored eyesight in their treated eyes, many were eager to receive the same treatment in the other eye. The current study advances that possibility, and the research team is planning another clinical trial of LCA gene therapy, which may include some of the subjects from the first group.

Additionally, the results may set the stage for gene therapy in LCA patients who were excluded from the previous trial. Adopting a conservative approach, the researchers did not treat patients who already had neutralizing antibodies against AAV in their blood. As many as a quarter of all people may carry these antibodies by their teenage and young adult years. Fortunately, unlike other organs, both human and animal eyes are insulated from these circulating antibodies. (Co-author Stephen Orlin, M.D., of Penn's Scheie Eye Institute, led studies of human samples and showed that even when antibodies to AAV were at high levels in the blood, antibodies within the eye remained at or near background levels). The authors conclude that the presence of those antibodies in the blood will most likely not prevent effective gene transfer in human eyes.

Funding support came from the CCMT, the Foundation Fighting Blindness sponsored CHOP-PENN Pediatric Center for Retinal Degenerations, the National Institutes of Health, Research to Prevent Blindness, Hope for Vision, the Paul and Evanina Mackall Foundation Trust at the Scheie Eye Institute, and the F.M. Kirby Foundation. Dr. High is an Investigator of the Howard Hughes Medical Institute, which also provided support.

Story Source:

Adapted from materials provided by University of Pennsylvania School of Medicine.
http://www.sciencedaily.com/releases/2010/03/100303141930.htm

Oldest Known Dinosaur Relative Discovered

Life reconstruction of Asilisaurus kongwe from the Middle Triassic of Tanzania, with the sail backed archosaur Hypselorhachis in the background. (Credit: Marlene Donnelly, Field Museum.)

ScienceDaily (Mar. 4, 2010) — Until now, paleontologists have generally believed that the closest relatives of dinosaurs possibly looked a little smaller in size, walked on two legs and were carnivorous. However, a research team including Randall Irmis, curator of paleontology at the Utah Museum of Natural History and assistant professor in the Department of Geology and Geophysics at the University of Utah has made a recent discovery to dispel this hypothesis.

The team announced the discovery of a proto-dinosaur (dinosaur-like animal) -- a new species called *Asilisaurus kongwe* (a-SEE-lee-SOAR-us KONG-way), derived from asili (Swahili for ancestor or foundation), sauros (Greek for lizard), and kongwe (Swahili for ancient). The first bones of *Asilisaurus* were discovered in 2007, and it is the first proto-dinosaur recovered from the Triassic Period in Africa. *Asilisaurus* shares many characteristics with dinosaurs but falls just outside of the dinosaur family tree -- living approximately 10 million years earlier than the oldest known dinosaurs.

The description of the new species *Asilisaurus kongwe* appears in the March 4 issue of the journal *Nature* in a paper co-authored by an international team, including Irmis, Sterling Nesbitt, a postdoctoral researcher at the University of Texas at Austin's Jackson School of Geosciences, Christian A. Sidor (Burke Museum and University of Washington), Kenneth D. Angielczyk (The Field Museum, Chicago), Roger M.H. Smith (Iziko South African Museum, South Africa), and Linda A. Tsuji (Museum für Naturkunde and Humboldt-Universität zu Berlin, Germany).

Fossil bones of at least 14 individuals were recovered from a single bone bed in southern Tanzania making it possible to reconstruct nearly the entire skeleton, except portions of the skull and hand. The individuals stood about 1.5 to 3 feet (0.5 to 1 meter) tall at the hips and were 3 to 10 feet (1 to 3 meters) long. They weighed about 22 to 66 pounds (10 to 30 kilograms), walked on four legs, and most likely ate plants or a combination of plants and meat.

"The crazy thing about this new dinosaur discovery is that it is so very different from what we all were expecting, especially the fact that it is herbivorous and walked on four legs, said Irmis, who was involved in the researching the discovery over the past three years.

Asilisaurus kongwe is part of a newly recognized group known as silesaurs. "We knew that there were a number of species from the Triassic that were similar to *Asilisaurus*," said Irmis, "but we were only able to recognize that they formed this group called silesaurs with the new anatomical information from

Asilisaurus." Members of the silesaur group were distributed across the globe during the Triassic, when all of the continents were together in a supercontinent called Pangaea.

