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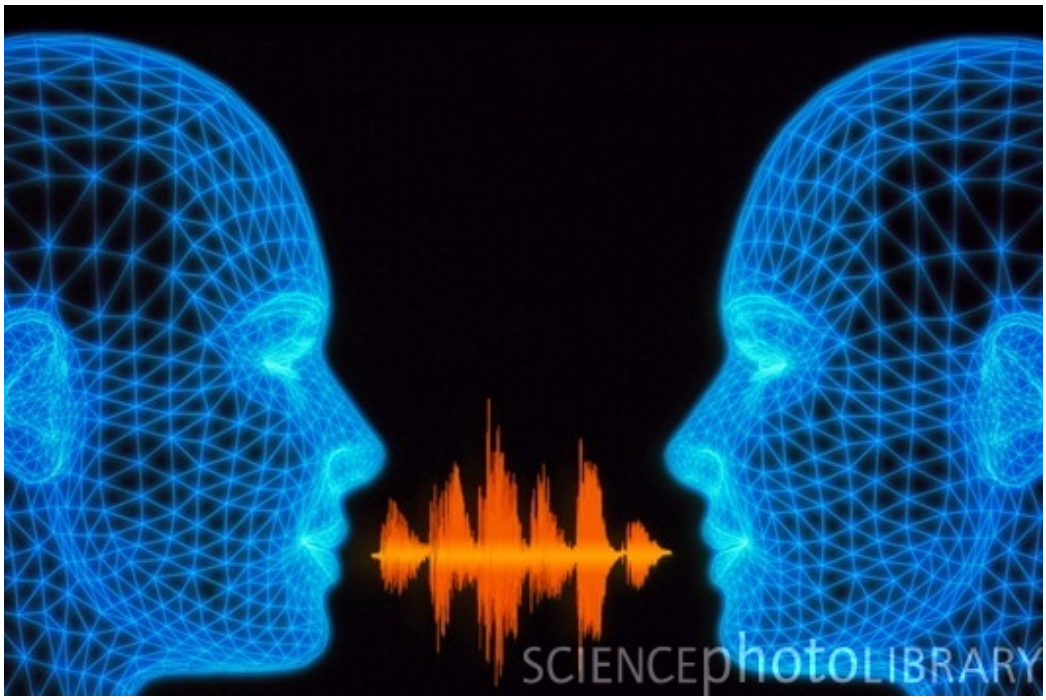
A software application recognizes human emotions from conversation analysis
08 November 2010 Facultad de Informática de la Universidad Politécnica de Madrid



Credit: PASIEKA / SCIENCE PHOTO LIBRARY Caption: Speech. Conceptual computer artwork representing speech. An electrical wave (orange) corresponds to the sound waves (voices) produced by the wire- frame human heads (blue)

Researchers from the Universidad Politécnica de Madrid's Facultad de Informática have developed an application capable of human emotion recognition from automated voice analysis.

The application analyses the sound measurements of a conversation, output by another purpose-built program. Then, based on the rules described in the new application, it is able to identify the emotions hidden in an expression and determine whether the speaker is sad, happy or nervous. Even if the emotion is unclear, the application is able to specify how close the speaker is to each emotion in percentage terms. The application was presented by Susana Muñoz Hernández at the First International Conference on Fuzzy Computation, held in Madeira, Portugal, in 2009.

The application is based on a new tool called RFuzzy, implemented in the Prolog programming language. Prolog is able to represent and operate with what is known as fuzzy logic. Prolog is used primarily in artificial intelligence and expert systems applications.

RFuzzy is a programming support, which stands out for its ease of use and its expressivity. It is able to represent, handle and reason with subjective concepts like high, low, fast, slow, etc.

Apart from being applied to detect emotions in human conversations, RFuzzy has also been used to enhance robot intelligence. In this particular case, RFuzzy was used to program robots participating in the world robot

soccer league (RoboCupSoccer), which has been held since 1996 with the aim of developing robotics and artificial intelligence. The experience was outlined in the book Robot Soccer, Inteh, Croatia, 2010, edited by Vladan Papic.

Being based on fuzzy logic, RFuzzy has important benefits for both conversation analysis and the enhancement of championship soccer robot behaviour. Its logical mechanisms are flexible and it leaves some margin of interpretation to the computer. The computer will then make the decision depending on a series of logical rules that take measurable parameters (volume, speech pitch and rate, position, speed or distance of the robot from the ball, etc.) as a reference.

The details of this research are to be published shortly in the INS- Information Science journal and can be consulted online at Science Direct.
http://www.fi.upm.es/?id=tablon&acciongt=consulta1&idet=659

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89174&CultureCode=en

The economic causes and consequences of envy

08 November 2010 Universidad Carlos III de Madrid - Oficina de Información Científica

There are powerful evolutionary reasons for being envious. This is what a study analyzing the economic causes and consequences of the envy, carried out by a Universidad Carlos III de Madrid (UC3M) researcher, has revealed.

The use of experimental techniques in Economics in recent years has demonstrated that decision making of individuals' is guided not only by an individual's own benefit, but also by material gains that other individuals can have in their social network; in a nutshell, out of envy. But within this research framework there is still another challenge: the discovery of the evolutionary origin of envy and theoretical proof of its possible effects on companies. This is what Antonio Cabrales, Full Professor of the UC3M Economics Department, has tried to do in a new research study, recently published in SERIEs, the journal of the Spanish Economic Association.

The concept of envy used in this study is that which is known in technical terms as "inequality aversion". That is, those individuals are willing to spend resources of all kinds (monetary, effort, etc.) as long as differences in material well-being with respect to other people are reduced. In this scientific article, envy is explained as something which is the result of competition for limited resources. "What the article demonstrates is that there are powerful evolutionary reasons for being envious, and as such, these reasons are encoded in our genes", stated Professor Cabrales.

According to this hypothesis, envy could have its origin in the fact that the resources obtained from work, for example, are used afterwards in some type of interpersonal conflict, such as when selecting the best partner or dominating the herd. In these cases, it is important to have accumulated more resources that the other, so that victory not only depends on having a lot, but on having more than the other. "For this reason it is important

that education and professional training correct these tendencies because of their potentially dreadful consequences for the individuals and the group, as they have done from the Ten Commandments to Shakespeare's Othello", he recalled.

The largest part of this study is theoretical and it has employed game theory techniques applied to the problems of interpersonal and intertemporal decisions presented. In addition, an experimental part was also carried out to analyze the effects of envy on actual subjects. For that purpose, a group of undergraduate students were placed in a computing laboratory in order to make decisions that had concrete monetary effects for them and at the same time for other people. Finally, this research has delved into the analysis of data used in the labour market, to try to discern how envy affects different variables regarding hiring, salaries, movement between companies, etc.

One of the things that this study points out is that there are many phenomena in the labour market which are easier to understand once envy is taken into account. For example, internal promotions, or the salary range of workers in companies are more compressed than one would think, if one takes into account individual productivity. "The effects of envy", Professor Cabrales pointed out, "can be observed in the compression of the salary scales, in promotions that are slower than would be recommended based on efficiency, and in which the most highly qualified leaving a company can have serious effects on those who stay", he concluded.

http://www.uc3m.es/portal/page/portal/actualidad_cientifica/noticias/economic_envy

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89189&CultureCode=en

Fat cells reach their limit and trigger changes linked to type 2 diabetes
08 November 2010 Biotechnology and Biological Sciences Research Council (BBSRC)

Credit: JIM DOWDALLS / SCIENCE PHOTO LIBRARY Caption: An illustration of Type 2 diabetes, a disease characterized by insulin resistance. Insulin is produced by islet cells in the pancreas, and acts in unison with glucose to regulate energy in the body's cells. In Type 2 diabetes, not enough insulin is produc

Scientists have found that the fat cells and tissues of morbidly obese people and animals can reach a limit in their ability to store fat appropriately. Beyond this limit several biological processes conspire to prevent further expansion of fat tissue and in the process may trigger other health problems.

Research funded by the Biotechnology and Biological Sciences Research Council (BBSRC), the Medical Research Council (MRC) and the European Union Sixth Framework Programme, shows that a protein called secreted frizzled-related protein 1 (SFRP1) is produced by fat cells and may be involved in changes to our metabolism that could increase the risk of diabetes and cardiovascular disease. The work was carried out at the University of Cambridge and will be published in a future edition of the International Journal of Obesity Research.

Professor Antonio Vidal-Puig from the Institute of Metabolic Science, University of Cambridge said "We have known for some time that many obese individuals are at greater risk of developing diabetes, cardiovascular disease and also cancer. But this is not true for all obese people."

Dr Jaswinder Sethi, also from the Institute of Metabolic Sciences, University of Cambridge added "What we still do not fully understand, is how the expansion of fat tissue is regulated in healthy people and how this process of regulation might be different in those obese people who have health problems such as the

metabolic syndrome."

One hypothesis is that storing surplus fat in itself may not lead to metabolic syndrome but there may be a maximum limit of how much fat a person can store safely before the body's natural responses lead to the debilitating chronic health problems often associated with obesity.

Dr Sethi continued "To investigate this we have been using a combination of molecular cell biology, human gene profiling and mouse genetics as tools to understand what is happening as fat cells and tissues develop and then, in some very obese people, lose their normal process of regulation."

The researchers have found that the level of SFRP1 increases as fat cells and tissues increase in volume until it peaks at about the point of mild obesity. There is evidence that SFRP1 is involved in recruiting new fat cells, thereby facilitating the expansion of fat tissue up until this point where it peaks.

"SFRP1 seems to be very closely linked to some sort of tipping point, after which the way in which our fat tissue is regulated changes significantly and there are knock-on consequences to our wider metabolism. We think that in very obese people this may be an early event that triggers metabolic syndrome and the chronic health problems associated with it, such as diabetes and cardiovascular disease," said Dr Sethi.

The fat tissue of people who are obese and also have diabetes shows signs of not being regulated as it usually would be. In this tissue, the researchers also see the levels of SFRP1 begin to fall so as to prevent further expansion of the tissue. It is this fall in SFRP1 that has knock-on effects on metabolism that may in part explain the link between morbid obesity and metabolic syndrome.

The researchers believe that SFRP1 works in concert with other molecules to respond to the availability, or not, of energy. Together these molecules also determine to what extent our fat tissue can continue to expand as we consume more calories than we burn.

Professor Douglas Kell, BBSRC Chief Executive said: "Research such as this leads to better understanding of the biochemistry that drives normal human physiology. In particular we can see how we usually respond to extremes brought on by the various onslaughts of our lifestyles and environments. Increasing our understanding of the fundamentals of metabolic signalling is an important part of working towards an increase in health span to match our increasing life spans."
http://www.bbsrc.ac.uk

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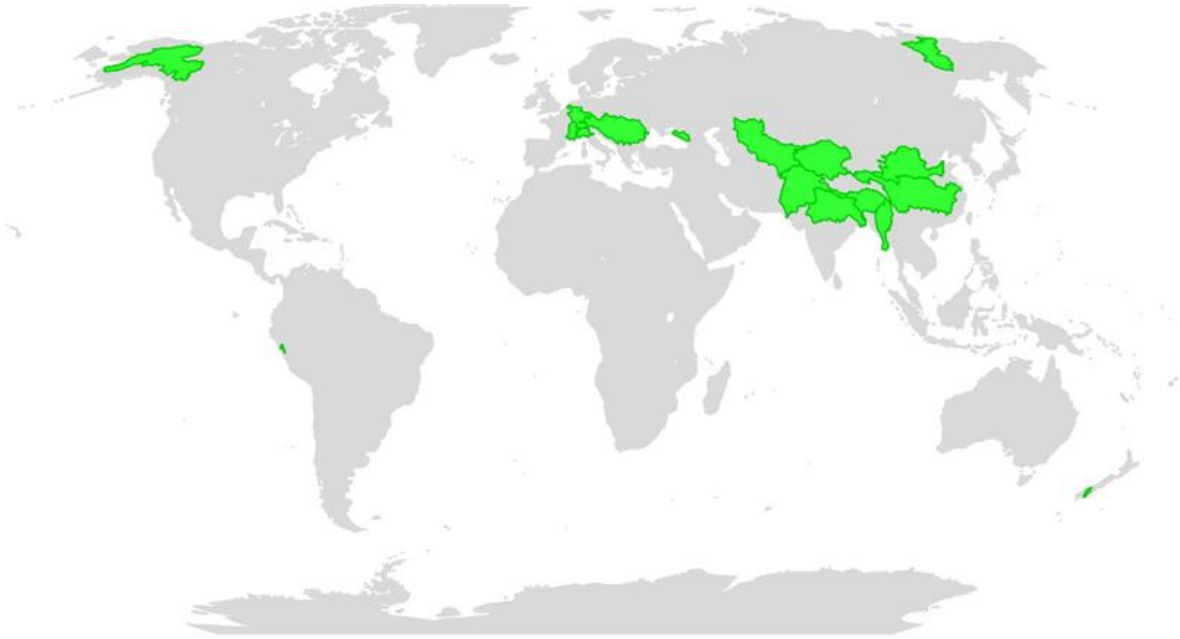
Climate Change: Water Reservoir Glacier - Climatologists demand a differentiated discussion

08 November 2010 University of Innsbruck



The researchers investigated the whole river basin region of certain glaciers in the Himalayas, the Andes, the Caucasus Mountains, Siberia, North America and New Zealand. (Uni Innsbruck)

Glaciers of large mountain regions contribute, to some extent considerably, to the water supply of certain populated areas. However, in a recent study conducted by Innsbruck glaciologists and climatologists it has been shown that there are important regional differences. The results of the study are published in the scientific journal *Proceedings of the National Academy of Sciences (PNAS)*.
In their recently published study the glaciologists and climatologists, headed by Prof. Georg Kaser and Dr. Ben Marzeion from the Institute of Geography of the University of Innsbruck, have demonstrated that the contribution potential of glaciers to the water supply of populated areas varies regionally. The scientists gathered data on the amount of precipitation on certain glaciers and calculated when the water is discharged and available in populated areas. “There is a big difference in whether the water is discharged in an arid period or in a period, when there usually is a lot of precipitation, e.g. in monsoon regions in Asia,“ explains Ben Marzeion. “And there are regions, for instance around the Aral Sea, where precipitation happens in the mountain regions in winter. The glacier melt water runoff in summer is vital for the population living in this area.“ The Innsbruck researchers modeled estimates that show human dependence on glacier melt in a certain region. They demonstrate that high-mountain communities are highly dependent on glacier melt water but the population density is usually relatively low in these regions. “The impact is a lot more dramatic in mid latitude river basins, where the population density is a lot higher and glacier melt still contributes to the available water reservoir to a large extent,“ the climatologists explain.
Regional differences
The incentive of the study was the widespread discussion about the impact of climate change on water availability in highly populated regions. “In the last few years numbers have been named that do not pass a closer examination,“ says glaciologist and climatologist Georg Kaser. “It is an exaggeration when it is claimed that the melting of glaciers endangers the water supply of 2 billion people.” With their study the

Innsbruck scientists want to draw attention to the considerable regional differences regarding the problem of future water supply. “By all means, the expected climatic development may have detrimental effects for smaller high-mountain communities.“
The data for the study was obtained from the World Glacier Inventory, global temperature and precipitation data and the Global Digital Elevation Model. The researchers investigated the whole river basin region of certain glaciers in the Himalayas, the Andes, the Caucasus Mountains, Siberia, North America and New Zealand. “In principle, this is a simple research approach, which, nevertheless, provides us with important arguments for a more differentiated discussion in climate research,“ says Georg Kaser, who is pleased about the results of the study, which has been published in the renowned scientific journal *Proceedings of the National Academy of Sciences (PNAS)*. “With regard to the next report issued by the Intergovernmental Panel on Climate Change (IPCC), our data can be seen as the basis for regionally more precise estimations and they show that the impact of the expected climate change may be higher in some regions than in others,” says Kaiser.

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Elastic electronics: Rules for fabrication of ordered monolayers of semiconducting polymers have been established

08 November 2010 Institute of Physical Chemistry of the Polish Academy of Sciences

Selforganization of thin layer of polymers investigated by means of scanning tunneling microscopy (STM) in the Institute of Physical Chemistry of the Polish Academy of Sciences in Warsaw. (Source: IPC PAS, Grzegorz Krzyżewski)

Displays thin like paper, rolled into a tube and other equally futuristic devices will not be created without organic electronics. Creating flexible electronic systems requires knowledge of polymer properties and conditions in which they become self-organised. A group of scientists from the Institute of Physical Chemistry of the Polish Academy of Sciences, in cooperation with employees of the Warsaw University of Technology and the Atomic Energy Commission in Grenoble, have managed to determine how thin layers of highly ordered polymers can be created – a key element in the production process of organic electronic systems.

Organic materials will change the face of electronics. Devices will become not only cheaper, thinner and lighter but will also gain unprecedented properties. It will be possible to roll a display into a tube or produce it from transparent elements and place directly on windows, for instance, in cars. However, before elastic electronics wins the mass market, the rules governing the fabrication of ordered thin layers of organic semiconductors must be learnt. A group of scientists from the Institute of Physical Chemistry of the Polish Academy of Sciences (headed by Assoc. Prof. Robert Nowakowski) and the Warsaw University of Technology (Prof. Małgorzata Zagórska) and the Atomic Energy Commission in Grenoble (Prof. Adam Proń) has achieved considerable progress in this respect. "We have examined how the organisation of molecules changes within layers, depending on the length of molecules. Thanks to this we understand why shorter molecules form ordered two-dimensional structures, while their long analogues create chaotic aggregates. We can sometimes eliminate this last effect completely," says Prof. Robert Nowakowski from the Microscopy and Spectroscopy Research Group of the Institute of Physical Chemistry of the Polish Academy of Sciences (IPC PAS).

Organic molecules may conduct current as well as metals. However, in metals electron cloud can move in any direction whereas current carriers in organic molecules move along the so-called conjugated double bonds. This means that carriers are very mobile only in one direction: along the long axis of the molecule. In this situation the conductivity can be improved in layers consisting of very long molecules, that is by using high-molecular compounds – polymers. However, this solution has a significant drawback. It is more difficult for high-molecular compounds (polymers) to create ordered layers. As a result they often arrange themselves randomly, which leads to the chaotic movement of charge carriers (the carrier, having passed through a long macromolecule of coil-like shape, may reappear nearly in the same place in which it started its journey). The chaotic structure leads to low charge carriers mobility. The problem described above can be solved through the use of molecules that are longer than typical organic molecules but in the same time short enough to show

natural tendency to self-ordering, i.e. oligomers. As a result of mutual interactions such molecules arrange themselves into parallel rows.
At present it is assumed that in future, organic electronic systems will be made from ordered layers of molecules that guarantee high mobility of carriers in the direction specified for a given device. The optimisation of structure of organic semiconductor layers consists in finding a compromise between the length of an oligomer chain and its self-organisation ability. "Chemists from the Warsaw University of Technology prepared for us new polymers and oligomers, derivatives of thiophene. However, the structural and microscopic examination of thin layers of these compounds showed that they were disordered. We suspected that this disorder resulted from polydispersity, that is the coexistence of molecules of different lengths. This phenomenon occurs in almost all synthetic polymers," explains Prof. Nowakowski. In order to verify this assumption, scientists from the IPC PAS developed a unique method for the separation of a mixture after polymerisation into fractions of molecules of identical length. High performance liquid chromatography and thin layer chromatography were used for this purpose. Then monolayers were deposited on a graphite substrate from these fractions, and they were examined with the use of a scanning tunnelling microscope.
The assumption regarding polydispersity turned out to be correct. The ordering of molecules is connected with the existence of long and elastic alkyl groups introduced into a molecule to increase its solubility. The shortest molecules create two-dimensional structures in the layer as a result of mutual interaction (interdigitation) of alkyl groups of neighbouring molecules in two perpendicular directions. The elongation of a molecule increases the number of alkyl groups interacting only perpendicularly to its longitudinal axis and leads to the asymmetry of intermolecular interactions. This results in the change of the type of ordering from two-dimensional islands, observed for shorter oligomers, into one-dimensional columns created by longer oligomers. "It turns out that the chaos in the layers is caused by the fact that they are created from a mixture of macromolecules of various lengths, each of which aims at a different type of ordering," says a PhD student Tomasz Jaroch from the IPC PAS.
The ordering of molecules in a layer has its origin in their structure. Even a small change in the structure of a mer (a repeat unit from which a polimer or oligomer chain is made) may affect the self-organisation process. The group of Prof. Małgorzata Zagórska from the Warsaw University of Technology synthesised oligomers with alkyl groups attached to the carbon atoms of the thiophene ring in different positions as compared to the case of oligomers examined previously. This change results in a decrease of the distance between alkyl groups within the mer unit and consequently, a change in interactions between molecules in the layer. In compounds synthesised in this way no negative effects of self-organisation have been observed: molecules of different lengths created ordered two-dimensional islands. The ordered layers prepared in this way show good semiconducting properties because the cores interacting directly along the oblong axis guarantee an increase in the effective mobility of charge carriers. The researchers from the IPC PAS confirmed experimentally the lack of interdigitation of the alkyl groups in this direction by demonstrating on microscopic pictures that it was possible to move a single oligomer within the layer. The interdigitation of alkyl groups along the axis of a molecule would make such an operation impossible.
The results of the research have great practical significance since they allow predicting the behaviour of oligomers and polymers in layers, and consequently, they open the way to the creation of ordered layers which guarantee better mobility of charge carriers in organic electronics devices.
The Institute of Physical Chemistry of the Polish Academy of Sciences (http://www.ichf.edu.pl/) was established in 1955 as one of the first chemical institutes of the PAS. The Institute's scientific profile is strongly related to the newest global trends in the development of physical chemistry and chemical physics. Scientific research is conducted in nine scientific departments. CHEMIPAN R&D Laboratories operating as part of the Institute implement, produce and commercialise specialist chemical compounds to be used, in particular in agriculture and pharmacy. The Institute publishes approximately 300 original research papers annually.

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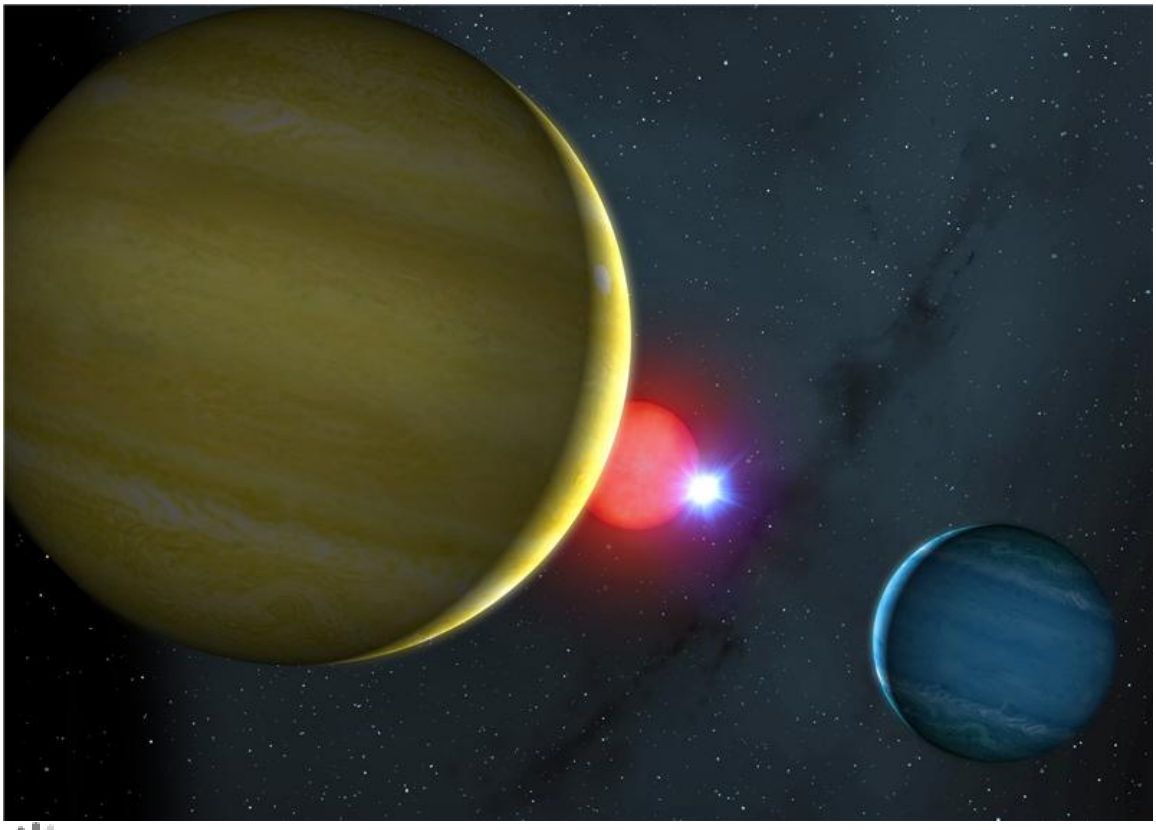
UK Astronomers Help Find Snooker Star System



NN Serpentis - Snooker Star System, image owned by the University of Warwick - image by Mark A. Garlick
07 November 2010 Warwick, University of

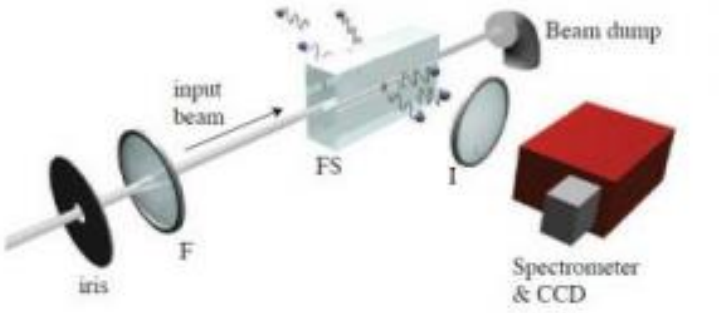
Astronomers at The University of Warwick and the University of Sheffield have helped discover an unusual star system which looks like, and may even once have behaved like, a game of snooker.
A print quality high resolution artist's impression of the system is available , under embargo, at:
http://www2.warwick.ac.uk/services/communications/medialibrary/images/november2010/nn_serpentis.jpg
The University of Warwick and Sheffield astronomers played a key role in an international team that used two decades of observations from many telescopes around the world. The UK astronomers helped discover this "snooker like" star system through observations and analysis of data from an astronomical camera known as ULTRACAM designed by the British researchers on the team.
They looked at a binary star system called NN Serpentis which is 1670 light years away from Earth. NN Serpentis is actually a binary star system consisting of two stars, a red dwarf and a white dwarf, which orbit each other in an incredibly close, tight orbit. By lucky chance Earth sits in the same plane as this binary star system, so we can we can see the larger red dwarf eclipse the white dwarf every 3 hours and 7 minutes.
It was already thought that there may be at least one planet orbiting these two stars. However the University Warwick and Sheffield astronomers were able to use these incredibly frequent eclipses to spot a pattern of

small but significant irregularities in the orbit of stars and were able to help demonstrate that that pattern must be due to the presence and gravitational influence of two massive gas giant planets. The more massive gas giant is about 6 times the mass of Jupiter and orbits the binary star every 15.5 years, the other orbits every 7.75 years and is about 1.6 times the mass of Jupiter.
Given the overall shape of the system, and how that this star system came to exist, it was hard for the British members of the research team not to think of the game of snooker.
One of the UK researchers on the project, Professor Tom Marsh from the University of Warwick's Department of Physics, said:
"The two gas giants have different masses but they may actually be roughly the same size as each other, and in fact will also be roughly the same size as the red dwarf star they orbit. If they follow the patterns we see in our own star system of gas giants with a dominant yellow or blue colours, then it's hard to escape the image of this system as being like a giant snooker frame with a red ball, two coloured balls, and dwarf white cue ball."
This star system will also have seen dramatic changes in what is relatively recent times in astronomical terms the what is now the White Dwarf "cue ball" of the system may have suffered, and caused, violent changes to its own orbit and the orbit of all the planets and stars in the system.
Professor Vik Dhillon from the University of Sheffield, said:
"If these planets were born along with their parent stars they would have had to survive a dramatic event a million years ago: when the original primary star bloated itself into a red giant, causing the secondary star to plunge down into the present very tight orbit, thereby casting off most of the original mass of the primary. Planetary orbits would have seen vast disturbances. Alternatively, the planets may have formed very recently from the cast off material. Either way, in relatively recent times in astronomical terms this system will have seen a vast shock to the orbits of the stars and planets, all initiated by what is now the white dwarf at the heart of the system."

http://www.aanda.org/index.php?option=com_article&access=standard&Itemid=129&url=/articles/aa/abs/2010/13/aa15472-10/aa15472-10.html

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89105&CultureCode=en

Simulating Black Hole Radiation With Lasers: Lasers Produce the First Hawking Radiation Ever Detected



This experimental layout produces a detectable analogue of Hawking radiation. The input laser pulse is focused into a sample of fused silica (FS) using an axicon or lens (F). An imaging lens (I) collects the photons emitted at 90 deg and sends them to an imaging spectrometer coupled to a cooled CCD camera. (Credit: F. Belgiorno, S.L. Cacciatori, M. Clerici, V. Gorini, G. Ortenzi, L. Rizzi, E. Rubino, V.G. Sala, D. Faccio)

ScienceDaily (Nov. 8, 2010) — A team of Italian scientists has fired a laser beam into a hunk of glass to create what they believe is an optical analogue of the Hawking radiation that many physicists expect is emitted by black holes.

Although the laser experiment superficially bears little resemblance to ultra-dense black holes, the mathematical theories used to describe both are similar enough that confirmation of laser-induced Hawking radiation would bolster confidence that black holes also emit Hawking radiation.

When Stephen Hawking first predicted the radiation bearing his name in 1974, he hypothesized that photons could be spontaneously generated from the vacuum at the edge of a black hole. However, Hawking radiation emitted from a black hole would be so weak that many scientists believe it to be nearly impossible to detect.

Scientists have turned to lasers before in attempts to create Hawking radiation, but have had difficulty isolating Hawking radiation from other forms of light emitted during experiments. Franco Belgiorno et al. combined a tunable laser beam with a bulk glass target, which allowed them to limit the Hawking radiation to certain wavelengths of infrared light and to capture the apparent Hawking radiation with an infrared sensitive digital camera.

A paper describing the possible production of a laser induced analogue of Hawking radiation appears in the current issue of *Physical Review Letters*, and is the subject of a Viewpoint article by John Dudley (CNRS, France) and Dmitry Skryabin (University of Bath, UK) in this week's edition of *Physics.*

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **American Physical Society**, via EurekAlert!, a service of AAAS.

Journal References:

1. John Dudley, Dmitry Skryabin. **New horizons for Hawking radiation**. *Physics*, 2010; 3 DOI: 10.1103/Physics.3.95
2. F. Belgiorno, S. Cacciatori, M. Clerici, V. Gorini, G. Ortenzi, L. Rizzi, E. Rubino, V. Sala, D. Faccio. **Hawking Radiation from Ultrashort Laser Pulse Filaments**. *Physical Review Letters*, 2010; 105 (20) DOI: 10.1103/PhysRevLett.105.203901

http://www.sciencedaily.com/releases/2010/11/101108140643.htm

'Altruism Gene' Associated With Higher Willingness to Donate, Researchers Find

New research reveals that a minute change in a particular gene is associated with a significantly higher willingness to donate. (Credit: iStockphoto/Feng Yu)

ScienceDaily (Nov. 8, 2010) — Do you like to do good things for other people? If so, your genes might be responsible for this. At least, the results of a study conducted by researchers of the University of Bonn suggest this. According to the study, a minute change in a particular gene is associated with a significantly higher willingness to donate. People with this change gave twice as much money on average to a charitable cause as did other study subjects.

The results have now been published in the journal *Social Cognitive & Affective Neuroscience*.

The researchers working with the psychologist Professor Dr. Martin Reuter invited their students to take a "retention test": The roughly 100 participants were to memorize series of numbers and then repeat them as correctly as possible. They received the sum of five Euros for doing this. Afterwards, they could either take their hard-earned money home or donate any portion of it to a charitable cause. This decision was made freely and in apparent anonymity. "However, we always knew how much money was in the cash box beforehand and could therefore calculate the amount donated," explains Reuter.

The scientists had asked their study subjects to undergo a cheek swab beforehand. They were able to extract DNA for genetic analyses from the cells thus sampled. In these analyses, they focused on one gene, the so-called COMT gene. It contains the building instructions for an enzyme which inactivates certain messengers in the brain. The most well-known of these messengers is dopamine.

It has been known for nearly 15 years that there are two different variants of the COMT gene: COMT-Val and COMT-Met. Both versions, which occur in the population with approximately equal frequency, differ in only a single building block. In the case of people with the COMT-Val variant, the associated enzyme works up to four times more effectively. Thus considerably more dopamine is inactivated in the brain of a person with this variant.

Mini-Mutation Affects Behavior

This mini-mutation also has effects on behavior: "Students with the COMT-Val gene donated twice as much money on average as did fellow students with the COMT-Met variant," explains Reuter. This is the first time that researchers have been able to establish a connection between a particular gene and altruistic deeds. However, it was already known from studies on twins that altruistic behavior is also partly influenced by our genes.

There is a good reason why the Bonn scientists focused their analysis on the COMT gene: For several years, it has been known that dopamine is involved in controlling social behavior in animals and humans. Thus the messenger, together with substances such as the neuropeptide vasopressin, influences sexuality and bonding. In addition, dopamine is linked with positive emotionality. Even the characteristic of being motivated by stimuli is controlled by this important neurotransmitter.

Editor's Note: *This article is not intended to provide medical advice, diagnosis or treatment.*

Story Source:

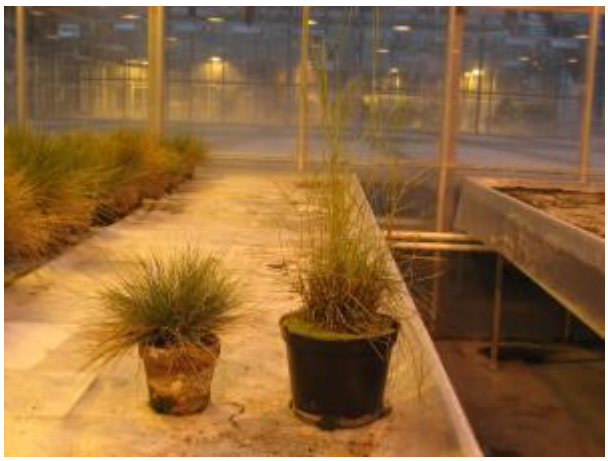
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Bonn**, via AlphaGalileo.

Journal Reference:

1. M. Reuter, C. Frenzel, N. T. Walter, S. Markett, C. Montag. **Investigating the genetic basis of altruism: the role of the COMT Val158Met polymorphism**. *Social Cognitive and Affective Neuroscience*, 2010; DOI: 10.1093/scan/nsq083

http://www.sciencedaily.com/releases/2010/11/101108072309.htm

Spontaneous GMOs in Nature: Researchers Show How a Genetically Modified Plant Can Come About



Festuca ovina (small, on the left) and Poa palustris (tall, on the right) growing in the researchers' greenhouses. (Credit: Image courtesy of Pernilla Vallenback)

ScienceDaily (Nov. 4, 2010) — Genetically modified plants can come about by natural means. A research group at Lund University in Sweden has described the details of such an event among higher plants. It is likely that the gene transfer was mediated by a parasite or a pathogen.

The debate over genetically modified organisms (GMOs) is heated. One of the arguments against them is that it is unnatural to mix genes from different species. However, research in Lund, Sweden, shows that genetic modification can take place naturally among wild plants.

"In our research group we have suspected this for some time, and now my colleague Pernilla Vallenback has used DNA analysis to show that this is indeed the case," says Professor Bengt O. Bengtsson at the Department of Biology at Lund University.

The research group on evolutionary genetics has discovered that a gene for the enzyme PGIC has been transferred into sheep's fescue (*Festuca ovina*) from a meadow grass, probably *Poa palustris*, a reproductively distinct species. The DNA analyses also show that only a small part of a chromosome was transferred. This is the first proven case of the horizontal transfer of a gene with known function from the nucleus of one higher plant to another.

"Unfortunately, we don't know exactly how the gene jump between the species occurred, which is not surprising as it took place perhaps 700,000 years ago. The most plausible explanation is that the gene was transmitted by a parasite or pathogen, such as a virus, perhaps with the help of a sap-sucking insect," says Professor Bengtsson.If gene jumps can occur naturally between plants belonging to different species, does this mean that there is no longer any reason to oppose genetically modified crops? According to Bengt O. Bengtsson, the answer is far from simple. He notes that the new results are interesting and important, but they do not say much about what is right or wrong in society.

"Many fear genetically modified crops because they believe that they may lead to unwanted gene spread in nature. This argument does not impress me. I sympathise, however, with the unease over the increased use of patents and monopolising practices in plant breeding. That is why it is so important that free and commercially independent research on plant genetics can be carried out in universities," says Bengt O. Bengtsson.

The research has been published in the scientific journal *PLoS ONE*.

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Lund University**.

Journal Reference:

1. Pernilla Vallenback, Lena Ghatnekar, Bengt O. Bengtsson. **Structure of the Natural Transgene PgiC2 in the Common Grass Festuca ovina**. *PLoS ONE*, 2010; 5 (10): e13529 DOI: 10.1371/journal.pone.0013529

http://www.sciencedaily.com/releases/2010/11/101104083102.htm

Scientists Turn Skin Cells Directly Into Blood Cells, Bypassing Middle Pluripotent Step

Researchers have demonstrated that human skin cells can be directly converted into blood cells, via a programming process that bypasses the pluripotent stage. (Credit: iStockphoto/Sven Hoppe)

ScienceDaily (Nov. 7, 2010) — In an important breakthrough, scientists at McMaster University have discovered how to make human blood from adult human skin.

The discovery, published Nov. 7 in the journal *Nature*, could mean that in the foreseeable future people needing blood for surgery, cancer treatment or treatment of other blood conditions like anemia will be able to have blood created from a patch of their own skin to provide transfusions. Clinical trials could begin as soon as 2012.

Mick Bhatia, scientific director of McMaster's Stem Cell and Cancer Research Institute in the Michael G. DeGroote School of Medicine, and his team of researchers have also shown that the conversion is direct. Making blood from skin does not require the middle step of changing a skin stem cell into a pluripotent stem cell that could make many other types of human cells, then turning it into a blood stem cell.

"We have shown this works using human skin. We know how it works and believe we can even improve on the process," said Bhatia. "We'll now go on to work on developing other types of human cell types from skin, as we already have encouraging evidence."

The discovery was replicated several times over two years using human skin from both young and old people to prove it works for any age of person.

John Kelton, hematologist and dean and vice-president of health sciences for McMaster University said: "I find this discovery personally gratifying for professional reasons. During my 30 years as a practicing blood specialist, my colleagues and I have been pleased to help care for cancer patients whose lives were saved by bone marrow transplants. For all physicians, but especially for the patients and their families, the illness became more frustrating when we were prevented from giving a bone marrow transplant because we could not find a perfect donor match in the family or the community. "Dr. Bhatia's discovery could permit us to help this important group of patients."

"The Bhatia research effort is building on significant findings in recent years, which have shown that human skin cells can be reprogrammed into pluripotent cells that have the potential to become all cell types.

"The pioneering findings published today are the first to demonstrate that human skin cells can be directly converted into blood cells, via a programming process that bypasses the pluripotent stage. Producing blood from a patient's own skin cells, has the potential of making bone marrow transplant HLA matching and paucity of donors a thing of the past."

"Bhatia's convincing demonstration that skin cells can be directly converted to hematopoietic progenitor cells is exciting and will immediately change the paradigms regarding the best way forward for production of hematopoietic cells to be used in regenerative medicine and in the study of human blood diseases," said

Cynthia Dunbar, head of the molecular hematopoiesis section of the National Heart, Lung and Blood Institute of the National Institutes of Health in the U.S.
"Bhatia's approach detours around the pluripotent stem cell stage and thus avoids many safety issues, increases efficiency, and also has the major benefit of producing adult-type l blood cells instead of fetal blood cells, a major advantage compared to the thus far disappointing attempts to produce blood cells from human ESCs or IPSCs."
This research was funded by the Canadian Institutes of Health Research, the Canadian Cancer Society Research Institute, the Stem Cell Network and the Ontario Ministry of Research and Innovation.
***Editor's Note**: This article is not intended to provide medical advice, diagnosis or treatment.*

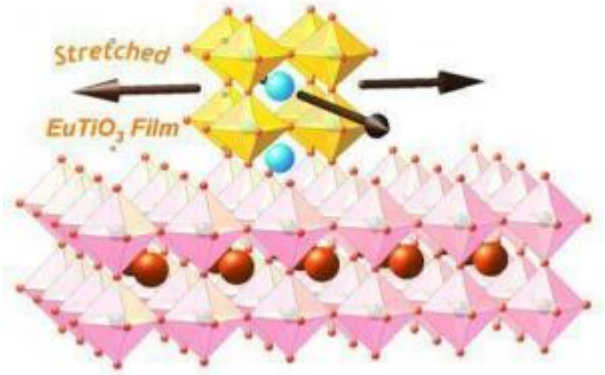
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **McMaster University**.

Journal Reference:

1. Eva Szabo, Shravanti Rampalli, Ruth M. Risueño, Angelique Schnerch, Ryan Mitchell, Aline Fiebig-Comyn, Marilyne Levadoux-Martin, Mickie Bhatia. **Direct conversion of human fibroblasts to multilineage blood progenitors**. *Nature*, 2010; DOI: 10.1038/nature09591

http://www.sciencedaily.com/releases/2010/11/101107202144.htm

'Super-Hero' Material Stretched Into a Possible Electronics Revolution



Cornell researchers made a thin film of europium titanate ferromagnetic and ferroelectric by "stretching" it. They did it by depositing the material on an underlying substrate with a larger spacing between its atoms. (Credit: Image courtesy of Cornell University)

ScienceDaily (Nov. 8, 2010) — It's the Clark Kent of oxide compounds, and - on its own - it is pretty boring. But slice europium titanate nanometers thin and physically stretch it, and then it takes on super hero-like properties that could revolutionize electronics, according to new Cornell research.

Researchers report that thin films of europium titanate become both ferroelectric (electrically polarized) and ferromagnetic (exhibiting a permanent magnetic field) when stretched across a substrate of dysprosium scandate, another type of oxide. The best simultaneously ferroelectric, ferromagnetic material to date pales in comparison by a factor of 1,000.

Simultaneous ferroelectricity and ferromagnetism is rare in nature and coveted by electronics visionaries. A material with this magical combination could form the basis for low-power, highly sensitive magnetic memory, magnetic sensors or highly tunable microwave devices.

The search for ferromagnetic ferroelectrics dates back to 1966, when the first such compound - a nickel boracite - was discovered. Since then, scientists have found a few additional ferromagnetic ferroelectrics, but none stronger than the nickel compound - that is, until now.

"Previous researchers were searching directly for a ferromagnetic ferroelectric - an extremely rare form of matter," said Darrell Schlom, Cornell professor of materials science and engineering, and an author on the paper.

"Our strategy is to use first-principles theory to look among materials that are neither ferromagnetic nor ferroelectric, of which there are many, and to identify candidates that, when squeezed or stretched, will take on these properties," said Craig Fennie, assistant professor of applied and engineering physics, and another author on the paper.

This fresh strategy, demonstrated using the europium titanate, opens the door to other ferromagnetic ferroelectrics that may work at even higher temperatures using the same materials-by-design strategy, the researchers said.

Other authors include David A. Muller, Cornell professor of applied and engineering physics; and first author June Hyuk Lee, a graduate student in Schlom's lab.

The researchers took an ultra-thin layer of the oxide and "stretched" it by placing it on top of the disprosium compound. The crystal structure of the europium titanate became strained because of its tendency to align itself with the underlying arrangement of atoms in the substrate.

Fennie's previous theoretical work had indicated that a different kind of material strain - more akin to squishing by compression - would also produce ferromagnetism and ferroelectricity. But the team discovered that the stretched europium compound displayed electrical properties 1,000 times better than the best-known ferroelectric/ferromagnetic material thus far, translating to thicker, higher-quality films.

This new approach to ferromagnetic ferroelectrics could prove a key step toward the development of next-generation memory storage, superb magnetic field sensors and many other applications long dreamed about. But commercial devices are a long way off; no devices have yet been made using this material. The Cornell experiment was conducted at an extremely cold temperature - about 4 degrees Kelvin (-452 Fahrenheit). The team is already working on materials that are predicted to show such properties at much higher temperatures. The team includes researchers from Penn State University, Ohio State University and Argonne National Laboratory.

The research was supported by the Cornell Center for Materials Research, a National Science Foundation-funded Materials Research and Engineering Center (MRSEC), and corresponding MRSECs at Penn State and Ohio State.

Story Source:

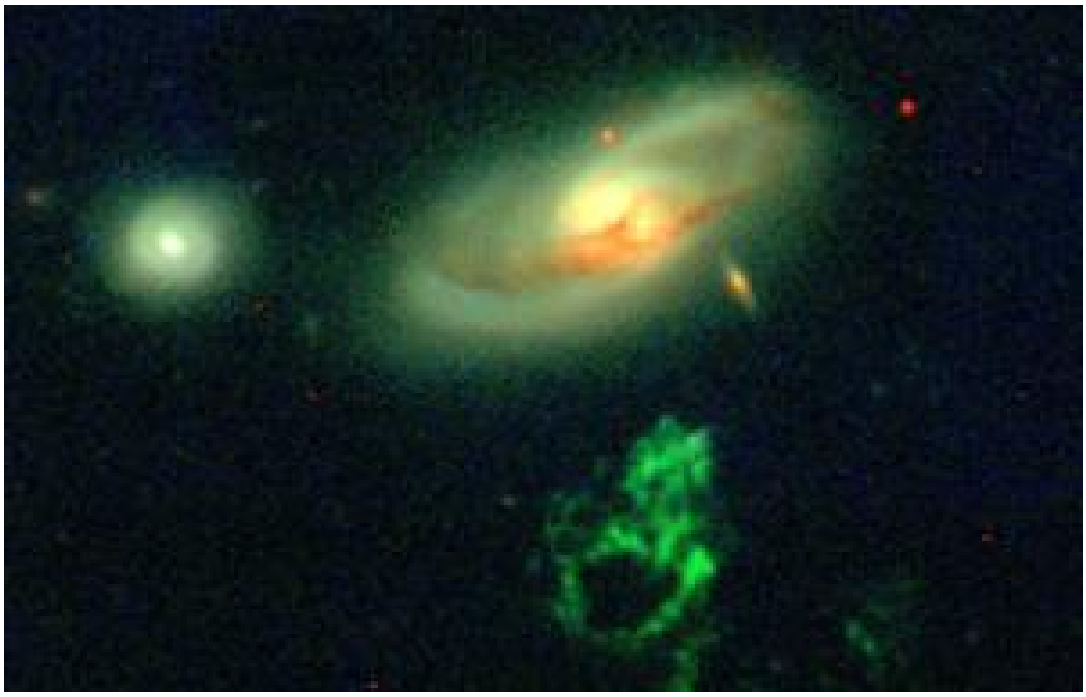
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Cornell University**. The original article was written by Anne Ju.

Journal Reference:

1. June Hyuk Lee, Lei Fang, Eftihia Vlahos, Xianglin Ke, Young Woo Jung, Lena Fitting Kourkoutis, Jong-Woo Kim, Philip J. Ryan, Tassilo Heeg, Martin Roeckerath, Veronica Goian, Margitta Bernhagen, Reinhard Uecker, P. Chris Hammel, Karin M. Rabe, Stanislav Kamba, Jürgen Schubert, John W. Freeland, David A. Muller, Craig J. Fennie, Peter Schiffer, Venkatraman Gopalan, Ezekiel Johnston-Halperin & Darrell G. Schlom. **A strong ferroelectric ferromagnet created by means of spin–lattice coupling**. *Nature*, 2010; 466 (7309): 954 DOI: 10.1038/nature09331

http://www.sciencedaily.com/releases/2010/08/100818131601.htm

Cosmic Curiosity Reveals Ghostly Glow of Dead Quasar



The green Voorwerp in the foreground remains illuminated by light emitted up to 70,000 years ago by a quasar in the center of the background galaxy, which has since died out. () (Credit: Photo by WIYN/William Keel/Anna Manning)

ScienceDaily (Nov. 6, 2010) — While sorting through hundreds of galaxy images as part of the Galaxy Zoo citizen science project two years ago, Dutch schoolteacher and volunteer astronomer Hanny van Arkel stumbled upon a strange-looking object that baffled professional astronomers. Two years later, a team led by Yale University researchers has discovered that the unique object represents a snapshot in time that reveals surprising clues about the life cycle of black holes.

In a new study, the team has confirmed that the unusual object, known as Hanny's Voorwerp (Hanny's "object" in Dutch), is a large cloud of glowing gas illuminated by the light from a quasar -- an extremely energetic galaxy with a supermassive black hole at its center. The twist, described online in the Astrophysical Journal Letters, is that the quasar lighting up the gas has since burned out almost entirely, even though the light it emitted in the past continues to travel through space, illuminating the gas cloud and producing a sort of "light echo" of the dead quasar.

"This system really is like the Rosetta Stone of quasars," said Yale astronomer Kevin Schawinski, a co-founder of Galaxy Zoo and lead author of the study. "The amazing thing is that if it wasn't for the Voorwerp being illuminated nearby, the galaxy never would have piqued anyone's interest."

The team calculated that the light from the dead quasar, which is the nearest known galaxy to have hosted a quasar, took up to 70,000 years to travel through space and illuminate the Voorwerp -- meaning the quasar must have shut down sometime within the past 70,000 years.

Until now, it was assumed that supermassive black holes took millions of years to die down after reaching their peak energy output. However, the Voorwerp suggests that the supermassive black holes that fuel quasars shut down much more quickly than previously thought. "This has huge implications for our understanding of how galaxies and black holes co-evolve," Schawinski said.

"The time scale on which quasars shut down their prodigious energy output is almost entirely unknown," said Meg Urry, director of the Yale Center for Astronomy & Astrophysics and a co-author of the paper. "That's

why the Voorwerp is such an intriguing -- and potentially critical -- case study for understanding the end of black hole growth in quasars."
Although the galaxy no longer shines brightly in X-ray light as a quasar, it is still radiating at radio wavelengths. Whether this radio jet played a role in shutting down the central black hole is just one of several possibilities Schawinski and the team will investigate next.
"We've solved the mystery of the Voorwerp," he said. "But this discovery has raised a whole bunch of new questions."
Other authors of the paper include Shanil Virani, Priyamvada Natarajan, Paolo Coppi (all of Yale University); Daniel Evans (Massachusetts Institute of Technology, Harvard-Smithsonian Center for Astrophysics and Elon University); William Keel and Anna Manning (University of Alabama and Kitt Peak National Observatory); Chris Lintott (University of Oxford and Adler Planetarium); Sugata Kaviraj (University of Oxford and Imperial College London); Steven Bamford (University of Nottingham); Gyula Józsa (Netherlands Institute for Radio Astronomy and Argelander-Institut für Astronomie); Michael Garrett (Netherlands Institute for Radio Astronomy, Leiden Observatory and Swinburne University of Technology); Hanny van Arkel (Netherlands Institute for Radio Astronomy); Pamela Gay (Southern Illinois University Edwardsville); and Lucy Fortson (University of Minnesota).

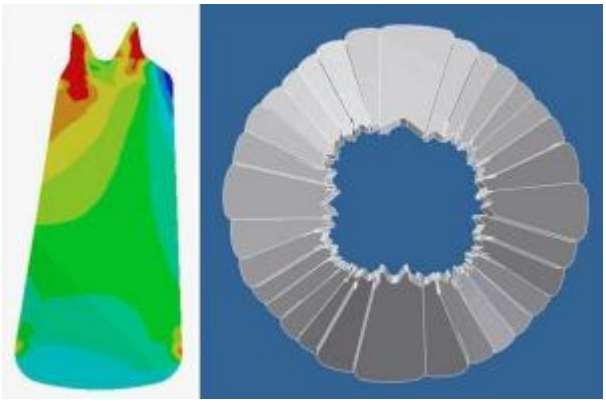
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Yale University**.

