http://www.japantimes.co.jp/news/2013/07/08/national/meat-eating-dinos-lived-in-nagasaki

Meat-eating dinos lived in Nagasaki

Two fossilized tooth fragments from a prehistoric carnivore were found in a layer of ground about 84 million years old on the Nagasaki Peninsula, officials said Monday.

FUKUI – The fossils are believed to be from a dinosaur that was more than 7 meters long, although it is difficult to identify the species from just the fragments, officials at the Fukui Prefectural Dinosaur Museum and the Nagasaki city board of education said.

One of the fragments, measuring 35.4 mm by 26.8 mm by 11.2 mm, forms roughly half of an estimated 6-cm-long tooth from the root, they said. It is one of the largest fossils of a carnivorous dinosaur's tooth ever found in Japan. The other fragment is 34.2 mm long and 13.6 mm wide.

Sharp protrusions show they were the teeth of a carnivore, the officials said.

Kazunori Miyata, chief researcher at the museum, discovered the fossils in July 2011 in the Mitsuze layer on the west coast of the Nagasaki Peninsula.

The discovery extended the known range of carnivorous dinosaurs to 13 prefectures in Japan, from Iwate in the northeast to Kagoshima in the southwest.

A bite of prehistory: This fossilized tooth fragment from a carnivore was unearthed on the Nagasaki Peninsula. **KYODO**

The Mitsuze layer, which is believed to have been formed in the late Cretaceous Period about 84 million years ago, has been a rich source of fossils, Miyata said, citing fragments of plant-eating dinosaurs, flying reptiles, alligators and turtles.

The new fossils are on display at Sanwa Gyosei Center in the city of Nagasaki until July 12 and at the Nagasaki Science Museum until July 28. Then the fossils will move to the Fukui dinosaur museum from Aug. 1 to Oct. 14. Starting Oct. 17, they will be displayed permanently at the Nagasaki Science Museum.

http://www.eurekalert.org/pub_releases/2013-07/uoa-ice070813.php

Immune cells essential to establishing pregnancy

New research from the University of Adelaide shows for the first time that immune cells known as macrophages are critical to fertility by creating a healthy hormone environment in the uterus.

Laboratory studies led by researchers in the University's Robinson Institute have shown that macrophages play an essential role in production of the hormone progesterone, which is crucial for embryo implantation and the initiation of pregnancy. Results of the study, which will be published online today by the Journal of Clinical Investigation, could lead to new insights into how to treat infertility in women.

"Previous research has demonstrated that macrophages are prevalent in reproductive tissues, but this is the first time that their absolute necessity for pregnancy has been demonstrated," says the leader of the project team, Professor Sarah Robertson, NHMRC Principal Research Fellow and member of the University's Robinson Institute.

"Macrophages organize the development of blood vessel networks in the ovary required for production of progesterone, which is the major hormone for initiating pregnancy."

The researchers have found that insufficient numbers of macrophages leads to reduced production of progesterone, which results in embryos implanting poorly or not at all, and can manifest later as miscarriage.

"The contribution of macrophages to the healthy vascular structure of the corpus luteum, which must develop rapidly in a matter of days to produce high levels of progesterone, was a surprise," Professor Robertson says.

"This is the first time that we have understood how pivotal macrophages are for conception and establishing pregnancy. "Environmental factors such as infection, obesity and stress all contribute to inflammatory responses and affect the generation and function of macrophages in women. This could therefore impact on the macrophages' ability to support pregnancy," she says.

However, the laboratory studies showed that treatment with progesterone could reverse the effects caused by reduced levels of macrophages.

"Insufficient progesterone is one reason for infertility in some women," Professor Robertson says. "Infertile women are now routinely provided with progesterone supplements as part of their assisted reproductive treatments, and this is also a promising therapy for recurring miscarriage."

But ultimately the researchers hope to improve fertility by more natural means. "If macrophages are shown to play the same role in women as we've seen in our laboratory studies, this gives us potential new avenues for targeting them with lifestyle and nutritional intervention, improving fertility by advancing the quality of the conception environment."

http://www.eurekalert.org/pub_releases/2013-07/uoc-cdp070813.php

Cosmochemist discovers potential solution to meteorite mystery

Chondrules may have formed from high-pressure collisions in early solar system

A normally staid University of Chicago scientist has stunned many of his colleagues with his radical solution to a 135-year-old mystery in cosmochemistry. "I'm a fairly sober guy. People didn't know what to think all of a sudden," said Lawrence Grossman, professor in geophysical sciences.

At issue is how numerous small, glassy spherules had become embedded within specimens of the largest class of meteorites—the chondrites. British mineralogist Henry Sorby first described these spherules, called chondrules, in 1877. Sorby suggested that they might be "droplets of fiery rain" which somehow condensed out of the cloud of gas and dust that formed the solar system 4.5 billion years ago.