Silesaurs are the closest relatives of dinosaurs, analogous to the close relationship of humans and chimps. Even though the oldest dinosaurs discovered so far are only 230 million years old, the presence of their closest relatives 10 million to 15 million years earlier implies that silesaurs and the dinosaur lineage had already diverged from a common ancestor by 245 million years ago. Silesaurs continued to live side by side with early dinosaurs throughout much of the Triassic Period (between about 250 million and 200 million years ago). The researchers conclude that other relatives of dinosaurs, such as pterosaurs (flying reptiles) and small forms called lagerpetids, might have also originated much earlier than previously thought.

Silesaurs have triangular teeth and a lower jaw with a beak-like tip, suggesting that they were specialized for an omnivorous and/or herbivorous diet. These same traits evolved independently in at least two dinosaur lineages (ornithischians and sauropodomorphs). In all three cases, the features evolved in animals that were originally meat-eaters. Although difficult to prove, it's possible that this shift conferred an evolutionary advantage. The researchers conclude that the ability to shift diets may have lead to the evolutionary success of these groups.

"The research suggests that at least three times in the evolution of dinosaurs and their closest relatives, meat-eating animals evolved into animals with diets that included plants," said Irmis. "These shifts all occurred in less than 10 million years, a relatively short time by geological standards, so we think that the lineage leading to silesaurs and dinosaurs might have had a greater flexibility in diet, and that this could be a reason for their success."

This new species (*Asilisaurus*) is found along with a number of primitive crocodilian relatives in the same fossil beds in southern Tanzania. The presence of these animals together at the same time and place suggests that the diversification of the relatives of crocodilians and dinosaurs was rapid, and happened earlier than previously suggested. It sheds light on a group of animals that later came to dominate terrestrial ecosystems throughout the Mesozoic Era (250 million to 65 million years ago).

"This new research suggests that there are more groups of animals yet to be discovered in this early period of dinosaur relatives," said Irmis. "It's very exciting because the more we learn about the Triassic Period, the more we learn about the origin of the dinosaurs and other groups."

Funding for the research was provided by the National Geographic Society, Evolving Earth Foundation, Grainger Foundation, and the National Science Foundation.

Story Source:

Adapted from materials provided by University of Utah.

Journal Reference:

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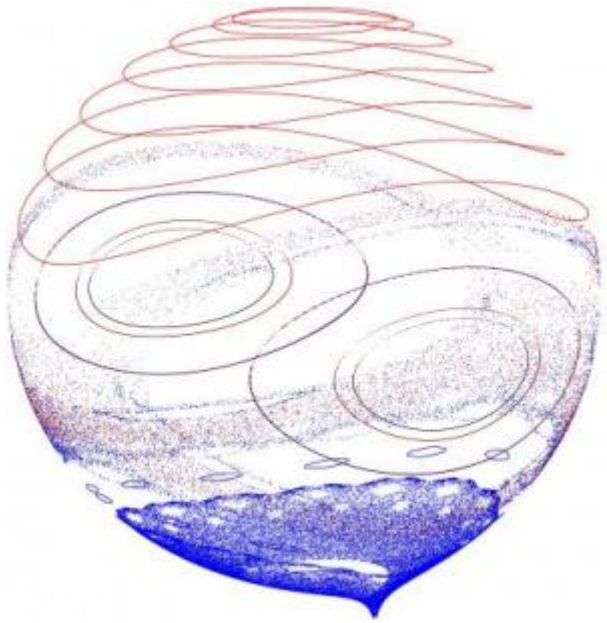
http://www.sciencedaily.com/releases/2010/03/100303131530.htm

Understanding Chaotic Motion of a Solid Body in a Fluid



So-called "Poincaré sections" were used to diagnose chaos in the body-flow interaction study of Johan Roenby of the Technical Univeristy of Denmark and Hassan Aref of Virginia Tech. The regular curves correspond to motions with minimal chaos. The "fuzzy" regions indicate that the chaotic regime has been entered. (Credit: Johan Roenby)

ScienceDaily (Mar. 4, 2010) — Virginia Tech Engineering Science and Mechanics Professor Hassan Aref, and his colleague Johan Roenby at the Technical University of Denmark shed new light on the chaotic motion of a solid body moving through a fluid. They claim to have discovered two basic mechanisms that lead to chaotic motion of the body as it interacts with its vortex wake. The work described In a paper appearing in the Feb. 24 issue of the *Proceedings of the Royal Society of London A*, may lead to better understanding and control of real body-vortex interactions.