Journal Reference:

1. Kevin Schawinski, Daniel A. Evans, Shanil Virani, C. Megan Urry, William C. Keel, Priyamvada Natarajan, Chris J. Lintott, Anna Manning, Paolo Coppi, Sugata Kaviraj, Steven P. Bamford, Gyula I. G. Józsa, Michael Garrett, Hanny van Arkel, Pamela Gay, Lucy Fortson. **The Sudden Death of the Nearest Quasar**. *The Astrophysical Journal*, 2010; 724 (1): L30 DOI: 10.1088/2041-8205/724/1/L30

http://www.sciencedaily.com/releases/2010/11/101103171638.htm

Earth's First Great Predator Wasn't: Carnivorous 'Shrimp' Not So Fierce, 3-D Model Shows



Researchers have developed A new 3-D modeling of the mouth parts of the Anomalocaris, a carnivorous shrimp-like creature that lived a half billion years ago. Left: model of the toothplate. Right: model of the mouth. (Credit: Image courtesy of Dr. James Hagadorn, Denver Museum of Nature & Science)

ScienceDaily (Nov. 8, 2010) — The meters-long, carnivorous "shrimp" from hell that once ruled the seas of Earth a half billion years ago may have been a real softy, it turns out. A new 3-D modeling of the mouth parts of the Anomalocaris, along with evidence that these parts were not hard like teeth, but flexible, shows that the famed predator could not have been munching on the hard shells of trilobites and other such creatures of the early seas.

What's more, there is no evidence from fossilized stomach contents or feces that Anomalocaris' ate anything hard enough to leave a fossilized trace. In fact it was this lack of fossil evidence backing any dietary preference -- right alongside other animals that do show fragments of what they ate in their gullets -- which inspired the investigation, said paleontologist James "Whitey" Hagadorn of the Denver Museum of Nature & Science.

Hagadorn presented his team's discoveries about Anomalocaris on Nov. 1 at the annual meeting of the Geological Society of America in Denver.

"It was supposed to roam around the Cambrian seas gobbling up trilobites and everything else," said Hagadorn. But the pineapple-like whorl of mouth parts and the associated whisker-like appendages of Anomalocaris all appear to have been bendable, in the fossil remains, he said. They are not mineralized like the exoskeletons of the trilobites they were supposedly eating.

His suspicions prompted Hagadorn to develop a 3-D, finite element analysis model of the Anomalocaris mouth. This allowed for testing just how the mouth worked and how much force it could create -- in other words, how strong a bite it had. The model turned up some surprises.

"It couldn't even close its mouth," said Hagadorn. And there was no practical way these mouth parts could create the force needed to break open a modern lobster shell nor a shrimp shell, which were used as analogues for a trilobite carapace in the model.

Another interesting discovery made along the way came from studying more than 400 Anomalocaris mouths. In none of them did Hagadorn find any signs of wear. That's strange because if they were genuine teeth there would be chips, scratches and other signs they were being used to munch on hard-shelled animals.

The model, gut contents, feces and wear all suggest Anomalocaris was not a trilobite eater. But they fail to help explain what this impressive beast from the Cambrian was eating.

"Maybe it ingested things and then spit them out," Hagadorn speculated. Another possibility is that it somehow broke down the food it was eating into very fine particles before ingesting it. At this point the only thing that appears certain is that the famed biggest predator of the early Cambrian is more mysterious than ever.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **The Geological Society of America**.

http://www.sciencedaily.com/releases/2010/11/101101083148.htm

Philosophers Through the Lens

By STEVE PYKE

I have spent almost a quarter century photographing philosophers. For the most part, philosophers exist, and have always existed, outside the public spotlight. Yet when we reflect upon those eras of humankind that burn especially bright, it is largely the philosophers that we remember. Despite being unknown at a time, the philosophers of an era survive longer in collective memory than wealthy nobleman and politicians, or the popular figures of stage, song and stadium. Because of this disconnect between living fame and later recognition, we have less of a record of these thinkers than we should. Our museums are filled with busts and paintings of long-forgotten wealth and beauty instead of the philosophers who have so influenced contemporary politics and society. My aim in this project has been the modest one of making sure that, for this era at least, there is some record of the philosophers.


Steve Pyke Judith Thomson, Cambridge, Mass., April 14, 2010

I did not initially plan to spend more than 20 years with philosophers. It was the fall of 1988. I was working for a number of different magazines, primarily The Face, taking photographs of the kind of cultural figures who typically rise to public awareness — musicians, artists, actors and novelists. One day I received an assignment to photograph the philosopher Sir Alfred Ayer. Ayer was dimly known to me, England being one of those rare countries in which each era has a few public philosophers — respected thinkers who are called upon to comment on the issues of the day. When I was growing up in the Midlands of the United Kingdom in the 1960s, that figure was Bertrand Russell. Later, he was replaced by Ayer. Still, I knew very little about Ayer other than what I recalled from snippets on BBC question time.

Interactive Feature

Why Philosophy?


A gallery of Steve Pyke's portraits of philosophers.

I was told in advance that he was very ill, and that my time with him would be limited to 10 minutes. When I walked into the room, he was wearing an oxygen mask. There were two women in the room. I can't

remember how we got beyond those evident barriers — the social and the physical — but I remained with him for four hours. We talked about many things, but mainly the Second World War. Apparently, many Oxford philosophers had been involved in the war effort, in intelligence. I recall in particular a story Ayer told me about having saved De Gaulle's life from a faction of the French resistance.

I can't identify why I found him such a compelling and fascinating figure. Partly it was him. But it was also the fact that philosophers come with a certain combination of mystery and weight. Our discussion gave me a burn to meet more philosophers. That is how my project started.

Steve Pyke Umberto Eco, New York City, Nov,. 15 2007

Philosophy is not the only profession I have cataloged. For example, I also have taken over the years many photographs of filmmakers. But my relationship with filmmakers is very different than my relationship with philosophers. My extensive experience with film gives me the ability to make my own judgments of relative merit. A sophisticated appreciation of film is something that many of us can and do cultivate. In the case of philosophers, however, I am, like most people, at sea. The philosophers whose work is most admired by other philosophers are very different from the philosophers who occasionally float to public consciousness. These are not people with connections to the larger world of media (one thing I have learned over these many years is that the cast of mind that leads one to philosophy is rarely one that lends itself to networking). I could only hope to be guided to them by those who had themselves struggled with its problems.

After my meeting with Ayer, I devised a plan to ask each philosopher I photographed for three names of philosophers they admired. Initially, I planned to meet and photograph perhaps 15 philosophers, and publish the results in a magazine. I certainly had no plan to spend the next quarter century pursuing philosophers around the globe. But Ayer had given me the names of four — Isaiah Berlin, Michael Dummett, Ted Honderich and Peter Strawson. Each of them in turn gave me three names, and there was not as much overlap as I had expected. My initial plan had to be modified. Soon, I settled on a formula. If a philosopher was mentioned by three different philosophers as someone whose work was important, I would photograph that philosopher. Of course, employing this formula required meeting many more philosophers. The idea of a short project with 15 photographs was rapidly shelved. To date, the list of those I've photographed is nearly 200 names long.

Steve Pyke Sally Haslanger and Steve Yablo, New York City, July 14, 2010
Throughout my career I have had to pursue my work with philosophers while making a living with my other professional work, and the cost has sometimes been high. But like any artist who has completed a large and demanding project, I have had good fortune.
Early in my career, I lived not far from Oxford University, a great center for philosophy for centuries. At that time, it employed many of the people whose names were mentioned most by other philosophers. In 2004, I moved to New York to take up a position at The New Yorker. The departments of philosophy at New York University and Rutgers University, like Oxford, are also staffed by many of the figures most mentioned by other philosophers. The New York area also has many other first-rate philosophy departments. Philosophers are a garrulous and argumentative species. Their chief form of social interaction is the lecture, which is typically an hour long, and followed by an hour of probing and aggressive objections from the audience. If one of the figures mentioned three times by other philosophers was not teaching at one of these departments, they almost certainly came to lecture at one of them at some point over the last seven years. My project has benefited from this happenstance. No doubt, I have missed many philosophers worthy of photographing. But had I not been in New York these past six years, I would have missed many more.
In the course of my work, I knew that most appreciators of art, even the most educated, would have but a dim window on the views of the philosophers I was photographing. So I asked each philosopher I photographed to supply 50 words summarizing their work or their view of philosophy (perhaps not surprisingly, several exceeded that limit.) These statements are as much a part of the work as the pictures themselves. Statement and portrait together form a single image of a thinker. (See the interactive gallery, "Why Philosophy?")
Most philosophers have spent their entire lives in intense concentration, developing and defending lines of argument that can withstand the fearsome critical scrutiny of their peers. Perhaps this leaves some mark on their faces; to that I leave others to judge.

Steve Pyke, a contributing photographer at The New Yorker and at Vanity Fair since 1998, has recently completed a series of portraits of the Apollo astronauts. The second volume of "Philosophers," with more than 100 portraits, will be published by Oxford University Press in May 2011.

http://opinionator.blogs.nytimes.com/2010/10/31/philosophers-through-the-lens/

Rare Hits and Heaps of Misses to Pay For

By NICHOLAS WADE

John Hersey

Research, in any field of science, is not the risk-free business that might easily be supposed from the confident promises of scientific spokesmen or the daily reports of new advances.

Nature yields her secrets with the greatest unwillingness, and in basic research most experiments contribute little to further progress, as judged by the rarity with which most scientific reports are cited by others.

Basic research, the attempt to understand the fundamental principles of science, is so risky, in fact, that only the federal government is willing to keep pouring money into it. It is a venture that produces far fewer hits than misses.

Even the pharmaceutical industry, a major beneficiary of biomedical research, does not like to invest too heavily in basic science. Rather, it lets private venture capital support the small biotechnology companies that first try to bring new findings to market, and then buys up the few winners of this harsh winnowing process.

If basic research is fraught with such a high failure rate, why then does it yield such rich economic returns? The answer is that such government financing agencies as the National Institutes of Health and the National Science Foundation are like the managers of a stock index fund: they buy everything in the market, and the few spectacular winners make up for all the disasters.

But just as index fund managers often go astray when they try to improve on the index's performance by overweighting the stocks they favor, the government can go wrong when it tries to pick winners.

This is why it was such a risk for California to earmark $3 billion specifically for stem cell research over the next 10 years. Stem cells are just one of many promising fields of biomedical research. They could yield great advances, or become an exercise in sustained failure, as gene therapy has so far been. By allocating so much money to a single field, California is placing an enormous bet on a single horse, and the chances are substantial that its taxpayers will lose their collective shirt.

Stem cell researchers have created an illusion of progress by claiming regular advances in the 12 years since human embryonic stem cells were first developed. But a notable fraction of these claims have turned out to be wrong or fraudulent, and many others have amounted to yet another new way of getting to square one by finding better methods of deriving human embryonic stem cells.

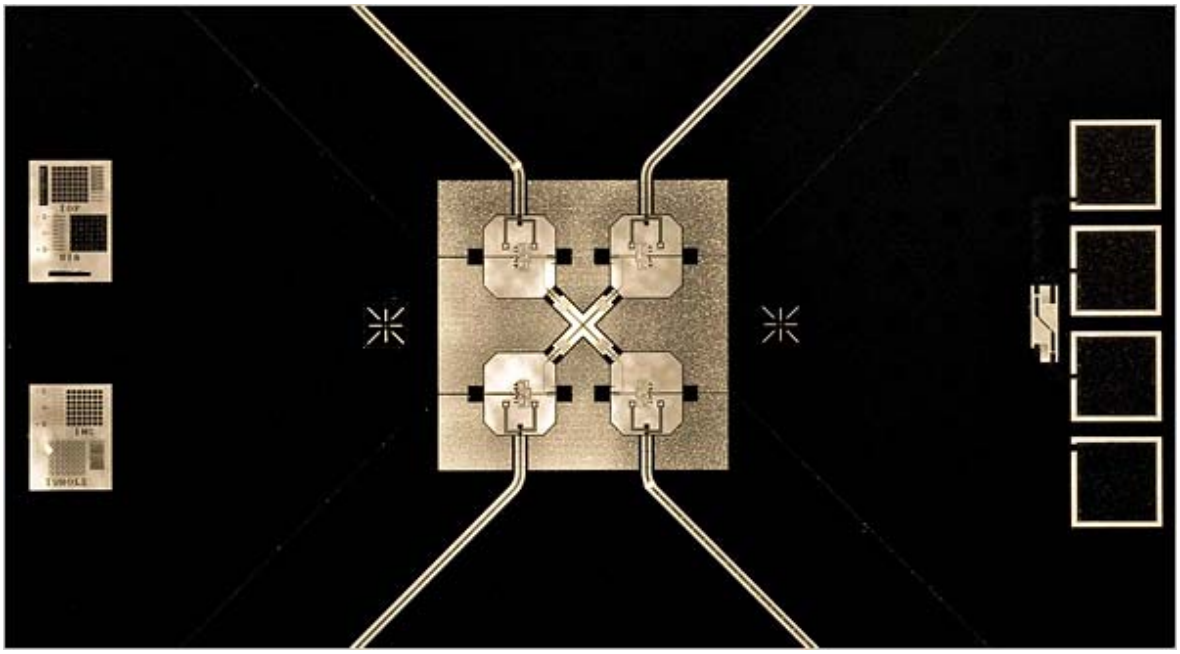
The major advances in stem cell biology have come from molecular biologists who study transcription factors, the master control switches that govern the cell's operations. The Japanese biologist Shinya Yamanaka showed that with a mere four of these factors, which he cleverly guessed, he could force an ordinary cell to walk back to embryonic state.

But the finding illustrates what stem cell research is really about. It's not about therapies and quick cures, it's about understanding the basic nature of human cells and what makes one type different from another even though all have the identical genome. In other words, it's a basic research program with little likelihood of

producing therapeutic gains in the near future. Stem cell scientists, while generally avoiding rash promises themselves, have allowed politicians to portray stem cells as a likely cure for all the major diseases.
Strangely, for a project that is aimed at regenerative medicine, the arbiters of stem cell research have largely neglected the free lesson that nature is offering as to how regenerative medicine could actually work. Many little animals, like newts and zebra fish, do regenerate parts of their bodies. But their recipe is the reverse of that presented by the advocates of stem cell therapy. Instead of taking a stem cell and trying to convert it into a well-behaved adult tissue, animals like the zebra fish start with the adult cell at the wound site, and walk it backward into a stemlike state from which a new limb grows.
For the California Institute for Regenerative Medicine to invest its $3 billion in studying newts, rather than building new science buildings on every state campus, might seem the best way of understanding regeneration, but that would be hard to explain to California's voters, who have been assured stem cell cures are just around the corner. Even if governments do better to avoid picking winners among basic research fields, they can play a necessary role in supporting specific scientific infrastructure that lies beyond the means of individual researchers or universities, like atom-smashers or the human genome project. But even these projects are not guaranteed success. More powerful atom-smashers let physicists explore new ranges of energy, but the expected new atomic particles are not always found there. The HapMap, a catalog of human genetic variation that grew out of the human genome project, was designed to uncover the genetic roots of common diseases and help develop new treatments. The project was well conceived and executed, but nature declined to provide many very useful answers. Still, there is nothing wrong with the National Institutes of Health having tried the experiment. The only shame would be in not having tried.
The same goes for the HapMap's successor, the 1000 Genomes Project, which is an attempt to construct an even larger genetic catalog. It's well worth trying, but success cannot be assumed — and should be the more applauded if attained.
To take scientific progress for granted is to underestimate the difficulties, professional and otherwise, that scientists must overcome. A researcher spends years in apprenticeship, mastering difficult techniques with a short useful life. He or she then has a few years to strike it lucky and become a lab chief, much of whose time is spent applying for grants and administering the work of the next generation of apprentice scientists.
It's amazing that the system works as well as it does. But its successes are hard won, not the inevitable victories that scientific spokesmen sometimes suggest when on the fund-raising trail.

http://www.nytimes.com/2010/11/09/science/09wade.html?_r=1

Quantum Computing Reaches for True Power
By JOHN MARKOFF



Erik Lucero
QUIBIT CHIP Four quibits are symmetrically coupled via a capacitive island, the cross in the center.

In 1981 the physicist Richard Feynman speculated about the possibility of "tiny computers obeying quantum mechanical laws." He suggested that such a quantum computer might be the best way to simulate real-world quantum systems, a challenge that today is largely beyond the calculating power of even the fastest supercomputers.
Since then there has been sporadic progress in building this kind of computer. The experiments to date, however, have largely yielded only systems that seek to demonstrate that the principle is sound. They offer a tantalizing peek at the possibility of future supercomputing power, but only the slimmest results.
Recent progress, however, has renewed enthusiasm for finding avenues to build significantly more powerful quantum computers. Laboratory efforts in the United States and in Europe are under way using a number of technologies.
Significantly, I.B.M. has reconstituted what had recently been a relatively low-level research effort in quantum computing. I.B.M. is responding to advances made in the past year at Yale University and the University of California, Santa Barbara, that suggest the possibility of quantum computing based on standard microelectronics manufacturing technologies. Both groups layer a superconducting material, either rhenium or niobium, on a semiconductor surface, which when cooled to near absolute zero exhibits quantum behavior.
The company has assembled a large research group at its Thomas J. Watson Research Center in Yorktown Heights, N.Y., that includes alumni from the Santa Barbara and Yale laboratories and has now begun a five-year research project.
"I.B.M. is quite interested in taking up the physics which these other groups have been pioneering," said David DiVincenzo, an I.B.M physicist and research manager.
Researchers at Santa Barbara and Yale also said that they expect to make further incremental progress in 2011 and in the next several years. At the most basic level, quantum computers are composed of quantum bits, or qubits, rather than the traditional bits that are the basic unit of digital computers. Classic computers are built with transistors that can be in either an "on" or an "off" state, representing either a 1 or a 0. A qubit, which

can be constructed in different ways, can represent 1 and 0 states simultaneously. This quality is called superposition.

The potential power of quantum computing comes from the possibility of performing a mathematical operation on both states simultaneously. In a two-qubit system it would be possible to compute on four values at once, in a three-qubit system on eight at once, in a four-qubit system on 16, and so on. As the number of qubits increases, potential processing power increases exponentially.

There is, of course, a catch. The mere act of measuring or observing a qubit can strip it of its computing potential. So researchers have used quantum entanglement — in which particles are linked so that measuring a property of one instantly reveals information about the other, no matter how far apart the two particles are — to extract information. But creating and maintaining qubits in entangled states has been tremendously challenging.

"We're at the stage of trying to develop these qubits in a way that would be like the integrated circuit that would allow you to make many of them at once," said Rob Schoelkopf, a physicist who is leader of the Yale group. "In the next few years you'll see operations on more qubits, but only a handful."

The good news, he said, is that while the number of qubits is increasing only slowly, the precision with which the researchers are able to control quantum interactions has increased a thousandfold.

The Santa Barbara researchers said they believe they will essentially double the computational power of their quantum computers next year.

John Martinis, a physicist who is a member of the team, said, "We are currently designing a device with four qubits, and five resonators," the standard microelectronic components that are used to force quantum entanglement. "If all goes well, we hope to increase this to eight qubits and nine resonators in a year or so."

Two competing technological approaches are also being pursued. One approach involves building qubits from ions, or charged atomic particles, trapped in electromagnetic fields. Lasers are used to entangle the ions. To date, systems as large as eight qubits have been created using this method, and researchers believe that they have design ideas that will make much larger systems possible. Currently more than 20 university and corporate research laboratories are pursuing this design.

In June, researchers at Toshiba Research Europe and Cambridge University reported in Nature that they had fabricated light-emitting diodes coupled with a custom-formed quantum dot, which functioned as a light source for entangled photons. The researchers are now building more complex systems and say they can see a path to useful quantum computers.

A fourth technology has been developed by D-Wave Systems, a Canadian computer maker. D-Wave has built a system with more than 50 quantum bits, but it has been greeted skeptically by many researchers who believe that it has not proved true entanglement. Nevertheless, Hartmut Neven, an artificial-intelligence researcher at Google, said the company had received a proposal from D-Wave and NASA's Jet Propulsion Laboratory to develop a quantum computing facility for Google next year based on the D-Wave technology.

http://www.nytimes.com/2010/11/09/science/09compute.html?ref=science

Mining the Seafloor for Rare-Earth Minerals

By WILLIAM J. BROAD

Charles D. Winters/Photo Researchers
Manganese nodules contain so-called rate-earth minerals, which have commercial and military applications. They are used in disk drives, fluorescent lamps and rechargeable batteries, among other things.

For decades, entrepreneurs have tried to strike it rich by gathering up ugly potato-size rocks that carpet the global seabed. Known as manganese nodules, the rocks are plentiful in nickel, copper and cobalt, as well as manganese and other elements, but lie miles down in inky darkness. Building giant machines to vacuum them up, despite much study and investment, has never proved to be economic.

Now, the frustrated visionaries are talking excitedly about the possibility of belated success, and perhaps even profits.

The nodules turn out to contain so-called rare-earth minerals — elements that have wide commercial and military application but have hit a production roadblock. China, which controls some 95 percent of the world's supply, had blocked shipments, sounding political alarms around the globe and a rush for alternatives. China ended its embargo late last month, but the hunt for other options continues.

So are seabed miners smiling at last?

"People are quite intrigued," said James R. Hein, a geologist with the United State Geological Survey who specializes in seabed minerals. Depending on China's behavior and the global reaction, he said, "rare earths may be the driving force in the near future."

In October, Dr. Hein and five colleagues from Germany presented a paper on harvesting the nodules for their "rare and valuable metals." They did so at the annual meeting of the Underwater Mining Institute, a professional group based at the University of Hawaii. The paper prompted visions of a fresh start.

"They really do add value," Charles L. Morgan, chairman of the institute, said of the rare earths in an interview. The result, he added, is that the nodules have taken on a new luster. "People are starting to think, 'Well, maybe these things aren't so dumb after all.' "

Dr. Morgan said he was considering whether to start analyzing a collection he oversees of 5,000 nodule samples from around the globe so as to ascertain their rare-earth content. But he cautioned that the field of seabed mining has a history of ups and downs.

"This new wrinkle may take them over the edge to make them truly economic," he said of the nodules. "But that remains to be seen."

The elements known as rare earths number 17 in all and range from cerium and dysprosium to thulium and yttrium.

Their unique properties have resulted in their growing use in many technologies of modern life. Applications include magnets, lasers, fiber optics, computer disk drives, fluorescent lamps, rechargeable batteries, catalytic converters, computer memory chips, X-ray tubes, high-temperature superconductors and the liquid-crystal displays of televisions and computer monitors.

The United States Geological Survey calls the rare elements "essential for hundreds of applications" and likely candidates in the near future for an "expanding array" of high-tech products. Supply shortages that go on for a long time, the agency warns in a fact sheet, "would force significant changes in many technological aspects of American society."

Secretary of State Hillary Rodham Clinton recently called China's export embargo a "wake-up call" for the world to find new resources.

Despite their name, most rare earths are not particularly rare. But their geochemical properties mean they seldom concentrate into economically exploitable ore pockets. During the last two decades, most production has shifted to China because of lower costs there and the country's record of lax regulation of environmental hazards. (The processing of rare earths can create toxic byproducts.)

Scientists have known about rare earths in seabed rocks for decades, seeing them as a curiosity. In 1968, Alan M. Ehrlich, a chemist at the Massachusetts Institute of Technology, wrote a Ph.D. dissertation titled "Rare Earth Abundances in Manganese Nodules."

In an interview, he expressed surprise at the interest of the seabed miners, saying the concentrations were too low to power a nodule renaissance.

The would-be miners agree. But they say rising global prices for the more common metals found in the seabed rocks are increasing the allure. Investors, they add, see the presence of the exotic elements as icing on the cake.

"The global activity is tremendous," said Dr. Hein of geological survey, referring to undersea exploration as well as processing assessments on land.

"Right now, rare earths are not the driving force," he said. "But for copper and nickel, the prices are there."

Dr. Hein said dwindling supplies of terrestrial copper — a key ingredient of industrialization used in everything from wires and switches to pipes and roofs — have forced miners on land to go after increasingly low grades of ore and have raised interest in seabed resources.

For instance, ore in the Chilean copper and gold mine that collapsed in August, trapping 33 miners, bears concentrations of copper that measure only a half percent, said Dr. Hein. "The nodules have 1 percent," he added, "so they're twice as rich."

The upshot is a new wave of global interest in vacuuming up the seabed nodules — rare earths and all.

"It's getting more active," said Dr. Morgan of the Underwater Mining Institute. "Industrial people are starting to look at it again."

http://www.nytimes.com/2010/11/09/science/09seafloor.html?ref=science

Hints on Dark Matter and a Wealth of Planets

By DENNIS OVERBYE

John Hersey

Both planetary science and cosmology are ripe for big news in 2011, the former in its effort to find planets beyond the Earth and the solar system that could harbor water and thus life as we know it, and the latter in the unending effort to figure out what the universe is made of.

Finding out how common habitable planets are around Sun-like stars is the mission of NASA's Kepler satellite, which has been trailing the Earth's orbit of the Sun ever since its launching in March 2009, staring at 156,000 stars in the constellations Cygnus and Lyra looking for telltale blips in starlight caused by planets passing in front of them. Last June, the Kepler team released a list of 350 stars thought to be harboring planets, but at the same time, and over the protests of some astronomers, they held back the data on 400 more stars that they wanted to check out over the summer.

In February, the Kepler 400 are expected to be released. The smallest planet on the previous list was about one and a half times the diameter of the Earth. The Kepler scientists will not say anything about the stars on the withheld list or their candidate planets, but in an e-mail message Natalie Batalha, a co-investigator on Kepler, said it would not be unreasonable to suspect that there is a smattering of planet candidates smaller than that on the new list. More small planets could also show up as more data is analyzed, she said.

The discovery of an Earth-size planet would be another step on a path that planet hunters have been following for the past 15 years, since the first exoplanet was discovered. About 500 exoplanets are now known, but most of these have been giant ones circling too close to their stars, because they are easiest to find. As techniques have been refined, smaller planets have come into view, and a recent survey by University of California astronomers, Andrew Howard and Geoffrey Marcy, concluded that about a quarter of all Sun-like stars should have Earth-size planets.

If indeed there are Earth-size planets in the Kepler 400, however, Dr. Batalha and others hasten to point out, these would not quite be the planets of our dreams. An Earth-like planet — that is to say, one that is the right temperature for water and thus life as we know it — would take about a year to complete a circuit around a star like the Sun.

Kepler would be lucky to have seen even one blip from a planet in such an orbit in the data analyzed so far and would need an additional year or two to record enough blips to determine that it was indeed in a habitable, water-friendly orbit around a star like our Sun.

The so-called habitable zone around a smaller dimmer star would be smaller, however, and a planet in that zone would complete its orbits more quickly, fast enough to have produced several blips noticeable by Kepler. In September, there was a flurry of excitement when a team of planet hunters led by Steven Vogt of the University of California, Santa Cruz, announced it had detected a small planet, Gliese 581g, in the

habitable zone of a dim red star in the constellation Libra. But enthusiasm cooled when a rival team of veteran planet hunters from the University of Geneva said it couldn't find the planet.
Dr. Batalha said that if the Gliese planet were in Kepler's patch of sky and did transit its star, the Kepler spacecraft would have seen it.
On Earth, scientists at the Large Hadron Collider will enjoy the accelerator's first full year of banging protons together in search of new secrets of nature. On top of Haleakala in Hawaii, the biggest digital camera ever built, with 1,400 megapixels, on a telescope known as Pan-Starrs 1, will continue scanning the sky for killer asteroids — in that case no news is good news — and anything else that goes bump in the cosmic night.
Another large camera, known as the Dark Energy Survey, will swing into action at a mountaintop observatory in Chile, looking to discern the effects of dark energy on the history and evolution of the universe.
Any day now, the mystery particle that is presumed to make up the dark matter that amounts to a quarter of creation, and which provides the gravitational scaffolding for galaxies, could pop out of the collider and leave its tracks in one of a number of underground detectors. Or it could signal its presence in space by high-energy emanations recorded by experiments like NASA's Fermi Gamma-ray Space Telescope or the Alpha Magnetic Spectrometer, a sophisticated cosmic ray detector that will be installed on the International Space Station next year.
A European satellite called Planck will continue its mission, begun in 2009, of surveying a cosmic radio haze left over from the Big Bang for clues to the origin and structure of the universe.
Meanwhile, the Hubble Space Telescope, rejuvenated by on-orbit surgery a year and a half ago, will keep scrutinizing the heavens with its matchless clarity, sifting eternity pixel by pixel.
The quest goes on, although the role and surely the leadership of American science in it is uncertain.
Incoming Republicans have already signaled their desire to whack discretionary spending, which includes nonmilitary research, back to 2008 levels.
That would pretty much undo the America Competes Act, which aimed at doubling research funds for a number of government agencies over five years; it was first passed in 2007 and reauthorized by the House of Representatives last summer but is still awaiting a vote in the Senate.
It might be a long wait.

http://www.nytimes.com/2010/11/09/science/09planets.html?ref=science

Strides in Materials, but No Invisibility Cloak
By HENRY FOUNTAIN

C. Holloway/National Institute of Standards and Technology

Antennas with metamaterials are being installed in cellphones because they are smaller and can better handle multiple frequencies.

If young Harry and friends had not cruised around Hogwarts unseen, hidden by an "invisibility cloak," much of the hype surrounding metamaterials might itself never have seen the light of day.
But when, half a decade ago, researchers made tentative steps toward what had been considered a theoretical possibility — using an artificially structured "meta" material to manipulate light or other electromagnetic waves in ways not achievable in nature — it did not take more than a clever headline or two to make the connection to the stuff of J. K. Rowling's wildly popular novels.
Scientists cautioned then that optical invisibility was hardly just around the corner. And that caution is repeated today. But researchers in the field point out that great strides have been made in the field of metamaterials, and there are some applications of the concept that may come into use in the next few years.
"It's something that people couldn't do or think about before — manipulate light in ways you couldn't dream about," said Vladimir Shalaev, a metamaterials researcher at Purdue University. Among the potential applications, he said, would be a "hyperlens," an add-on for a microscope that would overcome a fundamental limitation of such instruments, the ability to resolve objects smaller than the wavelength of light.
Metamaterials were first recognized as a theoretical possibility by a Russian physicist, Victor Veselago, who in the 1960s suggested it was possible to create materials with a negative refractive index. (An optical material with a negative refractive index, for example, would "bend" light back, outside of the material.)
Martin Wegener, a physicist at the Karlsruhe Institute of Technology in Germany, described the development of the concept in a broader sense. "People realized that mankind had only played with the electric component of light," he said, "and that it might be a lot of fun to play with the magnetic component."
To do so, researchers had to design physical structures that would allow the two components to be controlled independently. One they came up with was a split-ring resonator, a tiny C-shaped structure that in function is something like an electromagnet. The magnetic field that is produced by the flow of light or other electromagnetic radiation is extremely weak, but arrange countless numbers of these tiny structures in three dimensions and the material becomes polarized and magnetized and can do its magic.
In addition to novel types of lenses (which Dr. Wegener said were "not so sexy, but maybe much more useful than an invisibility cloak") it is possible to envision metamaterials that are perfect absorbers of light. These

"black like hell" materials, Dr. Wegener said, may be useful in solar energy applications, where absorbing more photons means producing more power.

A significant obstacle to creating metamaterials is that the size of the structures required depends upon the particular electromagnetic radiation — the smaller the wavelength, the smaller the structures must be. And the smaller the structures, the more difficult they are to fabricate, even using techniques like electron-beam lithography.

Another problem is that the metals used are inherently "lossy" — they dissipate some of the electromagnetic energy. So although a metamaterial lens, for instance, may manipulate light in interesting ways, it may transmit far less of it, making the lens less useful.

So far, the most progress has been made in metamaterials that work at microwave and radio frequencies, which have relatively long wavelengths. There are now cellphones with metamaterial antennas, which are smaller than conventional ones and can better handle multiple frequencies.

Other potential microwave devices may prove useful for military applications, said Ulf Leonhardt, a researcher at the University of St. Andrews in Scotland. Among these are cloaking devices that could hide an object from radar and antennas that work exactly like conventional ones but can be molded to match the aerodynamic shape of a plane.

The basic concept with these and other applications, Dr. Leonhardt said, is that metamaterials change the perception of space. "Something appears to be at a certain position, when in reality it is somewhere else."

Metamaterials may help improve magnetic resonance imaging, said George V. Eleftheriades, a researcher at the University of Toronto, by being used in the coils that generate and detect electromagnetic fields. A metamaterial coil could improve the signal-to-noise ratio in these machines, and improve the contrast of images.

It may even be possible to use a metamaterial lens to shift the electromagnetic fields generated by the MRI machine in a difficult-to-access part of the body to a different spot where they would be more readily detected by the coil, Dr. Eleftheriades said.

"It's all very, very fascinating," said Dr. Shalaev, describing the possibilities of metamaterials. "The ideas are there, the physics is there, but in terms of the realization of these ideas, there are some difficulties."

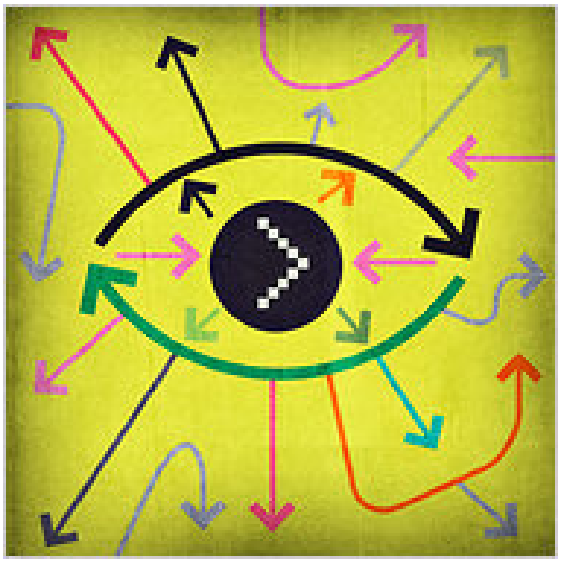
Dr. Shalaev and others said the fabrication hurdles may eventually be overcome by building metamaterials through self-assembly, in which molecules would combine to form the necessary structures. As self-assembly is essentially a chemical process, it could be relatively inexpensive compared to other techniques.

But Dr. Shalaev said that electron-beam lithography and other so-called nanofabrication techniques were steadily improving. "I see more progress in developing nanofabrication methods, which would make metamaterials easier to realize," he said. "I really think it's going to happen relatively soon."

http://www.nytimes.com/2010/11/09/science/09meta.html?ref=science

And Now, Predictions We'll Back 100 Percent

By JAMES GORMAN



It's a fool's errand to make precise predictions about the future. Even the famously prescient often fall on their faces.

In 1945, for example, Arthur C. Clarke suggested with astounding foresight that orbiting communications satellites would someday mimic Earth's rotation. But he also predicted that humans would land on Mars in 1994, that the last coal mine would be closed in 2006 and that in 2009, electronic monitoring would mean the end of professional criminals. He had to be kidding about the last one.

When I was first tempted to make specific predictions for 2011, I wisely resisted my own worst impulses. Then I thought, Why not predict what *won't* happen? Of course, predicting what won't happen can backfire, too. In 1920 The New York Times ridiculed the idea of the scientist Robert H. Goddard that rockets could leave the surface of the Earth. The newspaper published a correction on June 17, 1969, after the Apollo crew began its journey to the Moon.

I'm restricting myself to 2011, mostly, and I've got a lot of confidence in the 10 predictions that follow. In fact, I'll bet the house on them. Of course, the mortgage comes with it.

Here goes:

In 2011 human beings will not evolve, much.

Oh, I know, we recently evolved the ability to digest milk sugar. Milk sugar? What ever happened to really big evolutionary changes, like giant, bald heads with huge brains and extrasensory perception, or flippers and gills so we could live underwater in the New Atlantis?

Of course, a year isn't much time to evolve gills, given that we take so long to reproduce and grow up, so I'll extend this prediction to 2111.

We will not find any good-size life in outer space.

At best we'll get something microscopic. But I don't foresee us finding anything big enough to see with the naked eye. And that's what people want — not intelligent life, just something that moves around, maybe hops up and down, and makes some kind of noise (purring would be nice).

We will not find the ivory-billed woodpecker.

If you are one of the people who didn't know that we had lost it, well, we did. It happened when we cut down a lot of Southern hardwood forests. And now it seems to be extinct, although there are always new sightings.

No doubt there will be more blurry videotapes, with appended proofs that the blur is an ivory bill, but these are as unsatisfying as microscopic extraterrestrials, or Sasquatch footprints. We won't find a Sasquatch either.

Neanderthals will not be cloned.

How do I know? Because cloning predictions almost never come true. Remember the armies of cloned supermen, and the rampant identity confusion (because of clones, not credit card theft)? Have you seen them? No, instead we get something like the same cat again, but not exactly. And sheep: Cloning a sheep seems a bit like cloning chairs. How different are sheep from one another anyway?

The virtual colonoscopy will not replace the old-fashioned, really invasive one.

Computerized scans are not up to snuff yet. Besides, doctors would lose money, and until marijuana is legalized, colonoscopies are one of the few legal ways for the over 50 crowd to get high.

The first human will not be conceived in space.

This one is actually more of a dare than a prediction. It ought to be possible, and there's nothing lost in the trying. Please, astronauts, make my day, and your own. It will give the world a nice boost to have a space baby.

No one will upload himself or herself (memories, personality, neuroses, creepy desires) into a computer.

The transhuman moment, sometimes referred to as the singularity — when we, or some of us, transcend our physical bodies and become digital — will not occur next year.

I hope it does in my lifetime, though, because I like the idea of cybermysteries in which people are killed by being erased, or downloaded. But really, my big goal is to see "download" replace "whack" as a term of art in the world of crime. ("Did you download Charlie?" "Yeah, in cement shoes, boss, way down.")

Atheism will not become a dominant world religion despite the efforts of some scientists.

Because atheists, like certain negative prognosticators, are all about what's not — in this case, they assert, God.

The whole idea of getting together to reaffirm a lack of belief, joining hands and not praying, writing a creed about what they don't believe — I don't think so.

Now, zombieism: that's an up-and-coming alternative -ism, at least until someone writes them in to all the world's holy books. Then all bets are off.

The largest living animal will not turn out to be a 76-meter (249-foot) octopus in the Mariana Trench.

I'm going out on a limb here, because I'm contradicting Arthur C. Clarke. That's what he predicted for 2011. He also predicted that even larger creatures would be discovered shortly after this octopus event, when we bore through the ice of Jupiter's moon Europa (not happening either).

To be fair to a great man, though, I think he was just fooling around. He made those predictions in Reader's Digest in 2001, and by that time he'd been in the prediction game so long he must have been tired of the whole business and decided to say whatever came to mind, which, apparently, was that we would find a giant octopus.

Sadly, we won't. Happy 2011.

http://www.nytimes.com/2010/11/09/science/09predict.html?ref=science

A Gambling Town Bets a Museum Can Compete

By KIM SEVERSON

Jeff Haller for The New York Times

BILOXI, Miss. — Just months before a quirky little museum designed by the architect Frank Gehry was set to open in this Gulf Coast resort town, the waves from Hurricane Katrina lifted a three-story floating casino, slot machines and all, and slammed it into the project.

It might have dropped straight out of a Mark Twain story, like the steamboat that crushed Huck Finn's raft. Now, after years of struggle, the Ohr-O'Keefe Museum of Art officially opened on Monday. And the casinos that make $800 million a year in Biloxi are among the chief angels of its recovery.

Gambling companies have pumped millions into the rebuilding effort. In exchange, students of art and of Mr. Gehry will wander through the IP Casino Resort & Spa Exhibitions Gallery and a center for African-American art named after the Beau Rivage Resort & Casino.

The nature of the sponsorship, along with the flat-out surprise of a Gehry-designed building on this stretch of beach between Mobile, Ala., and New Orleans, raises the larger question: Can gambling and art mix in the Redneck Riviera?

"We have no template for this kind of museum," said Denny Mecham, the museum's executive director, who believes the museum will revive appreciation for the cultural heritage of the Mississippi Gulf Coast.

At its heart is a collection of fancifully glazed ceramics by George Ohr, the self-described "mad potter of Biloxi" who died in 1918. Art critics and historians regard him as a forerunner of the American modern art movement.

The need for something more than slot machines and blackjack is not lost on hospitality and gambling executives here, who acknowledge that keeping people in the casino for as long as possible is not the best strategy if Biloxi is to thrive as something more than a gambling town with really good fishing.

"We knew you had to sell them on Biloxi before you could sell them on Beau Rivage," said Mary Cracchiolo Spain, who handles public relations in Mississippi for MGM, owner of the Beau Rivage. "The tourism piece is the glue between the art world and the gaming community."

Museum officials estimate that 100,000 nongamblers might be drawn here each year simply on the power of Mr. Gehry's curving brickwork and twisting stainless steel structures. They are betting on what has come to be known as the "Bilbao effect." When Mr. Gehry's massive, titanium-clad Guggenheim Museum opened in Bilbao, Spain, in 1997, thousands of art tourists helped revive that dying industrial town.

Later buildings by Mr. Gehry have not had the same effect.

Few here believe that selling art and architecture in a city of 50,000 will be easy. Other high-minded cultural institutions are few.

The museum, which has opened three of what will eventually be five connected structures, could cost as much as $45 million. In addition to help from the gambling industry, the bill will be paid with a mix of insurance and government money, grants that include $3 million from the John S. and James L. Knight Foundation and private benefactors like Jeremiah O'Keefe, a former mayor.

The City of Biloxi, which donated the four acres on which the museum sits, modified its initial pledge after the hurricane. Priorities had to shift to social services and rebuilding.

"Supporting a museum is not going to be high on our list, particularly when a museum that started out to be an endeavor of about $9 or $10 million before Katrina is going to be a museum of $40 to $45 million," said Vincent Creel, the spokesman for the city.

"On the other hand," Mr. Creel said, "we realize a Frank Gehry museum is going to put us on the cultural map."

Many Biloxi residents, who have followed the museum's 12-year odyssey with not a small amount of skepticism, were hopeful.

"When they were building it and they had those ugly pods everywhere, you couldn't see the vision," said Carolyn Perry, a retired special-education teacher. "Now that it's together, you can see what it will do for this community. It's just a jewel."

Those pods — four supersized, twisted steel eggs that will hold small galleries filled with Mr. Ohr's pottery — became the buildings Biloxi loved to hate. People describe them variously as giant crushed beer cans, grain silos and spaceships.

Even the longtime mayor, A. J. Holloway, makes fun of them. But, Mr. Holloway concedes: "I don't know art. I'm a jock." (Mr. Holloway made a name for himself on the University of Mississippi football field.)

Mr. Gehry was persuaded to do the project after the mayor, Mr. O'Keefe and other museum supporters traveled to Los Angeles to lobby him shortly after the Guggenheim opened in Spain. He realizes that not everyone will immediately understand his vision, and that his modest buildings tucked among ancient live oaks may not have the immediate impact of structures like the Guggenheim or his undulating Walt Disney Concert Hall in Los Angeles.

"Nobody's going to get it until they come here," Mr. Gehry said in an interview.

Mr. Gehry said he had long been inspired by Mr. Ohr's pottery, and he even has a little gambling in his family.

"When I was a kid, my father was in the slot machine business," Mr. Gehry said.

For gamblers, however, the connection might not be enough. Despite posters in the hallways and a display of Ohr pots at a Beau Rivage gift shop, news of Mr. Gehry's museum had not penetrated the depths of the casino last weekend.

"I haven't heard a word about it," said Lois Allison, 69, who had traveled on a charter from Leesville, S.C., and was enjoying a modest amount of success at the Cash Wheel quarter machine.

"I came here to gamble," Ms. Allison said, "and I shouldn't even do that."

http://www.nytimes.com/2010/11/09/us/09biloxi.html?ref=design

How Cancer Acquired Its Own Biographer

By CHARLES McGRATH

Chang W. Lee/The New York Times
Dr. Siddhartha Mukherjee in his lab at the Herbert Irving Comprehensive Cancer Center.

In Dr. Siddhartha Mukherjee's lab, a Stanley Kubrick-like space at the Herbert Irving Comprehensive Cancer Center at Columbia University, enormous white freezers with digital temperature readouts keep tissue at 80 below zero. Sterile work stations with transparent hoods and bacteria-scattering blowers emit an unearthly blue light. And there is a bountiful supply of mice that, thanks to the addition of a jellyfish gene, literally glow either red or green in the dark.

Under the microscope, their blood-forming stem cells, a particular interest of Dr. Mukherjee's right now, shine like tiny Christmas lights. Just recently, he said, he and his team had discovered what may be a new mutation associated with the precancerous condition myelodysplasia.

"Cell culture is a little like gardening," he added. "You sit and you look at cells, and then you see something and say, 'You know, that doesn't look right.' "

Dr. Mukherjee, an oncologist and assistant professor of medicine at Columbia, known as Sid by his friends, is married to the MacArthur award-winning artist Sarah Sze and looks less like a scientist than like the leading man in a Bollywood musical. He belongs to that breed of physicians, rapidly multiplying these days, who also have literary DNA in their genome, and his first book, "The Emperor of All Maladies: A Biography of Cancer," comes out from Scribner on Nov. 16.

The book tells the stories of several cancer patients, and also of heroic researchers like Sidney Farber, who pioneered the treatment of childhood leukemia. But its main character, as the subtitle suggests, is the disease itself as it has been diagnosed, treated and thought about over the last 4,000 years.

In the early 1950s, Dr. Mukherjee points out in the book, cancer was still considered so unmentionable that a woman seeking to place an advertisement in The New York Times for a support group was told that the paper could not print either the word "breast" or the word "cancer." How about "diseases of the chest wall," an editor helpfully suggested. Then, a few decades later, cancer was in the public limelight, thought to be virtually curable if we just waged sufficient "war" against it.

What we understand now, thanks to advances in cell biology, Dr. Mukherjee writes, is that cancer is normalcy of a sort. Cancer cells are "hyperactive, survival-endowed, scrappy, fecund, inventive copies of ourselves," he says, and adds: "We can rid ourselves of cancer, then, only as much as we can rid ourselves of the processes in our physiology that depend on growth — aging, regeneration, healing, reproduction."

Dr. Mukherjee grew up in New Delhi; his father was a manager for Mitsubishi, and his mother had been a schoolteacher. He went to a Roman Catholic school there, where he was required to learn by heart a staggering amount of poetry, but attended college at Stanford, which he chose mostly because some cousins lived in California. After studying immunology at Oxford on a Rhodes scholarship, he went to Harvard Medical School.

By the time he got there, Dr. Mukherjee had pretty much decided to specialize in oncology, but the experience of actually encountering patients was transforming. "All of a sudden it's as if the world had turned," he said. "Everything suddenly becomes real, and your emotional responses become hyper-acute."

And it was because of a patient, he added, that he began to write "The Emperor of All Maladies." "I was having a conversation with a patient who had stomach cancer," he recalled, "and she said, 'I'm willing to go on fighting, but I need to know what it is that I'm battling.' It was an embarrassing moment. I couldn't answer her, and I couldn't point her to a book that would. Answering her question — that was the urgency that drove me, really. The book was written because it wasn't there."

He wrote most of it in bed, propped up on pillows, and by mastering what he called the "art of full indiscipline."

"Instead of saying, 'I'll get up every day at 5:30' or, 'I'll write from 9 to 12,' I did the complete opposite," he said. "I said: 'I will write during the day for 5 minutes, 10 minutes, whatever. I'll write in stretches until the book is done."

"The Emperor of All Maladies" (which Dr. Mukherjee adapted into an article for The New York Times Magazine last month) employs a complicated structure, looping around in time, juggling several themes at once and toggling between scientific discussions and stories of people, and yet Dr. Mukherjee says he wrote it in pretty much linear fashion from start to finish, without moving things around. He was influenced by both Richard Rhodes's study "The Making of the Atomic Bomb" and Randy Shilts's "And the Band Played On," each a big book about a historical moment, but his real breakthrough came, he said, when he conceived of his book as a biography.

"I began wondering, can one really write a biography of an illness?" he said. "But I found myself thinking of cancer as this character that has lived for 4,000 years, and I wanted to know what was its birth, what is its mind, its personality, its psyche?" At times in the book he even personifies the illness, talking about its "saturnine" quality, its "moody, volcanic unpredictability."

Last week Dr. Mukherjee gave an upbeat lunchtime talk to a group of cancer fellows at Columbia, young physicians who are preparing to become oncologists. He spoke quickly, clicking through a series of PowerPoint slides, but occasionally slowed down to remind the fellows about the kinds of questions that were bound to come up in their board exam. Talking about drug treatments, he reminded them: "If something is good, more is not necessarily better. Not always."

"Are cancer patients living longer?" he asked, and then answered his own question: it depends on which cancer and on when you start measuring. And yet in the treatment of myeloma, his main theme that day, changes had come so fast, he said, that everything he had learned at their age was already out of date, and a new generation of drugs — über-thalidomides, he called them — were changing the picture even as he spoke. Myeloma, a cancer of blood plasma cells, is still not curable but often now is very treatable.

Dr. David Scadden, a Harvard hematologist and oncologist who supervised Dr. Mukherjee when he was a cancer fellow, recalled that his enthusiasm was such that he sometimes seemed to levitate off the laboratory floor. "People who take care of cancer patients and also have the research dimension are people who are unsatisfied with how things are but optimistic about how they might be," he said. "Sid has an internal hope machine."

At one point in "The Emperor of All Maladies" Dr. Mukherjee calls oncology a "dismal discipline," but, sitting in his office, he said his work did not make him feel dispirited. "What does it mean to be an oncologist?" he explained. "It means that you get to sit in at a moment of another person's life that is so hyper-acute, and not just because they're medically ill. It's also a moment of hope and expectation and concern. It's a moment when you get to erase everything that's irrelevant and ask the most elemental questions — about survival, family, children, legacy."

"Most days," he added, "I go home and I feel rejuvenated. I feel ebullient."

http://www.nytimes.com/2010/11/09/books/09mukherjee.html?ref=books

Online law man: Virtual worlds need real laws

17:35 8 November 2010

Samantha Murphy, contributor

(Image: Jo Ito)

Tens of millions of people live, work and play in virtual worlds where anything goes. ***Greg Lastowka*** *thinks we need to police these lawless frontiers*

What prompted you to write your new book, *Virtual Justice*?

I've always been interested in technology law, and the issues surrounding law in virtual worlds are like canaries in a coal mine. Society is increasingly migrating to the internet, and virtual worlds are an intense version of that. The issues that arise in virtual worlds will ultimately filter through to broader society.

Do you think we need laws covering things like electronic commerce, freedom of speech and defamation in the virtual world?

Yes, we definitely do. Virtual law is interesting because these environments are in one sense fictional, in another very real. People invest real money and time and create real relationships. So, the question is: to what extent should the things that are happening in these environments be treated as if they were happening in physical space or in conventional online forums, email or blogs?