Researchers have continued to regard chondrules as liquid droplets that had been floating in space before becoming quickly cooled, but how did the liquid form? "There's a lot of data that have been puzzling to people," Grossman said.

Grossman's research reconstructs the sequence of minerals that condensed from the solar nebula, the primordial gas cloud that eventually formed the sun and planets. He has concluded that a condensation process cannot account for chondrules. His favorite theory involves collisions between planetesimals, bodies that gravitationally coalesced early in the history of the solar system. "That's what my colleagues found so shocking, because they had considered the idea so 'kooky,'" he said.

Cosmochemists know for sure that many types of chondrules, and probably all of them, had solid precursors. "The idea is that chondrules formed by melting these pre-existing solids," Grossman said.

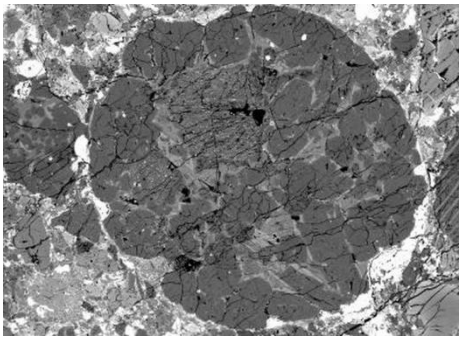
One problem concerns the processes needed to obtain the high, post-condensation temperatures necessary to heat the previously condensed solid silicates into chondrule droplets. Various astonishing but unsubstantiated origin theories have emerged. Maybe collisions between dust particles in the evolving solar system heated and melted the grains into droplets. Or maybe they formed in strikes of cosmic lightning bolts, or condensed in the atmosphere of a newly forming Jupiter.

Another problem is that chondrules contain iron oxide. In the solar nebula, silicates like olivine condensed from gaseous magnesium and silicon at very high temperatures. Only when iron is oxidized can it enter the crystal structures of magnesium silicates. Oxidized iron forms at very low temperatures in the solar nebula, however, only after silicates like olivine had already condensed at temperatures 1,000 degrees higher.

At the temperature at which iron becomes oxidized in the solar nebula, though, it diffuses too slowly into the previously formed magnesium silicates, such as olivine, to give the iron concentrations seen in the olivine of chondrules. What process, then, could have produced chondrules that formed by melting pre-existing solids and contain iron oxide-bearing olivine?

"Impacts on icy planetesimals could have generated rapidly heated, relatively high-pressure, water-rich vapor plumes containing high concentrations of dust and droplets, environments favorable for formation of chondrules," Grossman said. Grossman and his UChicago co-author, research scientist Alexei Fedkin, published their findings in the July issue of Geochimica et Cosmochimica Acta.

Grossman and Fedkin worked out the mineralogical calculations, following up earlier work done in collaboration with Fred Ciesla, associate professor in geophysical sciences, and Steven Simon, senior scientist in geophysical sciences. To verify the physics, Grossman is collaborating with Jay Melosh, University Distinguished Professor of Earth & Atmospheric Sciences at Purdue University, who will run additional computer simulations to see if he can recreate chondrule-forming conditions in the aftermath of planetesimal collisions. "I think we can do it," Melosh said.



Chondrules are visible as round objects in this image of a polished thin section made from the Bishunpur meteorite from India. The dark grains are iron-poor olivine crystals. This is a backscattered electron image taken with a scanning electron microscope. **Steven Simon**

Long-standing objections

Grossman and Melosh are well-versed in the longstanding objections to an impact origin for chondrules. "I've used many of those arguments myself," Melosh said.

Grossman re-evaluated the theory after Conel Alexander at the Carnegie Institution of Washington and three of his colleagues supplied a missing piece of the puzzle. They discovered a tiny pinch of sodium—a component of ordinary table salt—in the cores of the olivine crystals embedded within the chondrules.

When olivine crystallizes from a liquid of chondrule composition at temperatures of approximately 2,000 degrees Kelvin (3,140 degrees Fahrenheit), most sodium remains in the liquid if it doesn't evaporate entirely. But despite the extreme volatility of sodium, enough of it stayed in the liquid to be recorded in the olivine, a consequence of the evaporation suppression exerted by either high pressure or high dust concentration. According to Alexander and his colleagues, no more than 10 percent of the sodium ever evaporated from the solidifying chondrules.

Grossman and his colleagues have calculated the conditions required to prevent any greater degree of evaporation. They plotted their calculation in terms of total pressure and dust enrichment in the solar nebula of gas and dust from which some components of the chondrites formed. "You can't do it in the solar nebula," Grossman explained. That's what led him to planetesimal impacts. "That's where you get high dust enrichments. That's where you can generate high pressures."

When the temperature of the solar nebula reached 1,800 degrees Kelvin (2,780 degrees Fahrenheit), it was too hot for any solid material to condense. By the time the cloud had cooled to 400 degrees Kelvin (260 degrees Fahrenheit), however, most of it had condensed into solid particles. Grossman has devoted most of his career to identifying the small percentage of substances that materialized during the first 200 degrees of cooling: oxides of calcium, aluminum and titanium, along with the silicates. His calculations predict condensation of the same minerals that are found in meteorites.