Although it goes back to the work of Henri Poincaré at the end of the 19th century, chaos emerged in earnest as a new concept in science in the 1960s. Scientists then realized that even very simple systems, governed by perfectly deterministic laws, could have very complicated and seemingly random behavior. Anyone who has played with dice literally has had hands-on experience with the high sensitivity to initial conditions exhibited by a chaotic system. This makes long-term prediction of the system's evolution virtually impossible, Aref and Roenby explained.

It has long been known that the motion of a solid object through a fluid may be chaotic. Mechanisms that lead to chaotic motion in such systems are important, sometimes because one wants to avoid them, at other times because one wants to exploit them. For instance, when designing aircraft, one strives to prevent chaotic motion, whereas it might be a good strategy for a prey trying to escape a predator to enter a regime of erratic, unpredictable motion.

Fluid-body interactions are not very well understood. It is, however, reasonably well established that the delicate interplay between the body and the vortices shed from it, and present in the fluid, plays a key role. For example, it may be shown that if the motion is strictly two-dimensional and there are no vortices, chaos cannot occur. Chaos can occur for three-dimensional motion of a solid body through a fluid even in the absence of vortices.

To understand how vortices may create chaos in the body motion, Aref and Roenby studied a simplified body-vortex interaction model. The simplicity of the model allowed the scientists to take well-known,

non-chaotic solutions as the starting point and then slowly increase the influence of parameters that would cause chaos to occur. It was by triggering the chaos in this controlled manner that the authors discovered two sources of chaos in the model.

The work "shows how a chaotic region grows from a specific type of equilibrium," the authors claimed. Aref and Roenby knew from classical hydrodynamics that a body in an "unbounded, ideal liquid has a limiting motion between the rocking and tumbling regime. Adding a vortex to this effectively acts as a random torque on the body." This is one mechanism for chaos. The other chaotic regime arises when the body is made slightly non-circular. For certain parameter regimes this renders the vortex motion, and thereby its force on the body, chaotic. "The kind of parametric scans we have performed may give important clues as to which geometries and parameter regimes to avoid, if one wants to prevent chaotic motion," the authors said.

As Aref, Roenby and others unravel the forces that come into play when vortices are produced through interaction between a solid body and the fluid surrounding it, they are furthering the understanding of aerodynamic and hydrodynamic forces, the drag and lift that are paramount in virtually all motion of bodies through air or water.

Story Source:

Adapted from materials provided by Virginia Tech.

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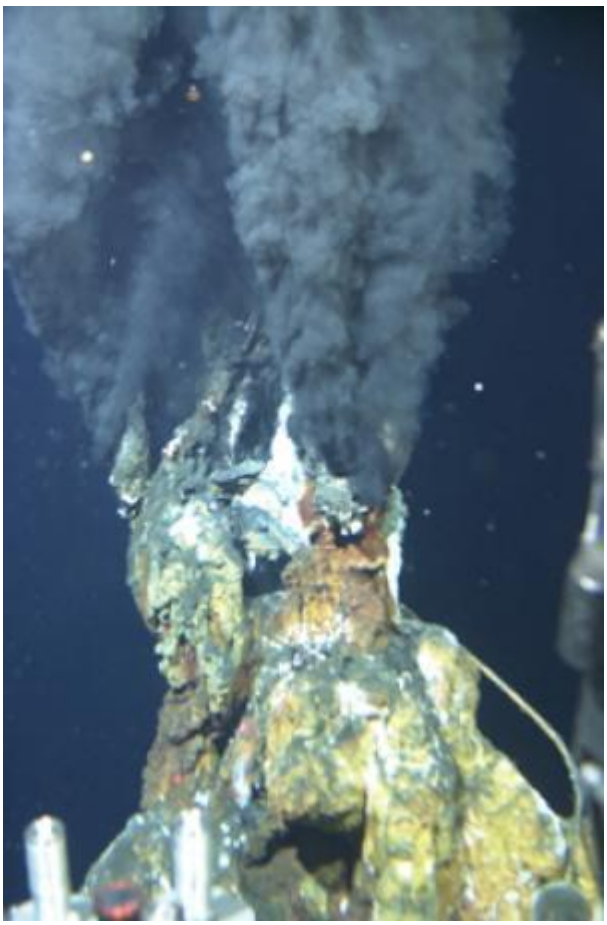
Hydrothermal Vents Discovered Off Antarctica