What kinds of laws do you think we need most?
We need to give careful consideration to how copyright operates in virtual worlds, where everything is mediated by the software. To a certain degree, copyright law is the umbrella regime for virtual worlds. You are dealing with copyright when you create a virtual world and also when you enter one. Once people are interacting in virtual worlds, such as Second Life, they are often creating and selling their own content. Their creativity is tied up with the copyright interests of the creators of those virtual worlds.
Then there's the question of virtual property. There are many virtual worlds in which currency and objects are exchanged for real money, and these virtual economies are growing. Already we have billions of dollars in transactions in virtual property. Yet the legal system has not determined whether virtual property should be treated as if it were physical property. The resolution of these issues will have implications for tax laws, criminal proceedings on theft and transfer of ownership, inheritance planning and more.
Have there been cases of people coming to grief over virtual theft?
One that I talk about in the book is the case of a Chinese gamer named Qiu Chegwei. His friend stole his dragon sabre - a virtual object in the online game *Legend of Mir 3* - and sold it, converting the profits into real money and keeping the proceeds. Because the original property was intangible and only existed within the game, the police refused to treat it as a theft. So Chegwei took the law into his own hands and killed his friend. He's now serving a life sentence in prison.
If we don't regulate the virtual property economy and if the law turns a blind eye to it, what you end up with is an anarchic frontier online. Money can change hands, social expectations can be disregarded and people can write malicious code that harvests passwords and gathers virtual property from others' accounts. All sorts of criminal or quasi-criminal activity can take place given the fact that these are very real economies, even if they have no legal status in the real world.
Surely technology has always influenced law. Are things fundamentally different today?
Yes, I think so. To an extent, technology is displacing law. A virtual world owner has a choice between law and technology as tools to further their interests - and they are generally turning to technology first. In 1999, Lawrence Lessig used the phrase "code is law", and it applies to virtual worlds today. If you control the very nature of the simulation - how gravity works, how a person walks, where they go, what they can say - then you have the power to govern the environment in a way that no sovereign in real space can.
So virtual law could end up being quite powerful?
The government can do a lot of things but it can't reverse the direction of gravity. Owners of virtual worlds can do an amazing number of things with regard to surveillance and interpersonal interactions.
In the online community LambdaMoo, for instance, the owners of that virtual world invented toading as a system of punishment for criminals. If you do something wrong, they turn your avatar into a toad. In a sense, technology has outpaced the law. Any owner of a technological platform essentially has the ability to regulate society.

http://www.newscientist.com/blogs/culturelab/2010/11/online-law-man-virtual-worlds-need-real-laws.html?DCMP=OTC-rss&nsref=online-news

Digging up the internet's ancient history

18:01 10 November 2010

Helen Knight, technology reporter

(Image: KylieUltra.com c.1997, archived by Good Technology)

While the web may only be gearing up for its 20th birthday next year, some of the earliest websites are already in danger of being lost to history forever.

That's because when new versions of websites were developed, the older versions were often simply discarded along with the hard drives and laptops they were stored on, says Jim Boulton of web content agency Story Worldwide, based in London.

In an attempt to preserve these websites, and the machines they originally ran on, Boulton has performed what he calls the first archaeological dig of the web, and the results will be displayed at an exhibition in London this week.

Previous attempts to preserve the web's history include a system called Memento, designed by Herbert Van de Sompel at Los Alamos National Laboratory in New Mexico, which finds versions of web pages from any date and time.

Elsewhere, the Internet Archive's Wayback Machine allows users to key in the URL they want, and then choose a version of the page from a list of years. But these systems only provide people with part of the story, Boulton says.

"The Wayback Machine is a decent effort, but you don't see it in the context of the time," he says. "You only see the website, you don't see the hardware or software it was shown on, so you don't get the full experience." To put together the exhibition, Boulton and a panel of advisers chose a wish list of websites they would like to see again, and tracked down original members of the design agencies to request their code.

They then "begged, borrowed and bought from eBay" the original laptops and computers the sites were displayed on.

"These machines are very fragile," he says. "Some of the monitors are on the verge of burning out, and some of the hard drives are on the brink of failing."

Among the websites being exhibited are one designed by early digital advertising agency Antirom, which can only be seen on a laptop built in 1995, and a Kylie Minogue website from 1997 (pictured above).

"This was one of the first to use all forms of multimedia," says Boulton. "You could listen to music, watch videos, and play an interactive game to dress and undress Kylie."

http://www.newscientist.com/blogs/shortsharpscience/2010/11/digging-up-the-internets-ancie.html

Stubborn US cities rated in personality test

- 22:00 10 November 2010 by **Jim Giles**

Cities have ingrained characters that are stubbornly hard to change – and they're not necessarily what you expect them to be. New York, for instance, is really quite average.
The findings come from a new way of ranking cities, based on one of the largest and most detailed sets of data on the world's metropolitan areas.
Because bigger cities contain more wealth and more crime than smaller ones, researchers often divide key indicators of urban health, such as crime rates, by a city's population to produce a per capita number that can be used to compare cities of different sizes.
But that approach suffers from a serious flaw, says Luís Bettencourt of Los Alamos National Laboratory in New Mexico and his colleagues.
In 2007, they showed that many attributes of life in cities around the world – from wages to number of patents produced – increase faster as their populations grow. If a city doubles in size, for example, the GDP of that city generally grows by 115 per cent (*Proceedings of the National Academy of Science*, DOI: 10.1073/pnas.0610172104). This effect, known as super-linear scaling, means that per capita indicators are biased to make large cities look more unusual than they actually are.
Bettencourt and colleagues have now recalculated the violent crime, personal income, GDP and patent rankings for more than 350 US metropolitan areas. The new results reveal that some supposedly exceptional cities, such as New York, are in fact quite ordinary. Other less-heralded places, like Minneapolis, emerge as unusually successful.
The researchers also found that notable changes in the health of cities take many decades. San Jose, for instance, has been unusually wealthy for its size, since the 1960s – well before boom time in Silicon Valley. The number of patents granted to people and institutions in Boston reveals it to be a particularly innovative city, but this characteristic – which began to emerge around 1980 – took at least 15 years to become clear. More rapid changes, such as the boom and slump of the 2001 dotcom bubble, show up as blips on otherwise slow-changing trajectories.
So what is the magic ingredient that makes a city successful? Bettencourt says that it is likely to lie with factors that are hard to quantify, such as the kind of creative thinking that top-flight universities encourage. Investments such as tax breaks for new businesses and better infrastructure can help, but town planners should not bet on such measures bringing about short-term success, he says: politicians who have to deliver results over only a few years just have to sit tight and be patient.
Journal reference: *PLoS One*, DOI: 10.1371/journal.pone.0013541
Cities with personalities

New York City, New York: just average
Sorry, New Yorkers: the city that never sleeps is surprisingly ordinary for its size. Manhattan and the surrounding urban areas had a GDP of over $1 trillion in 2006, but that's about expected given that over 18 million people live there. The good news? Violent crime rates in the region are lower than in any of the other 20 largest US metropolitan areas, as measured by the new scaling.
San Jose, California: bland yet exceptional
Safe but bland, or so the caricature goes. Yet the new scaling system pegs San Jose as one of the most exceptional US cities, in part because it produces far more patents than expected for a city of its size. The city is the unofficial capital of Silicon Valley, but its secret is not that easily explained: it's been near the top of the patent rankings since the 1960s, before the computer or biotech booms.
Corvallis, Oregon: exceptionally creative
For an innovative vibe, head here. Its 80,000 residents produce more patents for its size than any other place in the US. The town's record-beating output is down to a local Hewlett-Packard facility.
Fairbanks, Alaska: rich and dangerous

Wealthier cities tend to be safer, but Fairbanks bucks the trend. According to the new scaling, it is the 25th richest city and the fifth most dangerous.

Provo, Utah: poor but safe

This is the nemesis of Fairbanks in Alaska. Its residents have to contend with unusual poverty – it ranks 353 out of 363 in GDP, as scaled by city size – yet the town of 480,000 has a claim to fame: unlike almost all other poor cities, it is safe. In the violent crime rankings, Provo falls 296th.

San Francisco: plain smug

The inhabitants of San Francisco are often accused of being a touch smug, and the new rankings won't change that. When the 20 largest US cities are scaled according to population, San Francisco comes top in terms of personal income, GDP and patents produced. Its secret ingredient, however, lies outside the urban centre: much of that wealth and innovation comes from Silicon Valley, just south of the city.

Bridgeport, Connecticut: rich list

Less than a million people live in the region, but many are very wealthy indeed. Proximity to Wall Street, combined with a beautiful setting, have tempted many hedge funds and corporations to relocate here. Scaled by size, it is the richest metropolitan area in the US.

Phoenix, Arizona: underachiever

Until the subprime crisis struck, cities like this were hailed as boom towns. But the new ranking shows that Phoenix is actually an underperformer. Compared with rival regions, the city has had below-average rates of personal income and GDP for decades. It has remained sub-par even as its population has more than tripled in the last four decades.

Minneapolis, Minnesota: creative middle child

San Francisco and Boston are the most innovative large cities in the US, as measured by patents. No surprise there. But between the two lies Minneapolis. Home to medical technology company Medtronic, the city is respected by technology insiders but rarely attracts wider notice.

Brownsville, Texas: poor relation

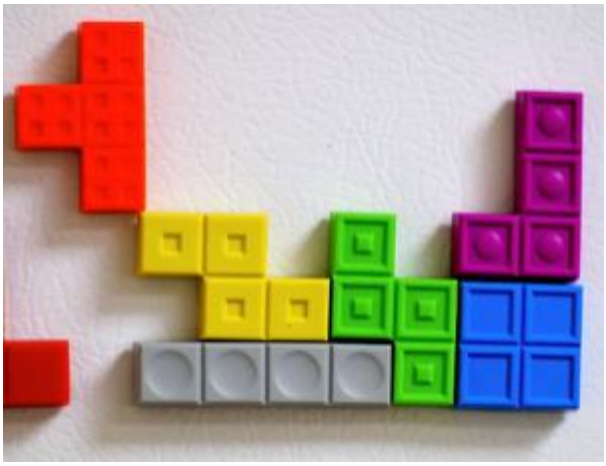
Brownsville illustrates just how entrenched city characteristics can be. Data for this border town goes back to 1960s, when it was far below the national average for wealth. Its score has only got worse since. Today, it ranks 361st for personal income and 362nd for GDP.

http://www.newscientist.com/article/dn19694-stubborn-us-cities-rated-in-personality-test.html

When it comes to traumatic flashbacks, Tetris blocks

- 22:00 10 November 2010 by **Duncan Graham-Rowe** and **Debora MacKenzie**

Unlikely therapy



Playing the computer game Tetris after a horrific experience can act like a "cognitive antibiotic" by reducing the harrowing flashbacks that haunt people with post-traumatic stress disorder (PTSD).
Flashbacks are a hallmark of PTSD, especially among soldiers who have witnessed terrible events in combat. Soldiers with PTSD are more likely to be disabled or to die from accident or illness than those who do not, even decades later. "It's the kind of memory that pops back when you don't want it to," says Emily Holmes, a clinical psychology researcher at the University of Oxford.
Last year Holmes showed that if volunteers played Tetris for half an hour after looking at graphic images of injuries, they had fewer unwanted memories of the images as a result. But it wasn't clear whether the game simply acted as a distraction or the effect was common to all computer games, she says.
Holmes's latest research suggests that this effect may only occur with visuospatial games, of which Tetris is the classic example.In her latest experiments, Holmes again showed volunteers the traumatic images and then compared the number of flashbacks experienced by Tetris players with the corresponding number among volunteers who had played a general knowledge "pub quiz" game; a control group had no computer game to play. She found not only that Tetris players seemed to have almost half as many flashbacks as normal, but that those playing the general knowledge game experienced slightly more than normal. "It made it worse in the short term," she says.

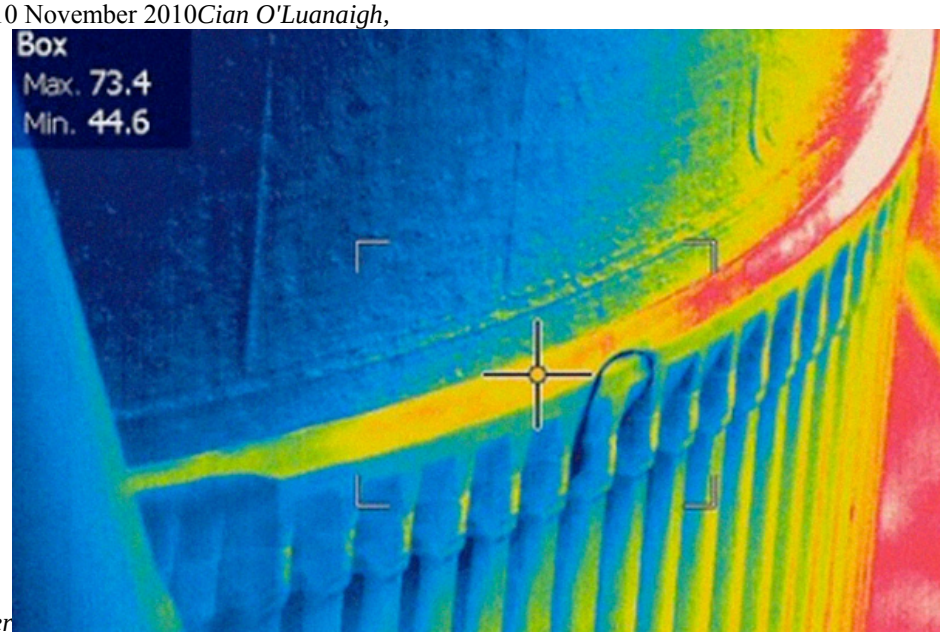
Game theory

What's more, the beneficial effects of Tetris remain even when played 4 hours after the trauma, says Holmes. This suggests that the game is not just a distraction, but is interfering with the mechanisms that form the intrusive memories, she says.
Flashbacks are caused when there is an imbalance between our perceptual experience – what we see, hear, taste and smell – and the conceptual experience that allows us to comprehend and make sense of it all. During a trauma, such as a high-speed car crash, the perceptual experience can be emphasised over the conceptual, says Holmes. This can make it difficult to remember the event as a coherent story, instead imprinting it in memory as a raw set of perceptual experiences: the flash of headlights and the grinding of metal, say. It is this kind of memory that can cause great distress to a victim by repeatedly popping up, Holmes says.
But it can take up to 6 hours after a trauma for the brain to create these intrusive memories from these events, leaving a window of opportunity to prevent them from forming. According to Holmes the Tetris effect occurs because the visuospatial work required to play the game places an additional burden on the perceptual systems within the brain and so interfere with this memory-forming process.
"It's not wiping out the memory – it's just taking the edge off its intrusiveness," she says. In contrast, the verbal game appears to interfere with our conceptual experience, making it difficult to make sense of the perceptual memories and so exacerbating the flashbacks.
Journal reference: *PLoS One*, DOI: 10.1371/journal.pone.0013706

http://www.newscientist.com/article/dn19710-when-it-comes-to-traumatic-flashbacks-tetris-blocks.html

The crack that delayed Discovery

18:08 10 November 2010*Cian O'Luanaigh,*



reporter

(Image: NASA)

This terahertz image shows the 50cm crack in the foam insulation of the space shuttle's fuel tank, at the joint where the liquid oxygen tank meets the inter-tank flange.The crack appeared on Friday as the tank was being drained of liquid hydrogen after a fuel leak prevented the shuttle from launching.

A missing chunk of foam insulation was responsible for the breakup of the shuttle Colombia as it re-entered the earth's atmosphere in 2003, causing the deaths of 7 astronauts.
Update at 2114 GMT on Wednesday: CBS News reports that after the cracked foam was removed on Tuesday night, cracks were found in an underlying structure called a stringer. Similar cracks were found on an external tank set to be used by the shuttle Atlantis in 2011 and "may be related to the use of lightweight materials in the latest generation of tanks", according to William Harwood of CBS News. He continues:

The crack in Atlantis' tank was repaired and engineers likely will follow a similar approach with Discovery's tank, possibly installing so-called doublers to reinforce the damaged stringer or a replacement section. Assuming management clearance to proceed and no other problems, fresh foam will be sprayed on, cured and sanded to match the surrounding insulation.

If the fuel leak and cracks can be fixed, Discovery's final mission, STS-133, could launch as soon as 30 November. The shuttle will bring supplies and extra storage capacity to the International Space Station.

http://www.newscientist.com/blogs/shortsharpscience/2010/11/the-crack-that-delayed-discove.html

Calcium causes brain cell loss in Parkinson's

- 18:00 10 November 2010 by **Catherine de Lange**

Calcium activity in the brain plays an important role in the onset of Parkinson's disease, according to a study in mice. The finding helps explain why common calcium-blocking drugs, such as those used to control blood pressure, appear to protect against the disease.

Damage to dopamine-releasing cells in a brain area called the substantia nigra (SN) is known to be involved in the onset of Parkinson's disease. "Pacemaking" cells in this area release pulses of dopamine, a hormone crucial for movement and balance. So damage to these cells leads to the symptoms of Parkinson's – such as tremors and stiffness.

A key question is why cells of the SN are so much more susceptible to damage than those in surrounding areas. Now it seems that calcium, which enters these cells to regulate their activity, is the culprit.

Jaime Guzman from Northwestern University in Chicago and colleagues compared the effect of calcium activity in two brain areas in mice – the pacemaking SN and a neighbouring area where there was no pacemaking activity.

Oxidative stress

They found that the calcium influx in the SN caused much higher levels of oxidative stress – pressure on cells to counteract the effects of molecules such as free radicals, that can damage proteins and DNA. Oxidative stress is thought to be the source of the cell damage that leads to Parkinson's disease.

"Although calcium channels normally participate in pacemaking, they aren't essential as other ion channels can pick up the slack," says James Surmeier, who was part of the team. Treating mice that had Parkinson's disease with calcium-channel-blocking drugs might therefore prevent cell damage without hindering essential pacemaking activity.

To investigate this possibility, the team used mice lacking a gene called DJ-1. The absence of this gene causes early onset Parkinson's disease, and mice who lacked the gene showed much higher levels of damage to the dopamine-releasing cells of the SN than normal mice. When treated with drugs that block calcium channels, however, the degree of cell damage dropped to levels seen in other types of brain cells that are relatively resistant to oxidative stress.

The right drug

The findings explain why previous research conducted by Christoph Meier at University Hospital Basel in Switzerland showed that calcium-blocking hypertension drugs reduced the risk of Parkinson's disease, while other types of drug used to treat high blood pressure did not.

"A lot seems to point towards a potential benefit of calcium-channel blockers in Parkinson's disease," says Meier, "but it's too early to tell whether they help prevent the disease or could improve the situation of patients who already have a diagnosis."

Surmeier is more confident. "We think that anyone at risk of developing Parkinson's disease should benefit by the use of calcium blockers such as isradipine," he says, as it appears that the dopamine-producing cells in the SN begin to disappear well before the onset of symptoms.

Isradipine is already in a phase II clinical trial for people with early stage Parkinson's disease, and Surmeier is now planning to investigate more selective and potent drugs.

Journal reference:

Nature, DOI: 10.1038/nature09536

http://www.newscientist.com/article/dn19711-calcium-causes-brain-cell-loss-in-parkinsons.html?full=true&print=true

Human evolution was shaped by plate tectonics

- 10 November 2010 by **Michael Marshall**

Home is where the hills are (Image: Nigel Pavitt/John Warburton-Lee/Alamy)

When early humans came down from the trees, they clambered up into tectonically active areas

THE course of human evolution was directed by the shifting and shaking of the Earth's crust.

"As a species we evolved the way we did as a result of living in very dynamic landscapes that selected for adaptability," says archaeologist Geoff Bailey of the University of York in the UK, who along with Geoffrey King of the Paris Institute of Earth Physics in France has spent over 20 years amassing evidence for the theory.

Humans evolved as a result of living in very dynamic landscapes that selected for adaptability

Our ancestors evolved into modern humans while inhabiting tectonically active regions, the researchers say. Intelligent species would have thrived in these deformed landscapes, exploiting the topography to hunt, avoid predators and competitors, and build defensible homes. Eventually they developed large brains, a prolonged childhood and the use of advanced tools and weapons. Less smart species would not have had the ability to use the uneven ground to their advantage.

The idea is similar to that put forward by Jared Diamond of the University of California, Los Angeles, in his best-selling book *Guns, Germs and Steel*. Diamond argues that factors such as the shapes of the continents and the location of mountain ranges were crucial in shaping modern history.

Bailey and King's work extends this to the millions of years of human evolution, but a lack of conclusive evidence has hampered its acceptance. With two new papers out this month, this could be about to change.

The pair began collaborating in the 1980s, after King pointed out that the ancient Greek settlements Bailey was excavating were all in tectonically active regions. "We realised there was something going on," says Bailey.

The Earth's surface is divided into plates, which move around over the millennia. Where they grind against each other, pressure builds up, and this can trigger earthquakes and volcanic eruptions. Most dramatically, the massive Toba eruption 74,000 years ago in what is now Indonesia chilled the climate around the world and came close to killing off the human race.

But Bailey and King are concerned with subtler effects. "Tectonic movements create and sustain landscapes in ways that are beneficial to human occupation," Bailey says.

In active regions, the folding and faulting of the crust, combined with regular earthquakes and volcanic activity create a disrupted landscape with many hills, valleys and cliffs, criss-crossed with solidified volcanic lava.

Bailey argues that these complex landscapes were perfect for early humans, who were not fast runners or particularly strong, but were intelligent and adaptable. For instance, even though weapons such as spears had not been invented, early hunters could kill large animals by exploiting the irregularity of the landscape.
What's more, since humans evolved from tree-living primates, they would have found it easy to switch to clambering around hills and valleys. "Humans are adapted for complex topography," says King. By contrast, they would have been at a disadvantage on flat, open plains like the African savannah, which is dominated by fast-running predators like lions and hyenas.
Tectonically active landscapes are also more likely to have reliable water sources, because earthquakes can trap water behind barriers of rock, forming lakes, and underground water can rise through faults to form springs. These water supplies would support plants and attract animals. Barriers like cliffs and ridges would have made life safer by allowing early humans to hide from predators and defend themselves against invaders (*Antiquity*, vol 80, p 265).
So much for the theory. If it is right, we should find that early humans were clustered in tectonically active regions. When Bailey and King superimposed the locations of human fossil sites throughout Africa with satellite images that show the roughness of the land, they found that they lined up neatly (see map).
In fact, 93 per cent of the fossil sites are in regions of high or medium surface roughness. For example, most of the classic human fossil sites, like Olduvai Gorge and Laetoli, are found along the East African Rift, where two continental plates are slowly coming apart. Bailey and King have found similar patterns of fossil sites in Arabia, which humans colonised later (*Quaternary Science Reviews*, in press).
However, it is by no means case closed for the tectonic theory. Buried remains are more likely to be thrown up onto the surface if they are in an earthquake-prone region, so the results could be misleading, says Michael Petraglia of the University of Oxford.
So Bailey and King, with Sally Reynolds of the University of the Witwatersrand in Johannesburg, South Africa, have extended their studies to South Africa, where human remains have been found in sites like Taung and Makapansgat (*Journal of Human Evolution*, in press). Rather than having been revealed by tectonic activity, the remains were found in caves. "There are hundreds of these caves, but only some have remains - and those are in regions that were tectonically active," Bailey says.
"It is a fascinating piece of work that will make people sit up and reconsider," says Chris Turney, a physical geographer from the University of Exeter, UK. Petraglia points out that shifts in the climate, like the desertification of the Sahara, would also have affected where our ancestors lived. "There are more factors to consider," he says, "but their ideas are very interesting."

http://www.newscientist.com/article/mg20827864.000-human-evolution-was-shaped-by-plate-tectonics.html?

Divers could breathe deep with liquid-filled lungs

- 10 November 2010 by **Helen Knight**
- Magazine issue 2786.

Scuba only takes you so deep (Image: Georges Antoni/Hemis/Alamy)

Inhaling oxygen-rich liquid would allow divers to explore deeper into the ocean than ever before, and even eliminate decompression sickness

YOU step into your diving suit and pull a helmet over your head. The helmet immediately starts to fill with liquid, but you don't panic, you simply begin breathing in the fluid as you would air.

No, this is not a scene from the movie *The Abyss* (pictured), but the brainchild of inventor Arnold Lande, a retired heart and lung surgeon formerly based at the University of Texas Medical School at Houston.

While some researchers work on ways to keep divers under for longer (see "How to spin seawater into air"), Lande has designed a liquid breathing system that he claims will allow people to dive to great depths without the risk of decompression sickness, otherwise known as the bends. It is caused when inert gases like nitrogen and helium in the air mixture divers breathe dissolve into their blood, particularly under the terrific pressures of the deep ocean. If a diver resurfaces too quickly, these gases can bubble into body tissues like the bubbles that form as a soda bottle is uncapped, causing terrible joint pain, seizures and paralysis.

Breathing an oxygen-carrying liquid would dispense with the need for inert gases like nitrogen, says Lande, and so eliminate the threat of the bends.

The idea to use liquid breathing for deep diving was first investigated in the 1960s. Alveoli in the lungs can exchange oxygen from a fluid if the gas is mobile enough in solution. But the human body isn't up to the task of heaving a liquid in and out fast enough to inhale sufficient oxygen and exhale enough carbon dioxide, so the idea was dropped.

In a paper presented last month at the first International Conference on Applied Bionics and Biomechanics in Venice, Italy, Lande proposed a way around this problem. He has designed a system in which the diver breathes in an oxygen-carrying liquid called perfluorocarbon, contained in a diving helmet.

To help their lungs push the liquid in and out, the diver would wear a cuirass ventilation device fitted around their chest. These devices, named after the armour worn by medieval soldiers, wrap around the upper body and are attached to a pump that exerts or removes pressure on the chest to help the lungs inhale and exhale.

"This would provide the assistance to the diver's breathing that he needs while he is working hard, having to pull a liquid into his lungs and expel it again," says Lande.

Gaseous oxygen would be bubbled into the liquid in the helmet to keep it topped up. The helmet would not help with the removal of CO_2, though. The system gets rid of this gas directly from the blood through an artificial gill fitted to the suit, in the form of a gas-permeable membrane. A catheter inserted into the femoral vein in the groin takes the blood out of the body to be filtered through the membrane. Heart and lung machines use a similar system, called a membrane oxygenator. For divers, the CO_2 would be absorbed by a material such as soda lime, and the treated blood would re-enter the body.

Could divers tolerate breathing in a liquid? The powerful human gag reflex would normally cause them to cough it straight back up. But Lande says that can be overcome with training and, if necessary, a drug to dull

the sensation of liquid pouring down the windpipe. "Once they were breathing the liquid in, I don't think they would have much of a problem with it," he says. "The alternative is putting a tube down their throat, which carries the risk of infection."
Once they were breathing the liquid in, divers would not have much of a problem with it
To keep the diving suit topped up with power and oxygen, Lande envisions a small propeller-driven, torpedo-like auxiliary vehicle that the diver would take along with them, to carry the necessary battery pack and oxygen tanks.
The idea is perfectly feasible and has been demonstrated extensively in other mammals, says Thomas Shaffer of the Nemours/Alfred I. duPont Hospital for Children in Wilmington, Delaware, who has investigated liquid ventilation since the 1970s. "A number of us put a perfluorochemical into animals' lungs and sent them to very great depths - over 300 metres - and then decompressed them in less than 1 second," he says. "Normally that would mean instant death for a mammal, but with the perfluorochemical, it wasn't a problem."
There have long been unconfirmed rumours that the US navy experimented with liquid breathing for divers in the 1980s, says Shaffer, who in 1989 was running trials using liquid ventilation to treat premature babies and adults in respiratory distress. While undertaking these trials, he worked with a doctor who claimed to have previously been a Navy Seal involved in these experiments. "His story seemed credible, but he refused to talk publicly about it," says Shaffer.
According to this source, the technology worked, but some divers developed stress fractures of the ribs from the huge effort required to breathe liquid without the help of any assistive device.
Another, far more serious, danger would be from divers panicking and vomiting into their breathing liquid, says Shaffer. "If you were to get sick in the fluid and aspirate it, you would have a lot of problems."
This could be overcome by putting a one-way valve in the system that would prevent any unwanted fluids from entering the lungs. If successful, this technology could allow divers to go as deep as 1000 metres below the surface to respond to deep-sea disasters (see graph). Though the blowout of the Deepwater Horizon oil rig in the Gulf of Mexico occurred at a depth of 1500 metres - too deep for the system to be effective - it could be useful for similar emergencies.
Indeed, Shaffer himself was approached by a member of the Russian navy and asked for advice when the Kursk nuclear-powered submarine sank in 2000, but there was not enough time to put a device together to allow divers go down to the wreck, he says.

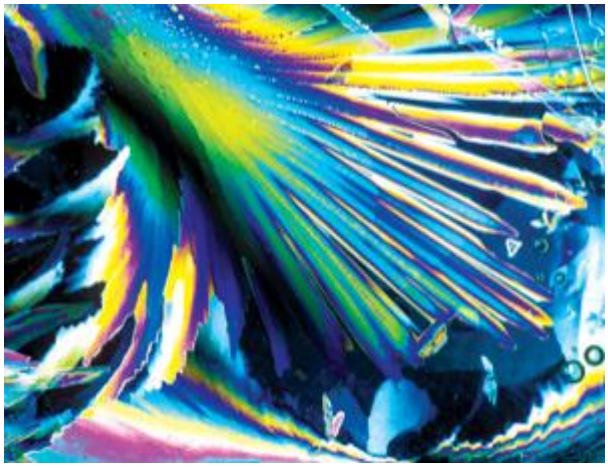
How to spin seawater into air

Israeli inventor Alan Bodner has developed a prototype device to extract air from seawater by lowering its pressure. This causes any gas dissolved in the water to bubble out - just like opening a carbonated drinks bottle. The air can then be captured and pumped into an underwater habitat or used by a diver.
Bodner first unveiled the concept back in 2005 but has now developed a proof-of-concept model. The battery-powered system, about the size of a briefcase, can process 200 litres of seawater per minute. The device uses a centrifugal pump to lower the water pressure, and the air bubbling out is then sucked up by a vacuum pump and piped into a container.
When combined with gas exhaled by a diver, this would be enough to provide them with the litre of oxygen per minute that they need, says Bodner. The system could be attached to a torpedo-style auxiliary rig which a diver could take into the depths with them.
To remove carbon dioxide from exhaled air, Bodner is now developing a system in which the stale air is "scrubbed" of CO_2 by mixing it with seawater. The air is pumped into a mixing chamber and seawater is then sprayed in. The droplets cling to and exchange gases with the air molecules, reducing the CO_2 in the air, which is then separated from the water and re-circulated back into the breathing apparatus. "This method, combined with my system that can supply oxygen from the water, provides a complete solution for breathing underwater," says Bodner.

http://www.newscientist.com/article/mg20827865.900-divers-could-breathe-deep-with-liquidfilled-lungs.html

Ice and a slice makes transistors more precise

- 14:16 10 November 2010 by **Jon Evans**
-



Micrographs of thin layers of crystal landscapes of melting ice (Image: Dr Keith Wheeler/SPL)

Winter is just beginning in the northern hemisphere, but pieces of equipment at Harvard University are already covered in ice. It seems the clear solid can be used as a mask to build transistors more precisely – in a process that's being dubbed "ice lithography".

Daniel Branton and his colleagues placed single-walled carbon nanotubes onto a silicon wafer, cooled it to about -163 °C and sprayed it with water, causing an 80-nanometre-thick layer of ice to form. Then the researchers used an electron beam to carve away two squares of ice, exposing the tops of some nanotubes, and deposited a layer of palladium on top of this ice mask.

Dipping the structure in alcohol melted the ice. The palladium layer above it then fell off, except in the two squares where the metal had stuck directly to the nanotubes. The resulting cluster of nanotubes, fused to two palladium electrodes, acted as a transistor.

The process resembles how computer chips are made, but in conventional, electron beam lithography, a chemical such as polymethyl methacrylate is used as the mask. Using ice makes the technique cleaner, cheaper and gentler on the nanotubes.

Clear control

Another advantage of ice lithography is that ice is transparent, so researchers could see where to remove sections of the mask so that the electrodes ended up precisely aligned with the nanotubes below.

In future this capability could also lead to the creation of more complex structures. "It could potentially fabricate devices which might be very difficult to fabricate using standard lithographic procedures," says Branton.

"It's a fascinating paper," says Sandy Dasgupta, a chemist at the University of Texas, Arlington, who pioneered an environmentally friendly, ice-based version of a commonly used technique for separating the compounds in complex mixtures, called ice chromatography. He is also interested in the potential to create more complicated nanoscale structures using ice.

Branton and his colleagues came up with the idea for ice lithography around five years ago, but say they have only now refined the technology to the point where they can produce working nanoscale devices. "We're trying to see what works and what doesn't work," he says.

Journal reference: *Nano Letters*, DOI: 10.1021/nl050405n

http://www.newscientist.com/article/dn19622-ice-and-a-slice-makes-transistors-more-precise.html?full=true&print=true

California's whales suffer sunburn

- 11:46 10 November 2010 by **Andy Coghlan**

Ouch, blue whale feels the heat (Image: Diane Gendron)

Whales in the Gulf of California are starting to blister in the sun, say researchers who have studied them for three years.

They blame the blisters on exposure to harmful ultraviolet radiation as the Earth's protective stratospheric ozone layer struggles to repair itself.

The whales get sunburned when they come up for air, rest on the surface and feed their young. "It's the first evidence that ultraviolet light can damage their skin, but it's difficult to say what the impact on their health might be," says Laura Martinez-Levasseur of the Institute of Zoology in London and Queen Mary, University of London, and co-leader with Karina Acevedo-Whitehouse of the team that observed the whales between 2007 and 2009.

Over that period, she and her colleagues studied blue whales, sperm whales and fin whales. They monitored the prevalence of blisters by taking 156 high-resolution photographs of skin on individual whales. They also took skin biopsies from 142 whales so they could analyse them for melanocytes, skin cells that react to sunlight by producing the protective chemical, melanin.

Over the three years the proportion of blue whales with blisters rose from 10 to 60 per cent. As you might expect the melanocyte counts also varied according to lifestyle and natural differences between the species. Fin whales, which have very dark pigmentation and which are resident year round in the sun-soaked Gulf of California, had counts twice those of blue whales, which only visit in the summer to calve and raise their young.

Martinez-Levasseur and her colleagues found that the blue whales suffered their worst blistering early on in the season. "When they arrive in the gulf from much colder areas, they are suddenly exposed to all this ultraviolet," she says. But they had fewer blisters by the end of the season, so like humans acquiring tans, they do adapt to the extra radiation.

Sun-worshipping sperm whales

The sperm whales also suffered quite severe blistering compared with the fins, but mainly because they spend much longer than the other two species resting at the surface. "They can spend all day on the surface," says Martinez-Levasseur, who found that the sperm whales had intermediate melanocyte counts.

Although the researchers conclude that the increased blistering is probably down to increasing UV exposure through depletion of protective ozone, meteorologists contacted by *New Scientist* were more doubtful. "I'd be cautious with the link to ozone depletion," says Guus Velders of the Netherlands Environmental Assessment Agency in Bilthoven.

"Since about 2000, the levels of ozone have been about constant," he says. "So I don't think the link between UV and sun damage found in whales can be associated, as proposed, with depletion of the ozone layer."

But John Turner of the British Antarctic Survey says that the ozone layer won't be fully healed till 2060 at the earliest. "So we're still bumping along the bottom, and we're still getting huge increases in UVB, even when there's cloud cover," he says.

The researchers found no evidence of worse effects of UV exposure, such as cancers and melanomas. But as a follow-up, Martinez-Levasseur and her colleagues are monitoring the whales for increases in the activity of genes involved in repairing UV damage to DNA.

Journal reference: *Proceedings of the Royal Society B*, DOI: 10.1098/rspb.2010.1903

http://www.newscientist.com/article/dn19707-californias-whales-suffer-sunburn.html

Brain gym helps elderly drivers avoid crashes

- 11:11 10 November 2010 by **Andy Coghlan**

Sharp senior (Image: Thomas Prior/Getty)

Elderly people who did 10 sessions of brain training had half as many crashes on the road as untrained counterparts – even though the training didn't directly relate to driving itself.

"There are no other cognitive training programs, or 'brain games', that have been demonstrated by published, peer-reviewed studies to enhance driving performance," says Jerri Edwards of the University of South Florida in Tampa, a co-leader of the study.

The results contradict a study of 11,000 people earlier this year, carried out by Adrian Owen at the University of Cambridge and colleagues, which found that brain training didn't help improve cognitive skills outside the game itself.

"Overall, people need to know that not all brain training is equal," says Edwards. "Some programs work and some don't."

On the road

With an average age of 73, the 908 participants in the latest study were assigned to one of three different computer training programs or to no training at all. One program focused on improving reaction speed, another on reasoning skills and the third on memory. Each course lasted for 10 sessions, and then the participants were tracked for six years to see how many times they had road crashes for which they were personally responsible.

It turned out that the reaction speed and reasoning skills programs helped reduce accidents by 50 per cent, but the memory training made no difference. Of the participants with no training, 18 per cent had at least one crash, just slightly ahead of the 16 per cent of memory course participants who had accidents. By contrast, only 10 per cent of the speed-training group had crashes, and 12 per cent of those on the reasoning course.

Over the 10 sessions, the courses cranked up the skills of the participants by presenting them with progressively tougher tasks. In the reaction-speed program, for example, participants had to fulfil tests such as identifying targets flashing up on a computer screen. The reasoning course challenged participants to recognise patterns to solve problems.

"On the road, the brain needs to process a lot of visual information quickly," says Steven Aldrich, chief executive of Posit Science, the company in San Francisco, California, that developed the programs. "So the visual speed-of-processing training directly improves brain functions involved in driving safely, making them faster and more accurate."

Get to the gym

In the light of the findings, Edwards recommends that the elderly try cognitive training programs – but only ones that have been validated by research. Also, she says they should maintain physical exercise, as this helps to keep the brain fit too.

"Research shows that over long periods of time, participation in cognitively stimulating activities may stave off dementia," says Edwards. "However, engagement in effective and challenging brain exercises targeting specific cognitive abilities may be required to immediately improve cognitive and everyday function of older adults," she says.

Aldrich says that participating in the courses had other beneficial spin-offs. Trained brains were 38 per cent less likely to develop depression up to a year afterwards, and less likely than controls to develop health problems when checked two and five years after training. Also, 68 per cent of those who took the reaction-speed course retained their increased reaction times at a two-year follow up.

Torkel Klingberg, who develops cognitive training progams at the Karolinska Institute in Stockholm, Sweden, says the study shows that training in basic cognitive abilities can improve everyday performance too. "Both the reasoning training and the speed-of-reaction training would improve attention skills, which are both important in driving," he says.

Adrian Owen was contacted for comment but was unable to respond.

Journal reference: *Journal of the American Geriatrics Society*, DOI: 10.1111/j.1532-5415.2010.03138.x

http://www.newscientist.com/article/dn19706-brain-gym-helps-elderly-drivers-avoid-crashes.html?full=true&print=true

Strange matter flow suggests inflation was incomplete

- 16:40 09 November 2010 by **Anil Ananthaswamy**

Is there a bulk flow of matter coursing through our universe? A new study bolsters the idea – and paints a new view of the process of inflation, the exponential expansion that occurred moments after the big bang.
The universe can be divided into two components: matter and radiation, which is seen as the cosmic microwave background (CMB). Much of the matter is in motion in a local sense – for example, our solar system is moving through the Milky Way. But according to the standard model of cosmology, the overall matter component should not be moving in any particular direction relative to the CMB.
Studies of the CMB show that Earth is moving in a particular direction with respect to the CMB. If this is all due to local movement, Earth should move with respect to distant cosmic objects at the same speed.
But when Yin-Zhe Ma of the University of Cambridge and colleagues analysed data from supernovae and about 4500 galaxies, they found that Earth's motion with respect to these objects was different. This suggests that they too are moving relative to the CMB, and hints at a bulk flow of matter, says the team.
Unfinished expansion
One controversial explanation given for earlier evidence of this flow was the tug of a second, distant universe. Ma's team says a more likely scenario is that the process of inflation, credited with smoothing out the distribution of matter and light in the early universe and causing the two components to move at the same rate, did not quite finish the job.
Team member Christopher Gordon of the University of Oxford cautions that this has yet to be confirmed by more precise data, such as from forthcoming instruments like the Square Kilometre Array and the Large Synoptic Survey Telescope, which will map more galaxies and supernovae, with far greater precision. "Actually seeing a signal from the pre-inflationary era would be a huge discovery," he says.
Cosmologist Douglas Scott of the University of British Columbia in Vancouver, Canada, who was not involved in the study, calls it an "eminently sensible analysis", but agrees with Gordon that more precise data is needed to claim discovery.
Journal Reference: http://www.arxiv.org/abs/1010.4276v1

http://www.newscientist.com/article/dn19701-strange-matter-flow-suggests-inflation-was-incomplete.html

Why chocolate protects against heart disease

miércoles, 10 de noviembre de 2010 Expertanswer (Expertsvar in Swedish)
Numerous studies have shown that cocoa has a protective effect against cardiovascular diseases. The reason for this has now been uncovered by researchers at Linköping University in Sweden. When a group of volunteers devoured a good-sized piece of dark chocolate, it inhibited an enzyme in their bodies that is known to raise blood pressure.

The findings, now being published in *Journal of Cardiovascular Pharmacology*, were revealed by a group of drug researchers headed by Ingrid Persson.
"We have previously shown that green tea inhibits the enzyme ACE, which is involved in the body's fluid balance and blood pressure regulation. Now we wanted to study the effect of cocoa, since the active substances catechins and procyanidines are related," says Ingrid Persson.

The researchers recruited 16 healthy volunteer subjects for the study. They were not tobacco users and were not allowed to take any pharmaceuticals for two weeks. During the last two days they were not allowed to eat chocolate or anything containing similar compounds, including many kinds of berries and fruits, nor could they drink coffee, tea, or wine.

When the study took place, everyone in the group – ten men and six women between the ages of 20 and 45 – ate 75 grams of unsweetened chocolate with a cocoa content of 72 percent. To analyze what happened with the ACE enzyme, blood samples were taken in advance and then a half hour, one hour, and three hours afterward.

In the sample taken three hours afterward, there was a significant inhibition of ACE activity. The average was 18 percent lower activity than before the dose of cocoa, fully comparable to the effect of drugs that inhibit ACE and are used as a first-choice treatment for high blood pressure.

When the activities of the enzyme decline, the blood pressure goes down with time. As expected, no such effect was found in the subjects. To show this, the study would have to continue over a longer period.

Even though Ingrid Persson is a drug researcher, the object of her studies is not to design new pharmaceuticals.

“Our findings indicate that changes in lifestyle with the help of foods that contain large concentrations of catechins and procyaninides prevent cardiovascular diseases,” she says.

http://journals.lww.com/cardiovascularpharm/Abstract/publishahead/Effects_of_Cocoa_Extract_and_Dark_Chocolate_on.99606.aspx

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89414&CultureCode=en

Three million entries now in Zentralblatt MATH

miércoles, 10 de noviembre de 2010 Springer Science+Business Media
Zentralblatt MATH (ZBMATH), the world's most complete reference database in mathematical research, published its three millionth bibliographic entry today. ZBMATH is the leading publication in mathematics and has been presenting the state of the art and development of research in this discipline for the past 150 years. A total of 3,500 journals and more than 1,100 book series and monographs are currently documented and analysed.

In practice, this means an annual growth of around 120,000 new entries from research institutes all over the world. The entries consist of abstracts or reviews written by more than 6,000 experts. The editorial work is carried out jointly by FIZ Karlsruhe and the editor-in-chief Professor Bernd Wegner.

On the basis of a cooperation agreement signed between FIZ Karlsruhe and the National Science Library of the Chinese Academy of Sciences in 2007, the rapidly developing Chinese research literature in the field of mathematics is listed in its entirety in the database. A total of more than 70,000 papers are already listed, with around another 8,000 added each year.

Zentralblatt MATH is now a database that goes far beyond the original concept of a journal and networks the international mathematical research community. The editorial office in Berlin structures and assesses content, makes the entries available in electronic form and ensures that the software is refined to be able to deal with the continual growth in mathematical publications. Strong networking among mathematicians allows the functionalities of the database to be optimally adapted to the requirements of researchers and users. Last year, for example, an author database was set up using complex identification processes. By displaying the papers in MathML, complicated mathematical formulas can now be read directly as well.

"There are surely few other scientific disciplines that are presented in such compact form in a comprehensive information database as mathematics is in ZBMATH," said Professor Bernd Wegner on the development of this service. "It is unique in that it contains almost the entire mathematical literature worldwide. This important instrument for mathematicians has managed to cross over into the digital age, evolving from a print journal with a long tradition into a unique electronic information service in mathematical research. Scientific research in mathematics is inconceivable without a service like ZBMATH."

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89405&CultureCode=en

Kickoff for Arctic Earth Observing System

From Svalbard. Photo: Anne-Christine Engvall, NILU

10 November 2010 Research Council of Norway, The
With EUR 4 million secured for the preparatory phase, the Norwegian ESFRI project Svalbard Integrated Arctic Earth Observing System (SIOS) is now underway. Partners from 14 countries recently gathered for the kickoff conference.
"The project has received very broad support, with 27 partner institutions," says Project Director Karin Refsnes of the Research Council of Norway. Fifty representatives of these partners participated in the conference to launch the project in Oslo in October.
To generate near-real-time data
The SIOS initiative is part of the roadmap for the European Strategy Forum on Research Infrastructures (ESFRI). The initiative's primary objective is to develop an optimised observational infrastructure which can support advanced Earth System models and provide near-real-time information on Arctic change to relevant stakeholders.
The project will prepare upgrades to the existing infrastructure, as well as organise a limited number of observation platforms and provide a basis for establishing a joint knowledge centre in Longyearbyen.
Planning and overview
The SIOS initiative has now entered the preparatory phase. "In this phase there is no funding for research or monitoring," explains Ms Refsnes. "The main tasks are to gain an overview of the existing infrastructure on Svalbard and establish the organisational, administrative and financial parameters. The EU has allocated EUR 4 million for this purpose, and the Research Council has contributed funding as well."
Coordinated by the Research Council
Ms Refsnes heads a secretariat with three employees who will coordinate these activities. The secretariat is located at the Research Council.
The Svalbard archipelago "Svalbard provides unique opportunities to observe climate change where its impacts are most pronounced, and where ecosystems are most vulnerable to rapid change. This provides an ideal basis for an initiative like SIOS. What's more," adds the project director, "the Svalbard archipelago already has extensive infrastructure in place for observation, research and teaching activities. And Svalbard is especially interesting because of its very large climate gradient due to alternating influences from the Arctic Ocean's cold waters and the Atlantic Ocean's temperate waters."
"In addition, the archipelago is the only place on earth where one can carry out detailed studies of solar influence on climate."

Active Norwegian participation
“We are very pleased with the support this project has among the Norwegian institutions,” says Ms Refsnes. “Every Norwegian research institution represented on Svalbard is involved: 11 as members of the consortium and 13 others as associate members.”
“The project is divided into nine work packages. Norwegian institutions have responsibility for six of them, while Germany, Poland and Italy are responsible for the others. Now the work of specifying the work packages begins.”
“This is a complex project with many interrelated components. We have to survey all of the relevant infrastructure on Svalbard and figure out what is lacking, taking into account observation systems for marine, ice, atmospheric and terrestrial conditions.”
SIOS - partner institutiona

- Research Council of Norway (RCN)
- Norwegian Ministry of Education and Research
- Norwegian Polar Institute (NPI)
- University Centre in Svalbard (UNIS)
- Alfred Wegener Institute (AWI), Germany
- Institute of Geophysics - Polish Academy of Sciences (IGF PAS), Poland
- National Research Council of Italy (CNR), Italy
- Arctic and Antarctic Research Institute of Roshydromet (AARI), Russia
- National Environment Research Council (NERC), UK
- Institut Polaire Francais - Paul Emile Victor (IPEV), France
- Polar Research Institute of China (PRIC), China
- Korea Polar Research Institute (KOPRI), Republic of Korea
- Scottish Association for Marine Science (SAMS), UK
- University of Groningen - Willem Barentsz Polar Institute, The Netherlands
- National Environmental Research Institute - University of Aarhus (DMU), Denmark
- University of Stockholm (ITM-SU), Sweden
- Finnish Meteorological Institute (FMI), Finland
- Arctic Centre - University of Lapland, Finland
- Polar Geophysical Institute - Russian Academy of Sciences (PGIA), Russia
- Institute of Oceanology - Polish Academy of Sciences (IOPAS), Poland
- University of Leicester, UK
- Kola Science Centre - Russian Academy of Sciences (KSC-RAS), Russia
- Geophysical Survey - Russian Academy of Sciences (GS-RAS), Russia
- National Institute of Polar Research (NIPR), Japan
- Czech Academy of Sciences, Czech Republic
- National Centre of Antarctic and Oceanic Research (NCAOR), India
- National Science Foundation (NSF), USA
- EISCAT Scientific Association
- Norwegian Institute of Marine Research (IMR)
- Norwegian Space Centre (NSC)
- University of Bergen (UIB)
- University of Tromsø (UIT)
- University of Oslo (UIO)
- Norwegian Meteorological Institute (met.no)
- Norwegian University of Science and Technology (NTNU)
- Norwegian Institute for Air Research (NILU)

- Norwegian Institute of Water Research (NIVA)
- Norwegian Institute of Nature Research (NINA)
- Andøya Rocket Range (ARR)
- Akvaplan-niva AS
- Kings Bay AS
- Norwegian Mapping Authority (NMA)
- Nansen Environmental and Remote Sensing Center (NERSC)
- NORSAR
- Norwegian Water Resources and Energy Directorate (NVE)
- The Governour of Svalbard
- Kongsberg Satellite Services AS (KSAT)
- Northern Research Institute (Norut)

http://www.forskningsradet.no/en/Newsarticle/Kickoff_for_Arctic_Earth_Observing_System/1253962902752?WT.mc_id=alphagalileo

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89396&CultureCode=en

'Magic bullet' offers hope to patients with rare genetic disease

Cystinosis sufferer Lena Forsyth, now aged 10

10 November 2010 Sunderland, University of

A 'magic bullet' designed by pharmaceutical scientists at an English university could eradicate the side effects of a drug used to treat a rare genetic disease. Researchers at the University of Sunderland have chemically modified a drug used to treat cystinosis - a disease which occurs when the body's mechanism to remove excess cystine (an amino acid) breaks down, leading to kidney problems and eventually affecting other organs - to remove unpleasant side effects such as nausea, vomiting, severe halitosis, body odour and a noxious taste.

The unpleasant side effects of a life-saving drug used to treat patients with a rare genetic disease could be eradicated thanks to a 'magic bullet' designed by pharmaceutical scientists at a North East university.

Professor Roz Anderson and PhD student Lisa Frost, at the University of Sunderland, have chemically modified a drug used to treat cystinosis - a disease which occurs when the body's mechanism to remove excess cystine (an amino acid) breaks down, leading to kidney problems and eventually affecting other organs.

There is still no cure, and if left untreated cystinosis can result in kidney failure before a child reaches the age of 10; it's rare for patients to live beyond the age of 40.

Drugs used successfully to treat patients with the disease contain the active ingredient cysteamine; however, this produces side effects such as nausea, vomiting, severe halitosis, body odour and a noxious taste. A large dose of the drug four times a day is also required to treat the disease, as 70 per cent is wasted through the body's metabolism during digestion, with no therapeutic benefit.

However, Prof Anderson and Lisa have modified the drug which targets cysteamine directly into the cells, aiming to improve its absorption into the body, reduce the amount needed to be taken and lower the adverse side effects.