A vent spews chemical fluids from the East Pacific Rise, about 5,600 miles from newly suspected vents on the Pacific Antarctic Ridge. (Credit: Woods Hole Oceanographic Institution.)



ScienceDaily (Mar. 4, 2010) — Scientists at Columbia's Lamont-Doherty Earth Observatory have found evidence of hydrothermal vents on the seafloor near Antarctica, formerly a blank spot on the map for researchers wanting to learn more about seafloor formation and the bizarre life forms drawn to these extreme environments.

Hydrothermal vents spew volcanically heated seawater from the planet's underwater mountain ranges -- the vast mid-ocean ridge system, where lava erupts and new crust forms. Chemicals dissolved in those vents influence ocean chemistry and sustain a complex web of organisms, much as sunlight does on land. In recent decades more than 220 vents have been discovered worldwide, but so far no one has looked for them in the rough and frigid waters off Antarctica.

From her lab in Palisades, N.Y., geochemist Gisela Winckler recently took up the search. By analyzing thousands of oceanographic measurements, she and her Lamont colleagues pinpointed six spots on the remote Pacific Antarctic Ridge, about 2,000 miles from New Zealand, the closest inhabited country, and 1,000 miles from the west coast of Antarctica, where they think vents are likely to be found. The sites are described in a paper published in the journal *Geophysical Research Letters.*

"Most of the deep ocean is like a desert, but these vents are oases of life and weirdness," said Winckler. "The Pacific Antarctic ridge is one of the ridges we know least about. It would be fantastic if researchers were to dive to the seafloor to study the vents we believe are there."

Two important facts helped the scientists isolate the hidden vents. First, the ocean is stratified with layers of lighter water sitting on top of layers of denser water. Second, when a seafloor vent erupts, it spews gases rich in rare helium-3, an isotope found in earth's mantle and in the magma bubbling below the vent. As helium-3 disperses through the ocean, it mixes into a density layer and stays there, forming a plume that can stretch over thousands of kilometers.

The Lamont scientists were analyzing ocean-helium measurements to study how the deep ocean exchanges dissolved gases with the atmosphere when they came across a helium plume that looked out of place. It was in a southern portion of the Pacific Ocean, below a large and well-known helium plume coming off the East Pacific Rise, one of the best-studied vent regions on earth. But this mystery plume appeared too deep to have the same source.

Suspecting that it was coming from the Pacific Antarctic Ridge instead, the researchers compiled a detailed map of ocean-density layers in that region, using some 25,000 salinity, temperature and depth measurements. After locating the helium plume along a single density layer, they compared the layer to topographic maps of the Pacific Antarctic Ridge to figure out where the plume would intersect.

The sites they identified cover 340 miles of ridge line--the approximate distance between Manhattan and Richmond, Va.--or about 7 percent of the total 4,300 mile-ridge. This chain of volcanic mountains lies about three miles below the ocean surface, and its mile-high peaks are cut by steep canyons and fracture zones created as the sea floor spreads apart. It is a cold and lonely stretch of ocean, far from land or commercial shipping lanes.

"They haven't found vents, but they've narrowed the places to look by quite a bit," said Edward Baker, a vent expert at the National Oceanic and Atmospheric Administration.