Prof Anderson said: "You can imagine how difficult it is for a child to cope, not only with the disease itself, but also with these unpleasant side effects; in some cases by the time a patient has reached their teenage years they've become so self conscious they've stopped taking their medication, even though they know it will speed up kidney failure and could result in their death.
"To approach this we've chemically modified the drug to target gamma-glutamyl transpeptidase, an enzyme on the surface of most cells that will carry the modified drug into the cell, so it becomes more like a magic bullet; directly getting inside those cells where it needs to be before the drug is released, increasing the therapeutic benefit.
"This means patients need less of the drug, as the dose is not being wasted through metabolism, and this also reduces the side effects."
The research is being supported by national charity, the Cystinosis Foundation UK, who are funding Lisa's PhD, and raised £14,000 to buy the university a piece of equipment which will drastically improve the effectiveness of her work.
Chairman of the foundation Roy Forsyth, whose 10-year-old daughter Lena has the disease, says: "We are committed to funding Lisa's work and research on the drug. We realised she needed the HPLC (High-Performance Liquid Chromatography) equipment to make her work more effective and efficient. It's crucial the research happens as quickly and effectively as possible; it will change lives."
He added: "It's outstanding for us to be involved in this quality of project and witness the results. If we can deliver a drug in the next 10 or 15 years then that will be fantastic. We are realistic and know these things take time, but we're committed to the university's research for the long term."
Prof Anderson, who has been involved in the university's cystinosis research for almost 12 years, said: "We are delighted with the help the foundation has given us, the HPLC equipment will improve the work we are doing."
She added: "Initial work has shown that our prodrug approach can produce the required medicinal action; further experiments are ongoing to move from proof of concept to scientific evidence.
"In order to move these promising molecules forward towards clinical use, a systematic investigation of their mechanism of action, efficacy, formulation, pharmacokinetics and toxicity will be required before Phase I clinical trials can begin."
Prof Anderson believes this can be done through a global collaborative group she is in the process of bringing together, initially made up of experts in the field of cystinosis from the UK, Belgium, France and Italy,
There is also evidence that cysteamine can be used in the treatment of other diseases, an area where Prof Anderson is encouraging further development.
"Cysteamine is known to have therapeutic potential in the treatment of Huntington's and Parkinson's diseases, but is limited by its adverse properties and side effects. It also shows activity against the bacteria that causes malaria," explained Prof Anderson.
She added: "Cystinosis patients also suffer from eye problems, for which the treatment is not ideal. We have designed another range of prodrugs specifically for ocular use and are evaluating their ability to treat this particular organ. Some of our pharmacy students are helping us with this research."
Prof Anderson and Lisa recently travelled to the International Cystinosis Conference in Italy to present their findings before an audience of clinical experts and people whose lives are affected by the disease.
"Meeting the families and children affected by this disease really pushed home how vital the work we are doing here is and made me even more determined to get results," says Lisa, who graduated from Sunderland with a degree in Chemical and Pharmaceutical Science.
"The HPLC equipment will certainly help with the project; it's new, reliable and dedicated to my work. Previously I had to share equipment, which was slowing the process down.
"It is challenging and hugely exciting being part of a project that could have a worldwide impact on people with all sorts of diseases."
http://www.sunderland.ac.uk

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89390&CultureCode=en

Children in lesbian families in the United States do not experience sexual or physical abuse by parents

Credit: DAMIEN LOVEGROVE / SCIENCE PHOTO LIBRARY Caption: MODEL RELEASED. Lesbian couple and pregnancy. A pregnant woman is comforted by her lesbian partner as they await shared motherhood. The pregnancy may have been created by artificial insemination

10 November 2010 Universiteit van Amsterdam (UVA)

Teenagers from lesbian families in the United States reported 0% sexual abuse by their parents or guardians. Furthermore, it also appears that - compared to peers with heterosexual parents - the teenage daughters of lesbian mothers are more likely to have sexual contact with someone of the same sex. Of the teens with a lesbian mother questioned in the study, 2.8% indicated that they considered themselves to be 'predominantly to exclusively' homosexual. These are the findings of a study investigating abuse, sexual orientation and sexual behavior among children of lesbian mothers in the U.S. that day was published on 9 November 2010 in the scientific journal *Archives of Sexual Behavior.* The study was conducted by Dr Nanette Gartrell and Naomi Goldberg of the Williams Institute at UCLA School of Law, and Dr. Henny Bos from the University of Amsterdam's (UvA) department of Child Development and Education.

The study is part of the U.S. National Longitudinal Lesbian Family Study (NLLFS), the longest-running study of lesbian families in the United States. The families have been followed since the time the children were conceived (all by donor insemination). The children are now, on average, seventeen years old. The researchers presented the 78 teenagers (39 girls and 39 boys) with a questionnaire about abuse. They were

asked whether they had ever been abused by a parent or guardian, and - if applicable - to state who had committed the abuse and what kind of abuse it was (verbal, emotional, physical or sexual). The teens reported no physical or sexual abuse by a parent or guardian. Earlier research by Dr David Finklehon (University of New Hampshire), based on a representative sample of all adolescents in the U.S., reported 26% of teenagers suffered physical abuse by a parent / guardian, and 8.3% reported sexual abuse.

Sexual orientation and sexual behavior

The researchers also asked the teens in lesbian families to describe their sexual identity. This was done using the Kinsey scale - a scale from 0 to 6, where 6 stands for exclusively homosexual. 18.9% of the girls questioned considered themselves to be bisexual, whereas 2.7% of the boys considered themselves bisexual. 0% of the girls and 5.4% of the boys considered themselves predominantly to exclusively homosexual.

The sexual behavior of adolescents was assessed with questions about heterosexual and homosexual contact, the age that first sexual contact occurred, the use of contraception, and pregnancy. Compared with the control group - consisting of peers with heterosexual parents - the children of lesbian parents were significantly older when they first had heterosexual contact. The daughters of lesbian mothers had significantly more homosexual contact compared with the daughters of heterosexual parents.
The Dutch situation

Henny Bos is conducting a study in the Netherlands among lesbian families modelled on the NLLFS. Next month, she will begin research into sexual abuse, sexual orientation and sexual behavior among teenage children of lesbian mothers in the Netherlands.
http://www.springerlink.com/content/0004-0002

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89384&CultureCode=en

Infant foods should be screened for mycotoxins

10 November 2010 Institute of Tropical Medicine Antwerp
An international team of scientists calls for protecting complementary food for infants in developing countries – especially those where corn is a staple food – against fumonisin, a toxin produced by fungi. Until now, physicians thought the growth retardation of children in those regions was to be blamed on the poor nutritional value of the complementary maize porridge they receive when breast milk is no longer sufficient. But toxins indeed are involved, the scientists report in the journal Molecular Nutrition and Food Research.
The call is made by scientists of the Institute of Tropical Medicine Antwerp and their colleagues of the Tanzania Food and Drugs Authority and Gent University. Until now, not much attention was paid to mycotoxins in food (mycotoxins are toxins produced by fungi) – with the exception of aflatoxin, of mouldy nuts ill fame. But their research in rural Tanzania does connect fumonisin with stunting and underweight. It is the first time anybody establishes this association.
Worldwide, 1 child in 3 suffers from growth retardation and 1 in 4 is underweight. The problems of stunting and underweight are associated with over 5 million deaths of children less than 5 years annually. 70% of these deaths are concentrated in sub-Saharan Africa and South Asia. Malnutrition is implicated in the majority of these deaths.
Already in 2004, the same researchers reported that improving the nutritional quality of complementary foods does not reduce stunting and underweight in Tanzanian toddlers. This raises questions about the actual management of malnutrition by international aid organisations.
So the research team went looking for other possible causes of poor growth as soon as breastfeeding falls off and maize porridge is introduced. They knew aflatoxin, the most notorious mycotoxin, had been observed to *impair child growth in Benin and Togo. So they explored for other fungal toxins that could end up in maize based complementary foods.*
They observed that children of twelve months, who through their corn flour based complementary food were exposed to fumonisin above the WHO maximum tolerable daily intake (2µg/kg body weight), were significantly shorter and lighter than their counterparts.
Fumonisin enters the food chain through fungi growing on maize, the staple food in Tanzania – and in many other parts of the world. The fungus can be present without being visible to the untrained eye. It can be prevented by correct storage of the maize.
http://onlinelibrary.wiley.com/doi/10.1002/mnfr.200900483/full

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89381&CultureCode=en

Can music therapy treat depression?

10 November 2010 Journal of Psychotherapy and Psychosomatics

A Swedish study that appears in the current issue of Psychotherapy and Psychosomatics applies music therapy to the treatment of depression.
Evidence suggests that music therapy should be further explored as a possible treatment. Music therapy is generally not associated with negative side effects and can be easily implemented. These factors contribute to high adherence and favorable treatment outcomes. Previous efficacy studies of music therapy for depression treatment suffered from a lack of specific stimuli, methodological shortcomings, or utilization of small samples.
This study deals with the largest trial to date investigating 2 forms of receptive music therapy among adults with depression. Recruited through media and by contacting doctors, potential subjects were screened online using the Goldberg Depression Questionnaire (GDQ). 203 subjects entered the study protocol. The study design included 4 arms: music therapy 1 (MT1), music therapy 2 (MT2), placebo (nature sounds), and waiting-list control. Assignment to study arms was based on subjects' preferences for the date of their initial study appointment (only on working days). The T1 period represents the central trial element of this study, while the additional study periods (T2, T3 and T4) were employed to explore wash-out effects, subject adherence, and treatment preferences. This report only draws on data from T1. During T1, the subjects were asked to strictly follow their assigned study protocol with the aim of determining the effects of MT1 and MT2. Subjects who received audio programs (i.e. MT1, MT2, or placebo) were blinded to the program they had received and could not switch from their assigned program to alternative music programs during T1. MT1 and MT2 were individualized music-focused audio therapies developed by the study investigators as receptive

music therapies for depression treatment. MT1 incorporated newly composed polyphonic modern music and MT2 consisted of specifically arranged classical music. Subjects listened twice daily for 30 min. Depression status was assessed at the beginning of T1 and T2 using the Hamilton Rating Scale for Depression (HAM-D), the Beck Depression Inventory (BDI) and the Hospital Anxiety and Depression Scale (HADS-D). A composite (COMP) depression scale was constructed based on the HAM-D (double weighted), BDI, and HADS-D z-scores. The overall drop-out rate at the beginning of T2 equaled 17.2% (35/203).
Compared to the control arm, a significant positive effect in COMP was observed for MT1 in T1 ($p = 0.030$), but not for MT2. Both MT1 and MT2 were associated with a significant positive effect on HAM-D and HADS-D scores. MT2 subjects experienced a positive effect on BDI scores, but not MT1 listeners. No significant change in any depression score was detected in the placebo arm. HAM-D, BDI, and HADS-D score changes correlated only moderately, with the highest correlation observed between BDI and HADS-D ($p=0.59$). In bivariate analysis, a 'worries' scale was the only possible confounder significantly associated with all 4 depression scores, suggesting that the HAM-D, BDI, and HADS-D scales may focus on different aspects of the construct of depression (e.g. cognitive and emotional factors).
Based on possible neurophysiologic and neurochemical effects, receptive music therapy, as explored in this pilot controlled trial, appears to be associated with reduced depressive symptoms and high treatment compliance, and may therefore potentially represent an effective depression treatment alternative, alone or in combination with psychosocial and pharmacological approaches.

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Does outcome in cardiovascular medicine depend on symptoms of depression?

10 November 2010 Journal of Psychotherapy and Psychosomatics
Cognitive symptoms of depression cannot be simply discarded as risk factors for heart disease progression. When using a structured diagnostic interview, both somatic and cognitive symptoms of depression are associated with adverse cardiac outcome after adjusting for potential confounders.
Evidence indicates that self-reported somatic/affective but not cognitive/affective symptoms of depression are highly prevalent in cardiac patients, and are predictive of cardiovascular mortality and cardiac events, even after somatic health status has been controlled for. These findings may help to develop symptom-targeted interventions to reduce both depression and cardiac disease progression. However, one major disadvantage of the analyses conducted so far is that they relied on self-report instruments, such as the Beck Depression Inventory. A drawback of self-reported depressive symptoms is that no weighing of symptoms is performed, as is carried out when establishing a psychiatric diagnosis with a structured interview. In the latter, symptoms only count when they are present most of the time, for at least 2 weeks, affect daily functioning and are not a consequence of a physical condition. As a result, it remains unclear to what extent findings using self-reported symptoms reflect clinically meaningful information.
The Authors of this study therefore evaluated the independent association between cardiovascular prognosis and ratings of the individual depressive symptoms based on a structured diagnostic interview. They used data from the Depression after Myocardial Infarction study (DepreMI), a naturalistic follow-up study which took place in 4 hospitals in the northern part of the Netherlands. The study included 468 MI patients, of whom 118 met DSM-IV criteria for post-MI depressive disorder, and 115 had a cardiac event during a mean follow-up of 2.5 ± 0.8 years. They used an adapted version of the Composite International Diagnostic Interview (CIDI) version 1.1, a fully standardized psychiatric diagnostic interview that can be used to assess mental disorders according to the definitions and criteria of DSM-IV. Thus, using symptom-specific data from a structured diagnostic interview, the following findings were obtained. First, they confirmed that, after adjusting for potential confounders, the presence of somatic symptoms of depression was associated with an increased risk of cardiovascular events. Second, in contrast with previous studies using self-report data, interview ratings of cognitive symptoms of depression were also associated with a significantly increased risk in multivariate analysis, although less strongly than somatic symptoms (HR = 1.20 and 1.39, respectively). Third, contrary to previous studies, adjustment for potential confounders resulted in higher effect estimates, while generally in studies using self-report data adjustment leads to lower estimates. These discrepancies may be explained by the fact that interview-based symptoms are based on strict criteria derived from the DSM, based on their presence, severity, consequences and etiology. This may result in less attenuation of the estimates by potential confounders compared to self-report data. The use of interview-based measurement may be more sensitive in detecting clinically relevant cognitive symptoms, and it is possible that these clinically relevant cognitive symptoms result in a higher level of cardiotoxicity.
In conclusion, when using a structured diagnostic interview, both somatic and cognitive symptoms of depression were associated with adverse cardiac outcome after adjusting for potential confounders. Cognitive symptoms of depression cannot be simply discarded as risk factors for heart disease progression. Rather, for a better understanding of the association between depression and cardiovascular disease progression, a more thorough assessment of depressive symptoms is needed by using interview-based ratings in addition to self-report data.

- **Full bibliographic information**Hoen, P.W. ; Conradi, H.J. ; Denollet, J. ; Martens, E.J. ; de Jonge, P. Interview-Based Ratings of Somatic and Cognitive Symptoms of Depression and Their Impact on Cardiovascular Prognosis. Psychother Psychosom 2010;79:319-320

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89366&CultureCode=en

Hope for Borneo's threatened biodiversity

Highly endangered Saba rhino in Sabah Malaysia

10 November 2010 Forschungsverbund Berlin e.V. (FVB)
To tackle species loss representatives of the Rhino and Forest Fund (RFF) and of the Forestry Department of Sabah / Malaysia launched a long-term reforestation project to restore forest in Borneo. Borneo's unique biodiversity is threatened by deforestation and habitat fragmentation. To save endangered species like the Sabah rhino, the clouded leopard, or the orang utan, it is necessary to restore and reconnect degraded and fragmented forest land. On Monday 8th November 2011, a Memorandum of Understanding (MoU) was signed between the Sabah Forestry Department and a German-based NGO, the Rhino and Forest Fund, giving the green light for a long-term forest restoration project in and around the Tabin Wildlife Reserve. The first trees will be planted in January 2011. In the MoU the government of Sabah ensures that the reserve and the restored areas will remain protected, excluding any conversion or logging in the future.
The core area of Tabin remains still untouched and represents one of the oldest and most diverse rainforests in the world. The reserve is surrounded by oil palm plantations, restricting movements of large mammals. The restoration project of the Rhino and Forest Fund will increase habitat and reconnect patches of rainforest, enabling the movements and breeding of isolated populations, such as the pygmy elephant and the Sabah rhino.
The MoU was signed during the 'International Conference on Forests and Climate Change' held at the Magellan Sutera Hotel, in Sabah, Malaysia on Monday. Datuk Sam Mannan, Director of the Sabah Forestry Department stated during the conference: "Forests are important for Sabah's climate and its rich biodiversity. They provide fundamental services to human well beings and therefore need to be protected and restored."
The Rhino and Forest Fund aims to save biodiversity by reforesting degraded and fragmented habitat and has a special focus on the nearly extinct Sabah rhino (*Dicerorhinus sumatrensis harrissoni)*. The RFF gets scientific advice from the Leibniz Institute for Zoo- and Wildlife Research (IZW) Berlin, Germany and funding from the Zoo Leipzig in Germany.
Dr. Petra Kretzschmar, co-founder of the German-based NGO stated: "We see the charismatic Sabah rhino as a flagship species for the diverse lowland rainforest in Sabah. The signing is a major breakthrough to effectively combine the protection of endangered species like the rhino and the restoration of their natural habitat."
Robert Risch, co-founder of the Rhino and Forest Fund concluded: "Our reforestation project will support Sabah's outstanding efforts to preserve its extraordinary biodiversity for future generations. Sabah is a hotspot of biodiversity and therefore of global significance. If Sabah loses species, the whole planet will become poorer. So there should be global awareness, cooperation and action on an international level to stop species loss.“
The restoration work will start in early 2011 and will be expanded during the next years.
http://rhinoandforestfund.homeip.net/

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89348&CultureCode=en

University of the Basque Country thesis verifies value of pyrolisis as technique for recycling pneumatic tyres

09 November 2010 Elhuyar Fundazioa
The manufacture of pneumatic tyres requires a large cost in energy and raw materials. Moreover, it is a great environmental problem once their life cycle is over, given that they are designed to resist all kinds of adverse conditions and are, thus, very complicated to eliminate. The chemist, Ms María Felisa Laresgoiti, chose to study the process of pyrolisis, both in order to recover part of the energy and material costs of the manufacture of pneumatic tyres as well as to solve the problem of their elimination. Pyrolisis is heating in the absence of oxygen, which results in the decomposition of the pneumatic tyres and the reuse of the resulting components. With the results, Ms Laresgoiti presented her PhD thesis at the University of the Basque Country (UPV/EHU), entitled, *Chemical recycling of pneumatic tyres through pyrolisis*.
Ms Laresgoiti used a 3.5 litre fixed bed reactor (one or more vertical tubes packed with particles which accelerate the process of reaction) and guaranteed the absence of oxygen —necessary for pyrolisis— by means of a nitrogen sweep. After a number of trials, she concluded that, at above 500 degrees and with 30 minutes of reaction time, the decomposition of the organic material of the tyres is complete. This decomposition generates 40 % of liquids and 16 % of gases, useable as fuels and/or sources of raw material. The remaining 44 % left after the process is solid inorganic material — loads, metals and soot, practically unaltered by the process and which can be reused for various applications.
Organic material
The liquids arising from the pyrolisis are a complex mixture of organic products that can carry out the same function of certain fractions derived from petroleum, and so are reusable as an alternative to fossil fuels. For example, they can substitute fuel oil in certain cases, although the high calorific power of the liquid obtained and their high content of nitrogen and sulphur prohibit their general commercial use. These liquids also can be used in part as commercial petrol, commercial diesel for motor vehicles and commercial central heating oil. Nevertheless, even then they do not comply with the required legal specifications, and so would have to be treated or mixed with other sources.
Also, besides their use as fuel, these liquids are useful as a source of various valuable chemical compounds, such as styrene (they are used, for example in the synthesis of plastic materials) or limonene (used as a biodegradable solvent, amongst other things).

Apart from the liquids, gases also form part of the organic material obtained from the pyrolisis of pneumatic tyres. These are fundamentally made up of hydrocarbons, and their high calorific power makes them an important energy source. This source is not only sufficient for self-feeding the process, but there is a surplus which can be taken advantage of energetically.

Inorganic material

The remaining 44 % of the product resulting from the pyrolisis of pneumatic tyres is inorganic. This is solid material and remains practically unaltered with respect to the dimensions and shape of the items before the process. This material is easily broken up into soot and steel filaments or strings from the tyre, and which can be reused or recycled independently.

According to the thesis, it is precisely the soot from the pyrolisis that could be used for a number of commercial applications. For example, Ms Laresgoiti believes that its possible application as a reinforcement in the manufacture of new pneumatic tyres should be considered. She also believes that soot could be of commercial use as semi-reinforcement material or non-reinforcement filler, as active carbon or pigment for inks.

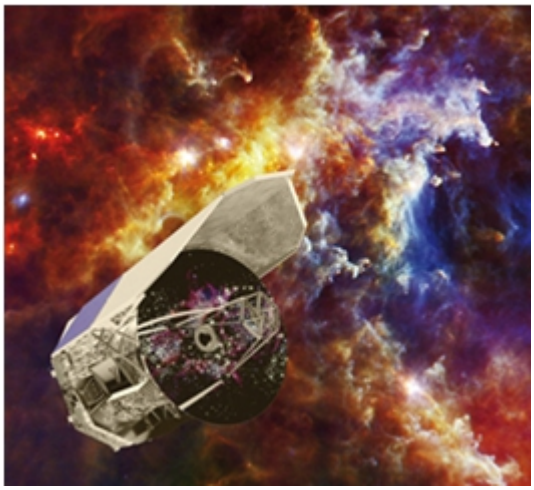
About the author

Ms María Felisa Laresgoiti Pérez (Llodio, Bizkaia 1964) is a graduate in Chemical Sciences. She drew up her PhD thesis under the direction of Ms Isabel de Marco Rodríguez and Mr Juan Andrés Legarreta Fernández, both professors at the Department of Chemical Engineering and the Environment at the Higher Technical School of Engineering in Bilbao (UPV/EHU). It was in this department that the researcher carried out her work. Currently, Ms Laresgoiti is a specialist laboratory technician at the UPV/EHU.

http://www.basqueresearch.com/berria_irakurri.asp?Berri_Kod=3037&hizk=I

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89327&CultureCode=en

Herschel detects five distant galaxies



09 November 2010 CNRS (Délégation Paris Michel-Ange)
An international team of astronomers including several French researchers has measured the exact distance to five very remote galaxies, using the ESA's Herschel Space Observatory and ground-based observations involving in particular the IRAM (Institute for Radio Astronomy at Millimeter Wavelengths) interferometer (1). The researchers have shown that the light from these galaxies must have travelled for around ten billion years before reaching us. To obtain these results, they first developed a novel method that, for the first time at submillimeter wavelengths (2), made use of a phenomenon known as gravitational lensing, a sort of cosmic zoom lens that can be detected by Herschel. Such rapidly evolving distant galaxies, which until now have been difficult to observe, are one of the keys to a better understanding of the history of galaxies in our Universe. These findings are published in the 5 November 2010 issue of the journal *Science*.

Albert Einstein predicted the phenomenon of gravitational lensing: when light travels close to a very massive object such as a galaxy, its path is bent. If a galaxy is located between the Earth and the very distant galaxy being observed, and if they are perfectly aligned, the light from the more distant object will therefore be magnified. This gravitational lensing effect behaves like a cosmic zoom lens, and makes it possible to observe extremely distant galaxies which emitted their light when the Universe was only 10 to 20% of its current age.

The international collaboration led by Mattia Negrello (The Open University, UK) involves 89 other astronomers, seven of whom work in French laboratories (3) backed by CNES. It used the SPIRE and PACS panoramic cameras that equip Herschel, whose instrumentation was largely developed in CEA and CNRS laboratories. For the first time, researchers were able to observe large regions of the sky at sub-millimeter wavelengths, which enabled them to detect potential gravitational lenses.

"*Discovering gravitational lenses makes it possible to observe extremely distant galaxies, which would be difficult to see without this phenomenon of light magnification*," explains Denis Burgarella, an astronomer at the Laboratory of Astrophysics of Marseille and one of the French co-authors of the study. "*Such galaxies are often the seat of sudden, intense star formation, which it is important to observe in order to understand the various stages of galaxy evolution throughout the history of the Universe*."

Each image of the Herschel-ATLAS (4) project contains tens of thousands of galaxies. Most of these are so

distant that their light has taken billions of years to reach us. On the basis of the first results of this panoramic survey (1/30th of the total area that will have been covered by the time the project comes to an end), the international H-ATLAS team focused on five exceptionally bright objects, which are gravitational lenses. By examining their respective positions with large ground-based optical telescopes, the astronomers found galaxies of a type that should not normally be bright at the wavelengths observed by Herschel. It is thus very likely that these moderately distant galaxies, seen in visible light, were actually gravitational lenses magnifying the light coming from far more distant galaxies observed by Herschel at sub-millimeter wavelengths. The astronomers then used the best ground-based telescopes, which enabled them not only to detect foreground galaxies but also to prove that there were indeed two perfectly aligned galaxies, at different distances, along each line of sight. The distance of each of these galaxies was measured using the spectral shift towards sub-millimeter wavelengths (5) of a line emitted by the carbon monoxide molecule, which is a marker for such galaxies. "*The IRAM interferometer played a major role in these measurements, showing that the light from these objects must have travelled for around ten billion years before reaching us,*" points out Pierre Cox, IRAM director and co-author of the study. Its high sensitivity and angular resolution, as well as recent improvements in instrumentation, should make it possible to precisely measure the distance to these remote objects, probe the properties of the dense clouds of matter in which stars form (by observing emissions from dust and molecular gases), and study both the morphology and dynamics of these galaxies in the far reaches of the Universe.

"*When Herschel's results have been completely exploited using these cosmic zoom lenses, astronomers will be able to study galaxies in the early Universe with the same wealth of detail as they do now for nearby galaxies*," predicts Alain Omont, a co-author who works at the Paris Institute of Astrophysics. The lenses found by Herschel will be key objects for the ALMA very large millimeter/submillimeter array, currently under construction in Chile. The study of the foreground galaxies that make up the lenses is also highly promising, since it is their dark matter halos that dominate the lensing effect. "*The statistics of accumulated results for hundreds of halos will provide new constraints on the still mysterious nature of dark matte*r," Negrello points out.
http://www.herschel.fr/fr/herschel/actualites.php?id_news=150

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89324&CultureCode=en

Oil Will Run Dry 90 Years Before Substitutes Roll Out, Study Predicts

At the current pace of research and development, global oil will run out 90 years before replacement technologies are ready, say experts. (Credit: iStockphoto)

ScienceDaily (Nov. 10, 2010) — At the current pace of research and development, global oil will run out 90 years before replacement technologies are ready, says a new University of California, Davis, study based on stock market expectations.

The forecast was published online on Nov. 8 in the journal *Environmental Science & Technology*. It is based on the theory that long-term investors are good predictors of whether and when new energy technologies will become commonplace.

"Our results suggest it will take a long time before renewable replacement fuels can be self-sustaining, at least from a market perspective," said study author Debbie Niemeier, a UC Davis professor of civil and environmental engineering.

Niemeier and co-author Nataliya Malyshkina, a UC Davis postdoctoral researcher, set out to create a new tool that would help policymakers set realistic targets for environmental sustainability and evaluate the progress made toward those goals.

Two key elements of the new theory are market capitalizations (based on stock share prices) and dividends of publicly owned oil companies and alternative-energy companies. Other analysts have previously used similar equations to predict events in finance, politics and sports.

"Sophisticated investors tend to put considerable effort into collecting, processing and understanding information relevant to the future cash flows paid by securities," said Malyshkina. "As a result, market forecasts of future events, representing consensus predictions of a large number of investors, tend to be relatively accurate."

Niemeier said the new study's findings are a warning that current renewable-fuel targets are not ambitious enough to prevent harm to society, economic development and natural ecosystems.

"We need stronger policy impetus to push the development of these alternative replacement technologies along," she said.

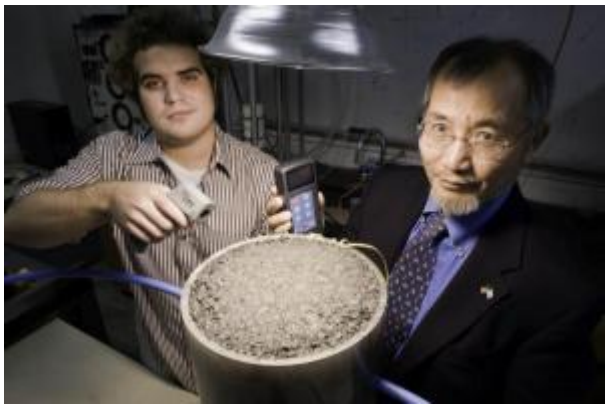
Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of California - Davis**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Nataliya Malyshkina, Deb Niemeier. **Future Sustainability Forecasting by Exchange Markets: Basic Theory and an Application**. *Environmental Science & Technology*, 2010; : 101108131041087 DOI: 10.1021/es100730q

http://www.sciencedaily.com/releases/2010/11/101109095322.htm

Researchers Aim to Harvest Solar Energy from Pavement to Melt Ice, Power Streetlights



URI student Andrew Correia and Professor K. Wayne Lee conduct a laboratory experiment to measure the solar energy generated by a patch of asphalt. (Credit: URI Department of Communications & Marketing photo by Michael Salerno Photography)

ScienceDaily (Nov. 9, 2010) — The heat radiating off roadways has long been a factor in explaining why city temperatures are often considerably warmer than nearby suburban or rural areas. Now a team of engineering researchers from the University of Rhode Island is examining methods of harvesting that solar energy to melt ice, power streetlights, illuminate signs, heat buildings and potentially use it for many other purposes.

"We have mile after mile of asphalt pavement around the country, and in the summer it absorbs a great deal of heat, warming the roads up to 140 degrees or more," said K. Wayne Lee, URI professor of civil and environmental engineering and the leader of the joint project. "If we can harvest that heat, we can use it for our daily use, save on fossil fuels, and reduce global warming."

The URI team has identified four potential approaches, from simple to complex, and they are pursuing research projects designed to make each of them a reality.

One of the simplest ideas is to wrap flexible photovoltaic cells around the top of Jersey barriers dividing highways to provide electricity to power streetlights and illuminate road signs. The photovoltaic cells could also be embedded in the roadway between the Jersey barrier and the adjacent rumble strip.

"This is a project that could be implemented today because the technology already exists," said Lee. "Since the new generation of solar cells are so flexible, they can be installed so that regardless of the angle of the sun, it will be shining on the cells and generating electricity. A pilot program is progressing for the lamps outside Bliss Hall on campus."

Another practical approach to harvesting solar energy from pavement is to embed water filled pipes beneath the asphalt and allow the sun to warm the water. The heated water could then be piped beneath bridge decks to melt accumulated ice on the surface and reduce the need for road salt. The water could also be piped to nearby buildings to satisfy heating or hot water needs, similar to geothermal heat pumps. It could even be converted to steam to turn a turbine in a small, traditional power plant.

Graduate student Andrew Correia has built a prototype of such a system in a URI laboratory to evaluate its effectiveness, thanks to funding from the Korea Institute for Construction Technology. By testing different asphalt mixes and various pipe systems, he hopes to demonstrate that the technology can work in a real world setting.

"One property of asphalt is that it retains heat really well," he said, "so even after the sun goes down the asphalt and the water in the pipes stays warm. My tests showed that during some circumstances, the water even gets hotter than the asphalt."

A third alternative uses a thermo-electric effect to generate a small but usable amount of electricity. When two types of semiconductors are connected to form a circuit linking a hot and a cold spot, there is a small amount of electricity generated in the circuit.

URI Chemistry Professor Sze Yang believes that thermo-electric materials could be embedded in the roadway at different depths -- or some could be in sunny areas and others in shade -- and the difference in temperature between the materials would generate an electric current. With many of these systems installed in parallel, enough electricity could be generated to defrost roadways or be used for other purposes. Instead of the traditional semiconductors, he proposes to use a family of organic polymeric semiconductors developed at his laboratory that can be fabricated inexpensively as plastic sheets or painted on a flexible plastic sheet.
"This is a somewhat futuristic idea, since there isn't any practical device on the market for doing this, but it has been demonstrated to work in a laboratory," said Yang. "With enough additional research, I think it can be implemented in the field."
Perhaps the most futuristic idea the URI team has considered is to completely replace asphalt roadways with roadways made of large, durable electronic blocks that contain photovoltaic cells, LED lights and sensors. The blocks can generate electricity, illuminate the roadway lanes in interchangeable configurations, and provide early warning of the need for maintenance.
According to Lee, the technology for this concept exists, but it is extremely expensive. He said that one group in Idaho made a driveway from prototypes of these blocks, and it cost about $100,000. Lee envisions that corporate parking lots may become the first users of this technology before they become practical and economical for roadway use.
"This kind of advanced technology will take time to be accepted by the transportation industries," Lee said. "But we've been using asphalt for our highways for more than 100 years, and pretty soon it will be time for a change."

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Rhode Island**.

http://www.sciencedaily.com/releases/2010/11/101109102720.htm

Oldest Fossilized Shrimp: Geologists Study Rare Well-Preserved Creature Showing Muscles

The fossil shrimp from Oklahoma and a recent shrimp. (Credit: Rodney Feldmann/NOAA)

ScienceDaily (Nov. 10, 2010) — Rodney Feldmann, professor emeritus, and Carrie Schweitzer, associate professor, from Kent State University's Department of Geology report on the oldest fossil shrimp known to date in the world. The creature in stone is as much as 360 million years old and was found in Oklahoma. Even the muscles of the fossil are preserved.

Their study will be published in *Journal of Crustacean Biology*.

"The oldest known shrimp prior to this discovery came from Madagascar," Feldmann said. "This one is way younger, having an age of 'only' 245 million years, making the shrimp from Oklahoma 125 million years older."

The fossil shrimp, having a length of about 3 inches, was found by fellow paleontologist Royal Mapes of Ohio University and his students. Feldmann and Schweitzer named the fossil after him: *Aciculopoda mapesi*.

The discovery is also one of the two oldest decapods ('ten footed') to which shrimp, crabs and lobsters belong. The other decapod, *Palaeopalaemon newberryi*, is of similar age and was found in Ohio and Iowa. "The shrimp from Oklahoma might, thus, be the oldest decapod on earth," Feldmann explained.

The fossil is a very important step in unraveling the evolution of decapods. However, more finds are necessary. "The common ancestor of the two species can probably be found in rocks that once formed the old continent Laurentia," Schweitzer said. "Nowadays, these rocks can be found primarily in North America and Greenland. Who's going to find it? Possibly by one of the numerous amateur collectors, who often graciously donate specimens to science."

The description of the fossil is not only remarkable because of its age, but also due to its preservation. In this case, the muscles that once made up the tail part of the shrimp were preserved. This is extremely rare in fossils. Feldmann knows why the muscles are still visible. "When the animal died, it came to rest on the seafloor," he said. "The muscles then were preserved by a combination of acidic waters and a low oxygen content as the animal was buried rapidly."

The shrimp lived in deeper waters of the ocean where currents were too weak to destroy the shrimp. Other animals that were found in the same rock include the extinct ammonites, nautiloids, brachiopods and sponges.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Kent State University**.

http://www.sciencedaily.com/releases/2010/11/101109172349.htm

Brains of Neanderthals and Modern Humans Developed Differently

The brains of Neanderthals and modern humans are very similar at the time of birth. A reconstruction of a Neanderthal baby is compared to a modern human newborn. While the face of the Neanderthal is already larger than in a modern human at the time of birth, their brain shapes and volumes are very similar. Internal casts of brain cavities of skulls (Neanderthal: red; modern humans: blue) provide information about the relative size and form of the brain. (Credit: Max Planck Institute for Evolutionary Anthropology)

ScienceDaily (Nov. 9, 2010) — Researchers at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany have documented species differences in the pattern of brain development after birth that are likely to contribute to cognitive differences between modern humans and Neanderthals.

Whether cognitive differences exist between modern humans and Neanderthals is the subject of contentious disputes in anthropology and archaeology. Because the brain size range of modern humans and Neanderthals overlap, many researchers previously assumed that the cognitive capabilities of these two species were similar. Among humans, however, the internal organization of the brain is more important for cognitive abilities than its absolute size is. The brain's internal organization depends on the tempo and mode of brain development.

Based on detailed measurements of internal shape changes of the braincase during individual growth, a team of scientists from the MPI has shown that these are differences in the patterns of brain development between humans and Neanderthals during a critical phase for cognitive development.

Discussions about the cognitive abilities of fossil humans usually focus on material culture (e.g. the complexity of the stone tool production process) and endocranial volumes. "The interpretation of the archaeological evidence remains controversial, and the brain-size ranges of Neanderthals and modern humans overlap," says Jean-Jacques Hublin, director of the Department of Human Evolution at the MPI-EVA in Leipzig where the research was conducted. Hublin adds, "our findings show how biological differences between modern humans and Neanderthals may be linked to behavioural differences inferred from the archaeological record."

As the brain does not fossilize, for fossil skulls, only the imprints of the brain and its surrounding structures in the bone (so called "endocasts") can be studied. The researchers used state-of-the-art statistical methods to compare shape changes of virtual endocasts extracted from computed-tomographic scans. The distinct globular shape of the braincase of adult *Homo sapiens* is largely the result of a brain development phase that is not present in Neanderthals.

One of the key pieces of evidence was the skull reconstruction of a Neanderthal newborn. In 1914, a team of French archaeologists had excavated the skeleton of a Neanderthal baby at the rock shelter of Le Moustier in the Dordogne. The original bones of the skeleton had been lost to science for more than 90 years, until they were rediscovered among museum collections by Bruno Maureille and the museum staff. The restored original baby bones are now on permanent display at the Musée National de Préhistoire in Les Eyzies-de-Tayac-Sireuil. The museum's director Jean-Jacques Cleyet-Merle made it possible to scan the delicate fragments using a high-resolution computed-tomographic scanner (μCT). Using computers at the Max Planck

Institute's virtual reality lab in Leipzig, Philipp Gunz and Simon Neubauer then reconstructed the Neanderthal baby from the digital pieces, like in a three-dimensional jigsaw puzzle.
"When we compare the skulls of a Neanderthal and a modern human newborn, the Neanderthal's face is already larger at the time of birth. However, most shape differences of the internal braincase develop after birth," explains Gunz. Both Neanderthals and modern human neonates have elongated braincases at the time of birth, but only modern human endocasts change to a more globular shape in the first year of life. Modern humans and Neanderthals therefore reach large adult brain sizes via different developmental pathways.
In a related study, the same team of MPI researchers had previously shown that the developmental patterns of the brain were remarkably similar between chimpanzees and humans *after* the first year of life, but differed markedly directly after birth. "We interpret those aspects of development that are shared between modern humans, Neanderthals, and chimpanzees as conserved," explains Simon Neubauer. "This developmental pattern has probably not changed since the last common ancestor of chimpanzees and humans several million years ago." In the first year of life, modern humans, but not Neanderthals, depart from this ancestral pattern of brain development.
Establishing when the species differences between Neanderthal and modern human adults emerge during development was critical for understanding whether differences in the pattern of brain development might underlie potential cognitive differences. As the differences between modern humans and Neanderthals are most prominent in the period directly after birth, they likely have implications for the neuronal and synaptic organization of the developing brain.
The development of cognitive abilities during individual growth is linked to the maturation of the underlying wiring pattern of the brain; around the time of birth, the neural circuitry is sparse in humans, and clinical studies have linked even subtle alterations in early brain development to changes in the neural wiring patterns that affect behaviour and cognition. The connections between diverse brain regions that are established during this period in modern humans are important for higher-order social, emotional, and communication functions. It is therefore unlikely that Neanderthals saw the world as we do.
The new study shows that modern humans have a unique pattern of brain development after birth, which separates us from our closest relatives, the Neanderthals. This uniquely modern human pattern of early brain development is particularly interesting in light of the recent breakthroughs in the Neanderthal genome project. A comparison of Neanderthal and modern human genomes revealed several regions with strong evidence for positive selection within *Homo sapiens*, i.e. the selection occurred *after* the split between modern humans and Neanderthals. Three among these are likely to be critical for brain development, as they affect mental and cognitive development.
"Our findings have two important implications," says Philipp Gunz. "We have discovered differences in the patterns of brain development that might contribute to cognitive differences between modern humans and Neanderthals. Maybe more importantly, however, this discovery will tell us more about our own species than about Neanderthals; we hope that our findings will help to identify the function of some genes that show evidence for recent selection in modern humans."
Editor's Note: *This article is not intended to provide medical advice, diagnosis or treatment.*

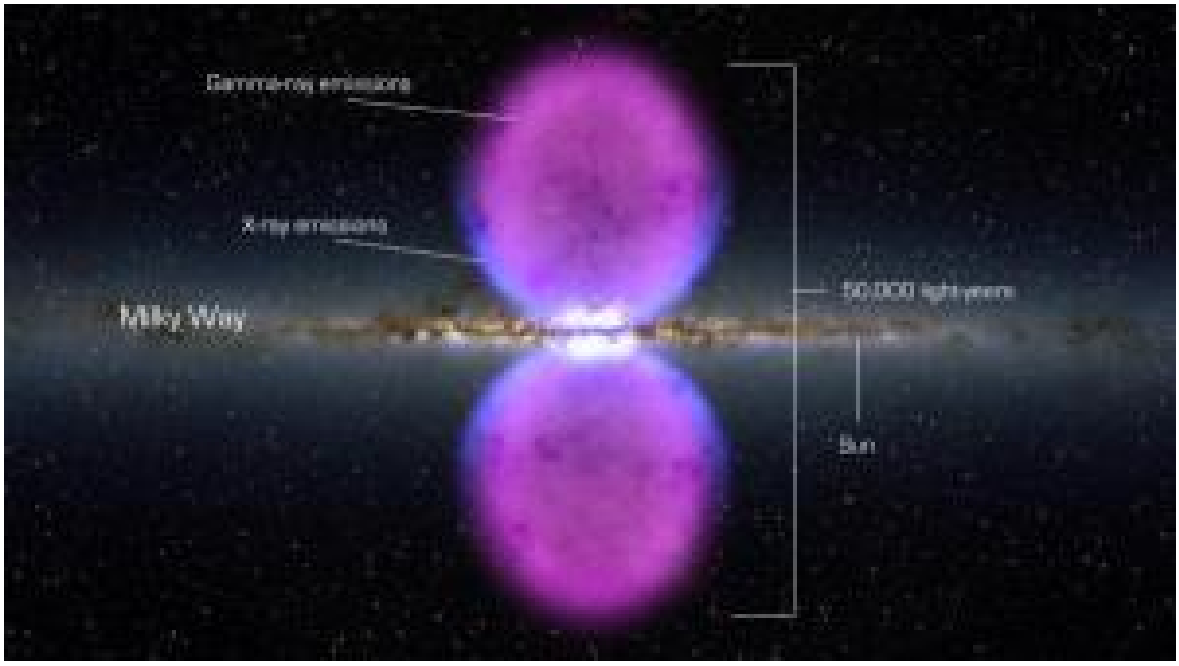
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Max-Planck-Gesellschaft**, via AlphaGalileo.

Journal Reference:

1. Philipp Gunz, Simon Neubauer, Bruno Maureille and Jean-Jacques Hublin. **Brain development after birth differs between Neanderthals and modern humans**. *Current Biology*, Volume 20, Issue 21, R921-R922, 9 November 2010 DOI: 10.1016/j.cub.2010.10.018

http://www.sciencedaily.com/releases/2010/11/101108140421.htm

NASA's Fermi Telescope Finds Giant Structure in Our Galaxy



From end to end, the newly discovered gamma-ray bubbles extend 50,000 light-years, or roughly half of the Milky Way's diameter, as shown in this illustration. Hints of the bubbles' edges were first observed in X-rays (blue) by ROSAT, a Germany-led mission operating in the 1990s. The gamma rays mapped by Fermi (magenta) extend much farther from the galaxy's plane. (Credit: NASA's Goddard Space Flight Center)

ScienceDaily (Nov. 9, 2010) — NASA's Fermi Gamma-ray Space Telescope has unveiled a previously unseen structure centered in the Milky Way. The feature spans 50,000 light-years and may be the remnant of an eruption from a supersized black hole at the center of our galaxy.

"What we see are two gamma-ray-emitting bubbles that extend 25,000 light-years north and south of the galactic center," said Doug Finkbeiner, an astronomer at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., who first recognized the feature. "We don't fully understand their nature or origin."

The structure spans more than half of the visible sky, from the constellation Virgo to the constellation Grus, and it may be millions of years old. A paper about the findings has been accepted for publication in *The Astrophysical Journal*.

Finkbeiner and his team discovered the bubbles by processing publicly available data from Fermi's Large Area Telescope (LAT). The LAT is the most sensitive and highest-resolution gamma-ray detector ever launched. Gamma rays are the highest-energy form of light.

Other astronomers studying gamma rays hadn't detected the bubbles partly because of a fog of gamma rays that appears throughout the sky. The fog happens when particles moving near the speed of light interact with light and interstellar gas in the Milky Way. The LAT team constantly refines models to uncover new gamma-ray sources obscured by this so-called diffuse emission. By using various estimates of the fog, Finkbeiner and his colleagues were able to isolate it from the LAT data and unveil the giant bubbles.

Scientists now are conducting more analyses to better understand how the never-before-seen structure was formed. The bubble emissions are much more energetic than the gamma-ray fog seen elsewhere in the Milky

Way. The bubbles also appear to have well-defined edges. The structure's shape and emissions suggest it was formed as a result of a large and relatively rapid energy release -- the source of which remains a mystery.
One possibility includes a particle jet from the supermassive black hole at the galactic center. In many other galaxies, astronomers see fast particle jets powered by matter falling toward a central black hole. While there is no evidence the Milky Way's black hole has such a jet today, it may have in the past. The bubbles also may have formed as a result of gas outflows from a burst of star formation, perhaps the one that produced many massive star clusters in the Milky Way's center several million years ago.
"In other galaxies, we see that starbursts can drive enormous gas outflows," said David Spergel, a scientist at Princeton University in New Jersey. "Whatever the energy source behind these huge bubbles may be, it is connected to many deep questions in astrophysics."
Hints of the bubbles appear in earlier spacecraft data. X-ray observations from the German-led Roentgen Satellite suggested subtle evidence for bubble edges close to the galactic center, or in the same orientation as the Milky Way. NASA's Wilkinson Microwave Anisotropy Probe detected an excess of radio signals at the position of the gamma-ray bubbles.
The Fermi LAT team also revealed Nov. 9 the instrument's best picture of the gamma-ray sky, the result of two years of data collection.
"Fermi scans the entire sky every three hours, and as the mission continues and our exposure deepens, we see the extreme universe in progressively greater detail," said Julie McEnery, Fermi project scientist at NASA's Goddard Space Flight Center in Greenbelt, Md.
NASA's Fermi is an astrophysics and particle physics partnership, developed in collaboration with the U.S. Department of Energy, with important contributions from academic institutions and partners in France, Germany, Italy, Japan, Sweden and the United States.
"Since its launch in June 2008, Fermi repeatedly has proven itself to be a frontier facility, giving us new insights ranging from the nature of space-time to the first observations of a gamma-ray nova," said Jon Morse, Astrophysics Division director at NASA Headquarters in Washington. "These latest discoveries continue to demonstrate Fermi's outstanding performance."
For more information about Fermi, visit: http://www.nasa.gov/fermi

Story Source:
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **NASA**.

http://www.sciencedaily.com/releases/2010/11/101109152447.htm

Engineered Plants Make Potential Precursor to Raw Material for Plastics

Researchers report engineering a plant that produces industrially relevant levels of compounds that could potentially be used to make plastics. (Credit: Image courtesy of DOE/Brookhaven National Laboratory)

ScienceDaily (Nov. 9, 2010) — In theory, plants could be the ultimate "green" factories, engineered to pump out the kinds of raw materials we now obtain from petroleum-based chemicals. But in reality, getting plants to accumulate high levels of desired products has been an elusive goal. Now, in a first step toward achieving industrial-scale green production, scientists from the U.S. Department of Energy's (DOE) Brookhaven National Laboratory and collaborators at Dow AgroSciences report engineering a plant that produces industrially relevant levels of compounds that could potentially be used to make plastics.

The research is reported online in *Plant Physiology*, and will appear in print in the December issue.

"We've engineered a new metabolic pathway in plants for producing a kind of fatty acid that could be used as a source of precursors to chemical building blocks for making plastics such as polyethylene," said Brookhaven biochemist John Shanklin, who led the research. "The raw materials for most precursors currently come from petroleum or coal-derived synthetic gas. Our new way of providing a feedstock sourced from fatty acids in plant seeds would be renewable and sustainable indefinitely. Additional technology to efficiently convert the plant fatty acids into chemical building blocks is needed, but our research shows that high levels of the appropriate feedstock can be made in plants."

The method builds on Shanklin's longstanding interest in fatty acids -- the building blocks for plant oils -- and the enzymes that control their production. Discovery of the genes that code for the enzymes responsible for so called "unusual" plant oil production encouraged many researchers to explore ways of expressing these genes and producing certain desired oils in various plants.

"There are plants that naturally produce the desired fatty acids, called 'omega-7 fatty acids,' in their seeds -- for example, cat's claw vine and milkweed -- but their yields and growth characteristics are not suitable for commercial production," Shanklin said. Initial attempts to express the relevant genes in more suitable plant species resulted in much lower levels of the desired oils than are produced in plants from which the genes were isolated. "This suggests that other metabolic modifications might be necessary to increase the accumulation of the desired plant seed oils," Shanklin said.

"To overcome the problem of poor accumulation, we performed a series of systematic metabolic engineering experiments to optimize the accumulation of omega-7 fatty acids in transgenic plants," Shanklin said. For these proof-of-principle experiments, the scientists worked with *Arabidopsis*, a common laboratory plant. Enzymes that make the unusual fatty acids are variants of enzymes called "desaturases," which remove specific hydrogen atoms from fatty acid chains to form carbon-carbon double bonds, thus desaturating the fatty acid. First the researchers identified naturally occurring variant desaturases with desired specificities, but they worked poorly when introduced into *Arabidopsis*. They next engineered a laboratory-derived variant of a natural plant enzyme that worked faster and with greater specificity than the natural enzymes, which increased the accumulation of the desired fatty acid from less than 2 percent to around 14 percent.

Though an improvement, that level was still insufficient for industrial-scale production. The scientists then assessed a number of additional modifications to the plant's metabolic pathways. For example, they "down-

regulated" genes that compete for the introduced enzyme's fatty acid substrate. They also introduced desaturases capable of intercepting substrate that had escaped the first desaturase enzyme as it progressed through the oil-accumulation pathway. In many of these experiments they observed more of the desired product accumulating. Having tested various traits individually, the scientists then combined the most promising traits into a single new plant.

The result was an accumulation of the desired omega-7 fatty acid at levels of about 71 percent in the best-engineered line of *Arabidopsis*. This was much higher than the omega-7 fatty acid levels in milkweed, and equivalent to those seen in cat's claw vine. Growth and development of the engineered *Arabidopsis* plants was unaffected by the genetic modifications and accumulation of omega-7 fatty acid.

"This proof-of-principle experiment is a successful demonstration of a general strategy for metabolically engineering the sustainable production of omega-7 fatty acids as an industrial feedstock source from plants," Shanklin said.

This general approach -- identifying and expressing natural or synthetic enzymes, quantifying incremental improvements resulting from additional genetic/metabolic modifications, and "stacking" of traits -- may also be fruitful for improving production of a wide range of other unusual fatty acids in plant seeds.

This research was funded by the DOE Office Science, and by The Dow Chemical Company and Dow AgroSciences.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **DOE/Brookhaven National Laboratory**.

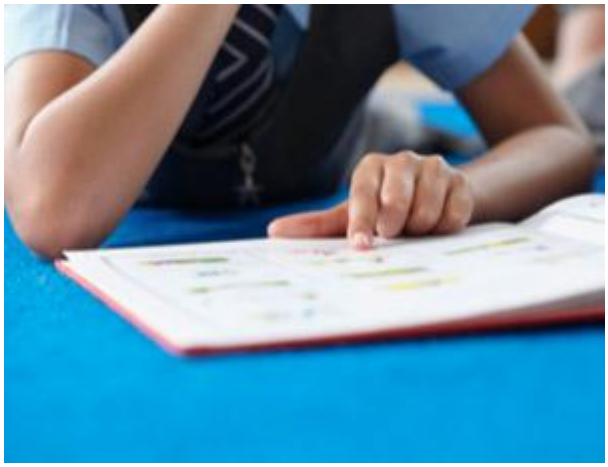
Journal Reference:

1. Huu Tam Nguyen, Girish Mishra, Edward Whittle, Scott A. Bevan, Ann Owens Merlo, Terence A. Walsh, and John Shanklin. **Metabolic Engineering of Seeds can Achieve Levels of w-7 Fatty Acids Comparable to the Highest Levels Found in Natural Plant Sources**. *Plant Physiology*, December 2010

http://www.sciencedaily.com/releases/2010/11/101108140638.htm

Bad memory for faces? Blame your reading skills

- 16:19 12 November 2010 by **Jessica Hamzelou**



Busily erasing social skills? (Image: Gary John Norman/Getty)

Have you ever been embarrassed by introducing yourself at a party to someone only for them to point out that you've met before? Don't feel too bad: your superior reading skills may be to blame, according to a new brain-scan study.

Stanislas Dehaene at the INSERM-CEA Cognitive Neuroimaging Unit in Saclay, France, has previously proposed a "neuronal recycling" theory, which suggests that new skills are handled by existing brain-cell circuits with older but related functions.

To test the hypothesis Dehaene and colleagues carried out functional MRI brain scans on 10 people who could not read, 22 who learned to read as adults and 31 who did so as children, while they were shown text and images.

The scans firstly confirmed which regions of the brain are associated with reading: as expected, the visual word form area, which is known to enable people to link sounds with written symbols, became active during reading, demonstrating that it plays an important role. Unsurprisingly, those who were better readers had more activation in this area when they were reading compared with the others. And when volunteers listened to spoken sentences, all their brains showed similar responses in the visual word form area.

Faced down

But when the researchers showed participants pictures of faces, the visual word form area of those who could read was much less active than that of participants who could not read. So, the researchers speculate, learning to read competes with face recognition ability – in this part of the brain at least.

"The intriguing possibility that our face-perception abilities suffer in proportion to our reading skills will be explored in future research," they say.

Dehaene has previously speculated that the ability to read may have hijacked a neuronal network that evolved to enable us to visually track animals.

Last year, Manuel Carreiras at the Basque Center on Cognition, Brain and Language in San Sebastián, Spain, found that the brains of adults who learned to read as adults were structurally different to those who could not read.

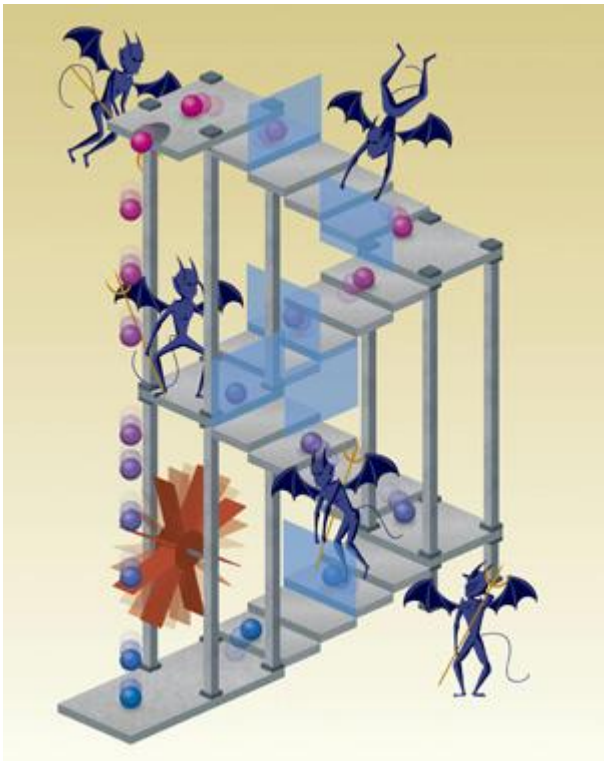
Carreiras describes Dehaene's findings as "remarkable". "The hypothesis suggests that this brain area has not evolved for reading but results from a reconfiguration of evolutionarily older brain circuits dedicated to object processing," he says.

Journal reference: *Science*, DOI: 10.1126/science.1194140

http://www.newscientist.com/article/dn19720-bad-memory-for-faces-blame-your-reading-skills.html?full=true&print=true

Summon a 'demon' to turn information into energy

- 11:58 15 November 2010 by **Stephen Battersby**



Energy in the making: every time a ball hops up a step, the demon stops it going back (Image: Mabuchi Design Office/Yuki Akimoto)

Demons can unleash arcane energies in physics as well as fantasy. The building of a real-life version of "Maxwell's demon" – which can turn information into useful energy – might mean that future nanomachines can be powered purely by information.

Conceived by James Clerk Maxwell in 1867, the demon exploits the random thermal motions of the microworld. It might watch a tiny ball on a spiral staircase, waiting for it to randomly hop up a step and then slam in a barrier to stop the ball moving down again. If the demon keeps doing this the ball keeps climbing. The potential energy of the ball could then be used to drive an engine.

Initially, it seemed as if Maxwell's demon was getting something for nothing, creating a perpetual motion machine, but later it became clear that the demon must expend some energy in getting information about these random motions, so it wouldn't break the laws of thermodynamics after all. But nobody was able to physically demonstrate the demon and find out for sure.

Now researchers in Japan led by Eiro Muneyuki of Chuo University in Tokyo and Masaki Sano of the University of Tokyo have used a tiny rotor and an electric field to construct a version of Maxwell's demon.

Rotor action

The rotor is formed from two linked polystyrene beads each 0.3 micrometres across. One is pinned to a glass surface leaving the other free to rotate around it and the whole thing is immersed in fluid. Buffeted by molecules of the fluid, the rotor turns clockwise as often as it does anti-clockwise.

But then the researchers add a complex electric field that applies a gentle torque to the rotor, which varies at different angles. The torque is analogous to the force of gravity acting on the tiny ball on a staircase.

Like the ball occasionally moving up a step, the rotor is sometimes buffeted enough by other molecules to move against the gentle torque. Overall, however, it is now much more likely to move in the direction of the torque (equivalent to hopping down a step in the spiral staircase) than to move against it (equivalent to hopping up).
Finally, enter the demon, whose eye is a camera and brain a computer that controls the electric field. Whenever the rotor makes some progress in turning against the torque, the demon shifts the electric field so that the rotor suddenly finds itself nudged onto the top of that "step". This keeps happening, and the overall effect is to gradually climb the staircase.

Demon power

As it does, the rotor gains energy. Crucially, though, the demon need pump no energy into the rotor, only information about the position of the rotor, which it uses to switch the field.
Video information about the rotor's position can be quantified in terms of digital bits. The researchers worked out that the exchange rate between energy and information matches theoretical predictions: at room temperature, one bit of information converts to about 3×10^{-21} joules.
Other researchers have summoned versions of Maxwell's demon before this, but they have not measured the energy gain and the information used, says Shoichi Toyabe of Chuo University in Tokyo, a member of the team. "We have verified that information can indeed be converted to potential energy and that the fundamental principle of the demon holds true," he told *New Scientist*.
While the amount of energy the system produces may seem insignificant, it might be enough to power nanomachines of the future, says Toyabe.
What's more, the relationship between energy and information could one day impose a fundamental limit on the amount of information super-efficient computers of the future can store, according to Christian van den Broeck of the University of Hasselt in Belgium.
Journal Reference: *Nature Physics*, DOI: 10.1038/NPHYS1821

http://www.newscientist.com/article/dn19723-summon-a-demon-to-turn-information-into-energy.html?full=true&print=true

Blood camera to spot invisible stains at crime scenes

- 18:13 12 November 2010 by **Helen Knight**

Hands off (Image: Henning Kaiser/AFP/Getty Images)

Call it CSI: Abracadabra. A camera that can make invisible substances reappear as if by magic could allow forensics teams to quickly scan a crime scene for blood stains without tampering with valuable evidence.

The prototype camera, developed by Stephen Morgan, Michael Myrick and colleagues at the University of South Carolina in Columbia, can detect blood stains even when the sample has been diluted to one part per 100.

At present, blood stains are detected using the chemical luminol, which is sprayed around the crime scene and reacts with the iron in any blood present to emit a blue glow that can be seen in the dark. However, luminol is toxic, can dilute blood samples to a level at which DNA is difficult to recover, and can smear blood spatter patterns that forensic experts use to help determine how the victim died. Luminol can also react with substances like bleach, rust, fizzy drink and coffee, causing it to produce false positives.

The camera, in contrast, can distinguish between blood and all four of these substances, and could be used to spot stains that require further chemical analysis without interfering with the sample.

To take an image of a scene, the camera beams pulses of infrared light onto a surface and detects the infrared that is reflected back off it. A transparent, 8-micrometre-thick layer of the protein albumin placed in front of the detector acts as a filter, making a dilute blood stain show up against its surroundings by filtering out wavelengths that aren't characteristic of blood proteins.

By modifying the chemical used for the filter, it should be possible to detect contrasts between a surface and any type of stain, says Morgan. "With the appropriate filter, it should be possible to detect [sweat and lipids] in fingerprints that are not visible to the naked eye," he says. "In the same way you could also detect drugs on a surface, or trace explosives."

Journal reference: *Analytical Chemistry*, DOI: 10.1021/ac101107v

http://www.newscientist.com/article/dn19722-blood-camera-to-spot-invisible-stains-at-crime-scenes.html?full=true&print=true

US internet hosts are linchpin of criminal botnets

- 12 November 2010 by **Jim Giles**
- Magazine issue 2786.

WHILE criminal gangs in Russia and China are responsible for much of the world's cybercrime, many of the servers vital to their activities are located elsewhere. An investigation commissioned by *New Scientist* has highlighted how facilities provided by internet companies in the US and Europe are crucial to these gangs' activities.

Researchers at Team Cymru, a non-profit internet security company based in Burr Ridge, Illinois, delved into the world of botnets - networks of computers that are infected with malicious software. Millions of machines can be infected, and their owners are rarely aware that their computers have been compromised or are being used to send spam or steal passwords.

Several botnets have been linked to gangs based in Russia, where police have a poor record on tackling the problem. But to manage their botnets these gangs often seem to prefer to use computers, known as command-and-control (C&C) servers, in western countries. More than 40 per cent of the 1500 or so web-based C&C servers Team Cymru has tracked this year were in the US. When it comes to hosting C&C servers, "the US is significantly ahead of anyone else", says Steve Santorelli, Team Cymru's director of global outreach in San Diego.

Santorelli and his colleagues also detected a daily average of 226 C&C servers in China and 92 in Russia. But European countries not usually linked with cybercrime were in a similar range, with an average of 120 C&C servers based in Germany and 64 in the Netherlands.

Internet hosts in western countries appeal to criminals for the same reasons that regular computer users like them, says Santorelli: the machines are extremely reliable and enjoy high-bandwidth connections. Team Cymru's research did not identify which companies are hosting botnet servers, but Santorelli says the list would include well-known service providers.

Criminals prefer internet hosts in western countries as they are reliable and have fast connections

The use of US-based C&C servers to control botnets is a source of frustration to security specialists, who have long been aware of the problem. It is happening even though most hosting companies shut down C&C servers as soon as they receive details of botnet activity from law enforcement agencies and security firms. "When we see an AT&T address serving as a botnet control point, we take it very seriously," says Michael Singer, an executive director at AT&T.

Despite these efforts, the criminals can quickly re-establish control by setting up a new C&C server with a different company, often using falsified registration information and stolen credit card details.

Hosting companies deal with botnets on a voluntary basis at present. They might be more vigilant if required to act by law, but that would create its own regulatory problems, Santorelli says. "The cops don't run or govern the internet after all, and neither do they want to," he says. For legal controls to work, it would be necessary to define who has the authority to decide whether a server is part of a botnet, and how requests from authorities abroad are dealt with.

Jeffrey Carr of security firm Taia Global, based in Washington DC, says that some less well-known providers have been warned about botnet activity on many occasions, but drag their heels when asked to shut down the criminals' servers.

The problem arises partly because web hosting can be a big earner for some firms. "They're generating millions of dollars in income," says Carr. Improvements in security, such as requiring service providers to verify the details of people who rent server facilities, could well hurt these firms' bottom line.

http://www.newscientist.com/article/mg20827866.000-us-internet-hosts-are-linchpin-of-criminal-botnets.html?full=true&print=true

iPhone app reveals the emotional downside of daydreams

- 19:00 11 November 2010 by **Jim Giles**

Oh yeah, I'm unhappy again (Image: KPA/Zuma/Rex Features)

Daydreaming seems to be bad for your mental health, say the psychologists who used an iPhone app to track the moods of more than 2000 people.

The app let the researchers do something that traditional psychology methods do not: intrude on people's lives on a regular basis. Around three times a day, the software prompts users to answer questions about what they are doing and feeling. It also asks users to say whether they are focusing on whatever task is at hand, or if their mind is wandering.

Mind-wandering turns out to be extremely common – users reported daydreaming almost 50 per cent of the time. The state occurred most frequently while people were brushing their teeth or doing other grooming. During only one activity – making love – did the frequency of mind-wandering drop below 30 per cent.

App users were also more likely to report feeling unhappy when their mind was wandering. Crucially, episodes of mind-wandering tended to precede bouts of low mood, but not vice versa, suggesting that the former caused the latter.

"That's the biggest take-home," says Matthew Killingsworth of Harvard University, who conducted the study with his colleague Daniel Gilbert. "Mind-wandering might be something that is damaging to people's happiness."

Sad bias

The link may be due to an asymmetry in how daydreams affect mood. Killingsworth and Gilbert found that daydreams about pleasant things were linked to improvements in mood, but only slight improvements. Thinking about neutral topics while mind-wandering was linked to a similarly modest drop in happiness, but

daydreams about unpleasant topics coincided with a 20-point drop on the 100-point scale that app users used to rate their mood.

"This is a really solid piece of work," says Jonathan Smallwood at the University of California, Santa Barbara. He says that mind-wandering and levels of happiness have been linked in laboratory studies, but never before in such a large population of people going about their daily lives.

But the claim that mind-wandering causes unhappiness needs to be further evaluated, he adds, because he and others have shown the effect can run in the opposite direction. In laboratory experiments, he found that lowering a person's mood, perhaps by showing them a video about a sad story, led to more mind-wandering.

"It's difficult to make causal claims," says Smallwood. "But it's undoubtedly the case that negative mood and mind-wandering are inextricably linked."

The connection suggests that cutting down on mind-wandering, either by practising meditation or simply by keeping busy, could help people battle depression. Cutting out daydreaming altogether, even if that were possible, is not recommended, though: "The irony is that mind-wandering also underlies invention," says Smallwood. "We don't want to tell people not to do it."

Journal reference: *Science*, DOI: 10.1126/science.1192439

http://www.newscientist.com/article/dn19715-iphone-app-reveals-the-emotional-downside-of-daydreams.html?full=true&print=true

Markets hint at 100-year energy gap

- 17:57 11 November 2010 by **Helen Knight**

The stock market has a worrying message for the future. It suggests we may run out of oil a century before we have an alternative fuel ready to replace it.

Nataliya Malyshkina and Deb Niemeier at the University of California, Davis, used the share prices of publicly traded oil and renewable-energy companies to predict when the new technologies are likely to be adopted.

The price of a new-technology company's shares reflects investors' forecasts of when its technologies will be introduced. Because their money is at stake, investors tend to put a lot of work into collecting and understanding relevant information, such as progress in the development of a technology and applicable government regulations and taxes, says Malyshkina.

"Better investors, whose forecasts are more accurate, tend to become richer and, therefore, influence market prices more than investors that make wrong bets," she says. Share prices have previously been used to accurately predict the outcome of US elections and sporting events.

When the pair studied the share prices of oil companies and alternative-energy technology companies, and estimated the rate of change of future investment, they found that investors do not expect the replacement of oil-based fuels with renewables for another 131 years.

Smart money

"Investors put far more money into the traditional oil companies than into alternative energy companies," says Malyshkina. "Therefore, investors believe that in the near future the traditional oil business is going to do better and to occupy a considerably larger share of the energy market than alternative-energy companies."

If global oil consumption continues to rise at the current rate of 1.3 per cent per year, the planet's proven oil reserves of 1.332 trillion barrels are expected to run out in 2041. "Our results suggest that there is a danger that crude oil will be depleted before it can be replaced by viable substitutes," the pair claim.

All is not lost, however. Malyshkina and Niemeier predict that as oil reserves shrink, and the need for a replacement becomes more pressing, people's behaviour and that of the market is likely to change.

Journal reference: *Environmental Science and Technology*, DOI: 10.1021/es100730q

http://www.newscientist.com/article/dn19714-green-machine-markets-hint-at-100year-energy-gap.html?full=true&print=true

Rock-burning, sea-zapping geoengineering could cut CO_2

- 15:27 12 November 2010 by **Michael Marshall**

Plans for geoengineering are often extravagantly high-tech, with giant space-based mirrors and artificial trees. But we might stabilise the climate just as well with a pile of chalk: rocks that suck carbon dioxide out of the air could be key in the fight against climate change.

"Enhanced weathering" could in theory remove as much CO_2 from the atmosphere as we want – although the practical challenges are enormous, said Tim Kruger of Oxford Geoengineering, a networking organisation in the UK, speaking at a conference at the Royal Society in London this week.

Kruger has two ideas for how to do it. The first involves adding calcium oxide – also known as quicklime and made from chalk – to the oceans. Calcium oxide reacts with water to form calcium hydroxide, which is strongly alkaline. This absorbs CO_2 dissolved in seawater, causing the ocean to suck replacement CO_2 out of the air.

His second method is to run an electrical current through seawater near the ocean surface. This causes a chemical reaction with the salt in the water, producing alkaline sodium hydroxide, which then absorbs CO_2 just like calcium hydroxide.

"Both methods have the potential to draw down carbon dioxide without limit," Kruger says, because the raw materials necessary are readily available.

Burn to save

Sure, they are promising, but both methods face major challenges, cautions Dieter Wolf-Gladrow of the Alfred Wegener Institute for Polar and Marine Research in Bremerhaven, Germany. To produce calcium oxide you have to burn chalk or limestone, producing CO_2 that must be stored; and electrolysing seawater produces huge amounts of hydrochloric acid, which also has to be safely disposed of. Generating the electricity to drive the electrolysis may also produce CO_2.

Wolf-Gladrow has looked at an alternative: scattering the common mineral olivine as a powder in humid tropical lands. Olivine reacts with CO_2, but it could only remove at most 3.7 gigatonnes of CO_2 per year – around one-tenth of our annual emissions. Too much olivine would eventually leach into tropical rivers and make them more alkaline, harming wildlife.

Journal reference: *Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.1000545107

http://www.newscientist.com/article/dn19719-rockburning-seazapping-geoengineering-could-cut-co2.html

Tropical forests thrived in ancient global warming

- 19:00 11 November 2010 by **Michael Marshall**

Won't be so lucky this time? (Image: Erik Sampers/Getty)

South America's tropical forests flourished when temperatures skyrocketed 56 million years ago. Could this mean that climate change will spare the Amazon?

Carlos Jaramillo of the Smithsonian Tropical Research Institute in Balboa, Panama, and colleagues excavated pollen and other plant remains from three sites in Colombia and Venezuela.

Their samples span the Palaeocene-Eocene Thermal Maximum (PETM), when soaring levels of greenhouse gases caused global temperatures to rise by 5 °C in about 10,000 years.

The tropical forests then faced average temperatures up to 34 °C, compared with 27 °C today, yet contrary to expectations the pollens suggest plant diversity increased.

Each sample of 150 grains of pollen from the PETM contained an average of 36 species, compared with just 24 species in samples from older, cooler times. And the rate at which new species formed was significantly higher in the PETM than before it.

The trends are puzzling because models predict that the Amazon will burn and be reduced to savannah with future climate change.

Hot and wet

The difference between what happened then and what is forecast to happen in future may be down to rainfall. Jaramillo found evidence that there was no less precipitation during the PETM than before – for instance, he found pollen from species that prefer wet environments. In contrast, the combination of climate change and deforestation is expected to dry out the Amazon in future.

Deforestation may be a key factor for modern forests, says Jaramillo, as cleared land dries out quickly. "If we didn't have humans deforesting the tropics, they would probably cope quite well with climate change," he says.

Matthew Huber of Purdue University in West Lafayette, Indiana, points out that Jaramillo's results may not apply to the entire tropics: the sample sites were in the north of South America.

"The models suggest that further south, like in the centre of Brazil, would be where it got really hot," he says. "I'm not too surprised that they find life was diverse at their sites, but others might well be barren."

Nevertheless, he says the work is a "big accomplishment", especially given the conditions under which Jaramillo had to work – under threat from local drug trafficking, his team had to be protected at times by the Colombian armed forces. "We have a window into a world we've never seen before," says Huber.

Journal reference: *Science*, vol 330, p 957

http://www.newscientist.com/article/dn19713-tropical-forests-thrived-in-ancient-global-warming.html

Countdown to 'thermogeddon' has begun

- 11 November 2010 by **Michael Le Page**
- Magazine issue 2786.

Too hot to handle (Image: Jeff Hutchens/Getty)

THERE may come a point, if the world warms enough, when parts of the tropics will become so hot and humid that humans will not be able to survive. Models predict that this could start to happen in places in as little as 100 years in the worst case scenario. Now, observations show the process is already under way.

As humidity rises, sweating cools us less, so we suffer heat stress at lower air temperatures. For now, no place on Earth exceeds the human threshold for heat tolerance, with the exception of a few caves like the Naica cave in Mexico. That is thanks to a fortunate natural thermostat: when humid air gets hot, it rises and causes storms that cool things down.

But there is a catch. The point at which air begins to rise - the stability threshold - depends on how warm and moist surrounding air is. Models predict that as the entire tropics warm, the stability threshold will rise.

Nathaniel Johnson and Shang-Ping Xie at the University of Hawaii studied satellite and rain-gauge data from the last 30 years and found that sea surface temperatures in the tropics now need to be about 0.3 °C higher than they did in 1980 before the air above rises and produces rain (*Nature Geoscience*, DOI: 10.1038/ngeo1008).

This means the stability threshold has already started to rise, says Johnson. He adds that the same should be true over land masses in the tropics.

Earlier this year, Steven Sherwood at the University of New South Wales in Australia pointed out the serious implications for humans. Heatwaves already kill tens of thousands of people, and even more will die as the thermostat rises.

Eventually, some tropical areas could get so hot and humid on occasion that even someone standing naked in the shade in front of a fan would die (*New Scientist*, 23 October, p 36).

Some tropical areas could get too hot and humid on occasion for humans to survive

http://www.newscientist.com/article/mg20827864.300-countdown-to-thermogeddon-has-begun.html?full=true&print=true

Cats that cure: Pets' healing power put to the test

- 08 November 2010 by **Hal Herzog**
- Magazine issue 2785.

Cat company can certainly be pleasant, but health-enhancing is another matter (Image: Helena Inkeri/Getty)

*Living with animals is good for our health. Lovely thought, but **Hal Herzog** says we're too keen to believe it*

WHY is it so difficult to think straight about animals? How do we assess the comparative cruelty of cockfights and Happy Meals? Is it really OK to use millions of mice in the hunt for a cure for baldness? And what makes us think the things we think about animals that don't think like us? These are questions I pose in my new book, *Some We Love, Some We Hate, Some We Eat*, and they are questions I hope the new science of anthrozoology will address in the coming years as it draws together psychologists, vets, sociologists, ethologists, anthropologists and others to study the complexities of human interactions with other species.

One of the field's current controversies - over whether interacting with animals alleviates human suffering - ties together some of my questions. There are reports of all sorts, from reasonable claims that stroking a cat lowers blood pressure to over-the-top ones such as swimming with dolphins alleviates autism and shrinks tumours. Sorting out the genuine science is going to be interesting.

I made a small start when I decided to check the research underpinning an article in my local newspaper, which claimed regular visits by "therapy dogs" improved the psychological adjustments of cancer patients. The original research turned out to be a clinical trial at the University of Missouri in which people undergoing radiation therapy were randomly placed in either a dog-visitation group, a human-visitation group, or a quiet reading group. The study was well-designed and the results clear and surprising: the data actually indicated that the dog visits had no effect on the health or happiness of the patients.

Public fascination with the healing powers of pets was fuelled by a study in 1980 of people who survived heart attacks. A research team lead by Erika Friedman, now at the University of Maryland in College Park, studied 92 people and found that 6 per cent of the pet owners in the study died within 12 months compared with 28 per cent of non-pet owners.

There have now been hundreds of studies on the medical and psychological impacts of interacting with animals, ranging from the cardiovascular benefits of petting a boa constrictor to horse riding as a treatment for attention-deficit hyperactivity disorder. From them emerges what looks like reasonably good evidence that beneficial effects sometimes accrue from living with animals. For example, several studies have found children brought up with pets are less susceptible to asthma, while a study of Germans and Australians reported pet owners made fewer visits to the doctor. Chinese women who owned dogs were found to sleep more soundly, take fewer sick days and feel better than dog-free women.

But what never seem to make the headlines are the many studies which showed pets to have no effects, or even adverse effects, on their owners' health and happiness. For instance, Deborah Wells at Queen's University Belfast, UK, reported that pet-owners with chronic fatigue syndrome were convinced that their companion animals provided them with a host of psychological and physical benefits, but objective measures showed they were just as tired, depressed, worried and unhappy as CFS sufferers without animals.

Epidemiologists in Finland found that pet ownership was associated with high blood pressure, kidney disease, arthritis, sciatica, migraines, panic disorders and obesity. Researchers at the Australian National University in Canberra reported that adults aged 60-plus who lived with pets were more likely to be depressed, take pain medication and generally be in worse mental and physical shape than pet-free people. And a recent study from the University of Western Australia in Perth found that while acquiring a dog increased the frequency of recreational walking by their owners, the total amount of exercise they got each week did not change.

After reading many studies of the effects of pets on people, I have tentatively concluded that, on the whole, pets are probably a healthy pleasure, though not to the degree that the pet industry would have us believe. The challenge for researchers is to figure out to what extent interacting with animals can benefit human health and why. The extent question is made difficult by the fact that negative results are seldom published - the "file-drawer effect".

At last year's meeting of the International Society of Anthrozoology I attended a session which illustrated this phenomenon. Presentations of three studies on the effects of animals on psychological well-being in groups such as college students and people living in nursing homes all clearly showed that pets had no effect, yet researchers told me they did not plan to submit their results to a journal.

A 2008 study published in *The New England Journal of Medicine* on the effectiveness of 12 anti-depressant drugs illustrates how ignoring unpublished studies can skew scientific findings (vol 358, p 252). The researchers found that overall, the studies that the US Food and Drug Administration judged to show positive results were about 12 times as likely to be published as studies with non-positive results. When the data from the unpublished research were included in the analysis, the estimates of the average effectiveness of anti-depressants dropped by 32 per cent. I suspect a similar decline would be true of animal therapy studies.

Replication is also a problem with research into human-animal relationships. A decade ago, researchers in Pretoria, South Africa, reported that levels of oxytocin (dubbed the "love hormone") increased when people pet dogs. Even though there were only 18 subjects, the study has been widely used as proof that the hormone is the chemical glue that cements the bonds between people and pets. Three research groups have tried to replicate the original study. One found the effect only in women, another only among people who gazed at their dogs, and the third found that petting dogs had no influence on oxytocin levels. (This last study was not published.)

Some research on the benefits of living with animals is just plain bad science. For a meta-analysis of the effectiveness of animal-assisted therapy, Brad Lundahl and his team at the University of Utah in Salt Lake City combed through 250 studies and could only find 39 that included data that met even minimal standards of rigour. And researchers Lori Marino and Scott Lilienfeld of Emery University in Atlanta, Georgia, concluded that nearly every study purporting to document the benefits of therapy based on swimming with dolphins is methodologically flawed.

Finally, because most studies on the benefits of living with companion animals on our mental and physical health are based on comparisons of people who own pets with those who do not, we know little about why pet-keeping may be associated with better health. Which way, for instance, does the causal arrow point? Does living with an animal make us healthier and happier, or are individuals who are healthy and happy to begin with more likely to acquire pets?

People who are healthy and happy to begin with may be more likely to acquire pets

Hopefully, we will have better answers quite soon. Human-animal interaction research centres are popping up all over the world, and the International Society for Anthrozoology holds annual conferences and publishes a peer-reviewed journal, *Anthrozoös*. For now, I'd say be careful about uncritically accepting claims about the miraculous healing powers of pets - and don't forget to walk the dog!

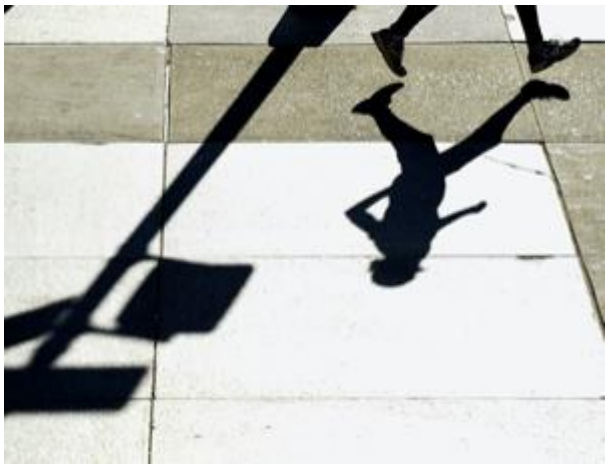
Profile

Hal Herzog is professor of psychology at Western Carolina University, North Carolina. This article was developed from his book, *Some We Love, Some We Hate, Some We Eat: Why it's so hard to think straight about animals*, published by HarperCollins (2010)

http://www.newscientist.com/article/mg20827856.000-cats-that-cure-pets-healing-power-put-to-the-test.html?full=true&print=true

Personal genomics tests prompt lifestyle changes

- 17:00 05 November 2010 by **Peter Aldhous**



It's amazing what a little information can do (Image: Timothy A. Clary/AFP/Getty Images)

Could a small dose of genetic information cure complacency about weight loss and exercise? That's the suggestion made by a new study of how information from "personal genomics" companies has influenced their customers.

David Kaufman of the Genetics and Public Policy Center in Washington DC quizzed 1048 customers who had ordered genome scans from Decode Genetics of Reykjavik, Iceland, 23andMe of Mountain View, California, or Navigenics, based in Foster City, California.

Asked about changes in their behaviour between two and six months after receiving the results, 34 per cent of respondents said they were being more careful about their diet, 14 per cent said they were doing more exercise, and 16 per cent had changed their medications or dietary supplements.

"I was surprised at the number of people who said they'd made changes already," says Kaufman, who revealed the results this week at the annual meeting of the American Society of Human Genetics (ASHG) in Washington DC.

That's impressive because getting people to adopt more healthy lifestyles is notoriously difficult – even when family history shows a high risk of conditions like type 2 diabetes and heart attacks.

Right thing, wrong reasons?

But responses to genetic information may be out of proportion to its actual predictive value. For most common diseases, the genome scans available now explain relatively little about your future risks. In the case of type 2 diabetes, for example, diet and exercise play a greater role in risk than genetics does, and the DNA variants discovered so far explain only a small proportion of the disease's heritability.

Even so, if genetic information has a disproportionate effect in getting people to heed advice that they should be following anyway, that could be a strong force for improving public health.

David Marrero, a specialist in diabetes prevention at Indiana University in Indianapolis, says he is impressed by reported changes in behaviour, but adds, "The question is how long it is sustained."

Early adopters

Kaufman hopes to run follow-up studies to address that question. Another important issue is whether genetic information will be similarly motivating when it moves outside the self-selecting group who now purchase genome scans and becomes part of mainstream medical practice.

Toby Jayaratne, a specialist in health behaviour at the University of Michigan in Ann Arbor, worries that some people will adopt a fatalistic attitude if told that they have a genetic predisposition to a particular disease, and become less likely to act to improve their health. This is more likely among poor and socially disadvantaged people, she adds.

Customers of personal genomics firms are typically relatively wealthy and well-educated. The same is true of those who have joined academic studies of the effects of providing genetic information on health behaviour. "They tend to be people who are highly motivated health-seekers and science geeks," says Barbara Bernhardt of the University of Pennsylvania in Philadelphia, who has conducted detailed interviews with 60 volunteers in the Coriell Personalized Medicine Collaborative, a pioneering effort to study the medical value of genetic information.

Risk judgements

Bernhardt's findings, also revealed at the ASHG meeting, suggest that people tend to focus mainly on whether their genetic risks for each condition are higher or lower than average, rather than paying close attention to the size of those risks. This means that people might be paying undue attention to risks that are not actually significantly elevated.

Kaufman, meanwhile, has found that a minority of his respondents misunderstand the "relative risk" figures provided by personal genomics firms, particularly when the risks are below average – a relative risk of 0.8, for instance, indicates that the person tested is 20 per cent less likely to develop a condition than a typical member of the same population.

However, despite these glitches, he finds little evidence that people are misinterpreting genetic information in ways that might be dangerous to their health. Those who said they had changed medications, for instance, had overwhelmingly done so in consultation with their doctor.

"We don't give people enough credit to people's abilities to decide what's useful to them," Kaufman suggests. "People who get their data are generally pleased with it, and they respond in generally positive ways."

http://www.newscientist.com/article/dn19688-personal-genomics-tests-prompt-lifestyle-changes.html

Red light forces cancer cells to suck up drugs

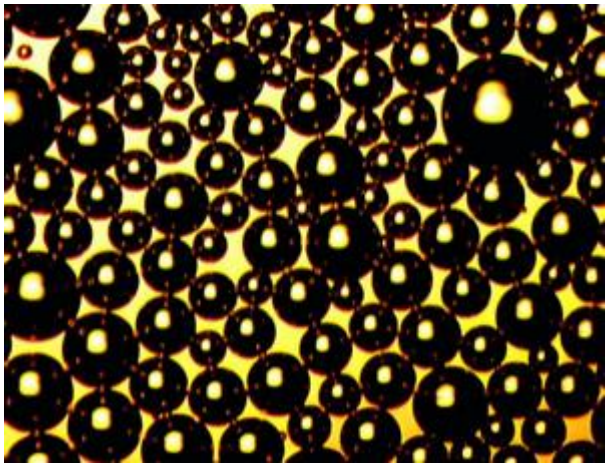
- 13 November 2010
- Magazine issue 2786.

CELLS absorb chemotherapy drugs more readily if they are zapped with red light. The finding could help produce more effective cancer treatments.
Most cancer chemotherapy relies on cells absorbing drugs by diffusion across the cell membrane. This does not always work, because some cells simply push the drug molecules back out using a natural pump mechanism.
To overcome this problem, Andrei Sommer at the University of Ulm in Germany and colleagues exposed cells to pulsed red laser light. Light of this wavelength decreases water density and pushes water out of the cell. When the laser is switched off, the water returns to its high-density state, forcing the cell to "suck in" water and any other molecules, including drugs, from its surroundings.
The researchers tested their technique by applying the light for 1 minute to human cervical cancer cells surrounded with common anti-cancer drugs such as epigallocatechin gallate (EGCG). This short period of light exposure was sufficient to kill off 70 per cent of cancer cells surrounded by EGCG, compared with 31 per cent of cells not exposed to light (*Journal of Controlled Release*, DOI: 10.1016/j.jconrel.2010.10.010).

http://www.newscientist.com/article/mg20827864.900-red-light-forces-cancer-cells-to-suck-up-drugs.html

Blood bubbles promise new treatments for brain disease

- 12 November 2010 by **Jessica Hamzelou**
- Magazine issue 2786.



(Image: Eleanor Stride)

SCUBA divers are all too aware of the danger of bubbles of air forming in the blood. The bends can be lethal. But bubbles in the bloodstream are not always a bad thing. Much smaller bubbles can be used to deliver drugs, help prevent damage from stroke and even open up the blood-brain barrier, a discovery that could lead to new treatments for diseases of the brain.

A few decades ago, researchers discovered by chance that "microbubbles" of air in the blood made ultrasound images clearer and brighter. Now a group of researchers who call themselves "the bubble community" are finding new roles for these bubbles.

Ultrasound applied to microbubbles in the blood causes them to oscillate, which appears to boost the uptake of drugs and gene therapies into nearby cells, though how this works is unclear. "The theory is that the bubbles are stimulating natural uptake mechanisms," says Eleanor Stride at University College London. "Exactly which mechanisms, we're not sure."

Ultrasound applied to microbubbles in the blood boosts the local uptake of drugs and gene therapies

Stride's team has enhanced this effect by adding magnetic nanoparticles to the microbubbles. The group injected mice with a solution containing a gene for bioluminescence, and a suspension of bubbles, before magnetically dragging the bubbles to one lung and applying ultrasound there.

Three days later, the team found bioluminescence only in the target lung, confirming that the gene hadn't been expressed elsewhere. The findings were presented at the Institute of Electrical and Electronics Engineers Ultrasonics Conference in San Diego, California, last month.

Even more surprising is the microbubbles' ability to open the blood-brain barrier - a blockade that stops large molecules, including many drugs, getting from the bloodstream into the brain. "If you expose the blood-brain barrier to bubbles and ultrasound, you can temporarily and reversibly enhance its permeability, which is potentially very interesting for a lot of brain treatments," says Stride.

Oscillating microbubbles could also be useful in stroke therapy. Christy Holland at the University of Cinncinnati in Ohio and her colleagues have been developing different types of bubbles to treat stroke in rats. In their latest project, the group filled microbubbles with xenon - a gas known to protect brain cells from dying and improve blood flow, but difficult to administer. They found that rats treated with xenon-filled bubbles after a stroke had smaller areas of brain damage than untreated rats (*Circulation*, DOI: 10.1161/circulationaha.109.879338).

Other groups have started trialling microbubbles in people. Andrei Alexandrov at the University of Alabama in Birmingham and his team treated stroke patients within 3 hours of stroke onset with one of three doses of tissue plasminogen activator (tPA) - used to break down clots - with or without microbubbles and ultrasound. Of those on the middle tPA dose with microbubbles and ultrasound, 67 per cent had restored blood flow within 2 hours. This happened in only 33 per cent of those on a lower dose of tPA alone. "The oscillating bubbles enable the tPA to reach binding sites in the clot," says Alexandrov.

However, there are still serious safety concerns. Two of the 11 people on the highest tPA dosage who also received ultrasound suffered a haemorrhage and died (*Annals of Neurology*, DOI: 10.1002/ana.21723). In these cases, it was unclear what caused the bleeding, though it is possible that collapsing bubbles could have damaged blood vessels. Alexandrov will be launching a new trial next year.

Until these concerns are answered, bubbles could instead be useful in cases where destruction is the goal. "Turn the ultrasound energy intensity up and the bubbles oscillate much more violently, and could actually break down blood clots, tumours and kidney stones," says Stride.

According to the bubble community, multi-purpose microbubbles have the potential to transform medicine. "Bubbles can be extremely useful in medical applications," says Stride. Holland agrees: "It's a hot area of research."

http://www.newscientist.com/article/mg20827864.500-blood-bubbles-promise-new-treatments-for-brain-disease.html

Almost half of US could be obese by 2050

- 11 November 2010
- Magazine issue 2786.

IN 40 years 40 per cent of the US population will be obese, according to a new prediction based on American trends.
Alison Hill's team at Harvard University developed a statistical model to predict the spread of behaviours through a social network of friends, family and neighbours, together with those behaviours that spontaneously arise without social influence.
The researchers applied their model to data taken over the last 40 years on the spread of obesity in 7500 people living in Boston.
Two per cent of the population became obese each year, with a person's chance of becoming obese increasing by 0.5 per cent for each contact they had with an obese person. Taking into account recovery rates from obesity and extrapolating to the wider population, Hill's model predicts obesity levels will plateau in about 40 years, at which time 42 per cent of Americans will be obese.
The prevalence of obesity in the Boston group has historically tracked closely with US levels, so the findings could indeed be valid nationwide, says Hill (*PLoS Computational Biology*, DOI: 10.1371/journal.pcbi.1000968).

http://www.newscientist.com/article/mg20827863.500-almost-half-of-us-could-be-obese-by-2050.html

Why your brain is the smartest on Earth

- 15 November 2010 by **John Duncan**
- Magazine issue 2786.

Inside the puzzle of smart brains (Image: Dan Kitwood/Getty)

Other animals are helping us understand how the human brain's almost entirely flexible structure sets our intelligence apart, says ***John Duncan***

THE human mind is among the most powerful forces on earth: the intelligence emerging from it allows us to cultivate vast cornfields or rice paddies and build sprawling cities; to launch spacecraft, paint pictures, compose music - or use reason to write this article.

But the full account of how human thought emerges from a biological brain, a network of billions of neurons communicating via tiny electrical impulses, still ranks among the great scientific mysteries. In 1951, Karl Lashley, one of the fathers of neuroscience, looked forward to a possible "physiology of logic". In my new book, *How Intelligence Happens*, I tell the story of how this dream is approaching reality, thanks to the modern integration of research in psychology, artificial intelligence, brain imaging and neurophysiology.

To a large degree, a human brain resembles the brains of other vertebrates. The behaviour of many animals is founded on a basic building block called the "innate releasing mechanism" - a fixed pattern of action prompted by a triggering sensory event.

Perhaps the best-known example of an IRM comes from the one of the founders of ethology, Niko Tinbergen, and his analysis of courting stickleback couples. At the mouth of his nest, the male sees a female enter his territory, her belly swollen with eggs and her posturing indicating she is sexually receptive. The sight releases

the male's response. He approaches and begins a characteristic zigzag dance. The dance induces the female to approach and on it goes. This pattern is repeated in many animals, with complex, apparently goal-directed behaviour built from the combined fragments, or subprograms, which are individual IRMs.
Human behaviour is also made up of complex programs. For much of our lives, the fragments of these programs are not IRMs: instead, I call them cognitive enclosures, an enormous number of focused, cognitive steps leading to the achievement of a goal. In any mental program, distinct cognitive enclosures follow one another in rapid succession. For example, in one second we search in our pocket for the car keys as we leave for work, in another we move into the car seat, and in a few more seconds, we check for traffic as we pull out into the road.
Breaking tasks into useful cognitive enclosures is as essential for this everyday sequence as it is for the more cerebral activities we consider "intelligent", such as constructing a proof to a mathematical problem or understanding the rules of a maze.
Ironically, from the first unwieldy tin boxes to the superfast laptops of 2010, computers fail abysmally at tasks, or subprograms, that humans find trivial. Computers are hopeless at distinguishing road signs, pedestrians or cars at a busy intersection, or at reading a paragraph of text and building an image of the world it describes. Where computers excel is in decomposing complex problems, dividing them up into separate, independently solvable subproblems - and then reassembling them into an organised, goal-directed structure.
In humans, we can show some parts of this decomposition and assembly experimentally. But we are only beginning to grasp other parts of the puzzle, such as the rapid transition between cognitive enclosures.
The clues come from many places. For more than 100 years, we have known that damage to one part of the cerebral cortex - the frontal lobes, immediately behind the forehead - "loosens" the structure of complex thought and activity. Person A planes a plank of wood but "forgets" to stop and continues planing into the bench; person B writes an incoherent sequence of calculations which fail to solve a mathematical problem he has been given. Often such people do very well on simple cognitive tests but can no longer hold jobs or navigate family life. Individual fragments of thought and action have been preserved, but the coherence of the whole is lost.
With modern MRI or functional MRI techniques we can peer into the frontal lobe to learn a lot more about how this biological programming works. Some of the simple tasks used in intelligence tests (such as completing a series of letters, or choosing the odd-one-out from a group of images) are chosen because they predict success in many kinds of activity, from lab-based measurements of language or memory to lifetime achievement in education or at work. Looking at people taking these tests during an fMRI scan, we see activity in a specific brain network, with components in several separate regions of the frontal lobe. Since activity in this network is also seen as part of the brain's response to any cognitive challenge, this suggests there is a core brain system which is key in building cognitive programs.
MRI images also tell us a lot about the coding in these regions. As we should expect of a system that can be programmed, the network responds to each new cognitive challenge by focusing on specific information needed to control current behaviour - that is, the specific content of the current cognitive fragment, or enclosure.
A neural network is composed of hundreds of millions of separate neurons, each incredibly small, yet often coding highly specific information in the electrical impulses it fires. Take the example of a toad noticing a worm. The toad responds with characteristic movements: it turns towards the worm, approaches, fixes its head in position and snaps its jaws.
Describing in detail how neurons make this happen, from the firing of a single neuron indicating the presence of the long, thin, wormlike object in one part of the visual field, right through to the integration of different kinds of information that will allow the toad to eat the worm, took three pages in my book - and that was an account for non-specialists.
At the same time, this also reveals how much is still missing, even in our explanation of this relatively simple case. We could not even begin to build an artificial neural network capable of mimicking the complexities of the toad's behaviour.
When it comes to the massively more complex mental ability of humans, we must also flip between what we are pretty sure about and what is eluding us. On the plus side, we are confident that the IRM of the stickleback

or the toad has been replaced in humans by an almost entirely flexible structure that can focus on virtually any kind of problem - from daily functioning to abstract reasoning.
We can begin to see how these enclosures are assembled in the brain, providing the essentially human element of our intelligence. It is a partial picture, like an early map of the world: some countries are clearly drawn, others no more than a sketch, and still others simply labelled "unknown". But it is a picture that at last begins to realise Lashley's dream.
There are also, I suspect, countries we don't even know are missing. Our human brain has allowed us to understand the atom and probe the boundaries of the universe, but is it really configured for unlimited conceptualisation or understanding? Is just one species so very different from all the others? Or is it rather that, like all the others, we can imagine only so far as our own nervous system allows us?
Are our brains really configured for unlimited understanding?

Profile

John Duncan is assistant director of the MRC Cognition and Brain Sciences Unit in Cambridge, UK, and visiting professor in cognitive neuroscience at the University of Oxford. This article was developed from his new book, *How Intelligence Happens*, published by Yale University Press

http://www.newscientist.com/article/mg20827861.400-why-your-brain-is-the-smartest-on-earth.html

History's biggest lungfish pops up in Nebraska

- 10:00 13 November 2010 by **Jeff Hecht**
- For similar stories, visit the **Evolution** Topic Guide

This huge tooth from an ancient lungfish was languishing in a drawer (Image: K Shimada)

The biggest lungfish on record has been uncovered in an unexpected place – a drawer in the Nebraska State Museum in Lincoln.

Kenshu Shimada of DePaul University in Chicago was searching the drawers for specimens of fish teeth. For a while, the largest one he came across was the size of his thumb. Then he discovered a "humongous" one, 117 mm wide.

James Kirkland, state palaeontologist at the Utah Geological Survey, identified the tooth as coming from the upper jaw of a lungfish in the extinct genus *Ceratodus*, a freshwater bottom-feeder which used massive tooth plates to crunch shelled animals.

Lungfish are among our closest living piscine relatives. Kirkland and Shimada estimate the new *Ceratodus* was at least 4 metres long, beating the previous record of 3.5 metres for an African fossil. The largest living lungfish come in at almost 2 metres.

Kirkland and Shimada suspect the monster lungfish, which dates from between 160 million and 100 million years ago – during the age of dinosaurs – fed on turtles.

A resident of central Nebraska named Verne Baldwin found the tooth in 1940 and gave it to the museum. But how it got to be in central Nebraska is a mystery, since the local rock is not from the right geological era. The giant lungfish may have lived hundreds of kilometres away, in what is now Wyoming, where there are deposits are loaded with teeth from smaller species of *Ceratodus*.

Describing the find at a meeting of the Society for Vertebrate Paleontology in Pittsburgh, Pennsylvania, last month, Shimada speculated that the ancient tooth might have been washed downstream to Nebraska by floods, or carried as a ritual object by early humans. He notes that other fossils have been found in archaeological sites far from where they should have originated.

http://www.newscientist.com/article/dn19721-historys-biggest-lungfish-pops-up-in-nebraska.html

Is this evidence that we can see the future?

- 16:29 11 November 2010 by **Peter Aldhous**

The future predicted now (Image: 20th Century Fox)

Extraordinary claims don't come much more extraordinary than this: events that haven't yet happened can influence our behaviour.

Parapsychologists have made outlandish claims about precognition – knowledge of unpredictable future events – for years. But the fringe phenomenon is about to get a mainstream airing: a paper providing evidence for its existence has been accepted for publication by the leading social psychology journal.

What's more, sceptical psychologists who have pored over a preprint of the paper say they can't find any significant flaws. "My personal view is that this is ridiculous and can't be true," says Joachim Krueger of Brown University in Providence, Rhode Island, who has blogged about the work on the *Psychology Today* website. "Going after the methodology and the experimental design is the first line of attack. But frankly, I didn't see anything. Everything seemed to be in good order."

Critical mass

The paper, due to appear in the *Journal of Personality and Social Psychology* before the end of the year, is the culmination of eight years' work by Daryl Bem of Cornell University in Ithaca, New York. "I purposely waited until I thought there was a critical mass that wasn't a statistical fluke," he says.

It describes a series of experiments involving more than 1000 student volunteers. In most of the tests, Bem took well-studied psychological phenomena and simply reversed the sequence, so that the event generally interpreted as the cause happened after the tested behaviour rather than before it.

In one experiment, students were shown a list of words and then asked to recall words from it, after which they were told to type words that were randomly selected from the same list. Spookily, the students were better at recalling words that they would later type.

In another study, Bem adapted research on "priming" – the effect of a subliminally presented word on a person's response to an image. For instance, if someone is momentarily flashed the word "ugly", it will take them longer to decide that a picture of a kitten is pleasant than if "beautiful" had been flashed. Running the experiment back-to-front, Bem found that the priming effect seemed to work backwards in time as well as forwards.

'Stroke of genius'

Exploring time-reversed versions of established psychological phenomena was "a stroke of genius", says the sceptical Krueger. Previous research in parapsychology has used idiosyncratic set-ups such as Ganzfeld experiments, in which volunteers listen to white noise and are presented with a uniform visual field to create a

state allegedly conducive to effects including clairvoyance and telepathy. By contrast, Bem set out to provide tests that mainstream psychologists could readily evaluate.
The effects he recorded were small but statistically significant. In another test, for instance, volunteers were told that an erotic image was going to appear on a computer screen in one of two positions, and asked to guess in advance which position that would be. The image's eventual position was selected at random, but volunteers guessed correctly 53.1 per cent of the time.
That may sound unimpressive – truly random guesses would have been right 50 per cent of the time, after all. But well-established phenomena such as the ability of low-dose aspirin to prevent heart attacks are based on similarly small effects, notes Melissa Burkley of Oklahoma State University in Stillwater, who has also blogged about Bem's work at *Psychology Today*.

Respect for a maverick

So far, the paper has held up to scrutiny. "This paper went through a series of reviews from some of our most trusted reviewers," says Charles Judd of the University of Colorado at Boulder, who heads the section of the *Journal of Personality and Social Psychology* editorial board that handled the paper.
Indeed, although Bem is a self-described "maverick" with a long-standing interest in paranormal phenomena, he is also a respected psychologist with a reputation for running careful experiments. He is best known for the theory of self-perception, which argues that people infer their attitudes from their own behaviour in much the same way as they assess the attitudes of others.
Bem says his paper was reviewed by four experts who proposed amendments, but still recommended publication. Still, the journal will publish a sceptical editorial commentary alongside the paper, says Judd. "We hope it spurs people to try to replicate these effects."
One failed attempt at replication has already been posted online. In this study, Jeff Galak of Carnegie Mellon University in Pittsburgh, Pennsylvania, and Leif Nelson of the University of California, Berkeley, employed an online panel called Consumer Behavior Lab in an effort to repeat Bem's findings on the recall of words. Bem argues that online surveys are inconclusive, because it's impossible to know whether volunteers have paid sufficient attention to the task. Galak concedes that this is a limitation of the initial study, but says he is now planning a follow-up involving student volunteers that will more closely repeat the design of Bem's word-recall experiment.
This seems certain to be just the first exchange in a lively debate: Bem says that dozens of researchers have already contacted him requesting details of the work.

http://www.newscientist.com/article/dn19712-is-this-evidence-that-we-can-see-the-future.html?full=true&print=true

Born to laugh, we learn to cry

- 11 November 2010 by **Andy Coghlan**
- Magazine issue 2786

Phew! That was close (Image: Tracy A. Woodward/The Washington Post/Getty)

EVER wondered how many of our everyday laughs, groans and sighs are instinctive rather than learned from our peers? It now seems that only expressions of laughter and relief are instinctive, whereas other emotional outbursts need to be learned from other people.

To find out which sounds are instinctive, a team led by Disa Sauter of the Max Planck Institute for Psycholinguistics in Nijmegen, the Netherlands, asked eight deaf and eight hearing individuals to vocalise nine different emotions, but without words. These included fear, relief, anger, hilarity, triumph, disgust and sadness.

Afterwards, Sauter and her colleagues played back the recordings to a panel of 25 hearing individuals, and asked them to match each utterance to an emotion.

It turned out that the only two easily identifiable emotional sounds made by the deaf participants were laughter and sighs of relief. "They seem to be the strongest," says Sauter.

The panel found it easier to guess all the other emotions if the sounds came from the hearing individuals. Even screams of terror were much less obvious from those who were deaf.

"This means that for many kinds of emotional sounds, hearing the sounds of others is an important part of development for our sounds to be understandable to others," says Sauter, whose team is presenting preliminary results as a poster at a conference held by the Acoustical Society of America next week in Cancun, Mexico.

Sauter suggests that laughter and smiling probably both evolved as important communication signals to help avoid confrontation by increasing empathy. "Even other primates laugh, if you tickle a gorilla or orang-utan," she says.

"I think this is a really novel way of looking at emotional expressions, by investigating how vocalisations develop in the absence of auditory feedback," says Sophie Scott of London's Institute of Neuroscience. "The laughter finding makes a great deal of sense, and laughter has been described as more like a different way of breathing than a way of speaking."

David Ostry, who studies vocalisation in deaf people at McGill University in Montreal, Canada, says that deaf people may learn to laugh by watching how hearing people do it. Sauter agrees this is possible and has set up an experiment to investigate this.