Of course, finding vents in polar waters is not easy, even with a rough idea where to look. In 2007, Woods Hole Oceanographic Institution geophysicist Rob Reves-Sohn led a team of scientists to the Gakkel Ridge between Greenland and Siberia to look for vents detected six years earlier. Although they discovered regions where warm fluids appeared to be seeping from the seafloor, they failed to find the high-temperature, black smoker vents they had come for. In a pending paper, Sohn now says he has narrowed down the search to a 400-kilometer-square area where he expects to find seven new vents, including at least one black smoker.

The search for vents off Antarctica may be equally unpredictable, but the map produced by the Lamont scientists should greatly improve the odds of success, said Robert Newton, a Lamont oceanographer and study co-author. "You don't have to land right on top of a vent to know it's there," he said. "You get a rich mineral soup coming out of these smokers -- methane, iron, manganese, sulphur and many other minerals. Once you get within a few tens of kilometers, you can detect these other tracers."

Since the discovery of the first hydrothermal vents in the late 1970s, scientists have searched for far-flung sites, in the hunt for new species and adaptive patterns that can shed light on how species evolved in different spots. Cindy Van Dover, a deep sea biologist and director of the Duke University Marine Laboratory, says she expects that new species will be found on the Pacific Antarctic Ridge, and that this region may hold important clues about how creatures vary between the Indian and Pacific Oceans, on either end.

"These vents are living laboratories," said Van Dover, who was not involved in the study. "When we went to the Indian Ocean, we discovered the scaly-foot gastropod, a deep-sea snail whose foot is covered in armor made of iron sulfides. The military may be interested in studying the snail to develop a better armor. The adaptations found in these animals may have many other applications."Other study authors include Peter Schlosser, head of Lamont's Environmental Tracer Group and Lamont marine geologist Timothy Crone.

Story Source:

Adapted from materials provided by The Earth Institute at Columbia University.

Journal Reference:

1. Winckler, G., R. Newton, P. Schlosser, and T. J. Crone. **Mantle helium reveals Southern Ocean hydrothermal venting**. *Geophysical Research Letters*, 2010; 37 (5): L05601 DOI: 10.1029/2009GL042093

http://www.sciencedaily.com/releases/2010/03/100303114012.htm

More, Better Biodiesel

The safflower is one of the plants can be made into a fuel cocktail that performs better at low temperatures than conventional biodiesel. (Credit: Jack Kelly Clark/UC Division of Agriculture and Natural Resource)

ScienceDaily (Mar. 4, 2010) — Yields of biodiesel from oilseed crops such as safflower could be increased by up to 24 percent using a new process developed by chemists at UC Davis. The method converts both plant oils and carbohydrates into biodiesel in a single process, and should also improve the performance characteristics of biodiesel, especially in cold weather.

A paper describing the method, which has been patented, is online in the journal *Energy & Fuels.*

Conventional biodiesel production extracts plant oils and then converts them into fatty acid esters that can be used to power engines, said Mark Mascal, professor of chemistry at UC Davis and co-author of the paper with postdoctoral researcher Edward Nikitin. That leaves behind the carbohydrate portion of the plant -- the sugars, starches, and cellulose that make up stems, leaves, seed husks and other structures.

The new process converts those carbohydrates into chemicals called levulinic acid esters -- at the same time and in the same vessel that the oils are converted to fatty acid esters -- resulting in a fuel cocktail that performs better at low temperatures than conventional biodiesel.

The fuel cocktail has a similar boiling range to conventional biodiesel, but is thinner; it becomes waxy at a lower temperature. Performance at low temperatures is a significant problem with B100 (conventional biodiesel), Mascal said.

"Our hope is that this blend of levulinate esters and biodiesel would perform better over a wider range of temperatures than biodiesel," Mascal said.

Levulinate esters are nontoxic and are used as food additives, Mascal said.

Costs of the new process may be somewhat higher than for conventional biodiesel production, but should be offset by improved fuel yields and performance, he said.

The researchers are partnering with Bently Biofuels of Minden, Nev., to test the performance of levulinate/B100 blends.

Story Source:

Adapted from materials provided by University of California - Davis.
http://www.sciencedaily.com/releases/2010/02/100219135419.htm