By discovering more about when deaf people vocalise instinctively and when they need to learn, Sauter says, it may be possible to better interpret distress calls from deaf infants.

http://www.newscientist.com/article/mg20827864.200-born-to-laugh-we-learn-to-cry.html

Homeopathy consultations can benefit arthritis patients, say scientists

Southampton, University of

Credit: HATTIE YOUNG / SCIENCE PHOTO LIBRARY Caption: MODEL RELEASED. Homeopathic consultation. A male patient has a consultation with a homeopath. A rack of tubes containing medication is seen on the desk. Homeopathic medication is intended to cure the symptoms of an illness by administering tiny doses of substances which cause the same symptoms.

Dosages are made through a series of dilutions. Homeopathic substances are prepared from plant, mineral, animal or other biological sources. Homeopathy, founded by Samuel Hahnemann in 1811, is a controversial therapy. It is gaining some acceptance, though, as it requires the doctor to treat the patient as a whole rather than just the specific illness observed

New evidence that homeopathic consultations can reduce the symptoms of rheumatoid arthritis has been revealed by scientists from the University of Southampton.

In a study published today in the journal Rheumatology, researchers found that arthritis patients significantly benefited when they received homeopathy alongside conventional treatment over a period of 6 months, but this improvement was due to homeopathy's consultation process and not its remedies.

"Although previous trials have shown homeopathy may help patients with rheumatoid arthritis, this is the first time that we have scientific evidence that these benefits are specifically due to its unique consultation process," comments lead author Dr Sarah Brien, a senior research fellow in complementary medicine at the University of Southampton.

"Homeopathic consultations differ from those in conventional medicine in that homeopaths focus on treating the patient, whereas conventional doctors tend to treat the illness. The homeopathic consultation process improves the health of these arthritis patients based on standard rheumatology measurements and does so safely and without side effects.

"What we don't yet know is if it is possible to introduce some of the techniques or approaches used within these consultations into conventional medicine."

Researchers recruited 83 people with rheumatoid arthritis from clinics in Southampton, Poole and Winchester for the study. Each patient received a series of homeopathy consultations over a 24 week period between January 2006 and July 2008, while continuing their conventional treatment. Patients and doctors reported significant reductions in a variety of symptoms including reduced 'disease activity scores', fewer swollen joints, reduced pain and improved mood.

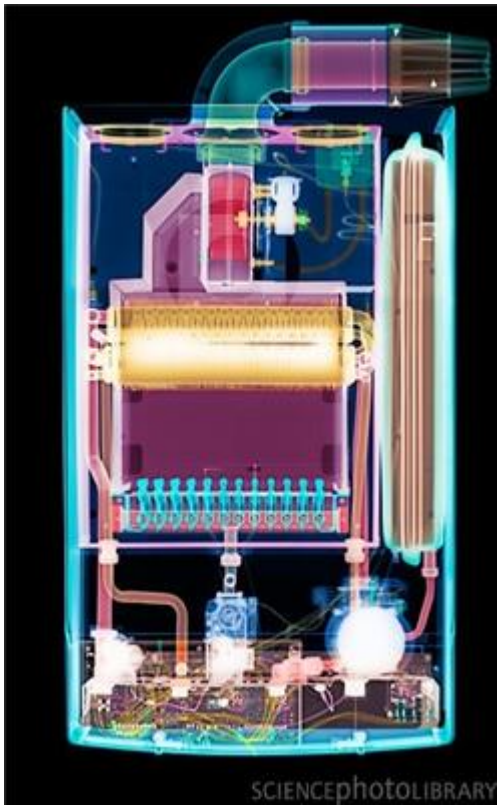
The team now plans to conduct more research into identifying which elements of the consultation process are most beneficial and if homeopathy is a cost effective treatment.

http://rheumatology.oxfordjournals.org/content/early/2010/11/08/rheumatology.keq234.full

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89735&CultureCode=en

District heating in Europe has major potential for the future

15 November 2010 Expertanswer (Expertsvar in Swedish)



District heating in Europe has major potential for the future. Heat market shares for this heating technology could threefold in many large European cities, while still maintaining the current level of profitability. It is also predicted that district heating systems in densely populated cities and city districts will continue to be competitive, even if there is a future drop in heat demands. These are the findings of a new, unique survey conducted by a group of researchers at Halmstad University in Sweden.

"The purpose of the project was to evaluate the continued competitiveness of district heating technology even if heat demands were to be reduced in the future," says Sven Werner, Professor of Energy Technology at Halmstad University, who led the research project.

By reformulating a classic calculation formula for investment costs in district heating networks, the researchers were able to create a unique calculation model, making it possible to estimate investment cost levels for district heating systems even in places that do not currently have district heating. Previous estimations have only been possible to perform on the basis of existing networks.

The researchers then analysed the current standing of district heating technology on the heat market in 83 cities in four European countries: Germany, France, Belgium and the Netherlands. They also evaluated the technology's future competitiveness in relation to local heating alternatives and reduced heat demands.

In 2006 district heating accounted for an average of 21 per cent of the heat market in the cities investigated. "Our calculations did, however, show that market shares corresponding to 60 per cent would be a cost-efficient average expansion level. This means that it would be possible to threefold the current heat market shares for district heating in the cities that we studied, with a profitability level calculated on the basis of the current situation," says Urban Persson, Ph D student in Energy Technology, who was a member of the group of researchers.

The study also shows that in densely populated cities there are no major threats to the position of district heating because of a warmer climate. Among other things, new technology, for example current developments in the fourth generation of district heating technology, can contribute towards this.

The district heating study is part of a three-year Swedish project dealing with various energy technologies: "Pathways - Swedish Systems Solutions", which is being undertaken in partnership with Chalmers University of Technology and financed by the Swedish Energy Agency. This is in turn a parallel project to the major international "Pathways to Sustainable European Energy Systems".

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89732&CultureCode=en

Where Did You Get Those Eyes And That Brain?

15 November 2010 Elsevier

Credit: SIMON FRASER / SCIENCE PHOTO LIBRARY Caption: Alzheimer's disease culture cell. Coloured scanning electron micrograph (SEM) of a cell used in Alzheimer's disease research. This cell has been genetically engineered to produce amyloid precursor protein (APP), which in turn forms the protein amyloid. Plaques of amyloid in the brain are a major pathological feature of Alzheimer's disease. This cell was cultured from a nerve cancer (neuroblastoma), and has shorter and more numerous processes (dendrites and axons) than a healthy nerve cell. Alzheimer's is a brain-wasting disease common in the elderly. It causes confusion, memory loss, personality changes and eventually death. Magnification unknown

A family history of Alzheimer's disease significantly increases the risk for developing this disorder, but a new study in *Biological Psychiatry* suggests that which of your parents has the disease is very important.

Alzheimer's is the most common form of dementia in late-life, affecting over 5 million elderly in the United States alone. In order to develop preventative treatments, it is necessary to identify those individuals who are at highest risk for developing Alzheimer's.
Although individuals with a parental history of Alzheimer's are at increased risk for developing the disease, the specific biological and genetic mechanisms accounting for this increased risk are not known.
An important consideration may be a phenomenon called genomic imprinting, where the pattern of the inherited disease differs based on whether the risk genes are inherited from the mother or the father.
Imprinting is a type of epigenetic regulation, meaning that long lasting changes in gene function are produced through regulatory mechanisms rather than by altering the sequence of the DNA.

In this new study, researchers set out to evaluate Alzheimer's risk in healthy, cognitively normal individuals by measuring their cerebrospinal fluid proteins, which are known to be altered in Alzheimer's. They compared individuals with a maternal or paternal history of Alzheimer's to individuals with no family history. Only individuals whose mothers had Alzheimer's showed altered levels of a protein called amyloid, a major hallmark of Alzheimer's pathology, as well as proteins involved with oxidative stress (i.e., free radicals, which are harmful to the brain as well as the rest of the body). In contrast, individuals whose fathers had Alzheimer's and those with no family history had protein levels within normal range.

"Our data indicate that adult children of mothers with Alzheimer's may be at increased risk for developing the disease," explained Dr. Lisa Mosconi, the first author on the study. "It is therefore extremely important to understand the genetic mechanisms involved in maternal transmission of Alzheimer's disease, which are currently unknown. Identifying a genetic predictor for the disease might lead to preventive treatments years before the onset of clinical symptoms."

Dr. John Krystal, Editor of *Biological Psychiatry*, added: "This study is very important because we are just beginning to understand the epigenetic control of particular genes. In theory, some day, one might develop a medication that reduces the risks associated with a maternal history of Alzheimer's disease."

The authors cautioned that additional follow-up research is now needed to test the usefulness of these protein measures for predictive purposes and to investigate potential susceptibility genes for Alzheimer's disease.

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89729&CultureCode=en

Growing grass for a green biorefinery – an option for Ireland?

15 November 2010 Teagasc

The basic principles of a green biorefinery are similar to an oil refinery but, instead of oil, grass or silage is used as the raw material for the production of a variety of products

The need to reduce atmospheric greenhouse gas emissions and dependency on fossil fuels has been one of the main driving forces towards the use of renewable resources for energy and chemicals.
Researchers at Teagasc, in association with Wageningen University and Research Centre, The Netherlands, have been looking into the possible use of grassland biomass for the production of energy and chemicals, or green biorefinery (GBR), and have detailed their results in an article in *TResearch*, Teagasc's Science magazine.
"The basic principles of a green biorefinery are similar to an oil refinery but, instead of oil, grass or silage is used as the raw material for the production of a variety of products," explains Dr Padraig O'Kiely, Teagasc Animal & Grassland Research and Innovation Centre. "The development of an Irish green biorefinery industry is coherent with the EU Biofuel Directive and the EU's strategy to develop a 'knowledge-based bio-economy'," says Dr O'Kiely.
The researchers carried out a scoping study based on data and knowledge from the operation of GBRs in Europe and, combined with new Irish data on grass quality, assessed the economic, technical and environmental feasibility of a GBR in an Irish context, which they used to develop a blueprint for a first-generation GBR.
Results from the study suggested that the ideal catchment area for a GBR was 700-800ha depending on biomass availability within the catchment area, and the availability should be in excess of 30 per cent in order to contain transport costs. In terms of suitable locations, Dr O'Kiely said: "In general, the viability of GBR

will be highest in areas that have experienced declining livestock numbers and lower farm income, particularly, but not exclusively, areas that support a higher proportion of non-dairy farms. These areas have a higher potential availability of surplus grass biomass. This would mean that the GBR would not have to compete with the traditional agricultural commodities, but rather would provide potential supplementary income to farmers".

Following on from this study, the researchers recently obtained funding from the Department of Agriculture, Fisheries and Food to carry out further work to investigate the potential of different grass species and red clover to produce biomass either as a fresh crop or as silage; the potential of these species to provide fibre that could be used industrially; and, the potential of these species to produce biomethane in anaerobic digestion systems.

Other partners in this ongoing project are University College Cork (UCC) and Queen's University Belfast (QUB). The group at UCC is developing optimal pilot-scale anaerobic digesters for producing biomethane from grass silage, while the group at QUB is investigating how alternative treatments of the silage immediately prior to anaerobic digestion could improve the biomethane yield.

http://www.teagasc.ie/publications/tresearch/

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89723&CultureCode=en

Optimal phosphorus fertilization level achievable

15 November 2010 MTT Agrifood Research Finland

Credit: RON SANFORD / SCIENCE PHOTO LIBRARY Caption: Crop duster applying fertiliser to potato crop. Klamath, Oregon

The interests of the farmer and waterways in terms of phosphorus fertilization may be closer to each other than thought so far, discovered Senior Scientist *Antti Iho* from MTT in his dissertation study.
For plants, phosphorus is a vital nutrient, but phosphorus runoff may accelerate eutrophication in waterways. According to the dynamic calculation model drawn up by Iho, it is possible to optimise phosphorus fertilization to provide a sufficient amount of nutrients to cover the needs of crop cultivation while limiting the amount of runoff phosphorus.
"The phosphorus level optimal from the crop cultivation perspective is not far from the phosphorus level optimal from the point of view of society and the environment. In other words, there is no major contradiction between the good of the farmer and of society," Iho sums up.
Annual fertilization steers soil reserves
The crop response to phosphorus is largely based on the soil phosphorus reserve available to plants and not directly on phosphorus provided in the form of fertilizer.
In his dissertation Iho examines annual fertilization chiefly as a way of regulating the soil phosphorus level over the long term. He developed a theoretical framework for controlling phosphorus fertilization in order to ensure an optimal end result for both the farmer's economy and society.
Farmers have to take into consideration fertilizer price, impact on yield and the price of the end product, such as crop. Society also has to consider the effects of phosphorus runoff on the eutrophication of waterways and the resulting adverse consequences, such as algae blooms.
"From the perspective of environmental protection, the most important thing is to select the correct level of phosphorus fertilizer, not simply to reduce fertilization," Iho stresses.
The price of waterway eutrophication is decisive
Iho applied his dynamic model to the phosphorus fertilization of barley cultivated on clay soil using certain price levels. He discovered that, from a commercial perspective, it was profitable for the farmer to aim at

keeping the phosphorus level of fields at slightly over 7. The optimal phosphorus level from the environmental perspective was just under 6.5.
"From the viewpoint of both the farmer and society, unnecessarily high soil phosphorus reserves should be lowered using very similar optimum solutions," Iho notes.
The difference between the desired phosphorus levels depends on the emphasis, or price, placed on the adverse effects of eutrophication. According to Iho, while it may be difficult to find a compromise between the economically and socially sensible solutions on environmentally vulnerable field sections, in other sections the two objectives might be very close to each other.
The researcher points out that the sensible level of phosphorus fertilization depends on the prevailing status of soil phosphorus reserves, which may vary greatly even within one section of the field.
"The determination of the precise fertilization levels and the recommended soil phosphorus levels requires soil type- and plant-specific data on the best indicator of phosphorus reserves available for plants and on the combined crop response of soil phosphorus and phosphorus fertilization."
The doctoral dissertation of L.Ph. (Agriculture and Forestry) Antti Iho, "Essays on socially optimal phosphorus policies in crop production", will be examined at the Faculty of Agriculture and Forestry of the University of Helsinki on 26 November 2010. The opponent will be Professor Angels Xabadia from the University of Girona, with Professor Markku Ollikainen from the University of Helsinki as custodian.
http://www.mtt.fi/english

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89699&CultureCode=en

Tools to create avatars that preserve same identity and manner of interacting on any visual support

15 November 2010 Elhuyar Fundazioa
Unlike simple instructions or an automatic answering machine, an avatar or virtual person carrying out the tasks as an assistant enables its user to have "more intuitive and natural" communication, states Ms María del Puy Carretero, computer engineer and researcher at the Vicomtech-IK4 centre, who is working on perfecting avatars. In fact, she has recently proposed and validated a series of tools and architecture that enables a virtual person to perform equally on a computer screen, a mobile telephone or a PDA, i.e. its identity and manner of interaction is not affected by changing the device. Based on the work undertaken, Ms Carretero defended her thesis, entitled *Multidevice avatars for multimodal interaction* at the University of the Basque Country (UPV/EHU).
Ms Carretero used the markup languages known as ACML (AMD Core Math Library) and VHML (Virtual Human Markup Language) as computer applications in order to determine respectively the appearance and manner of interacting of the avatar. One of the main contributions of the thesis is, precisely, a series of tools proposed by the author for the simple labelling of the avatar using these two languages. Thanks to these tools of the author, it is much easier to specify and edit the appearance and behaviour of the virtual person and facilitate its integration into different applications, in such a way that, on changing the device, its identity is preserved.
Likewise, in her thesis, Ms Carretero designed, proposed and validated a multi-device architecture which thus facilitates the integration of the virtual personage into different devices, having the same appearance and voice and identical behaviour in all of these.
Computational advantages

As explained by the researcher in her thesis, integrating this series of applications does not involve great problems for the computer being used. On the contrary, the load for the server is very small, thus facilitating the scalability of the number of users; i.e. this does not seriously affect the quality or fluidity of its activity. Moreover, the interaction between the user and the avatar is immediate. Finally, the proposals measured also open the possibility of interacting with the avatar on a local network instead of online, resulting in great savings Internet traffic data.

About the author

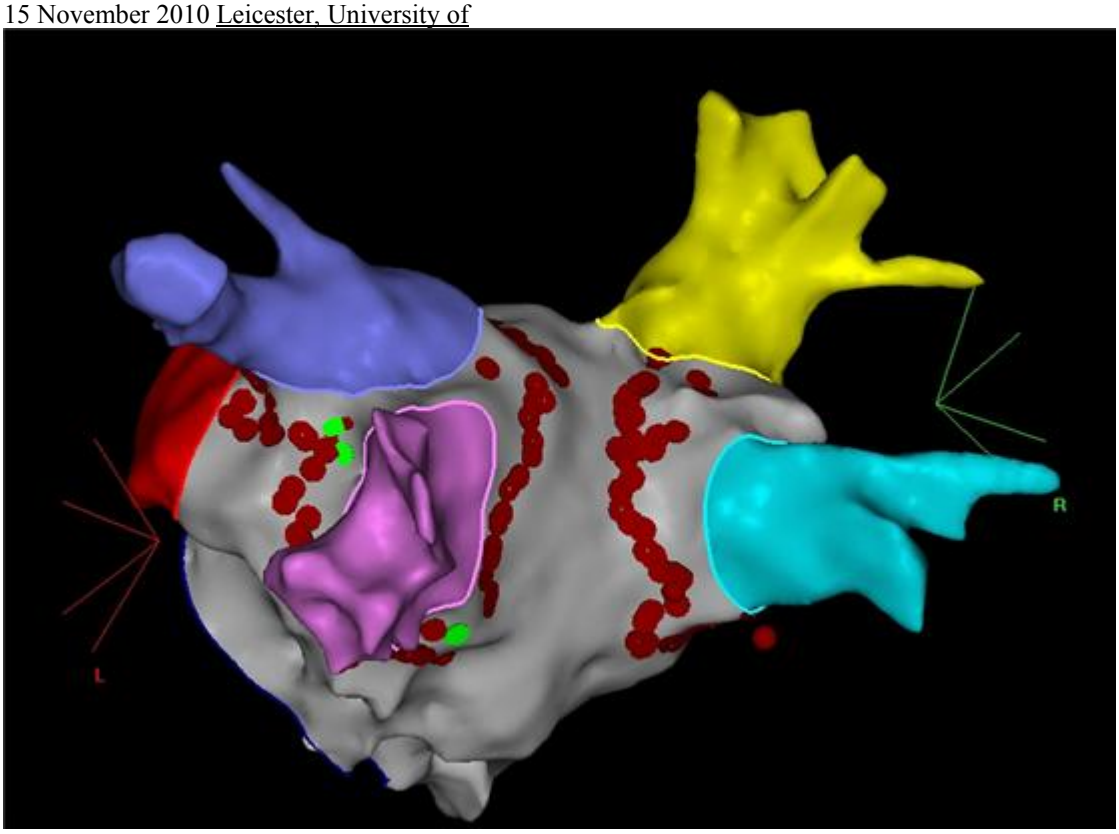
María del Puy Carretero Carrasco (Donostia-San Sebastián, 1980) is a computer engineer. She drew up her PhD thesis under the direction of Mr Alejandro García-Alonso Montoya (Department of Computational Science and Artificial Intelligence at the Faculty of Information Science at the UPV/EHU) and Ms Amalia Ortiz Nicolás (responsible for R+D+i solutions at the Enne Entertainment Studios production company). She is currently a scientific collaborator at the Vicomtech-IK4 centre, where she undertook her PhD thesis.

http://www.basqueresearch.com/berria_irakurri.asp?Berri_Kod=3049&hizk=I

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89687&CultureCode=en

Robo-op marks new world first for heart procedure

15 November 2010 Leicester, University of



The world's first remote heart procedure, using a robotic arm alongside 3-D mapping, is due to take place at Glenfield Hospital in Leicester.
It comes six months after Dr Andre Ng carried out the first ever remote catheter ablation procedure using the Amigo Robotic Catheter System.
Dr Ng, is senior lecturer at the University of Leicester and consultant cardiologist and electrophysiologist at Glenfield Hospital.
On Tuesday 16 November, Dr Ng will be carrying out another "world first" using the robotic arm in combination with advanced 3-dimensional mapping to fix an irregular heart rhythm called atrial fibrillation (AF).
The patient is a 63 year-old man from Alvaston in Derby.
AF is the commonest heart rhythm disturbance seen in clinical practice, with over half a million sufferers in the UK. It also increases the risk of a person having a stroke by five times and doubles the risk of death.
Patients with AF benefit from catheter ablation which is being used more and more. However, the procedure carried out by hand, can take several hours and results can be variable. The robotic system is best suited for this type of ablation. Glenfield Hospital started ablation for AF, treating 25 patients in 2002, increasingly steadily to over 200 in 2009.
Catheter ablation procedures involve inserting thin wire catheters into the groin and up to the heart. Electrodes on the catheters help to identify the cause of the heart rhythm problem. Once identified, the doctor can place one of the catheters at the location of the problem and ablate or “burn” the tissue. Catheter ablation has been used over the past two decades effectively to cure abnormal heart rhythms.

Dr Ng said: "The new Amigo robotic system we have at Glenfield is unique and a new improved version of the original system which can now be used with different types of catheters, especially allowing the combination with the CARTO-3 3D mapping system. CARTO-3 is the latest version of the established and widely used advanced mapping and navigation system which displays and guides precise location of catheter positions in 3D space. We are the first centre in the world to use this new Amigo system and hence the first to be able to combine the two cutting edge technologies together for the ablation procedure. "
Dr Ng and his team are actively involved in the evaluation and development of this pioneering robotic arm system. The initial experience has demonstrated that the doctor can use the Amigo to move catheters via the remote controller safely in an adjacent room outside the x-ray zone, thereby reducing the radiation exposure and eliminating the need for wearing heavy lead aprons. Dr Ng is to conduct two clinical research trials at Glenfield on the safety and efficacy of the Amigo system in electrophysiology and ablation procedures with the support of the University of Leicester and the Leicester Cardiovascular Biomedical Research Unit.
Dr Ng said: "The initial experience with using the Amigo system suggests that great precision of catheter movement can be achieved using robotic control. Combining this for the first time with the accuracy of placing ablation lesions with the CARTO-3 3D mapping system is a significant way forward. It is hoped that using the two advanced technologies together would improve the efficacy and safety of these complex procedures. The versatility of the new Amigo system also allows for cross-platform use of different types of catheters and different mapping systems which greatly enhance treatment options."

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89678&CultureCode=en

Regular exercise reduces large number of health risks including dementia and some cancers

15 November 2010 Wiley - Blackwell

Regular exercise can reduce around two dozen physical and mental health conditions and slow down how quickly the body ages, according to a research review summarising the key findings of 40 papers published between 2006 and 2010. The paper provides an invaluable source for both news and feature editors as it is divided into a number of key sections, ranging from: "Why should I exercise" to "I'm too busy, I don't have time". Health conditions covered by the review include: cancer, heart disease, dementia, stroke, type 2 diabetes, depression, obesity and high blood pressure.

People who take regular exercise could reduce their risk of developing around two dozen physical and mental health conditions - including some cancers and dementia - and slow down how quickly their body deteriorates as they age.

An extensive research review, published in the December issue of IJCP, the International Journal of Clinical Practice, says that apart from not smoking, being physically active is the most powerful lifestyle choice any individual can make to improve their health.

Physiotherapist and lecturer Leslie Alford from the University of East Anglia reviewed 40 papers covering the latest international research published between 2006 and 2010.

“The literature reviewed shows that how long people live and how healthy they are depends on a complex mix of factors, including their lifestyle, where they live and even luck” says Mr Alford. “Individuals have an element of control over some of these factors, including obesity, diet, smoking and physical activity.

“Although the focus of my study was on men’s health, the messages on physical activity are relevant to both sexes and all age groups.”

Health benefits identified by the review include:

· Regular moderate to intense physical activity is associated with decreased risk of coronary heart disease and ischaemic and haemorrhagic stroke.

· A growing body of evidence suggests that increasing physical activity can also reduce the risk of certain types of cancers, osteoporosis, type 2 diabetes, depression, obesity and high blood pressure.
· Evidence of the beneficial effects of physical activity in the primary prevention and management of cancer is growing and there is an association between higher levels of physical activity and lower cancer death rates.
· Research has found that walking or cycling for at least an half-an-hour a day is associated with a reduction in cancer and that when this is increased to an hour cancer incidence falls by 16 per cent.
· Evidence is mixed when it comes to specific cancers. Research has shown a strong relationship between increased physical activity and reduced colon cancer in both sexes. And men who are more active at work - not just sitting at a desk - have lower rates of prostate cancer.
· Other cancer studies show that physical activity after diagnosis can aid recovery and improve outcomes.
· Studies have also shown that men who are physically active are less likely to experience erection problems.
· There is growing evidence that physical activity could decrease the risk of dementia in the elderly.
Recommendations identified by the review include:
· Healthy adults aged between 18 and 65 should aim for 150 minutes of moderate intensity physical activity a week, such as 30 minutes of brisk walking, five days a week. And people who undertake more vigorous intensity exercise, such as jogging, should aim for 20 minutes three days a week.
· Healthy adults should aim for two strength-training sessions a week that work with the body's major muscle groups.
· Older people can benefit from exercise that helps to maintain their balance and flexibility.
· People who are physically active should continue to exercise even when they become middle aged or elderly and those who aren't should increase their physical activity.
· Not smoking and following a healthy diet is also important.
"Ideally, to gain maximum health benefits people should exercise, not smoke, eat a healthy diet and have a body mass index of less than 25" says Mr Alford. "The more of these healthy traits an individual has, the less likely they are to develop a range of chronic disorders. Even if people can't give up smoking and maintain a healthy weight, they can still gain health benefits from increasing the amount of regular exercise they take.
"Physical inactivity results in widespread pathophysiological changes to our bodies. It appears that our bodies have evolved to function optimally on a certain level of physically activity that many of us simply do not achieve in our modern, sedentary lifestyles.
"What is clear from the research is that men and women of all ages should be encouraged to be more physically active for the sake of their long-term health."
http://onlinelibrary.wiley.com/doi/10.1111/j.1742-1241.2010.02478.x/pdf

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89663&CultureCode=en

The Great Cyberheist

By JAMES VERINI

One night in July 2003, a little before midnight, a plainclothes N.Y.P.D. detective, investigating a series of car thefts in upper Manhattan, followed a suspicious-looking young man with long, stringy hair and a nose ring into the A.T.M. lobby of a bank. Pretending to use one of the machines, the detective watched as the man pulled a debit card from his pocket and withdrew hundreds of dollars in cash. Then he pulled out another card and did the same thing. Then another, and another. The guy wasn't stealing cars, but the detective figured he was stealing something.

Indeed, the young man was in the act of "cashing out," as he would later admit. He had programmed a stack of blank debit cards with stolen card numbers and was withdrawing as much cash as he could from each account. He was doing this just before 12 a.m., because that's when daily withdrawal limits end, and a "casher" can double his take with another withdrawal a few minutes later. To throw off anyone who might later look at surveillance footage, the young man was wearing a woman's wig and a costume-jewelry nose ring. The detective asked his name, and though the man went by many aliases on the Internet — sometimes he was cumbajohny, sometimes segvec, but his favorite was soupnazi — he politely told the truth. "Albert Gonzalez," he said.

After Gonzalez was arrested, word quickly made its way to the New Jersey U.S. attorney's office in Newark, which, along with agents from the Secret Service's Electronic Crimes Task Force, had been investigating credit- and debit-card fraud involving cashers in the area, without much luck. Gonzalez was debriefed and soon found to be a rare catch. Not only did he have data on millions of card accounts stored on the computer back in his New Jersey apartment, but he also had a knack for patiently explaining his expertise in online card fraud. As one former Secret Service agent told me, Gonzalez was extremely intelligent. "He knew computers. He knew fraud. He was good."

Gonzalez, law-enforcement officials would discover, was more than just a casher. He was a moderator and rising star on Shadowcrew.com, an archetypal criminal cyberbazaar that sprang up during the Internet-commerce boom in the early 2000s. Its users trafficked in databases of stolen card accounts and devices like magnetic strip-encoders and card-embossers; they posted tips on vulnerable banks and stores and effective e-mail scams. Created by a part-time student in Arizona and a former mortgage broker in New Jersey, Shadowcrew had hundreds of members across the United States, Europe and Asia. It was, as one federal prosecutor put it to me, "an eBay, Monster.com and MySpace for cybercrime."

After a couple of interviews, Gonzalez agreed to help the government so he could avoid prosecution. "I was 22 years old and scared," he'd tell me later. "When you have a Secret Service agent in your apartment telling you you'll go away for 20 years, you'll do anything."

He was also good-natured and helpful. "He was very respectable, very nice, very calm, very well spoken," says the Secret Service agent who would come to know Gonzalez best, Agent Michael (a nickname derived from his real name). "In the beginning, he was quiet and reserved, but then he started opening up. He started to trust us."

The agents won his trust in part by paying for his living expenses while they brought him to their side and by waiting for Gonzalez to work through his withdrawal. An intermittent drug addict, Gonzalez had been taking cocaine and modafinil, an antinarcoleptic, to keep awake during his long hours at the computer. To decompress, he liked Ecstasy and ketamine. At first, a different agent told me, "he was extremely thin; he smoked a lot, his clothes were disheveled. Over time, he gained weight, started cutting his hair shorter and shaving every day. It was having a good effect on his health." The agent went on to say: "He could be very disarming, if you let your guard down. I was well aware that I was dealing with a master of social engineering and deception. But I never got the impression he was trying to deceive us."

Gonzalez's gift for deception, however, is precisely what made him one of the most valuable cybercrime informants the government has ever had. After his help enabled officials to indict more than a dozen members of Shadowcrew, Gonzalez's minders at the Secret Service urged him to move back to his hometown, Miami, for his own safety. (It was not hard for Shadowcrew users to figure out that the one significant figure among their ranks who hadn't been arrested was probably the unnamed informant in court documents.) After aiding another investigation, he became a paid informant in the Secret Service field office in Miami in early 2006. Agent Michael was transferred to Miami, and he worked with Gonzalez on a series of investigations on which Gonzalez did such a good job that the agency asked him to speak at seminars and conferences. "I shook the hand of the head of the Secret Service," Gonzalez told me. "I gave a presentation to him." As far as the agency knew, that's all he was doing. "It seemed he was trying to do the right thing," Agent Michael said.

He wasn't. Over the course of several years, during much of which he worked for the government, Gonzalez and his crew of hackers and other affiliates gained access to roughly 180 million payment-card accounts from the customer databases of some of the most well known corporations in America: OfficeMax, BJ's Wholesale Club, Dave & Buster's restaurants, the T. J. Maxx and Marshalls clothing chains. They hacked into Target, Barnes & Noble, JCPenney, Sports Authority, Boston Market and 7-Eleven's bank-machine network. In the words of the chief prosecutor in Gonzalez's case, "The sheer extent of the human victimization caused by Gonzalez and his organization is unparalleled."

At his sentencing hearing in March, where he received two concurrent 20-year terms, the longest sentence ever handed down to an American for computer crimes, the judge said, "What I found most devastating was the fact that you two-timed the government agency that you were cooperating with, and you were essentially like a double agent."

IN APRIL, I visited Gonzalez at the Wyatt Detention Center in Central Falls, R.I., situated by a river and a pleasant place as jails go. Once muscular and tan, Gonzalez, who turned 27 and 28 behind bars, was pallid and thin. His khaki uniform hung on him baggily, and his eyes were bloodshot behind wire-rim glasses. Occasionally a mischievous smile played on his face; otherwise, he looked through the wire-glass partition with a sympathetic but inscrutably intense stare.

He didn't want to talk about his crimes at first, so in a soft voice he told me about his ex-girlfriend, who had stopped visiting him ("I can't blame her"), about what he'd been reading ("Stalingrad," by Antony Beevor; "Into Thin Air," by Jon Krakauer; essays by Ralph Waldo Emerson), about his thoughts on recent high-profile computer breaches in the news. The public's ignorance about his chosen criminal field baffled him. He had become a fan of National Public Radio at Wyatt, and had recently listened to a discussion of hackers on "Fresh Air." ("Terry Gross is a great host," he wrote me earlier in a letter, but "these authors and co-authors can't possibly be making decent earnings. Are they?") He talked about his childhood and family. His father, Alberto Sr., is a landscaper who as a young man left Cuba on a raft and was picked up by a Coast Guard cutter in the Florida straits. He and Albert share a birthday with Gonzalez's 5-year-old nephew, "whom I love more than anyone in this world," Gonzalez said. His nephew's mother, Maria, Gonzalez's sister and only sibling, "always learned by listening to our parents' advice." He didn't.

Gonzalez bought his first PC, with his own money, when he was 12. He took an interest in computer security after it was infected with a downloaded virus. "We had to call the technician who sold it to us, and he came over," he said in one letter. "I had all these questions for him: 'How do I defend myself from this? Why would someone do this?' " He got over his indignation easily enough, and by the time he was 14 had hacked into NASA, which resulted in a visit by F.B.I. agents to his South Miami high school. Undeterred, Gonzalez formed a cooperative of "black hats" — curiosity-driven hackers with an antiauthoritarian bent — and acquired a reputation. He gave an interview to the online magazine ZDNet under his new screen name, soupnazi: "Defacing a site to me is showing the admins [and] government . . . that go to the site that we own them," he said. On the side he was also purchasing clothing and CDs online with stolen credit-card numbers. He ordered the merchandise delivered to empty houses in Miami, and then had a friend drive him to pick it up during lunch period.

By the time he dropped out of Miami Dade College during his freshman year, Gonzalez had taught himself, by reading software manuals, how to hack into Internet service providers for free broadband. He discovered he could go further than that and co-opted the log-ins and passwords of managers and executives. "On their computers would always be a huge stash of good information, network diagrams, write ups," he said, audibly enthralled at the memory. "I would learn about the system architecture. It was as if I was an employee."

Gonzalez's closest friend, Stephen Watt, who is now serving a two-year prison sentence for coding a software program that helped Gonzalez steal card data, describes Gonzalez as having "a Sherlock Holmes quality to him that is bounded only by his formal education." Like the other hackers who would go on to form the inner circle of Gonzalez's criminal organization, Watt met Gonzalez when both were teenagers, on EFnet, an Internet relay chat network frequented by black hats. Watt and Gonzalez interacted strictly online for a year, though each lived in South Florida. Once they began spending time together, in Florida and New York, Watt, who is 27, noticed that Gonzalez's talents as an online criminal carried over into his life away from the computer. "He could spot wedding rings at 50 yards. He could spot a Patek Philippe at 50 yards. He would have been a world-class interrogator. He was very good at figuring out when people were lying."

Like many hackers, Gonzalez moved easily between the licit and illicit sides of computer security. Before his first arrest, in the A.T.M. lobby, Gonzalez made his way from Miami to the Northeast after he hacked into a New Jersey-based Internet company and then persuaded it to hire him to its security team. The transition from fraudster to informant was not too different.

After he agreed in 2003 to become an informant, Gonzalez helped the Justice Department and the Secret Service build, over the course of a year, an ingenious trap for Shadowcrew. Called Operation Firewall, it was run out of a makeshift office in an Army repair garage in Jersey City. Gonzalez was its linchpin. Through him, the government came to, in hacker lingo, own Shadowcrew, as undercover buyers infiltrated the network and traced its users around the world; eventually, officials even managed to transfer the site onto a server controlled by the Secret Service. Meanwhile, Gonzalez patiently worked his way up the Shadowcrew ranks. He persuaded its users to communicate through a virtual private network, or VPN, a secure channel that sends encrypted messages between computers, that he introduced onto the site. This VPN, designed by the Secret Service, came with a special feature: a court-ordered wiretap.

Gonzalez worked alongside the agents, sometimes all day and into the night, for months on end. Most called him Albert. A couple of them who especially liked him called him Soup, after his old screen-name soupnazi. “Spending this much time with an informant this deeply into a cybercrime conspiracy — it was a totally new experience for all of us,” one Justice Department prosecutor says. “It was kind of a bonding experience. He and the agents developed over time a very close bond. They worked well together.”

On Oct. 26, 2004, Gonzalez was taken to Washington and installed in the Operation Firewall command center at Secret Service headquarters. He corralled the Shadowcrew targets into a chat session. At 9 p.m., agents began knocking down doors. By midnight, 28 people across eight states and six countries had been arrested, most of them mere feet from their computers. Nineteen were eventually indicted. It was by some estimates the most successful cybercrime case the government had ever carried out.

“I did find the investigation exciting,” Gonzalez told me of turning against Shadowcrew. “The intellectual element. Unmasking them, figuring out their identities. Looking back, it was kind of easy, though. When someone trusts you, they let their guard down.”

He did say, however, that he “actually had a bad conscience” about it. “I had a moral dilemma, unlike most informants.” On another occasion, when he was discussing the same subject, Gonzalez wrote to me in a letter, “This distinction is very important . . . my loyalty has always been to the black-hat community.”

Those captured by the government with his help are less interested in this distinction. “Shadowcrew was not a forum of thugs,” a member who occasionally laundered money for Gonzalez told me. This casher served two years in prison thanks to Operation Firewall. “He was a coward who betrayed us all, and I suppose if you believe in karma, he got what he deserved in the end.”

Before being arrested, Gonzalez had actually vouched for this casher to the higher-ups at Shadowcrew. He had gone out of his way to help many members, according to the federal prosecutor in New Jersey, Scott Christie, who worked with him on Operation Firewall. Christie says that based on their exchanges when Gonzalez was being recruited as an informant, Gonzalez seemed to be “less interested in money than in building up Shadowcrew.” He “gave back to the members in the way of education and personal benefit. Unlike other cybercriminals, he wasn’t just out for gain.”

Indeed, no one I spoke with compared him to a gangster or a mercenary — preferred honorifics among hackers — but several likened him to a brilliant executive. “In the U.S., we have two kinds of powerful, successful business leaders. We have people like Bill Gates and Steve Jobs, who are the most sophisticated of electronic technicians and programmers,” says Steve Heymann, the Massachusetts assistant U.S. attorney who, in the spring of 2010, secured a combined 38 years of prison time for Gonzalez and his co-conspirators for their corporate breaches. “Then we have others, like the C.E.O.’s of AT&T or General Electric, who are extremely good in their area but also know when to go to others for expertise and how to build powerful organizations by using those others. Gonzalez fits into that second category.”

BY THE TIME Gonzalez returned to Miami after Operation Firewall, in late 2004, he was already exploring the vulnerability of corporate wireless networks. Just as data security had been an afterthought for many businesses in their rush to get online in the 1990s, creating opportunities for the likes of Shadowcrew, many firms had taken no precautions as they eagerly adopted WiFi in the early 2000s. Gonzalez was especially intrigued by the possibilities of a technique known as "war driving": hackers would sit in cars or vans in the parking lots of big-box stores with laptops and high-power radio antennae and burrow through companies' vulnerable WiFi networks. Adepts could get into a billion-dollar multinational's servers in minutes.

Gonzalez reconnected with an old friend from EFnet, Christopher Scott, who was willing to do grunt work. Scott began cruising the commercial stretches of Route 1 in Miami, looking for war-driving targets. His experiments at BJ's Wholesale Club and DSW met with success. He stole about 400,000 card accounts from the former, a million from the latter. He described the breaches and passed card numbers to Gonzalez.

The following summer, Scott parked outside a pair of Marshalls stores. He enlisted the help of Jonathan James, a minor celebrity among Miami black hats for being the first American juvenile ever incarcerated for computer crimes. (At 15, he hacked into the Department of Defense; he lived under house arrest for six months.) Scott cracked the Marshalls WiFi network, and he and James started navigating the system: they co-opted log-ins and passwords and got Gonzalez into the network; they made their way into the corporate servers at the Framingham, Mass., headquarters of Marshalls' parent company, TJX; they located the servers that housed old card transactions from stores. Scott set up a VPN — the system Gonzalez and the Secret Service used to ensnare Shadowcrew — so they could move in and out of TJX and install software without detection. When Gonzalez found that so many of the card numbers they were getting were expired, he had Stephen Watt develop a "sniffer" program to seek out, capture and store recent transactions. Once the collection of data reached a certain size, the program was designed to automatically close, then encrypt, compress and forward the card data to Gonzalez's computer, just as you might send someone an e-mail with a zip file attached. Steadily, patiently, they siphoned the material from the TJX servers. "The experienced ones take their time and slowly bleed the data out," a Secret Service analyst says.

By the end of 2006, Gonzalez, Scott and James had information linked to more than 40 million cards. It wasn't a novel caper, but they executed it better than anyone else had. Using similar methods, they hacked into OfficeMax, Barnes & Noble, Target, Sports Authority and Boston Market, and probably many other companies that never detected a breach or notified the authorities. Scott bought a six-foot-tall radio antenna, and he and James rented hotel rooms near stores for the tougher jobs. In many cases, the data were simply there for the taking, unencrypted, unprotected.

"For a long time, probably too long a time, computer security was something that was just dollars and cents off the bottom line — it doesn't bring in money," Heymann told me when I asked why war-driving hackers were able to steal data so easily. "At the same time, in these cases, companies were beginning to warehouse vast amounts of information" far more swiftly than they were coming to understand the vulnerabilities of their systems. A result was what he called "a primeval muck that creates a period when dramatic, costly attacks can get at vast amounts of resources."

At the same time that Gonzalez was stealing all this bank-card data, he was assembling an international syndicate. His favored fence was a Ukrainian, Maksym Yastremskiy, who would sell sets of card numbers to buyers across the Americas, Europe and Asia and split the proceeds with him. Gonzalez hired another EFnet friend, Jonathan Williams, to cash out at A.T.M.'s across the country, and a friend of Watt's in New York would pick up the shipments of cash in bulk sent by Williams and Yastremskiy. Watt's friend would then wire the money to Miami or send it to a post-office box there set up by James through a proxy. Gonzalez established dummy companies in Europe, and to collect payment and launder money he opened e-gold and WebMoney accounts, which were not strictly regulated (e-gold has since gone out of business). He also rented servers in Latvia, Ukraine, the Netherlands and elsewhere to store the card data and the software he

was using for the breaches. Finally, he joined up with two Eastern European hackers who were onto something visionary. Known to him only by their screen names, Annex and Grig, they were colluding to break into American card-payment processors — the very cash arteries of the retail economy.

"I've been asking myself, why did I do it?" Gonzalez told me over the phone from prison recently. "At first I did it for monetary reasons. The service's salary wasn't enough, and I needed the money. By then I'd already created the snowball and had to keep doing it. I wanted to quit but couldn't." He claims his intentions were partly admirable. He genuinely wanted to help out Patrick Toey, a close friend and hacker who would later do much of the more sophisticated legwork involved in Gonzalez's hacking into corporate networks. Unlike Gonzalez and Watt, Toey, who is 25, had a rough upbringing. After dropping out of high school, he supported his mother and his younger brother and sister by hacking. Gonzalez invited Toey to live in his condominium in Miami, rent-free. Gonzalez owned it, but he enjoyed living at home with his parents more. He says he loved his mother's cooking and playing with his nephew, and he could more easily launder money through his parents' home-equity line of credit that way.

Gonzalez relished the intellectual challenges of cybercrime too. He is not a gifted programmer — according to Watt and Toey, in fact, he can barely write simple code — but by all accounts he can understand systems and fillet them with singular grace. I often got the impression that this was computer crime's main appeal for Gonzalez.

But he also liked stealing. "Whatever morality I should have been feeling was trumped by the thrill," he told me. And he liked spending. Partly but not entirely in jest, he took to referring to his scheme as Operation Get Rich or Die Tryin', after the 50 Cent album and movie. Gonzalez would not discuss with me just how rich he got, but he certainly was seeing profits in the millions of dollars. Little of that found its way to Toey, however, and probably none to Watt. For himself, Gonzalez bought, in addition to the condo, a new BMW 330i. He often stayed in luxury hotel suites in Miami on a whim. He took frequent trips to New York, where he and Watt — who worked by day in the I.T. department of Morgan Stanley and later developed securities-trading software and moonlighted as a nightclub promoter — spent thousands on hotels, restaurants, clubs and drugs. Lots of drugs. "I don't know when he slept," Agent Michael says, referring to Gonzalez's lifestyle during the time they worked together.

It seems clear now that Gonzalez didn't mind betraying people. What would come to anger the Secret Service most is that he used information from their investigations to enrich himself. "He would be working for the service during the day, and then come home and talk to me, and I'd be selling dumps for him," Toey told me, referring to databases of stolen card information. Gonzalez sold dumps to hackers who he knew were under investigation, in effect setting them up. In the case of one Miami suspect being investigated by the service, Toey told me: "We basically ripped [him] off and sold him databases that were all dead and expired. They came from a company where a breach was being investigated by the service. He got caught with the database, and it looked like he'd done it." Toey and Gonzalez then split the profits. (Gonzalez confirmed this account of events.)

When I asked Toey how he felt about using information from government investigations to betray other hackers, including black hats, he said: "I didn't like it at all that he did it. But at the same time, I don't know any of those people." He added, "More money for us."

Agent Michael investigated the Miami suspect, but he did not know until I told him that Gonzalez had set the man up. "It doesn't surprise me," he said. "Looking back, we knew what he wanted us to know. . . . He was leading a double life within a double life."

BY THE SPRING of 2007, Gonzalez was tired of working for the Secret Service. "He wasn't showing up on time," according to Agent Michael, who began talking with other agents about cutting Gonzalez loose. "He

didn't want to be there." He was also tired of war driving. He wanted a new challenge. He found one in a promising technique called SQL injection.

SQL (usually pronounced "sequel") stands for Structured Query Language, the programming language that enables most commercial Web sites to interact with their associated databases. When you log on to the Web site of a clothing store to buy a sweater, for example, the site sends your commands in SQL back to the databases where the images and descriptions of clothing are stored. The requested information is returned in SQL, and then translated into words, so you can find the sweater you want. But there is a vulnerability here: such databases in a company's servers often exist in proximity to other all-too-accessible databases with more sensitive information — like your credit-card number.

SQL is the lingua franca of online commerce. A hacker who learns to manipulate it can penetrate a company with frightening dependability. And he doesn't need to be anywhere near a store or a company's headquarters to do so. Since SQL injections go through a Web site, they can be done from anywhere.

Gonzalez urged Watt and Toey to experiment with SQL. Watt wasn't interested. "I had objections to what he was doing on a moral level — and on top of that, I took an intellectual exception," Watt says. "If Albert said we were going to go after the Church of Scientology or Blackwater, I would have dove in headfirst." Toey, however, said he felt he owed Gonzalez. He began poking around on the sites of businesses that seemed vulnerable — or for which he had a philosophical distaste. "I just didn't like what they did," he said of the clothing chain Forever 21. The clothes were poorly made, he said, and the employees poorly paid. "It's just everything I hate about this country in one store."

Under the assault of Toey's expertise and contempt, Forever 21 didn't stand a chance. "I went to their Web site, and I looked at their shopping-cart software, and within five minutes, I found a problem," he said, with his customary concision. "Within 10 minutes we were on their computers and were able to execute commands freely. From there we leveraged access until we were the domain administrators. Then I passed it over to Albert."

What came next was the truly inspired step. Gonzalez focused on TJX in part because it stored old transactions, but he found that many of the cards were expired. He needed a way to get to cards right after customers used them. It was possible, he learned, to breach the point-of-sale terminals at stores, the machines on checkout counters through which you swipe your card at the supermarket, the gas station, the department store — just about anywhere you buy something.

Gonzalez and Toey took reconnaissance trips to stores around Miami to look at the brands and makes of their terminals. He downloaded schematics and software manuals. Earlier, Jonathan Williams visited an OfficeMax near Los Angeles, loosened a terminal at a checkout counter and walked out of the store with it. Hackers working with an Estonian contact of Gonzalez's hacked into the Maryland-based Micros Systems, the largest maker of point-of-sale systems, and stole software and a list of employee log-ins and passwords, which they sent to Gonzalez.

Now once Toey got him into a system, Gonzalez no longer had to sift through databases for the valuable stuff. Instead, he could go straight to the servers that processed the cards coming from the terminals, in the milliseconds before that information was sent to banks for approval. He tried this on JCPenney, the clothing chain Wet Seal and the Hannaford Brothers grocery chain, in the last instance compromising more than four million cards. His Estonian contact used the technique on Dave & Buster's. "Every time a card was swiped, it would be logged into our file," Toey says. "There was nothing anyone could do about it."

When they pieced together how Gonzalez organized these heists later, federal prosecutors had to admire his ingenuity. "It's like driving to the building next to the bank to tunnel into the bank," Seth Kosto, an assistant

U.S. attorney in New Jersey who worked on the case, told me. When I asked how Gonzalez rated among criminal hackers, he replied: "As a leader? Unparalleled. Unparalleled in his ability to coordinate contacts and continents and expertise. Unparalleled in that he didn't just get a hack done — he got a hack done, he got the exfiltration of the data done, he got the laundering of the funds done. He was a five-tool player."

Gonzalez and Toey were returning from a trip to Toys "R" Us to check out its terminals one afternoon in the spring of 2008 when a sports car with tinted windows pulled up behind them at a red light. Gonzalez became suspicious and turned into a bus lane. The sports car followed. When the light turned green, Gonzalez didn't move. The car didn't move. After waiting for minutes, in a static game of chicken, car horns blaring, Gonzalez suddenly accelerated into oncoming traffic before doing a U-turn and turning into an alley. The pursuing car flew by, Gonzalez pulled out behind him, sped up alongside the car and peered inside. Gonzalez and Toey made out a police light on the dashboard. It was a surveillance car.

Gonzalez had by that point stopped working as an informant, according to the service. Instructions had come down to the Miami field office to start tailing him. Maybe the most valuable cybercrime informant it had ever employed, the key to Operation Firewall, was now being investigated. And the Secret Service wasn't alone: the F.B.I. was looking into a wireless intrusion at Target's headquarters that originated at one of its Miami stores. The store, the bureau discovered, was in the line of sight of Gonzalez's condo, in ideal range for a war-driving antenna.

But Gonzalez wasn't worried. He was certain he'd covered all his tracks.

KIM PERETTI KNOWS Gonzalez as well as almost anyone in the government. She has worked with him. She has also prosecuted him — though Peretti does not come across as a federal prosecutor. Younger in appearance than her 40 years, she grew up in Wisconsin and is girlish, even bubbly, in person, apt to express frustration with phrases like "Oh, sugar!" Peretti was hired to the Justice Department's Computer Crime and Intellectual Property Section shortly after 9/11. Peretti made a point of getting to know the agents in the Secret Service's Electronic Crimes Task Force because she knew that they were, like her, eager to make a name in going after cybercriminals. She lobbied to be assigned to Operation Firewall, and in 2003 she was.

When I met Peretti at a restaurant near her new office in McLean, Va. — she left the government in May to take a job at PriceWaterhouseCoopers — she was wearing a blue skirt suit and designer glasses. "She's got the whole Sarah Palin eyewear thing going on," Gonzalez had written to me in a letter, by way of explaining that it wasn't at all unpleasant being investigated by her. But their relationship goes back further than that. Much of what Peretti knows about cybercrime she learned from working with Gonzalez.

"Albert was an educator," she said, describing their experience on Operation Firewall. "We in law enforcement had never encountered anything like" him. "We had to learn the language, we had to learn the characters, their goals, their techniques. Albert taught us all of that." They worked as well together as any investigative team she has been a part of, she said.

When we met, Peretti brought with her a poster-size screen shot of Shadowcrew's homepage as it appeared the day after the raids. Secret Service technicians had defaced it with a photograph of a shirtless, tattooed tough slouching in a jail cell. The text said, "Contact your local United States Secret Service field office . . . before we contact you!"

By the time she was 35, thanks to Operation Firewall and Gonzalez, Peretti was the Justice Department's chief prosecutor of cybercrime in Washington. But in 2005, even as she was litigating the Shadowcrew case, she encountered a new cybercrime wave unlike anything that had come before. "The service keeps calling me, saying, 'We've got another company that contacted us,' " she said. "The volume was getting bigger and bigger. There was just an explosion."

In the days before Christmas 2006, the Justice Department and Stephen Heymann, the assistant U.S. attorney in Massachusetts, received a series of frantic calls from TJX's attorneys. The company had been contacted by a credit-card company, because a rapidly growing number of cards used at Marshalls and T. J. Maxx stores seemed to have been stolen. TJX had examined its Framingham, Mass., servers, and what it found was catastrophic. According to its own account, for about a year and a half, cards for "somewhere between approximately half to substantially all of the transactions at U.S., Puerto Rican and Canadian stores" were believed stolen. It was the biggest theft of card data in U.S. history, and there wasn't a lead in sight.

"At that point we had quite literally the entire world as possible suspects," Heymann told me in May, when we met in his office in the federal court building overlooking Boston Harbor. With his father, Philip, a deputy attorney general in the Clinton administration, Heymann teaches courses on criminal law at Harvard Law School. He had been deputy chief of the Massachusetts U.S. attorney's criminal division and then set up one of the first computer-crime units in the country, so he was well versed in the comparative challenges. "If you've got a murder scene, there's blood, there's fingerprints. If you have a hacker going into a company, the critical information can be lost the moment the connection is broken. The size of the networks might be so large and so confusing that they're very hard to understand and search. The people involved may only be known by screen names. Figuring that out is very different from figuring out who Tony the Squirrel is," he said. Heymann had never seen anything like the TJX breach.

Then, in 2007, attorneys for Dave & Buster's called the Secret Service. That company, too, had been breached, but this was different. The thieves had managed to access its point-of-sale system. By that summer, Peretti and Heymann had huge amounts of data, lots of potential leads and no clue as to whom they were chasing. "For the first six to nine months, it was tiring, exhaustive, thorough," Heymann told me. "I'd like to tell you it was also brilliant and incisive and led to the key lead, but it wasn't." They were in desperate need of a break.

They finally got one, courtesy of Peretti's old friends at the Secret Service. For two years, it turned out, an undercover agent in its San Diego office had been buying card dumps from Maksym Yastremskiy, Gonzalez's fence. The agent traveled to Thailand and Dubai to meet with the Ukrainian, and in Dubai he furtively copied the hard drive in Yastremskiy's laptop. Technicians at the Secret Service combed through it and discovered, to their joy, that Yastremskiy was a meticulous record keeper. He had saved and catalogued all of his customer lists and instant messages for years. In the logs, they found a chat partner who appeared to be Yastremskiy's biggest provider of stolen card data. But all they had for the person was an I.M. registration number — no personal information.

In July 2007, Yastremskiy was arrested in a nightclub in Turkey, and the Secret Service turned up a useful lead. The anonymous provider had asked Yastremskiy to arrange a fake passport. One of the provider's cashers had been arrested, and he wanted to get his man out of the United States. The only problem: he didn't say where the casher had been arrested.

So agents phoned every police station and district attorney's office around the country that had made a similar arrest or brought a similar case. After weeks of these calls, their search led them to a prison cell in North Carolina, where Jonathan Williams was being held. He had been arrested with $200,000 in cash — much of which had been intended for Gonzalez — and 80 blank debit cards; the local authorities hadn't linked him to a larger criminal group, and they couldn't have known about Gonzalez. The Secret Service agents plugged in a thumb drive in Williams's possession at the time of his arrest and found a file that contained a photograph of Gonzalez, a credit report on him and the address of Gonzalez's sister, Maria, in Miami. (He was also arrested with a Glock 9-millimeter pistol and two barrels for the gun, one threaded to fit a silencer.) The file was "a safety precaution, in case [Gonzalez] tried to inform on me," Williams told me from prison in June. Officials then traced packages Williams had sent to the post-office box in Miami. This led the Secret Service to Jonathan James. They pulled James's police records and found that in 2005 he was arrested by a Palmetto

Bay, Fla., police officer who found him in the parking lot of a retail store in the middle of the night. The officer didn't know why James and his companion, a man named Christopher Scott, were sitting in a car with laptops and a giant radio antenna, but she suspected they weren't playing World of Warcraft.

The real eureka moment came when Secret Service technicians finally got the I.M. registration information for whoever was providing Yastremskiy with bank-card data. There was no address or name, but there was an e-mail address: soupnazi@efnet.ru. It was a dead giveaway to anyone who knew Gonzalez. Peretti remembers vividly the afternoon in December 2007 when agents called her and told her to come to their office. They sat her down and showed her the e-mail address. "And they looked at me," Peretti said. "They've got 10 agents looking at me. Three minutes passed by, I was sitting there like a dull person. And then I was like, 'Oh, my God!' "

Gonzalez knew the Secret Service was investigating Yastremskiy, but he continued to move databases through him. When I asked Gonzalez why, he said, "I never thought he would leave Ukraine." The country has no extradition policy with the U.S. But Yastremskiy did leave. "It wasn't until he got busted," Gonzalez told me, that he realized his mistake.

Operation Get Rich or Die Tryin' unraveled fast. Christopher Scott's home and Gonzalez's condo were raided simultaneously. Agents seized Scott, along with nine computers and 78 marijuana plants; in Gonzalez's place they found various designer drugs and a half-asleep Patrick Toey. Toey was flown to Boston to testify before a grand jury. He directed Heymann and Peretti to the e-gold and WebMoney accounts and to servers located abroad. The servers eventually led them to Watt, who returned to his Greenwich Village apartment to find agents and a battering ram awaiting him. The Gonzalezes' home was raided, but Albert was not there.

Peretti knew that if they didn't find him soon, he would disappear. "Albert had said during Firewall how afraid he was of spending any time in prison," she said. "I knew he'd be gone the next day."

They found him at 7 in the morning on May 7, 2008, when agents rushed into his suite at the National Hotel in Miami Beach. With him were a Croatian woman, two laptops and $22,000. Over time, he started talking. Months later, he led Secret Service agents to a barrel containing $1.2 million buried in his parents' backyard. Attorney General Michael Mukasey himself held a news conference in August 2008 to announce the indictment. "So far as we know, this is the single largest and most complex identity-theft case ever charged in this country," he told reporters. Gonzalez's attorney assured him the government's case was weak. Electronic evidence often didn't hold up, he said.

That was before attorneys for Heartland Payment Systems Inc., in Princeton, N.J., called Peretti in early January 2009. One of the largest card-payment processors in the country, Heartland, which services about a quarter of a million businesses, had been hacked. But not just hacked — owned in a way no company had ever been owned. As Peretti would soon learn from Gonzalez, he had helped the two Eastern European hackers, Annex and Grig, slip into Heartland via SQL injection. By the time Heartland realized something was wrong, the heist was too immense to be believed: data from 130 million transactions had been exposed. Indictments were brought against Gonzalez in New Jersey, New York and Massachusetts (where the cases were eventually consolidated). At a loss for anything else to say, Gonzalez's attorney told a reporter: "He's really not a bad guy. He just got way in over his head."

On May 18, 2008, Jonathan James shot himself in the head. He left a suicide note saying he was convinced the government would try to pin Gonzalez's crimes on him because of the notoriety James had gained as a teenage hacker.

AT HIS SENTENCING in March, Gonzalez, who pleaded guilty to all charges, sat almost motionless. As far as I saw, he didn't once look back at the gallery in the federal courtroom in Boston, where his mother sat

stoically while his father wept into a handkerchief as Gonzalez's sister consoled him. Nor did he glance at Heymann, as he told the court that Gonzalez had committed the worst computer crimes ever prosecuted; nor at Peretti, nor his old colleagues from the Secret Service, who also sat in the gallery. Gonzalez just leaned forward and peered straight ahead at the judge, as though — the set of his head was unmistakable — staring intensely at a computer.

He spoke just once, a few sentences at the end. "I blame nobody but myself," he said. "I'm guilty of not only exploiting computer networks but exploiting personal relationships, particularly one that I had with a certain government agency who believed in me. This agency not only believed in me but gave me a second start in life, and I completely threw that away." Accounting for time served and good behavior, Gonzalez is expected to get out of prison in 2025.

In May, Toey began a five-year sentence, and Scott started a seven-year sentence. Yastremskiy was given 30 years in a Turkish prison, a fate apparently so grim he's lobbying to be extradited to the U.S. so he can be imprisoned here. Watt, who maintains that he was never fully aware of what Gonzalez wanted to use his software for, and who refused to give information on Gonzalez to the grand jury or prosecutors, was sentenced to two years.

According to Attorney General Eric Holder, who last month presented an award to Peretti and the prosecutors and Secret Service agents who brought Gonzalez down, Gonzalez cost TJX, Heartland and the other victimized companies more than $400 million in reimbursements and forensic and legal fees. At last count, at least 500 banks were affected by the Heartland breach. But the extent of the damage is unknown. "The majority of the stuff I hacked was never brought into public light," Toey told me. One of the imprisoned hackers told me there "were major chains and big hacks that would dwarf TJX. I'm just waiting for them to indict us for the rest of them." Online fraud is still rampant in the United States, but statistics show a major drop in 2009 from previous years, when Gonzalez was active.

The company line at the Justice Department and the Secret Service is that informants go bad all the time, and that there was nothing special about Gonzalez's case. As Peretti put it, "You certainly feel anger" — but "you're not doing your job if you fall into the trap of thinking the criminal you're working with is your best friend." The agent in charge of the Criminal Investigative Division at the Secret Service told me: "It's unfortunate. We try to take measures. But it does happen. You need to deal with criminals to get other criminals. Albert was a criminal."

Heymann lauds how the Secret Service handled things. "When you find out one of your informants has committed a crime," he said, "you can hide the fact, which unfortunately does happen from time to time. You can play it down — soft-pedal it, try to make it go away. Or you can do what I think the Secret Service very impressively did here, which is to go full bore." He said that after Gonzalez became a suspect, "the size of the investigation, the amount of assets, all increased significantly. That reflects enormous integrity."

But Gonzalez did have friends in the government, and there is no question some of them feel deeply betrayed. Agent Michael was the most candid with me about this: "I put a lot of time and effort into trying to keep him on the straight and narrow and show him what his worth could be outside of that world, keep him part of the team. And he knows that, and he knew what good he could have done with his talent." He continued, "We work with a million informants, but for me it was really tough with him."

After his sentencing, Gonzalez was transferred from Wyatt to the Metropolitan Detention Center in Brooklyn (before ultimately ending up in a prison in Michigan). Situated between a loud stretch of the Brooklyn-Queens Expressway and Gowanus Bay, M.D.C. is brutal, even for a prison. Populated by hardened offenders, it is among the last places a nonviolent government informant would want to be. "The place is terrible," Agent Michael said. "But you know what? When you burn both ends of the candle, that's what you get."

Even Gonzalez was impressed by the government's indifference to his comfort. He says he always knew it would stick it to him somehow, "but I never thought it would be this badly."

"I've been asking myself a lot why didn't I ever feel this way while I was doing it," Gonzalez told me, when I spoke with him in June. An inmate at M.D.C. who didn't like informants had recently threatened to kill him, he said. It was his 29th birthday, and the 5th birthday of his nephew. Gonzalez's sister wanted to bring her son to New York to visit, but Gonzalez told her not to. "I didn't want him to get scared, seeing me in here," he told me. Instead, Gonzalez was spending the day reading a biography of Warren Buffett.

I asked him how he felt when he thought about people like Agent Michael and Peretti. "They're part of the betrayals," he said.

During the legal proceedings, the court ordered Gonzalez to undergo a psychological evaluation. "He identified with his computer," the report reads. "It is hard, if not impossible, even at the present for Mr. Gonzalez to conceptualize human growth, development and evolution, other than in the language of building a machine."

As we spoke, Gonzalez recalled how he first became obsessed with computers as a child. "I remember so many times having arguments with my mother when she'd try to take the computer power cord from me, or she'd find me up at 6 a.m. on the computer when I had to be at school at 7:30. Or when I'd be out with [my girlfriend] and not paying any attention to her because I'd be thinking about what I could do online."

He reflected on his days with Shadowcrew, and on his decision to help the government. "I should have just done my time in 2003," he said. "I should have manned up and did it. I would be getting out about now."

James Verini is a writer in New York. This is his first article for the magazine.

http://www.nytimes.com/2010/11/14/magazine/14Hacker-t.html?_r=1&ref=magazine

Targetome, the first GIGA spin-off, is waging a targeted and personalised war against cancer

17 November 2010 Liège, University of

The University of Liège has presented TARGETOME, the most recent of its spin-offs, which is also the first to spring from its applied geno-proteomics centre, GIGA. Based on research carried out by the GIGA-Cancer metastasis research laboratory, led by Professor Vincent Castronovo, the Targetome business company is marketing a new technique used to identify biomarkers which are specifically over-expressed in certain cancers and cancerous metastases. This new technique for identifying cancer biomarkers, which has been patented by Professor Castronovo, is the first stage in the development of a new type of diagnosis methodologies and anti-cancer therapies, enabling early detection, efficient localization through imaging of malign lesions and their selective destruction.

'*With the discovery of these important specific biomarkers, medicine will in time be able to foresee waging a targeted and personalised 'clean war' against cancer and particularly against its disseminated form: meastases,*' declares Professor Vincent Castronovo. '*New perspectives are opening up concerning patient diagnosis and therapy. We are moving towards selective immunotargeting treatments which will have the advantage of sparing the healthy tissues in order to focus on the cancerous cells*.'

AROUND FIFTY BIOMARKERS IDENTIFIED

The originality of the technique developed by Professor Castronovo (*In-vitro method for screening accessible biological markers in pathologic tissues*) lies in the fact that, contrary to previous techniques, it enables the identification of biomarkers (targets) which have three essential qualities for any high value added target: they are in abundant in the cancer lesions, they are specific and above all they are accessible, which means reachable by high affinity ligands such as antibodies. This approach is unique as it identifies potential therapeutic targets through the same path that will in the end be used for the administration of the targeted therapy, in other words the bloodstream pathway.

The availibility at the Liège University Hospital Center of a unique human tissue Biobank and the know-how of Professor Edwin de Pauw's (ULg) mass spectrometry department in the area of proteins identification have widely contributed to the efficiency and the speed with which this new biomarker identification technique has been developed.

This technique which has been patented by ULg has already enabled the identification, and in part the validation, of some fifty biomarkers which are over-expressed in six types of cancer: breast cancer, Hodgkin's lymphoma (a cancer of lymphoid tissues), glioblastoma (cancer of the brain), bone metastases, hepatic metastases (liver) and cancer of the pancreas.

These biomarkers constitute targets for new immunotargeting programmes through the means of monoclonal antibodies adapted either for imaging (the antibodies marked by a radioactive isotope will serve as tracers and

will allow the diagnosis to be refined with an unparalleled precision), or adapted for a targeted therapy (antibodies will thus be constructed to deliver anti-cancerous substances exclusively to the sick cells).

'*The imaging tracers and the antibodies for a targeted therapy which are developed on the basis of Targetome biomarkers represent a revolution in oncology: offering a genuine personalised therapy which will concentrate by a factor of 100 the toxic agent only within the patient's cancerous cells!*'' underlines Professor Castronovo.

IN DEVELOPMENT WITH THE PHARMACEUTICAL INDUSTRY

Targetome is positioning itself as a biotechnology R&D business company. Given the enormous development costs involved (above all because of the clinical trials to be carried out), Targetome's strategy aims at granting licenses to pharmaceutical companies for validated and patented targets.

For the most promising biomarkers, Targetome will take things in hand as far as the production of the monoclonal antibodies necessary for preclinical trials (*in vitro* and on mice). These monoclonal antibodies will be developed jointly with ProGenosis, another ULg spin-off housed at the GIGA, and the Marloie Accredited Rural Economy Centre. The validated monoclonal antibodies will be patented and licensed to pharmaceutical companies at a higher cost than would be the case for just the biomarkers. '*At the initial stage, Targetome will base its development on biomarkers specific to hepatic metastases and cancer of the pancreas*,' points out Professor Castronovo.

For the moment Targetome is capitalised at the legal minimum of €62.500 by Gesval and the business company promoters. The capital will soon be raised to €300,000 through the involvement of Spinventure and private investors.

Targetome is taking part in the Radiotarget project, co-ordinated by the Walloon competitiveness cluster Biowin. The objective is to develop a Rhenium-188 production apparatus to mark therapeutic antibodies for new targets validated by Targetome in the treatment of hepatic metastases.

Targetome is one of the winners of the 1,2,3 Go competition, which judged the best technology company business plans in the Greater Region. The prize was awarded on September 30, 2010, at Nancy.

http://www.alphagalileo.org/ViewItem.aspx?ItemId=90014&CultureCode=en

SAGE launch new open access publication for the social sciences

17 November 2010 SAGE Publications

SAGE, the publisher today announced the launch of *SAGE Open*: a new publication to support open access publishing in the social and behavioral sciences and the humanities.

SAGE Open will publish peer-reviewed original research and review articles in an interactive, open access format. The journal will offer authors quick review and decision times; a speedy, continuous-publication format; and global distribution for their research via the SAGE Journals Online platform. The articles will also be guaranteed professional copyediting and typesetting.

The publication supports the growing number of authors who require their articles to be freely available on publication, either because of personal preference or because of university or government mandates.

Unlike traditional journals, *SAGE Open* will not limit content due to page budgets or thematic significance. Rather it will accept articles solely on the basis of the quality of the research, evaluating the scientific and research methods of each article for validity.

"SAGE's position as a global leader in social science publishing gives authors submitting their work to *SAGE Open* an assurance of high quality," said Jayne Marks, Vice President and Editorial Director for SAGE's Library Information Group. "We will be creating an advisory board consisting of discipline leaders and a large editorial board of subject experts to ensure high quality publication."

SAGE Open will also include several enhanced features to give readers greater power to determine the significance of articles published, with usage metrics, commenting features, subject categories, article ranking and recommendations.

"SAGE has a long history of supporting and nurturing new interdisciplinary fields of research," said Bob Howard, Director of Social Science Journals. "By covering multiple disciplines in one place, we hope that *SAGE Open* will also facilitate the discovery of the connections between papers, whether within or between disciplines."

For more information, visit:

http://www.sageopen.com

http://www.alphagalileo.org/ViewItem.aspx?ItemId=90008&CultureCode=en

Costs Chapter 11 cases examined

17 November 2010 University of Groningen

In his study at the University of Groningen, PhD student Stephen Lubben examined both the very large chapter 11 cases that are the subject of much academic and popular attention, and the more typical chapter 11 cases that are numerically more common.

In the United States, chapter 11 continues to attract a good deal of attention, as large debtors like Lehman Brothers, General Motors, and Washington Mutual pay millions of dollars – in Lehman, perhaps as much as $1 billion – to work their way through bankruptcy.

The sheer numbers involved, stacked against the losses suffered, often lead to heated claims that professionals do little in chapter 11 but loot the estate. But these impressionist endeavors provide little actual understanding of how much chapter 11 costs. And how much chapter 11 costs is important both internationally and domestically as policymakers increasingly struggle to develop tools that will mitigate the e6ects of financial distress.

In his Lubben presents three broad categories of models: models of the total cost of chapter 11, models of attorney costs, and models of financial advisor costs. With these new tools it becomes possible to examine past and future chapter 11 costs, and compare those costs with other possible solutions.

Lubben's conclusion is that time spent in chapter 11 has no relationship with cost once a fully specified model is considered. References to a professional's "burn rate" are thus misleading, inasmuch as it implies a fixed or constant cost to chapter 11. Costs ebb and flow through the course of the case. Prepackaged chapter 11 cases are not significantly cheaper than regular chapter 11 cases. Cases filed in New York or Delaware do not cost more – in fact, these jurisdictions seem to actually reduce chapter 11 costs, likely because of their greater experience with complex chapter 11 cases. Fee examiners do not reduce the costs of big chapter 11 cases.

Complexity and the compensation structure of the professionals retained, which may itself reflect further aspects of complexity, are the key determinants of cost. Debtor size is but a loose proxy for these factors, but is itself of reduced relevance once a fuller model is developed. Complexity is associated with economies of scale, resulting in lower chapter 11 costs for the very largest, most complex cases.

Lubben concludes with the hope that his study will be but the beginning of a more subtle, less combative examination of chapter 11. Given the current economic reality, the debate is of special import.

http://www.rug.nl/corporate/nieuws/archief/archief2010/promoties_oraties/39_Lubben

http://www.alphagalileo.org/ViewItem.aspx?ItemId=90002&CultureCode=en

Unique source material in Kröller-Müller biography

17 November 2010 University of Groningen

A chest of 3400 letters lies at the heart of a biography of Helene Kröller-Müller (1869-1939), the founder of the museum that bears her name in Otterlo. The biography, 'De eeuwigheid verzameld' [Collecting Eternity], will be published soon. Thanks to this unique source material, author Eva Rovers has been able to throw new light on the most famous art collector in the Netherlands. Kröller-Müller turns out indeed to have been very important for the acceptance of modern art in the Netherlands. Her collecting passion was fuelled not so much by a great love of art as by an almost religious mania. Although she lived most of her life in the Netherlands, her German origins turn out to have played a major role in her views on art and politics throughout her life. Rovers will be awarded a PhD for her research by the University of Groningen on 15 November.

Van Deventer's chest

In December 2005, the Kröller-Müller Museum in Otterlo was bequeathed the archive of Sam van Deventer, a confidant of Helene Kröller-Müller. This 'Van Deventer's chest' contained over 3400 letters, most written by Helene herself. Eva Rovers was the first, and thus far the only, person to be granted access to this archive:'Helene emerges as a stubborn, determined woman. She dismissed the architect Ludwig Mies van der Rohe, fought so hard with Berlage that he resigned his job, and was also difficult for many other people around her, but she really wanted to share her insights and her collection with others. 'It was this passion that led her as early as 1913 to make her collection of modern art, one of the largest in Europe, accessible to the public. Until the 1930s, it was only possible to admire geniuses like Van Gogh, Picasso and Mondrian in her exhibition rooms.

Van Gogh

At times, Kröller-Müller bought Picassos and Mondrians like other ladies bought hats and handbags. Once she returned from three days in Paris with fifteen paintings by Vincent van Gogh, an artist who was very controversial at the time. She would eventually own nearly three hundred of his works. 'By buying Van Goghs so early, paying large amounts for them, and taking them on tour of America, for example, she was of significant influence on the evaluation of his work.'

German roots

Her letters reveal that her German roots always played a role in her life. She had moved to the Netherlands before the First World War, but discovered to her frustration that due to that war she was regarded with suspicion. As a result, she decided to go to work as a nurse in a German field hospital in Liège. She remained pro-German later, too, and developed sympathy for National Socialism. Despite this, she was appalled when in September 1939, a few months before her death, her fatherland again unleashed a war. Despite her German background, she remained true to her intention to build her museum in the Netherlands and to present it to the Dutch people. This was a gesture to show that art rose above the horrors of the time.

Philanthropy

The biography of a pure-blood Maecenas like Kröller-Müller is particularly interesting in the current political climate, when the government is withdrawing its support of the arts. The book makes crystal clear how important private individuals are for the art world. Collectors like Helene Kröller-Müller laid the foundations for numerous museums across the world. Her motives were not only to elevate the masses, a large part consisted of philanthropy. Rovers: 'People like her always hover slightly on the borders between philanthropy and self-glorification. However, she really felt the philanthropic need to leave a monument to culture behind her. And she succeeded.'

http://www.rug.nl/corporate/nieuws/archief/archief2010/persberichten/171_2010

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89999&CultureCode=en

First Compelling Evidence for a Black Hole After Recent Supernova

17 November 2010 Elsevier

Black holes, or the remnants of hyper-or supernova explosions, have intrigued scientists since the concept was first introduced in 1967. Astronomers have only ever been able to observe gamma-ray bursts, considered the births of young black holes, at far distance. Researchers have now found compelling evidence for the birth of a black hole in the so-called local Universe--representing the youngest black hole ever discovered in our cosmic neighborhood. The results of this research have been published in the most recent issue of the Elsevier journal *New Astronomy* vol 16 Issue 3.

Making use of archival data from the Chandra X-Ray Observatory, astronomers Daniel Patnaude, Avi Loeb and Christine Jones had a closer look at SN 1979C, a supernova in the galaxy M100. Earlier studies by Kasen and Bildsten (2010) and by Woosley (2010) suggested that SN 1979C, a "type IIL supernova", may have been powered by the birth of a magnetar – a neutron star with an extremely strong magnetic field. Observing a remarkably constant X-ray luminosity from supernova SN 1979 however, the authors propose that the late time glow of the supernova is more consistent with a stellar mass black hole accreting material from either a fallback disk or from a binary companion. They conclude that SN 1979C is likely to harbor a black hole with a mass five times that of the Sun. Furthermore, the black hole may be accreting matter from its surroundings or from a companion star.

"This is potentially a very important result. Seeing a black hole being born is exciting in its own right, but it also informs our models of how massive stars die and make supernovae. How did the implosion of the inner five solar masses of a massive star to a black hole create an explosion of the rest of the star and an extremely brilliant display, i.e. SN 1979C? Is the observed X-ray emission truly a unique signature of a black hole? We can expect to hear a lot more from the theorists on this one", says Professor Stanley Woosley, Editor of the journal *New Astronomy*.

Publisher of *New Astronomy*, Jose Stoop, also remarked, "We believe that these critical observations will help reveal which stars end up as black holes, and which ones as neutron stars. The authors suggest that this particular supernova, formed when a star about 20 times more massive than the sun collapsed, could have been right on the edge of becoming a black hole".

The data was derived from the Chandra X-ray Observatory. This Observatory is part of NASA's "Great Observatories" program and was launched in 1999. The program also comprises the Hubble Space Telescope, the Spitzer Space Telescope and the now deorbited Compton Gamma Ray Observatory. NASA has organized a press conference on November 15th 2010 to discuss the above results. The press conference was broadcasted live at NASA TV.

- **Full bibliographic information**"Evidence for a possible black hole remnant in the Type IIL Supernova 1979C" New Astronomy, Volume 16, Issue 3, April 2011, Pages 187-190 by D.J. Patnaude, A. Loeb, C. Jones will be freely available for a period of three months.

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89996&CultureCode=en

Ansel Adams or Not? More Twists

By REYHAN HARMANCI

In the beginning, there was just Rick Norsigian, a California man who announced in July that he believed that he had purchased "lost negatives" of Ansel Adams for $45 at a garage sale.

His art dealer put the value of the find at $200 million, and the story made news around the world.

Then an 87-year-old woman surfaced to say that she had three prints that looked a lot like Mr. Norsigian's images — one was hanging in her bathroom — and that they had been shot, she said, not by Adams, but by Earl Brooks, her uncle, who was a little-known photographer.

Now Melinda Pillsbury-Foster says her grandfather Arthur C. Pillsbury, a well-known photographer of the period, should be added to the list of possible creators of the images of Yosemite park and the Northern California coast that Mr. Norsigian bought a decade ago.

Ms. Pillsbury-Foster said she was contacted by Mr. Norsigian several years ago, had reviewed his images and had found their quality and style reminiscent of her grandfather's work.

"There was nothing there to suggest that my grandfather wasn't the photographer," she said. With the help of a Chicago photograph collector, she says she has since found photos credited to her grandfather that resemble pictures from Mr. Norsigian's collection.

Other candidates may emerge as well, because Yosemite has long been a natural draw for photographers. "It's hard to know how many" possible photographers were shooting in the park during that period, said Leroy Radanovich, a photographer and historian of the park, who also mentioned some other possibilities, including Harry Pidgeon, a known Yosemite photographer who traveled with Mr. Brooks. "Yosemite is a popular place."

With so many candidates, competing experts and imperfect authentication techniques, an ironclad answer may prove elusive.

When a panel of art historians and forensic investigators hired by Mr. Norsigian declared last summer that the images were certainly the work of Adams, the team relied on several factors, including a handwriting analysis that concluded that the sleeves of some of the negatives had writing on them that looked to be that of Adams's wife, Virginia Adams

But since then, one member of Mr. Norsigian's panel has said he believes the identification was wrong, and another has lowered his level of certainty.

The Ansel Adams Publishing Rights Trust has disputed Mr. Norsigian's claim, and so has the Center for Creative Photography, the archive at the University of Arizona of which Adams was a co-founder in 1975 and to which he gave much of his work. One of the center's archivists looked at copies of some of Mr. Norsigian's images years ago and said she did not think they were by Adams. More recently, the center issued a statement that said that there was "no reason to believe" that they were Adams's work.

But Mr. Norsigian and his lawyer, Arnold Peter, are battling back. This week they released e-mails they said they had obtained through a public records request. The e-mails Mr. Peter released indicate that the center issued the statement critical of Mr. Norsigian's effort only after the managing trustee of the Adams trust, William A. Turnage, threatened to end his "34 years of support and assistance" for the center if it did not take a public stand. In earlier e-mails center officials had said they hoped to remain neutral.

"In my opinion," Katherine Martinez, the center's director, wrote in one of the e-mails, "CCP staff should not be drawn into debate about the negatives."

The center declined comment on the e-mails.

The Center for Creative Photography may have a continuing role in the debate because further forensic testing could require reviewing Adams negatives there.

The case for Mr. Brooks as the photographer received a little boost in recent days as his great-grandson Cameron Horne, of Atlanta, came forward with the photographer's 673-page unpublished memoir, as well as diaries and photo albums. One of the albums contains an image that matches one of Mr. Norsigian's negatives. In his writing, Mr. Brooks also talks about his use of glass negatives, a skill the Norsigian team had said they doubted he possessed.

In his memoir and other materials, Mr. Brooks, who died in 1978, depicts himself as an adventurer who grew up in Visalia, Calif., and took to photography and camping in Yosemite at an early age. He became a photo processor during a brief stint at Stanford University and then took up that work as a profession when he lived in San Francisco in the early 1920s. He later opened a photo studio in Arden, Del., and tried to sell pictures of Canadian parks to National Geographic.

Mr. Pillsbury, for his part, was a lifelong photographer and scientist who owned a photo studio in Yosemite and made thousands of images of the park. After the Norsigian announcement this summer, Ms. Pillsbury-Foster said she went back and looked at the negative numbers from the photocopied sleeves that Mr. Norsigian had given her years earlier and, she said, they corresponded with missing parts of the Pillsbury collection.

Unless some kind of definitive evidence surfaces, perhaps from forensic testing of the Norsigian glass plates, the hunt for additional clues is likely to continue.

This week the Adams trust and Mr. Norsigian will face off in federal court, where the trust has filed a trademark violation suit because Mr. Norsigian has been selling prints of the images, though with a disclaimer that the work is sold "as is," without trust authentication.

Also this month, there is a show in a San Francisco gallery, whose owner, Scott Nichols, has staged an exhibition of Yosemite photography since the 1860s. Several of the photos that the Brooks family attributes to Earl Brooks — and that Mr. Norsigian attributes to Ansel Adams — are included, along with undisputed Adams images.

Mr. Nichols said that while it was possible to recognize the mark of an artist like Adams, many of the images, especially those made around the turn of the 20th century, look similar: luscious black-and-white prints, often taken from the same spots.

"You might have a signature style that might slightly identify itself," he said, "but otherwise, yeah, they are a bunch of the same."

Reyhan Harmanci is a staff writer at The Bay Citizen, which produces a twice-weekly local section in the Bay Area editions of The New York Times.

http://www.nytimes.com/2010/11/10/arts/design/10adams.html?_r=1

Lower Back and Foot Pain Associated with More Severe Knee Osteoarthritis Symptoms

17 November 2010 Wiley - Blackwell

A new study found that patients with osteoarthritis (OA) of the knee who also have pain in other joints were more likely to experience greater knee pain. Specifically, pain in the lower back as well as foot pain and elbow pain on the same side as the affected knee were associated with more severe knee pain. Full details appear in the December issue of *Arthritis Care & Research*, a journal published by Wiley-Blackwell on behalf of the American College of Rheumatology.

Knee OA is the leading cause of disability in the U.S., with nearly 4.3 million adults over age 60 having the symptomatic form of the disease according to the Centers for Disease Control and Prevention (CDC). A study by Helmick et al. published in *Arthritis & Rheumatism* reported 59 million people have low back pain, which is the most common cause of lost work time among individuals less than 45 years of age and the third most common cause among those 45 to 65 years of age.

The current study team led by Pradeep Suri, M.D., from Harvard Medical School, New England Baptist Hospital, and Spaulding Rehabilitation Hospital in Boston, Massachusetts used data provided by individuals from the Osteoarthritis Initiative—a multicenter population-based observational cohort study of knee OA. A subgroup of 1,389 participants, ages 45-79 years who had symptomatic knee OA in at least one knee were included, with patients also asked to identify pain in the lower back, neck, shoulder, elbow, wrist, hand, hip, knee, ankle or foot. Researchers used the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) to measure the level of pain of patients in the study on a scale of 0 to 20 with lower scores representing less pain and stiffness.

Results indicate that 57.4% of participants reported having pain in their lower back. Participants with low back pain had a mean WOMAC pain score of 6.5, while those without pain in their lower back scored 5.2. Researchers found that low back pain was significantly associated with an increase in the WOMAC knee pain score, with similar associations demonstrated in all other individual joint locations that were studied. Those models analyzing pain locations simultaneously show only low back pain, and ipsilateral foot pain and elbow pain were significantly associated with a higher knee pain score.

Additionally, researchers determined that having more than one pain location, regardless of the site, was associated with greater WOMAC knee pain score. In participants with four or five pain locations the severity of knee pain was even higher. “Our findings show that pain in the low back, foot and elbow may be associated with greater knee pain, confirming that symptomatic knee OA rarely occurs in isolation. Future

studies are needed to determine whether treatment of pain occurring elsewhere in the body will improve therapy outcomes for knee OA," Dr. Suri concluded.

- **Full bibliographic information**"Low Back Pain and Other Musculoskeletal Pain Comorbidities in Individuals sith Symptomatic Osteoarthritis of the Knee: Data from the Osteoarthritis Initiative." Pradeep Suri, David C. Morgenroth, C. Kent Kwoh, Jonathan F. Bean, Leonid Kalichman, and David J. Hunter. Arthritis Care and Research; Published Online: August 26, 2010 (DOI: 10.1002/acr.20324); Print Issue Date: December 2010. http://onlinelibrary.wiley.com/doi/10.1002/acr.20324/abstract

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89993&CultureCode=en

Agreement to create a global network to analyze the impact of science on society

17 November 2010 Universidad Carlos III de Madrid - Oficina de Información Científica

The International Conference on Science in Society, organized for the first time in Spain by Universidad Carlos III de Madrid (UC3M) and which was held last week, approved the creation of a global network for researchers in this area to foment a field which, in the words of the UC3M Full Professor of Journalism and conference organizer, Carlos Elías, is perceived to be "one of the most important academic disciplines in the 21st century because it studies how science transforms the public sphere". The network will begin with the conference attendees: 188 participants from 33 countries and more than 150 universities from all over the world. In addition, some universities have committed to this creation of an active and virtual center for communication to support and promote this area in their respective countries.

UC3M, according to Carlos Elías, is one of the universities which has committed to supporting a space for reflection for Spain where all of the agents who intervene in the confluence of science in society in our country can interact: from university and secondary school teachers and professors to scientists, philosophers, sociologists, journalists, filmmakers, economists, social psychologists and policy makers from different State or autonomous region entities. All of this will be analyzed from the academic point of view within this emerging field.

This international event, which was last held at the Cambridge University (England), took place from November 11 to 13 at the UC3M Leganés campus. The conference represented an opportunity to discuss in Spain, within the framework of Science Week, how such urgent issues are dealt with in other countries, issues such as the lack of scientific vocations in the West, comparison of scientific policies, public communication of science, and teaching innovations in science.

Carlos Elías pointed out that the international conference demonstrated two premises: that the area of Science in Society "does not have anything to do with science and society, or science, technology and society as it had been called until now." There is a good deal of potential, but he also stressed the fact that the majority of researchers feel isolated because as it is a transversal discipline, the departments do not usually support it, and prefer it to stay within the traditional limits of its field. "For this reason we decided to at least stay in virtual contact through the Internet and the conference webpage, to foment advances which we will analyze at next year's Washington conference", he added.

Elías termed the conference "a liberating experience" because it provided the opportunity to express the grievances of those of us who dedicate ourselves to this field". In this sense, he pointed out that "being an

emerging area, still in its beginnings, is fascinating as well as frustrating, because in many cases we don't know, for example if we form part of science, engineering, humanities, social sciences, or all of them at the same time. It is not clear to us which department we belong to or what option to choose when we have to request a research project; thus it is important that we stay united".

Diverse and international attendance

Of the 188 participants, 11 were Spanish. Having the conference in Madrid fostered Spanish participation which was close to nil in the previous conference. Participation from emerging countries in this area was noteworthy; countries such as Canada, the presence of Oceania (Australia, New Zealand) and that of Asia, with representatives from China, South Korea, India, Pakistan and Singapore. Another point to highlight was the participation by researchers from Arab countries, such as Kuwait and the United Emirate Republic, or that of Africa, such as South Africa, Ghana or Zimbabwe. This international participation underlines the fact that research into the social aspect of science is a global field which has transcended Anglo-Saxon academia where it began.

A significant aspect of this encounter, according to its organizers, is the inter-disciplinary nature of the event, with participants from distinct fields of knowledge, ranging from biodegradable chemistry (Elena Polush, University of Iowa, USA) to evaluating public policy) (Fatos Tarifa, University of Tirana, Albania), including the relationship between emotional intelligence and behavior (Petro van der Merwe, University of South Africa), and representation from the medical establishment (Maija Leff, Stanford University, USA), the relation between science and education (Abdullah Al Rubaish, University of Dammam, Saudi Arabia) and the study of alternative energy and biodiversity. (Temis Taylor, Utah State University, USA).

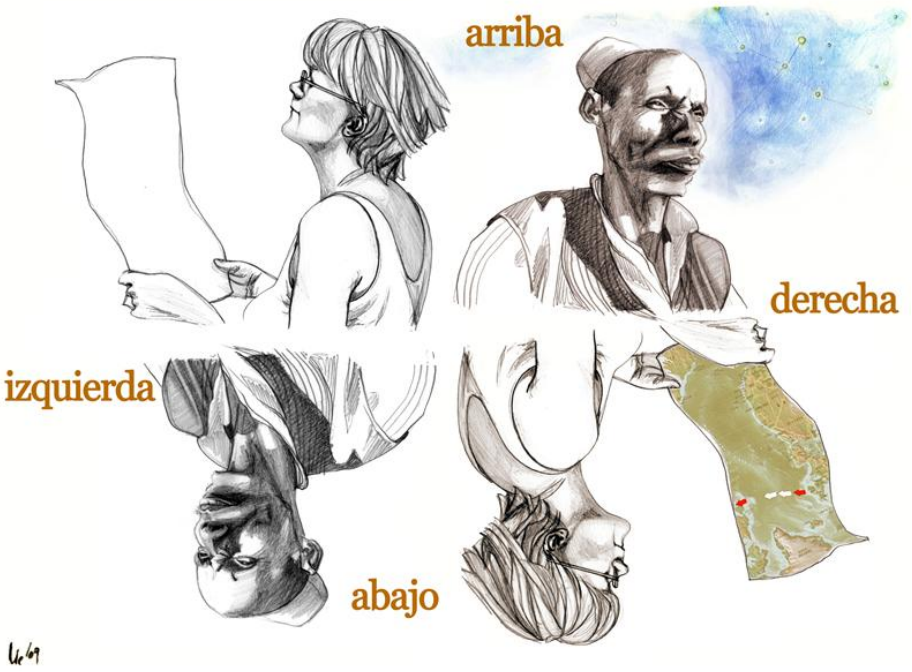
Among the plenary speakers were such international experts as Matthew Stanley, History of Science professor from New York University and Jimena Canales, Harvard professor, whose latest book, *A Tenth of a Second: A History. Chicago University Press, 2010*, has been a critical success in US academic journals. Professor Carlos Elías stresses that being the host country has given Spain the opportunity to include the most noteworthy Spanish experts in this area, such as Javier Echeverría, Full Professor of Philosophy of Science and the Ikerbasque/CSIC Research Professor; Javier Ordóñez, Full Professor of History of Science at the Universidad Autónoma de Madrid; Fernando Broncano, Full Professor of the Philosophy of Science at UC3M; Javier Moscoso, Coordinator of the CSIC Humanities and Social Sciences Centers; and Jesús Zamora, Full Professor of the Philosophy of Science at the UNED.

http://www.uc3m.es/portal/page/portal/actualidad_cientifica/noticias/agreement_network

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89978&CultureCode=en

People with no ideology vote for the party in power

17 November 2010 Plataforma SINC



Around 28% of the electorate describe themselves as non-ideological voters, according to the latest Barometer from the Centre for Sociological Research (CIS). A high percentage of voters' decisions have nothing to do with factors such as political candidates or party identity, but rather on the political group that happens to be in power at the time. This is the conclusion of a study carried out by a team from the University of Girona (UdG), the Juan March University and the University of Trento (Italy).

"Our results are quite surprising, because they show that people with no ideology are always more likely to vote for the party in power. This happens regardless of whether it is a right wing or left wing government and whether the government is likely to win or lose the election", Lluís Orriols, co-author of the study, a researcher at the University of Oxford (United Kingdom) and a professor at the UdG, tells SINC.

"Political science gives us extensive knowledge of how ideological voters behave, but there has been a tendency to overlook the portion of the electorate that, in Spain, represents one-fifth of the electorate", Orriols adds.

The researchers reached this conclusion, which has been published in the Revista Española de Investigaciones Sociológicas, on the basis of an analysis of data from CIS surveys from the start of the democratic period (1979) through to 2008. The single exception to this result was in 2004.

"This is the single case that breaks with the trend since 1979. This was because there was a very peculiar

context to these general elections. This was the first time there was a victory for the main opposition party with the government having an absolute majority, based on a mass mobilisation of the left-leaning electorate. But in general these voters show robust voting trends", Álvaro Martínez, another co-autor of the study and researcher at the Italian Research Institute for the Evaluation of Public Policy (IRVAPP), tells SINC.

"When there are highly ideologised legislatures, which prioritise the ideological agenda over management, this 'frightens' the kind of voters who prefer stability", points out Orriols.

The profile of voters with no ideology is older people (aged over 65), with an educational level below the electorate average (primary studies), poorly informed and with little interest in politics.

They always vote for majority parties

This type of voter is less likely to vote for small parties, even when these are in government. "In Spain, this would be the case with Izquierda Unida (IU) and in Catalonia, and with parties such as Esquerra Republicana (ERC) or Iniciativa per Catalunya Verds. In fact, during the current elections IU, Iniciativa and ERC are not expected to win many votes from this portion of the electorate. Their votes are likely to be divided between the Socialist Party of Catalonia (PSC) and Convergencia y Unión", the political scientists explain.

There is another exception at autonomous region level. "The elections in Catalonia in 2006 did not follow the usual pattern, because people with no ideology voted more heavily for Convergencia y Unión, meaning that Pascual Maragall failed to win over this electorate, which should by rights have been his", says Orriols.

"José Montilla has reduced the ideological level of his government, which is more a government of management, and so we should expect voters with no ideology to vote for this government once again. In fact, the most recent CIS survey seems to bear this out", concludes Orriols.

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89981&CultureCode=en

'Never too early' – Queen's urges young people to 'find their future'

17 November 2010 Queen's University, Belfast

For the first time in Northern Ireland, 14-16 year olds are being given their own guide to what their future may hold as a university student.

Traditionally such guides have always been targeted at post-GCSE students. Now, Queen's University has produced *Find Your Future: The young person's guide to higher education.*

Enabling pupils to see how their current learning links with their future, the new guide is the ultimate handbook for young teens who may be thinking of going to University but are unsure of what steps to take next.

Created for students in Years 10-12, the unique publication aims to help young people make key decisions about their future. The user-friendly publication includes information on student life, study facilities, courses and scholarships available, a guide to university vocabulary, a question-and-answer section, and profiles of first-year students sharing their experiences of university life.

Launching the Guide, the University's Pro-Vice-Chancellor for Education and Students Professor Ellen Douglas-Cowie said: "Nothing is more important than preparing a child for the challenges and opportunities of the future.

"Queen's is aware that many young people find choosing their future education options a very daunting process. We aim to ensure that all prospective students have access to useful information that enables them to make the right decisions. This Guide offers career guidance at a much younger stage in a student's career, and we believe it will encourage young people to aim high, to make the right decisions at the right time and to realise their full potential."

The publication also supports the University's extensive programme of initiatives to raise awareness and aspirations among young people, delivered as part of Queen's commitment to widening participation, and it has already generated a very positive response among teachers and pupils.

Among those welcoming the Guide is the Principal of Wellington College in Belfast, Matthew Pitts, who said: "The earlier students are made aware of their choices the better. The new Queen's Guide will be invaluable in raising aspirations and expectations and will ensure that all students are able to link their current learning with their futures."

The College's Head of Careers Education and Guidance, Gary O'Hara, described the publication as "a very important resource".

He said: "The current reform of post-primary education provides young people with the opportunity to take advantage of a much broader curriculum, and gives them many different options to pursue. This Guide effectively addresses the need for earlier intervention and guidance to help them choose wisely and well."

http://www.qub.ac.uk/home/TheUniversity/GeneralServices/News/PressReleases/Title,215184,en.html

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89969&CultureCode=en

Heart disease in children harms mothers' mental health

17 November 2010 Research Council of Norway, The

Mothers of children with severe heart disease are more likely to suffer from anxiety and depression than mothers of healthy children, even once any medical interventions are over.

Every year some 500 children with congenital heart defects are born in Norway. Most of them survive, but how does the children's illness affect the mental health of their mothers?

"Having a baby with a heart defect can be a shock. In the most severe cases, surgery must be performed immediately after birth as well as several times more during the child's first year of life," explains Øivind Solberg, a doctoral fellow in psychology at the Norwegian Institute of Public Health in Oslo.

Mr Solberg's doctoral research is funded under the Research Council's Programme on Mental Health. His study is part of a larger-scale project at the Norwegian Institute of Public Health, that itself is part of a research initiative entitled "Mothers of children with congenital heart disease (CHD): psychosocial problems from pregnancy through child age 3 years" (HEARTMOMS), a collaborative project being carried out by researchers in the field of psychology and paediatrics at both the national and the international level.

Some 50 000 mothers involved in the study

As Mr Solberg explains, roughly 10 per cent of all new mothers experience a depressive reaction after childbirth that can vary from mild to severe. "We want to find out whether mothers of children with congenital heart defects experience a greater negative impact on their mental health than mothers of healthy children, and whether the degree of severity of the children's heart condition makes a difference," explains Mr Solberg.

The project links data from Rikshospitalet University Hospital's registry of congenital heart defects (BERTE) with psychological and social data from the Norwegian Mother and Child Cohort Study (MoBa). Some 50 000 mothers are included in Mr Solberg's study, some 250 of whom have children with heart defects.

Worse off than before

The first findings indicate that mothers of children with mild or moderate heart defects adjust well and do not differ significantly from the mothers in the control group.

Mothers of children with severe heart defects, on the other hand, are more likely to suffer from anxiety and depression 6 to 18 months after giving birth, both as compared to the control group and to their own mental health state during pregnancy.

"The mothers are monitored regularly from early on in the pregnancy until their children are three years old. This gives us insight into how they were coping before their children were born and allows us to monitor the course of their psychological reaction over time," explains Margarete Vollrath, who heads the project at the Norwegian Institute of Public Health. The figures obtained at the three-year stage have not yet been analysed.

"What is interesting is that the mothers still suffer from anxiety and depression once their children have reached the age of 18 months and most of the medical interventions are over," states Ms Vollrath.

This can partly be explained by the fact that children with congenital heart disease often have a greater need for care and follow-up from their mothers. The mothers spend long periods of time at the hospital, particularly in the child's first year of life when most of the medical interventions are carried out. Concerns about the child's health and future can lead to chronic mental strain, in a situation that does not allow for sufficient rest and restitution.

Relationships with partners and contentment with life not greatly affected

One piece of positive news, however, is that the child's heart disease does not appear to have a negative impact on the mothers' relationships with their partners or their general contentment with life, at least not during the first six months of the child's life. This was one of the findings of an ongoing study carried out under the HEARTMOMS project.

Children need to be followed up

"Mental health and development in children with congenital heart disease" (HEARTKIDS) is a project that runs parallel to the HEARTMOMS project. Researchers involved in the project have been conducting research on the sick children themselves. They have found that newborn babies with severe heart defects are more likely to be irritable and more difficult to pacify than other children. Children with heart defects also often have developmental problems.

"The results show that saving these children on the operating table is only half the battle – these children also need close follow-up afterwards. The same applies to several of the children's mothers and the families in general," says Øivind Solberg.

http://www.forskningsradet.no/en/Newsarticle/Heart_disease_in_children_harms_mothers_mental_health/1253963033507

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89975&CultureCode=en

Scientists announce new advance with potential for future cancer targeting

17 November 2010 Leicester, University of

New research that provides potential for exciting new approaches to targeting diseases such as cancer has been announced by an international team of academics.

They have also announced the potential for more targeted treatments following their identification of proteins that play a vital role in the life of a human cell.

The research teams from Germany and the UK have published their work in the Advance Online Publication on Nature Cell Biology's website.

The teams are from the Centre for Molecular Biology at the University of Heidelberg and from the Department of Biochemistry at the University of Leicester. Their work was supported by the German Research Foundation (DFG), Wellcome Trust, Cancer Research UK and the Association for International Cancer Research.

Professor Elmar Schiebel, who led the study from the University of Heidelberg, said: “Our study describes novel and important insights into a key process involved in cell division. This work suggests novel approaches to the targeted treatment of cancer.“

Professor Andrew Fry, who led the University of Leicester team, added:

“This is an exciting new development that offers potential for finding news ways of inhibiting unregulated cell division which is a characteristic of cancer and we are already working with colleagues in Newcastle and London to develop this research.”

The scientists investigated the processes involved in cell division which led to their identification of a new potential breakthrough. Professor Fry explains: “When cells divide they must accurately separate their genetic material on a scaffolding structure called the mitotic spindle. As cells divide in two, the mitotic spindle scaffold has two poles, or ends, to which the genetic material, carried on chromosomes, must separate.

“The poles of the spindle are generated by a pair of structures called centrosomes, which are normally held in close proximity in cells, but which at the start of cell division move to opposite ends of the cell. Failure of centrosome separation blocks division of cells and can ultimately lead to cell death.

"Our research has identified new proteins that control centrosome separation as well as assessing the relative contributions of these together with previously described regulators. Importantly, this work suggests exciting new approaches to the targeted treatment of diseases characterized by deregulated cell division, such as cancer, as inhibitors of centrosome separation have the potential to prevent uncontrolled cell proliferation.

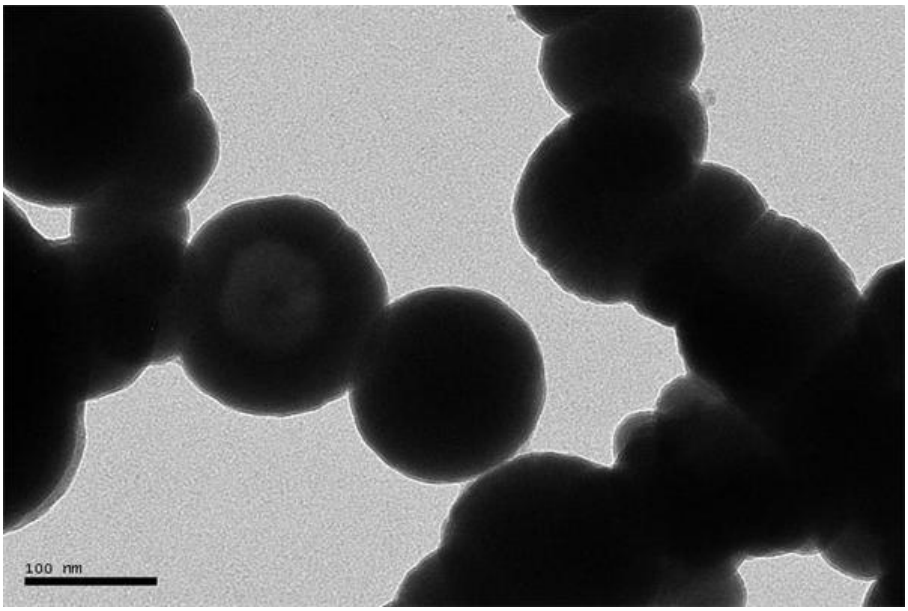
"Moreover, combining drugs against different regulators may reduce cytotoxic side-effects by allowing reduced concentrations of each inhibitor to be used in patients.

"In order to undertake proof of principle experiments, we are now in the process of developing inhibitors against these novel centrosome separation regulators in collaboration with the Institute of Cancer Research in London and the Northern Institute for Cancer Research at the University of Newcastle."

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89960&CultureCode=en

Tecnalia investigates nanoparticles for soil remediation

17 November 2010 Elhuyar Fundazioa



Tecnalia, through its Construction Unit, aims to increase the efficiency, reduce execution times and cut operational costs associated with remedial solutions for contaminated sites and for building development itself.Applications in nanotechnology appear to have no limit and currently scientific work is being undertaken which shows that the application of certain nanoparticles is highly suitable for the recovery of contaminated soils. At present the number of contaminated sites is very high, especially in those areas where industrial activity has been intense over recent years. This contamination is related to different groups of contaminants, such as mineral oil, solvents, heavy metals, pesticides, etc.

The properties of elemental iron nanoparticles make them react very efficiently with contaminant compounds in the soil, breaking them down or changing their nature in order to make them less harmful. In this way, the processes of site remediation become faster and more efficient than using conventional technologies. Moreover, they are widely versatile since they can be deployed in the treatment of several types of contaminants with good results.In this line, the Tecnalia Construction Unit (specifically the recovery and regeneration of soils team and the nanomaterials group) are closely working on various projects for the application of this technology to contaminated soils containing different pollutants (solvents, heavy metals, pesticides, etc.), with the goal of optimizing the results obtained from the remedial treatment of contaminated areas. The experiences to date have shown very promising results.

http://www.basqueresearch.com/berria_irakurri.asp?Berri_Kod=3050&hizk=I

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89948&CultureCode=en

Imec and PEIRA develop platform for in-vitro study of brain tissue

17 November 2010 Interuniversity Microelectronics Centre (IMEC)

The nanoelectronics research centre imec and Peira, a Belgium-based manufacturer of pharmaceutical and chemical research instruments, jointly developed an innovative slice-tilting instrument for in-vitro research on brain tissue. The new tool enables long-term studying of brain cultures through electronic stimulation and read-out, essential in getting insight into the functioning of the brain.

To increase knowledge on neuronal networks, on how our brain works, and on the cellular processes causing neurodegenerative diseases such as Alzheimer's disease, brain tissue slices need to be investigated for a longer time. To keep brain tissue slices alive to study long-term effects in neuronal circuits, the slices have to be cultured. They have to attach to a substrate and start growing. Such a brain tissue culturing procedure is as a very difficult and precise manipulation, and it is believed to be one of the most challenging cultures known in the medical world. Therefore, imec has developed together with Peira, a custom slice-tilting device containing up to 16 chips with stimulation and read-out electronics, especially customized to grow brain slice tissue on. The tilting device is fully incorporated in a cell growth incubator. Parameters such as tilting angle, speed and interval time can be programmed to obtain optimal growth, survival and functionality of the brain slice. The new tool ensures optimal growth of brain slices on the chips for more than a month. It enables in-vitro investigation of long-term processes in brain circuits.

"With its research into lab and preclinical instrumentation, imec aims to play an important role in developing powerful healthcare diagnostics and therapy," says Kris Verstreken, Program Director Life Sciences at imec. Imec's experience in nano- and microsystems technology is at the basis of innovative devices and instruments for the pharmaceutical industry. Imec has been developing novel techniques and protocols for brain slice culturing on multi-electrode array and microchip surfaces. Part of this innovation is the concept for a new slice tilter device for the culturing process. "This in-vitro brain tissue research instrument is an example of how our technology can support medical research into areas such as neurology, cardiology or oncology, interacting not only at the level of the individual cell but also capturing the complexity of cellular networks,

tissues or organs. For the practical implementation of the slice tilter device, imec and Peira have joined forces."

"We share a believe at Peira that breakthrough research will often need novel and unique instruments to create new insights," says Hans Nicasy, founder and managing director at Peira. This brain tissue instrument is a nice illustration of how Peira solves the researcher's problem by integrating good engineering practices into an efficient and effective apparatus. The slice tilter platform was developed in close cooperation between the researchers at imec and Peira's engineers. Peira supplies scientists in academia and the biotech and pharmaceutical industries with innovative instruments and co-develops customized research platforms that help to create new insights in the pathways of neuro diseases such Alzheimer and Parkinson or help to develop new cancer diagnostics or therapy tools."

http://www2.imec.be/be_en/press/imec-news/imecpeira.html

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89942&CultureCode=en

Innovative neural probe senses and stimulates individual brain cells

17 November 2010 Interuniversity Microelectronics Centre (IMEC)

Imec, together with its partners within the European FP6 Program NeuroProbes, has created a new neural probe enabling electrical and chemical recording and stimulation of single neurons in the brain. Applications of the new technology are vast, ranging from tools for fundamental research on the functioning of the brain, to instruments for more precise diagnosis of brain seizures before brain-surgery.

To discriminate single neurons in the brain, the recording electrode should be positioned very close to the neuron, ideally within 100 micrometers or less. To date, multi-electrode recording probes have relied on trial and error, as it is not possible to mechanically optimize the position of electrodes independently from each other. The new Electronic Depth Control (EDC) technology, introduced by imec and its NeuroProbes partners, enables individual adjustment of the position of the different electrodes without requiring any mechanical displacement. The EDC neural probe has hundreds of electronically switchable electrodes, allowing to scan for the most informative neural signals, to lock onto them, and eventually adjust their position during the course of an experiment.

The new EDC neural probe technology opens the door to dozens of new research tracks, and even promises to refine work currently underway. Next to fundamental brain research, one of the key roles of the EDC technology is pre-operative diagnostics prior to brain surgery for a variety of conditions. “It is known that similar probes have been used for decades to discover the focus of an epileptic seizure, for example,” explains Herc Neves, scientist at Belgium’s imec and coordinator of the NeuroProbes project. “You have a patient that is about to be operated on, and you want to remove as little tissue as possible. By pinpointing where the seizure is generated, you remove only that tissue, resulting in safer and less invasive surgery.”

This work was part of the NeuroProbes project (coordinated by imec), partly funded by the European Commission under Framework Program 6. EDC probes have been validated and used successfully in scientific experiments by neuroscientists at the Hungarian Academy of Sciences and the University of Parma (Italy). EDC technology is the result of a close collaboration with the Microsystem Materials Laboratory of the Department of Microsystems Engineering (IMTEK) at University of Freiburg (Germany).

http://www2.imec.be/be_en/press/imec-news/neuroprobes.html

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89939&CultureCode=en

Studies in Hyperreality

By VIRGINIA HEFFERNAN

The rearview mirror looked odd, even ominous. It spread nearly a yard across the top of the taxi's windshield.

But it wasn't its breadth that made the mirror uncanny. With a shudder I realized: not a mirror. Instead, the device was a *screen*, mounted to the top of the windshield. A grainy, faded color image played, as on a security cam. This was real-time video of the view from the rear of the taxi — a closed-circuit-type image that appeared to be horizontally flipped.

"Is that v-video?" I asked the driver. "It takes some getting used to," he said.

Some *getting used to*? Does that getting-used-to happen on the highway or in traffic on the Brooklyn Bridge? I didn't ask; I didn't want to know. Apparently such backup cameras, or reversing cameras, have been around for years, and some drivers love the wider panorama and additional light they offer. Recorded video from these devices — "rearview film" — even represents a nanogenre on YouTube. I sat back and stared at the screen, trying to enjoy the muddy-colored traffic witnessed with the eyes I now had in the back of my head.

I told myself that *all* screens require getting used to. Silvered-glass mirrors must have taken some comparable psychovisual adjustment in the 19th century. Traditional passenger-side mirrors, moreover, make it a point of pride to be deceptive ("Objects in mirror are. . . ."), and motorists long ago accommodated their distortions. Anyone who sees the world through eyeglasses or contact lenses — glass or polymers styled at various degrees of concavity and convexity — has adjusted to a sort of screen right over their eyes. But the taxi's rearview video seemed a cut apart. Drivers who use these videos are no longer looking at the thing itself; they are looking at a reproduction of the thing, an image of the thing. Aren't they?

The mind reels, or mine does. I was brooding about all this not long ago when John Timmer, the science editor of the tech site Ars Technica, pointed me toward a set of mesmerizing videos on YouTube that have

helped people re-envision — of all things — microbiology. With these videos, too, there is a mind-bending question about the distinction between seeing the thing itself and seeing a reproduction of the thing.

The microbiology videos depict the otherwise invisible interior life of a cell using computer animation. One video, which shows how DNA replicates itself, is a clip from a PBS film called "DNA." It looks like a lot of furry jewel-colored pipe cleaners in outer space, engaged in purposeful but fluid moves that recall early Lucasfilm. It's intriguing-looking, like an experimental short film, and, guided by the voiceover, I finally (temporarily) understood DNA.

John Pavlus, a science writer who runs an ingenious video production company called Small Mammal, had a more effusive scientist's take on the video. "Everyone knows that DNA is the code of life, and that every time a cell divides the double helix is copied," he wrote by e-mail. "But how? Literally *seeing* the nano-size molecular 'assembly line' that actually *performs* this miraculous bit of automated work a zillion times a day is kind of breathtaking." Other cell videos that Timmer recommended are part of a project called Exploring Life's Origins, or E.L.O. — an online experiment by Jack Szostak, a Harvard scientist who shared last year's Nobel Prize in physiology. Szostak has long been interested in reproduction, artificial and biological; early in his career, he created the world's first artificial yeast chromosome. It's perhaps no surprise that he — with his partner at E.L.O., Janet Iwasa, who teaches molecular visualization at Harvard Medical School — turned to filmmaking. Szostak and Iwasa now artificially reproduce the processes of cell reproduction on digital video.

With these films, Szostak and Iwasa have made it possible to "see" cell activity that can't be seen. Timmer described these maxi-models as "close to reality." In a sense, the animations are clearer representations of reality than reality itself. Timmer explained: "There really are a collection of proteins that copy DNA — we can detect them in various ways, we can see the work they do, we can identify the genes that encode them, etc. So, there's a reality there. But the actual process of doing the copying involves rapid changes on size scales of a few atoms, all taking place in a dynamic and complex environment inside the cell. Even if we could see all the atoms involved (we can't), it would never look quite the same twice because there's so much else going on." So scientists believe they can see what's actually happening in cells only on screens that use Hollywood technology — computer animation. And drivers have discovered a strategic advantage in ignoring mirrors and installing video screens. I don't know why this comes as an alarming twist. Screens are typically sites of deception, exaggeration, projection, fantasy, art and play. But maybe they give us a sharper view of reality too.

Points of Entry This Week's Recommendations

CELLBLOCK
BioVisions, the Harvard multimedia project, and Exploring Life's Origins, a separate project by Janet Iwasa and Jack Szostak at Harvard, describe and illustrate cellular activity. These haunting displays can be seen at multimedia.mcb.harvard.edu and exploringorigins.org.

REFLECTIONS ON REFLECTIONS
For a real visit to the mental fun house, you need a great, trippy book on mirrors or cameras. Consider Susan Sontag's "On Photography" (1977), Roland Barthes's "Camera Lucida" (1979) or Jonathan Miller's "On Reflection" (1998).

ON THE WIRES
News categories on Ars Technica include gaming, gadgets, science and Apple — the four food groups of tech coverage. Ars Technica — a Condé Nast property — belongs in every Web reader's balanced diet.

http://www.nytimes.com/2010/11/14/magazine/14FOB-medium-t.html?ref=magazine

New drug targets vitamin D receptors in hormone resistant prostate cancers: promising results from first clinical trial

17 November 2010 The European CanCer Organisation (ECCO)

A new anti-cancer drug aimed at vitamin D receptors on cancer cells has prompted encouraging responses in the levels of PSA (prostate specific antigen) in men with prostate cancer that has become resistant to hormonal therapies.

Results of the phase II(a) clinical trial will be presented at the 22nd EORTC-NCI-AACR [1] Symposium on Molecular Targets and Cancer Therapeutics in Berlin today (Thursday). The trial found that when the new drug, inecalcitol, was combined with the existing, current therapy (docetaxel and prednisone) 83% of patients responded to the treatment with a drop in PSA levels of 30% or more within three months of the treatment. PSA levels are used as a marker for tumour activity and successful treatment shrinks cancer, leading to a drop in PSA levels in the blood.

"The PSA responses with this combination are encouraging," said Dr Jacques Medioni, who presented the findings. "It compares favourably with historical data showing that normally 65% of patients respond when treated with docetaxel alone. Furthermore, PSA levels declined by 50% in 67% of patients treated with inecalcitol, and biochemical relapse (when PSA levels start to go up again) did not occur for at least 169 days."

Now inecalcitol is to be tested further in more patients in a larger, phase II(b) clinical trial, which is expected to start in the second quarter of 2011.

Prostate cancer is a chronic disease, usually occurring in men over 50. It is the second most common cancer in men worldwide and an estimated 2.47 million men died from the disease in 2008 worldwide. Initially, male hormones drive the growth of most prostate cancers and so anti-hormonal drugs are effective in stabilising the cancer for several months or years. However, at some point the tumour usually progresses and becomes resistant to anti-hormonal treatments and then it is defined as being hormone-refractory or hormone-resistant prostate cancer (HRPC). Once this happens the prognosis is poor and treatment is currently limited to docetaxel chemotherapy. The average time of survival with HRPC is around 19 months.

Inecalcitol is a novel vitamin D receptor agonist [2], which is extremely effective at inhibiting cancer cell proliferation and differentiation. It is a synthetic derivative of calcitriol, the natural active metabolite of vitamin D3, but it is ten times more potent and one hundred times less toxic than calcitriol.

Dr Medioni, who is associate professor of medical oncology and head of the Clinical Oncology Centre for Early Trials at the Hôpital Européen Georges Pompidou in Paris (France), and his colleagues in other centres in France enrolled 54 patients in groups of three to six to test the drug for efficacy and toxicity and to discover the maximum tolerated dose.

In this first clinical trial of the drug in HRPC, the patients had an average age of 71, ranging from 49-87; 83% had bone metastases; and the median average PSA levels were 31.7 nanograms per millilitre of blood (ng/ml), ranging from 0.8-962.4 ng/ml. [3]

The researchers found the maximum tolerated dose of inecalcitol was 4000 micrograms a day, as none of the patients treated at this level experienced side effects more serious than mildly raised calcium levels in their blood (hypercalcaemia). Follow-up of a few patients is ongoing, but analysis of 47 patients who were treated

with doses up to 2000 micrograms a day showed that PSA levels dropped by 30% or more in 83% of patients within three months of treatment.

“These are really interesting results,” said Dr Medioni. “This study was of a small group of patients and so it is difficult to extrapolate to the wider population of prostate cancer patients; however, the majority of men had very advanced disease and, therefore, it is very encouraging to see PSA levels dropping in such a high proportion of patients and a time to biochemical relapse of nearly half a year. The trial has confirmed that inecalcitol is the first Vitamin D receptor agonist that can be given daily at a high anti-proliferative dose without causing hypercalcaemia.”

A phase II(b) trial to confirm these results is planned for 2011 in centres in Europe and the USA, followed by a multi-centre, randomised, double-blind phase III clinical trial. In addition, work will begin in the near future to evaluate whether inecalcitol may have a role to play in the treatment of early prostate cancer that is still hormone dependent, with the aim of extending the period before the cancer progresses to being hormone-resistant.

Abstract no: 430. Poster on Thursday 18 November in the Exhibition Hall (ground level) from 08.00/09.00 hrs to 18.00 hrs CET.

[1] EORTC [European Organisation for Research and Treatment of Cancer, NCI [National Cancer Institute], AACR [American Association for Cancer Research].

[2] An agonist is a drug that binds to a receptor in a cell and triggers a response by the cell. It often mimics the action of naturally occurring substances.

[3] There is no one PSA reading that is considered ‘normal’. The reading varies from man to man and the normal level increases as you get older. However, they tend to range between 3 ng/ml for a man under 60 to 5 ng/ml for a man over 70.

[4] Worldwide rights to inecalcitol are owned by Hybrigenics (Paris, France), a spin-off company of the Pasteur Institute. It is given to patients as a capsule.

[5] Hybrigenics funded this research.

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89927&CultureCode=en

Theory, algorithms, and applications for data modelling

miércoles, 17 de noviembre de 2010 Southampton, University of

An academic at the University of Southampton's School of Electronics and Computer Science has just received funding to develop new approaches to data modelling and model-free data processing.

Dr Ivan Markovsky, who has devoted most of his career to numerical methods for data modelling has been awarded a €783,000 Starting Grant from the European Research Council (ERC) to develop his approach further. The (ERC) Starting Grants are awarded to excellent early career researchers to enable them to devote their time fully to research.

Dr Markovsky's research has the unique aim of unifying and simplifying the growing number of data modelling methods and making them more easily applicable. "Data modelling is the only problem that is common to all areas of science and engineering," said Dr Markovsky. "Moreover, models are often the bottleneck in applications. However, current data modelling knowledge is rather fragmented and repetitive."

The central concept of his work is a mathematical problem, called structured low-rank approximation, which includes many applications and existing methods. "It is amazing that a diverse list of applications can be formulated and solved as a single core mathematical problem," said Dr Markovsky.

A high-gain, high-risk objective of the project is model-free data processing, which bypasses the modelling stage and goes straight to the final goal, thus tackling the problem as a whole.

"Our research suggests ways to merge data modelling with model-based data processing, which allows us to skip the modelling step. This approach has been tried before but it is not efficient yet and needs more work," Dr Markovsky added.

If successful, the research will have impact on applications in acoustics, biomedical signal processing, and bioinformatics.

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89930&CultureCode=en

PARP inhibitor, MK-4827, shows anti-tumour activity in first trial in humans

The European CanCer Organisation (ECCO)

A new drug that targets proteins responsible for helping cancer cells to repair damage to their DNA has shown promising anti-tumour activity in its first trial in humans. Some patients with a range of solid tumours, many of whom had been treated unsuccessfully for their cancer with other therapies, have seen their tumours shrink or stabilise for periods of between 46 days to more than a year. The research will be presented at the 22nd EORTC-NCI-AACR [1] Symposium on Molecular Targets and Cancer Therapeutics in Berlin today (Thursday).

Laboratory studies of the drug, MK-4827, have shown that it inhibits proteins called PARP1 and PARP2 (poly(ADP)-ribose polymerase). PARP is involved in a number of cellular processes and one of its important functions is to assist in the repair of single-strand breaks in DNA. If one single-strand broken DNA is replicated (replication occurs before cell division) then it results in a double-strand break. By inhibiting the action of PARP, double-strand breaks occur, leading to cell death. Tumours that are caused by a mutation in the BRCA1 or BRCA2 genes are susceptible to cell death through PARP inhibition because correctly functioning BRCA genes assist in repairing double-strand DNA breaks via a process called homologous-recombination-dependent DNA repair, whereas mutated versions are unable to perform this role. Normal cells don't replicate as often as cancer cells and they still have homologous repair operating; this enables them to survive the inhibition of PARP and makes PARP a good target for anti-cancer therapy.

In a Phase I trial conducted at the H Lee Moffitt Cancer Center (Tampa Florida, USA), University of Wisconsin-Madison (Madison, USA) and the Royal Marsden Hospital (London, UK), MK-4827 was given to 59 patients (46 women, 13 men) with a range of solid tumours such as non-small cell lung cancer (NSCLC), prostate cancer, sarcoma, melanoma and breast and ovarian cancers. Some patients had cancers caused by mutations in the BRCA1/2 genes, such as breast and ovarian cancer, but others had cancers that had arisen sporadically.

The drug was given in pill form once a day, and the researchers found that the maximum tolerated dose was 300 mg a day. Dr Robert Wenham, Clinical Director for Gynecologic Oncology in the Department of Women's Oncology at the Moffitt Cancer Center, who is presenting data on behalf of the participating investigators, said: "MK-4827 is generally well tolerated, with the main dose-limiting toxicity being thrombocytopenia – an abnormal decrease in the number of platelets in the circulatory blood. The most common side effects are mild nausea, vomiting, anorexia and fatigue."

The researchers saw anti-tumour responses in both sporadic and BRCA1/2 mutation-associated cancers. Ten patients with breast and ovarian cancers had partial responses, with progression-free survival between 51-445 days, and seven of these patients are still responding to treatment. Four patients (two with ovarian cancer and two with NSCLC) had stable disease for between 130-353 days.

Dr Wenham said: “Most patients in the trial had exhausted standard therapies and those who responded to this drug have benefited. Several patients have been receiving treatment for more than a year. The responses mean that MK-4827 is working as hoped and justify additional studies. Just how well MK-4827 works compared to other treatments is the goal of the next set of studies.”

He gave a possible explanation as to why patients with cancers that were not caused by BRCA1/2 mutations also responded to the PARP inhibition. “BRCA is a tumour suppressor gene that assists in repairing double stranded DNA breaks. In BRCA-mutation related cancers, loss of both copies of the gene results in a non-functional protein and thus BRCA deficiency. Because BRCA works with other proteins, BRCA-pathway related deficiency can be seen in the absence of two mutated copies of the BRCA genes. This may explain why responses have been reported for this class of drugs in non-BRCA mutant cancers.”

Dr Wenham and his colleagues are recruiting more patients for additional studies and an expansion of the existing trial. “We want to understand what types of cancers will respond best to treatment with MK-4827,” he said. “Cohorts are currently open for patients with ovarian cancer patients without germ-line BRCA mutations, and prostate cancer patients. Cohorts will open soon for patients with T-cell prolymphocytic leukaemia, endometrial cancer, breast cancer and colorectal cancer. MK-4827 is also being studied in combination with conventional chemotherapy drugs.”

Abstract no: 362. Poster on Thursday 18 November in the Exhibition Hall (ground level) from 08.00/09.00 hrs to 18.00 hrs CET.

NB: due to unforeseen circumstances, Dr Robert Wenham is unable to attend the Symposium. His co-author Dr Shahneen Sandhu will attend the poster session in his place.

[1] EORTC [European Organisation for Research and Treatment of Cancer, NCI [National Cancer Institute], AACR [American Association for Cancer Research].

[2] This study was funded by Merck & Co. Inc. MK-4827 is owned by Merck & Co. Inc.

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89924&CultureCode=en

Bees take the sting out of mouth ulcers

miércoles, 17 de noviembre de 2010 Bradford, University of

The healing properties of propolis – a mixture of resin and wax made by honey bees to seal and sterilise their hives – have been known for many years. But its use in medicine and food supplements has been limited because the sticky substance is not water soluble and has a strong, off-putting smell.

Now researchers at the University of Bradford's Centre for Pharmaceutical Engineering Science have developed a way of purifying propolis that retains its medicinal properties, but makes it dissolve in water and eliminates its pungent smell. The technique has already led to the development of a new mouth ulcer gel and opens the door to a huge range of other pharmaceutical and nutraceutical applications for the substance.

"Propolis is a complex chemical mix and a very useful natural product," explains Centre Director, Professor Anant Paradkar, who led the research. "Propolis has been shown to be anti-microbial, anti-fungal, a strong anti-oxidant, non-allergenic and can boost the immune system. It also promotes wound healing and has anaesthetic properties.

"There is a substantial market for propolis-based products – particularly in China, the USA and South Asia. The main stumbling block in developing products has been the solubility and odour issues, which our formulation overcomes."

Professor Paradkar's team has been developing the new technique to purify propolis in collaboration with natural medicine manufacturer, Nature's Laboratory. The researchers have helped the company develop a new propolis-based mouth ulcer gel, which has better anaesthetic, anti-microbial and anti-fungal properties than gels already on the market and is safe for use in children.

"A problem for mouth gels is that adhesion to the skin membrane inside the mouth is difficult – because of the nature of the surface, the gel can simply slide off," says Professor Paradkar. "As propolis retains some of its stickiness even in a water soluble formulation, when it is applied to specific areas in the mouth, it adheres more effectively."

The Centre has gained funding for a Knowledge Transfer Partnership with Nature's Laboratory, to further develop the purification system for use at a larger scale and support the creation of new propolis-based products. The aim is, through the KTP, that the company will be able to set up a purification process to increase its own manufacturing capacity.

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89912&CultureCode=en

Cutting-edge research: Centre for molecular medicine research opened in Oslo

miércoles, 17 de noviembre de 2010 Research Council of Norway, The

The University of Oslo recently opened its new Centre for Molecular Medicine Norway (NCMM). The centre is the second in Norway to form a partnership with the European Molecular Biology Laboratory (EMBL).

Together with research groups in Umeå (Sweden) and Helsinki (Finland), the new centre will also be part of a Nordic partnership in the European system, the Nordic EMBL Partnership for Molecular Medicine. Professor Kjetil Taskén, Director of the Biotechnology Centre of Oslo at the University of Oslo, is to head the new research centre, which will bring together six different groups of researchers in the field of molecular biology.

Cutting-edge Norwegian expertise

Researchers at NCMM will focus on the molecular mechanisms of disease. Norway is at the forefront in research on the molecular mechanisms of cancer, cardiovascular disease, neurological diseases and immune disorders.

“It is this cutting-edge expertise that forms the basis for the EMBL partnership and we expect this collaboration to generate many important research findings in the future,” explains Professor Taskén.

Focus on translational research

The new Norwegian EMBL node will also focus on translational research – i.e., on getting research results out of the laboratory and into the hospitals. The centre will work at the national level to ensure that discoveries in the laboratory are quickly translated into clinical practice.

Funding from the Research Council

The Research Council of Norway has allocated NOK 50 million over a five-year period to the running of the centre and will provide a further NOK 50 million if the centre is a success.

The Sars International Centre for Marine Molecular Biology in Bergen was the first research centre in Norway to form a partnership with EMBL, acquiring the status of EMBL node in 2003. Research at EMBL is conducted by 85 independent research groups that together cover a broad spectrum in the field of molecular biology.

http://www.forskningsradet.no/en/Newsarticle/Centre_for_molecular_medicine_research_opened_in_Oslo/1253963025938?WT.mc_id=alphagalileo

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89909&CultureCode=en

Nurse practitioner-led spinal clinic produced impressive results and shorter waiting times

miércoles, 17 de noviembre de 2010 Wiley - Blackwell

A nurse practitioner-led spinal clinic produced impressive results when compared with the clinics ran by two spinal surgeons. Waiting times were shorter, there was 100% agreement on diagnosis and 95% agreement on management plans. And overall satisfaction among the 177 patients was 96%. Waiting times for specialty consultation in public healthcare systems are lengthy and stressful for patients, with figures quoted in the article for Canada, UK, Germany, USA, New Zealand and Australia.

Ninety-six per cent of patients with back problems were satisfied with the assessment carried out by a specially trained nurse practitioner, according to a study in the December issue of the Journal of Advanced Nursing.

Seventy-four per cent were happy to see her rather than wait up to a year to see a surgeon, with less than a quarter of those who preferred to see a surgeon saying that the extra wait was acceptable.

The pilot study at Toronto Western Hospital in Ontario, Canada, was judged a resounding success after nurse practitioner Angela Sarro came up with exactly the same clinical diagnosis as orthopaedic spine surgeons Dr Yoga Raja Rampersaud and Dr Stephen Lewis in 100 per cent of the 177 patients she assessed. She also suggested the same management plan as the two surgeons in 95 per cent of cases.

“Waiting times for specialty consultations in public healthcare systems worldwide are lengthy and impose undue stress on patients waiting for further information and management of their condition” says Angela Sarro. “Back pain can be very unpleasant and debilitating and 85 per cent of us will experience it at some point in our lives.

“According to the College of Family Physicians of Canada, 57 per cent of people in Canada waited longer than four weeks for specialty care in 2006, compared with 60 per cent in the USA, 46 per cent in Australia, 40 per cent in the UK, 23 per cent in Germany and 22 per cent in New Zealand.

“The aim of our study was to see whether a clinic led by a nurse practitioner could speed up the diagnosis and management of patients with certain spinal conditions pre-selected by the surgeons’ offices.”

The 96 male and 81 female patients ranged from 23 to 85 years of age, with an average age of 52. All had been referred by their family doctor with suspected disc herniation, spinal stenosis or degenerative disc disease.

Key findings included:

· Overall satisfaction was very high (96 per cent), with the nurse practitioner consultation scoring 97 per cent and the thoroughness of the examination scoring 94 per cent. Just over nine out of ten patients (91 per cent) understood their condition better after seeing the nurse practitioner.

· Patients waited ten to 21 weeks to see the nurse practitioner, with an average wait of 12 weeks. This compared with ten to 52 weeks to be seen by the surgeons in a conventional clinic, with average waiting times ranging from three to four months for disc herniations to eight to twelve months for spinal stenosis.

· Just over a quarter of the patients (26 per cent) said that they would have preferred to have been seen by a surgeon in a conventional clinic, but 77 per cent of those patients would not have been prepared to wait an extra three to four months to do so.

· Just under ten per cent (18 patients) were correctly identified as surgical candidates by the nurse practitioner. In addition, 66 were referred for specific nerve root block, 14 for facet block and 26 for further radiological imaging.

"Nurse practitioners are nurses who have received additional specialist training" explains Angela Sarro. "They typically work in healthcare centres and primary care practices in the community, but their role is advancing into areas such as emergency departments and long-term care settings.

"At the moment there are clinical, legal and funding barriers in the Canadian health system that prevent nurse practitioners from being fully independent when it comes to assessing and managing patients who require specialist care.

"However, we feel that there may be scope for government-funded triage clinics led by nurse practitioners to reduce waiting times for spine consultations.

"This initiative would expand the role of the nurse practitioners and provide faster consultation and improved health outcomes for patients, families and communities."

Co-author Dr Yoga Raja Rampersaud adds: "We believe that our study demonstrates that nurse practitioners can play an effective and efficient role in delivering timely healthcare to patients requiring specific disease management in a specialty setting.

"Although skill levels will vary from one nurse practitioner to another, physicians can work with them to help them to develop expertise in their specialty area. Ongoing evaluation is also important to ensure that quality of care is maintained and that patients are satisfied with the consultation."

http://www.journalofadvancednursing.com

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89906&CultureCode=en

International surface metrology standards are being developed in Poland

miércoles, 17 de noviembre de 2010 Institute of Physical Chemistry of the Polish Academy of Sciences

The research on materials' surface layers with spectroscopic methods, extremely important for nanotechnology, material engineering, microelectronics and many other areas, requires knowledge of certain physical parameters that are available in the databases distributed by the US National Institute of Standards and Technology (NIST). Used by the researchers worldwide, several of these databases are being developed by Prof. Aleksander Jabłoński from the Institute of Physical Chemistry of the Polish Academy of Sciences.

Superficial layers of materials, no thicker than several atomic layers, play a key role in many important areas of science and technology, including microelectronics, catalysis or corrosion science. These surface layers are nowadays being studied with different surface sensitive techniques, in particular with electron spectroscopies. Quantitative surface analysis by spectroscopic methods requires, however, taking into consideration certain parameters that are available in the databases distributed by the US National Institute of Standards and Technology (NIST) in Washington. Several of these databases are being developed by Prof. Aleksander Jabłoński from the Institute of Physical Chemistry of the Polish Academy of Sciences. The coming release of the latest of these databases coincides with honouring of Prof. Jabłoński's achievements with the Maria Skłodowska-Curie Scientific Award that is awarded by the Polish Academy of Sciences.

The surface of materials determines the way they interact with the environment. The presence of impurities can, however, change the surface in a hardly predictable manner. "Even when a material contains alien molecules on a few parts per million level, they can migrate to the surface and cover the whole sample. Surface properties of such a substance are then different than those of the material's interior," says Prof. Jabłoński, stressing that the knowledge on actual physical and chemical properties of materials' surfaces is of paramount importance to industries employing the most recent accomplishments of material engineering, microelectronics and various nanotechnologies.

Surface studies employ usually two research methods: photoelectron spectroscopy and Auger electron spectroscopy. In the former, the surface of the sample is irradiated with X-rays and the electrons ejected by photons from surface layers are recorded. In the latter, the material is bombarded with a monoenergetic electron beam, and the energies of electrons emitted due to intra-atomic radiationless transitions (i.e.,

transitions not accompanied by photon emission) are recorded. As only the electrons ejected from atoms close to the surface have a chance to leave the sample without energy loss, both methods "see" only a few most external atomic layers of the material.

The photoelectron spectroscopy allows to analyze the valence and the chemical form of elements, as well as the distribution of chemical compounds on the material surface, including non-conductors such as substances of biological origin, ceramics or plastics. An electron beam can be focused easier than the x-rays and therefore the Auger electron spectroscopy allows for a better resolution of the element distribution on the surface, approaching in the most recent instruments 10 nanometres.

Accurate analyses by surface sensitive spectroscopies imply necessarily a development of a reliable theory of electron transport in surface region of condensed matter. The mathematical formalism describing the phenomenon is founded on certain parameters that allow a quantitative surface analysis. Extension of theory accomplished by Prof. Jabłoński and his proposals of new parameters resulted in a development of comprehensive databases making life easier for electron spectroscopy users. These compilations – containing parameters such as electron scattering cross sections, mean free paths of electrons and electron attenuation lengths – attracted interest of the US National Institute of Standards and Technology that subsequently started to distribute them. As a result, in years 2001-2010 more than 2000 software packages containing databases developed in the Institute of Physical Chemistry of the PAS have been distributed. These databases are commonly used by researchers worldwide. Recently, Prof. Jabłoński has completed tests of another database, SRD 154, which includes so called modified backscattering factors. The database is scheduled for distribution soon by NIST.

For his work on how to increase the accuracy of surface analyses using spectroscopic techniques, including the preparation of databases for the NIST, Prof. Jabłoński has been just awarded with the prestigious Maria Skłodowska-Curie Scientific Award. The award is awarded annually by the Division III Mathematical, Physical and Chemical Sciences of the Polish Academy of Sciences, alternatively in physics and in chemistry. The award is presented to Polish scientists, non-members of the PAS, whose outstanding and creative work particularly contributed to the development of science. A formal award presentation to Prof. Jabłoński is scheduled to take place in the coming days.

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89897&CultureCode=en

Scripps Research Scientists Devise Broad New Technique for Screening Proteins

miércoles, 17 de noviembre de 2010 The Scripps Research Institute

A team led by scientists from The Scripps Research Institute has developed a powerful new method for detecting functional sites on proteins. The technique may have broad applications in basic research and drug development.

Described in an advance, online publication of the British journal *Nature* on November 17, 2010, the method enables scientists to take a sample of cells, locate the sites on their proteins that have a certain kind of biochemical reactivity, and measure the degree of that reactivity.

"It lets us find functional sites on proteins more efficiently than before, and that's going to be helpful not only for characterizing unknown proteins, but also for finding new sites of importance on already-characterized proteins," says the study's senior investigator, Benjamin F. Cravatt III, PhD, professor and chair of the Department of Chemical Physiology and member of the Skaggs Institute for Chemical Biology at Scripps Research in La Jolla, California.

The Hyper-Reactive Sites

Scientists already have techniques for identifying the sequence of amino acids that make up a given protein. But this sequence data doesn't tell them all they need to know. Initially translated from genetic material as a simple chain of amino acids, a protein thereafter typically folds into a complex, three-dimensional structure. The hard-to-predict details of this structure can strongly determine which sites on a protein are highly reactive.

Scientists can find these reactive sites with biochemistry studies, but traditionally such studies have required months or even years of work, even for a single protein. Partly for this reason, tens of thousands of proteins in humans and other species remain uncharacterized.

"What we've needed is a more efficient method to find and quantitatively analyze reactive sites," said Cravatt, "not just for one protein in a purified sample but for a large set of proteins in their natural setting, such as within a whole cell or tissue."

In the study reported in *Nature*, Cravatt's team, led by Research Associates Eranthie Weerapana, PhD, and Chu Wang, PhD, set out to develop just such a method. As a proof of principle, they targeted cysteine, one of the most reactive amino acids found on proteins. "A cysteine site on a protein often is responsible for enzymatic activity, or serves as an anchoring point for a chemical modification that regulates the protein's activity," says Wang.

A Dynamic Duo of Probes

The approach the team developed involved the creation of special kind of cysteine-labeling chemical probe – in fact, two probes, which were chemically the same but differed very slightly in their mass so that they could later be distinguished. Typically, probes that label cysteines are used at a high enough concentration to mark all the cysteines in a given sample. In this case, the two probes were added to cellular proteins at a concentration about a hundred times lower than normal, so that for most cysteines, the labeling would be incomplete. Another novel element of the scheme was that the concentration of the probes was varied, so that one protein sample was treated with up to ten times higher probe than the other.

"Our hypothesis was that the hyper-reactive cysteines of interest would be fully labeled by these probes even at very low probe concentrations, and thus the low- and high-concentration probes would label these cysteines to the same degree," says Wang. "The cysteines with ordinary reactivity, by contrast, would be incompletely labeled at low probe concentrations and would show greater labeling as the probe concentration became higher."

The team first tested the technique on the proteins found within a human breast cancer cell line, and soon identified and located more than 800 cysteine sites on 522 proteins. For more than 90 percent of these cysteines, the low and high concentration probes showed correspondingly low and high levels of labeling, indicating that the cysteines had ordinary reactivity.

"But a small fraction of the cysteines showed a constant level of labeling for low and high concentration probes," said Wang, "indicating that they were hyper-reactive."

At first by examining select proteins from this group, and later by looking up all 522 labeled proteins in a database, the team found that the cysteines marked as hyper-reactive by their technique were highly enriched in known functional sites. The non-hyper-reactive cysteines, by contrast, were much less commonly listed as functional.

"By extrapolation, we can say that cysteines that haven't yet been officially characterized, but which show this hyper-reactivity in our assay, are likely to be functional," said Cravatt. To lend further support to this hypothesis, the team performed experiments, in collaboration with Scripps Research Assistant Professor Kerri Mowen, Ph.D, on an uncharacterized hyper-reactive cysteine in this list and showed that it played an important functional role in its parent proteins.

In a final set of experiments, collaborating investigator David Baker and colleagues at the University of Washington supplied a set of synthetic proteins that had been designed to work as enzymes. Weerapana and Wang and their team were able to predict, using their reactive-cysteine tagging technique, which of these proteins had the hoped-for enzymatic function.

"This is a relatively precise and straightforward method for screening designed proteins for functional properties," said Cravatt. "It could be very useful for creating new enzyme catalysts for basic research and industrial applications."

And cysteine is only one type of amino acid to which this basic technique could be applied. “All you would have to do, in principle, is change the reactive group on the probe, and instead of targeting cysteines, target lysines or serines or tyrosines, or some other amino acid,” Cravatt said. “I think the approach will have broad utility in many areas of biology.”

In addition to Cravatt, Wang, Weerapana (who has since been named an assistant professor of chemistry at Boston College) and Mowen, authors of the paper, titled “Quantitative reactivity profiling predicts functional cysteines in proteomes,” are Gabriel Simon, Myles Dillon, and Daniel Bachovchin of Scripps Research; Florian Richter of the University of Washington, Seattle; and Sagar Khare and David Baker of the University of Washington, Seattle, and the Howard Hughes Medical Institute.

Research for the paper was funded in part by the National Institutes of Health.

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89891&CultureCode=en

Listening for Ocean Spills and their Ecological Effects

miércoles, 17 de noviembre de 2010 — miércoles, 17 de noviembre de 2010 American Institute of Physics (AIP)

- **Lugar:** Cancun, Mexico

Acoustic Technologies for Detecting Oil in Water presented at 2nd Pan-American/Iberian Meeting on Acoustics

Scientists who study acoustics (the "science of sound") have over the years developed a variety of techniques to probe the hidden depths of oceans. This week, many of these acoustic researchers will come together to discuss how these technologies were used to monitor April's Deepwater Horizon oil spill, to present new data on the gusher's ecological impacts, and to highlight new techniques under development that could improve our ability to detect oil in ocean water.

This special session will take place on November 17, 2010 at the 2nd Pan-American/Iberian Meeting on Acoustics, a major conference on the science and technology of acoustics held in Cancun, Mexico.

Some of these researchers will be presenting original data on the spill itself and its environmental impact.

Thomas Weber and colleagues at the University of New Hampshire in Durham and the National Oceanic and Atmospheric Administration's Alaska Fisheries Science Center and Office of Coast Surveys will talk about Deepwater spill data collected using acoustic technologies originally developed for researching fisheries. For more information on this presentation, see their lay-language paper:
http://www.acoustics.org/press/160th/weber.htm

When the deep wellhead burst, Natalia Sidorovskaia of the University of Louisiana at Lafayette found herself in a unique position. As a member of the Littoral Acoustics Demonstration Center of the University of Southern Mississippi, she had been part of a team listening to the waters near this rig for 9 years -- using underwater microphones (hydrophone) to count sperm whales and beaked whales in the area.

"One of our sites was only 9 miles away from the Deepwater Horizon site, said Sidorovskaia.

Thanks to a rapid response award from the National Science Foundation and ship time donated by Greenpeace, Sidorovskaia and two mathematicians were able to revisit to these waters in September and spend a week collecting post-spill data.

By comparing this data to their pre-spill studies, the scientists hope to get an idea of whether the number of whales in the area has changed. They plan to present this new analysis in their talk on November 17.

"Our estimations agree with NOAA's -- about 1,655 sperm whales before the spill," said Sidorovskaia. "If we killed 3 animals in the gulf, it might affect the population in the growth."

Other researchers at the session will present new -- though largely unproven -- ideas for adapting technologies now used to study the structure of the ocean to detect the presence of oil in water as well.

At the University of Southern Mississippi in Hattiesburg, Michael Vera is exploring a technique commonly used to measure temperature gradients in the ocean (ocean-acoustic thermometry) which detects changes in the speed of a sound broadcast through water. Like a lens bending light, ocean water can distort sound in

measurable ways that reveal various properties of the ocean.

Vera's computer models, which simulate a Deepwater Horizon-like stream of oil, indicate that the presence of concentrated crude oil should also reveal itself by changing the speed of sound propagation.

"The model suggests that the oil should be detectable near the wellhead," said Vera.

He is working to refine his model with a more realistic simulation of oil that also includes other materials such as methane. Vera has written a lay-language paper about this research, available here: http://www.acoustics.org/press/160th/vera.htm

Mohsen Badiey of the University of Delaware in Newark, Boris Katsnelson of Voronezh University in Russia, and Jim Lynch of the Woods Hole Oceanographic Institute in Massachusetts are investigating another technique used to study the ocean's three-dimensional structure.

Badiey and this team have spent years studying the structure of the ocean near the continental shelf using sound sources and receivers -- ships and moored points that broadcast sound and arrays of sensors in shallow waters that detect the refraction patterns of this sound. Their recent findings reveal that the three-dimensional nature of sound propagation can be used to detect the boundaries of fluids with different indexes of sound refraction.

"This is a rather unusual approach for ocean acoustics," said Lynch. "For almost a century, almost all work has been 2-D slices of sound."

Any kind of stratified front -- gradients of temperature or density -- can cause interferences and perturbations in this sound. Measurements of these interference patterns have recently revealed information about propagating internal waves on the New Jersey continental shelf.

Their preliminary theoretical calculations give them hope that this technique could be adapted to detect oil spills and other liquids in large-scale areas of water up to few thousand square kilometers on the oceanic shelf.

For more information about the session, including several other presentations not described above, see page 24 of the meeting program:

http://asa.aip.org/cancun/wednesdayam.pdf

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89888&CultureCode=en

Groundbreaking energy-saving project to be trialled at the University of Bath

martes, 16 de noviembre de 2010 Bath, University of

For the first time in the UK, researchers from the University of Bath are working with RWE npower in a groundbreaking project exploring the potential energy savings of using a localised DC (Direct Current) electricity supply network.

Professor Raj Aggarwal and Dr Miles Redfern, from the University's Department of Electronic & Electrical Engineering, are leading the project that will set up 50 computers in the University library to draw their energy from a specially created local DC network.

The six-month trial is designed to test the feasibility and potential energy, financial and environmental benefits of using a DC supply compared with an alternating current (AC) system.

In DC networks, the electrons flow steadily in a single direction, whereas in an AC system, the electrons keep switching directions. All electronic equipment such as computers, TVs and communications systems use DC current, but the power that comes from wall sockets is AC, so these devices must use an AC/DC converter.

Senior Lecturer in Electronic & Electrical Engineering, Dr Miles Redfern explained:

"With the explosion of electronic systems in entertainment, communications and computing, all of which are inherently DC powered, DC supply networks have to be considered as an alternative to AC supplies.

"The library at Bath has AC systems operating alongside the DC ones, providing us with an invaluable test-bed to establish if DC supplies can offer advantages for our current electricity demands."

Allan Robinson, Head of Product at RWE npower said: "It is vital as an energy generator/supplier we explore every option that will deliver potentially significant energy savings for our customers.

"Partnerships such as this are vital for two reasons: first to bring together the overwhelming experience of both parties; and secondly to deliver a robust report that will enable the industry to take the technology forward to explore its potential on a larger scale."

The funding for the project has come from a Knowledge Transfer Account Partnership Development Award which has been matched by RWE npower.

http://www.bath.ac.uk/news/2010/11/16/dc-trial/

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89858&CultureCode=en

Sticky snack for elephant-shrews

Springer Science+Business Media

Long-nosed Cape rock elephant-shrews are fond of sticky treats, according to Dr. Petra Wester from the University of Stellenbosch in South Africa. Her investigations show for the first time that the elephant-shrew, *Elephantulus edwardii*, licks the nectar of the flowers and pollinates the Pagoda lily. Her results are published in Springer's journal, *Naturwissenschaften – The Science of Nature*.

Dr. Wester studied the behavior of the animals in the northern Cederberg area of South Africa, where Pagoda lily plants, *Whiteheadia bifolia* (Hyacinthaceae), are found in shady rock crevices and cavities. Over four nights, she placed mammal traps with baits – a mixture of peanut butter and rolled oats – near the lily plants. The next day, Dr. Wester collected the faeces of the animals from the traps. Two elephant-shrews were captured and released into glass terraria containing flowering lily plants, where Dr. Wester observed their foraging behavior.

The captive elephant-shrews visited the flowers more than 50 times over four days, moving from one flower cluster to another. With their long, flexible noses they went between the stamens and licked the nectar between the ovary and the stamens with their long, slender tongues. In the process, they touched the pollen-sacs and their long nose got dusted with pollen. The animals also touched the stigmas.

The elephant-shrews indulged in the nectar without feeding on pollen directly or eating, damaging or destroying the flowers. Interestingly, the animals preferred the nectar over the other food – peanut butter with rolled oats and apples – and over water. Dr. Wester also found that the faecal samples of the elephant-shrews contained pollen from the Pagoda lily, the likely result of fur grooming after flower visits, rather than actual feeding on pollen.

Elephant-shrews, together with rodents, primates and marsupials, are part of a rather unusual group of pollinating animals that are known as 'non-flying mammals' to differentiate them from the more common bats. Elephant-shrews look similar to mice, except for their long nose, but are not related to rodents. They belong to the order Macroscelidea, which includes aardvarks, tenrecs, golden moles, hyracoids, sirenians and elephants.

Dr. Wester concludes: "Data on elephant-shrews as pollinators are extremely scarce. This study is the first to clearly show that *Elephantulus edwardii* visits flowers for nectar and as a consequence also pollinates them. It is very likely that further species of elephant-shrews might be pollinators."

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89861&CultureCode=en

Microorganisms in the ground don't slack off in winter

martes, 16 de noviembre de 2010 Expertanswer (Expertsvar in Swedish)

It is known that soil microorganisms can maintain some activity during the cold winter months. Scientist at Swedish University of Agricultural Sciences (SLU) and Umeå University in Sweden have now shown that the microorganisms in frozen soils are much more viable than previously anticipated and also has large potential for growth.

In northern forest ecosystems, there is a great deal of carbon stored in the ground. The degradation of this carbon supply is a crucial component in computational models used to describe the effects of future climate changes.

In recent years it has been noticed that the winter half of the year can also have a great impact on the carbon balance of forests, as microorganisms (fungi and bacteria) continue to degrade organic carbon despite freezing temperatures and frozen ground. Just how microorganisms go about breaking down organic carbon under such adverse conditions has largely been unknown, which has rendered it difficult to carry out reliable calculations of a forest's carbon balance in wintertime.

"The results of previous studies have been interpreted as meaning that microorganisms in frozen ground cannot grow but merely give off a certain amount of carbon dioxide. A research team at SLU in Umeå and at Umeå University has now shown that this is not the case. Instead, the capacity of microorganisms to grow in frozen ground is astonishingly similar to that of the summer half of the year, although the growth rate is lower," says Mats Öquist from SLU, who directed the study.

These findings are being published this week in the prestigious journal *PNAS*, published by the American Academy of Sciences.

The study was performed in close collaboration between Mats Öquist, Mats Nilsson, and Stina Harrysson Drotz at SLU, and Jürgen Schleucher and Tobias Sparrman (Umeå University).

In previous publications these scientists have established that the activity of microorganisms in frozen ground is mainly regulated by access to unfrozen water, and they have identified what characteristics in the ground govern the availability of water.

These studies have been possible thanks to a method for monitoring unfrozen water using nuclear magnetic resonance spectroscopy (NMR), a method that was developed by the team. In combination with the latest findings about the capacity of microorganisms to exploit organic materials and grow in frozen ground, this research makes it possible to develop more reliable computational models of the carbon balance of the northern hemisphere.

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89852&CultureCode=en

Using plants against soils contaminated with arsenic

martes, 16 de noviembre de 2010 Zurich, University of

Two essential genes that control the accumulation and detoxification of arsenic in plant cells have been identified. This discovery is the fruit of an international collaboration involving laboratories in Switzerland, South Korea and the United States, with the participation of members of the National Centre of Competence in Research (NCCR) *Plant Survival*. The results presented are a promising basis for reducing the accumulation of arsenic in crops from regions in Asia that are polluted by this toxic metalloid, as well as for the cleanup of soils contaminated by heavy metals. The findings are published this week in the prestigious journal PNAS.

The sinking of tubewells in Southeast Asia as well as mining in regions such as China, Thailand, and the United States, are the cause that arsenic concentrations in water often exceed the World Health Organization (WHO) limit of 10 µg/L, the value above which health problems start to occur. Tens of millions of people are exposed to this risk by drinking contaminated water or by ingesting cereal crops cultivated in polluted soils. A long lasting exposure to this highly toxic metalloid could affect the gastrointestinal transit, the kidneys, the liver, the lungs, the skin and increases the risk of cancer. In Bangladesh, it is estimated that 25 million people drink water that contains more than 50 µg/L of arsenic and that two million of them risk of dying from cancer caused by this toxic substance.

Plants offer a way for toxic metals to enter the food chain. We know, for example, that arsenic is stored within rice grains, which, in regions polluted with this toxic metalloid, constitutes a danger for the population whose diet depends to a great extent on this cereal.

Arsenic or cadmium in soils is transported to plant cells and stored in compartments called vacuoles. Within the cell, the translocation of arsenic and its storage in vacuoles is ensured by a category of peptides – the phytochelatins – that bind to the toxic metalloid, and are transported into the vacuole for detoxification, similar to hooking up a trailer to a truck. In terms of the process, it is the "truck and trailer" complex that is stored in the vacuole.

"By identifying the genes responsible for the vacuolar phytochelatin transport and storage, we have found the missing link that the scientific community searched for the past 25 years", explains Enrico Martinoia, a professor in plant physiology at the University of Zurich. The experiments carried out on the model plant *Arabidopsis* can easily be adapted to other plants such as rice.

Enrico Martinoia is one of the directors of this research that includes the Korean professor Youngsook Lee from the Pohang University of Science and Technology (POSTECH) and Julian Schroeder, biology professor at the University of California, San Diego (UCSD). Along with Stefan Hörtensteiner, also from the University of Zurich, and Doris Rentsch from the University of Bern, he is one of the three members of the NCCR *Plant Survival* who participated in this study which was published in PNAS.

Controlling these genes will make it possible to develop plants capable of preventing the transfer of toxic metals and metalloids from the roots to the leaves and grains thereby limiting the entry of arsenic into the food chain. "By focusing on these genes, states Youngsook Lee, we could avoid the accumulation of these heavy metals in edible portions of the plant such as grains or fruits."

At the same time, researchers have discovered a way to produce plants capable of accumulating a greater amount of toxic metals which consequently can be used to clean up contaminated soils. These plants would then be burned in blast furnaces in order to eliminate the toxic elements.

http://www.alphagalileo.org/ViewItem.aspx?ItemId=89849&CultureCode=en