Over the last decade, Grossman and his colleagues have written a slew of papers exploring various scenarios for stabilizing iron oxide enough that it would enter the silicates as they condensed at high temperatures, none of which proved feasible as an explanation for chondrules. "We've done everything that you can do," Grossman said. This included adding hundreds or even thousands of times the concentrations of water and dust that they had any reason to believe ever existed in the early solar system. "This is cheating," Grossman admitted. It didn't work anyway.

Instead, they added extra water and dust to the system and increased its pressure to test a new idea that shock waves might form chondrules. If shock waves of some unknown source had passed through the solar nebula, they would have rapidly compressed and heated any solids in their path, forming chondrules after the melted particles cooled off. Ciesla's simulations showed that a shock wave can produce silicate liquid droplets if he increased the pressure and the quantities of dust and water by these abnormally if not impossibly high amounts, but the droplets would be different from the chondrules actually found in meteorites today.

Cosmic shoving match

They differ in that actual chondrules contain no isotopic anomalies, whereas the simulated shock-wave chondrules do. Isotopes are atoms of the same element that have different masses from one another. The evaporation of atoms of a given element from droplets drifting through the solar nebula causes the production of isotopic anomalies, which are deviations from the normal relative proportions of the element's isotopes. It's a cosmic shoving match between dense gas and hot liquid. If the number of a given type of atoms pushed out of the hot droplets equals the number of atoms getting pushed in from the surrounding gas, no evaporation will result. This prevents isotope anomalies from forming.

The olivine found in chondrules presents a problem. If a shock wave formed the chondrules, then the olivine's isotopic composition would be concentrically zoned, like tree rings. As the droplet cools, olivine crystallizes with whatever isotopic composition existed in the liquid, starting at the center, then moving out in concentric rings. But no one has yet found isotopically zoned olivine crystals in chondrules.

Realistic-looking chondrules would result only if evaporation were suppressed enough to eliminate the isotope anomalies. That, however, would require higher pressure and dust concentrations that go beyond the range of Ciesla's shock-wave simulations.

Providing some help was the discovery a few years ago that chondrules are one or two million years younger than calcium-aluminum-rich inclusions in meteorites. These inclusions are exactly the condensates that cosmochemical calculations dictate would condense in the solar nebular cloud. That age difference provides enough time after condensation for planetesimals to form and start colliding before chondrules form, which then became part of Fedkin and Grossman's radical scenario.

They now say that planetesimals consisting of metallic nickel-iron, magnesium silicates and water ice condensed from the solar nebula, well ahead of chondrule formation. Decaying radioactive elements inside the planetesimals provided enough heat to melt the ice.

The water percolated through the planetesimals, interacted with the metal and oxidized the iron. With further heating, either before or during planetesimal collisions, the magnesium silicates re-formed, incorporating iron oxide in the process. When the planetesimals then collided with each other, generating the abnormally high pressures, liquid droplets containing iron oxide sprayed out.

"That's where your first iron oxide comes from, not from what I've been studying my whole career," Grossman said. He and his associates have now reconstructed the recipe for producing chondrules. They come in two "flavors," depending on the pressures and dust compositions arising from the collision.

"I can retire now," he quipped.

Citation: "Vapor saturation of sodium: Key to unlocking the origin of chondrules," by Alexei V. Fedkin and Lawrence Grossman, Geochimica et Cosmochimica Acta, Vol. 112, July 2013, pages 226-250.

Funding: National Aeronautics and Space Administration.

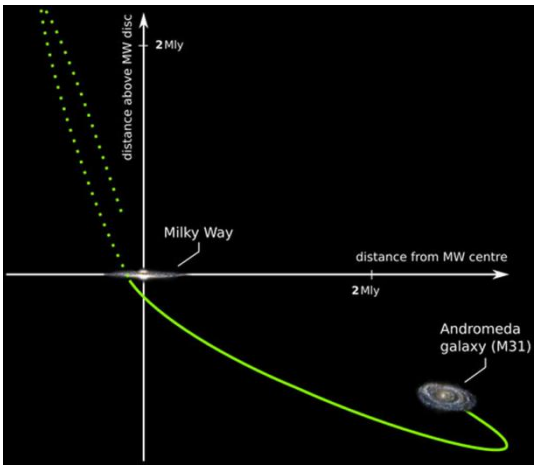
http://scitechdaily.com/study-suggests-andromeda-crashed-into-the-milky-way-10-billion-years-ago/

Study Suggests Andromeda Crashed into the Milky Way 10 Billion Years Ago

A new study suggests that Andromeda crashed into the Milky Way roughly 10 billion years ago, explaining the observed structure of the two galaxies and their satellites.

July 8, 2013 by Staff

For many years scientists have believed that our Galaxy, the Milky Way, is set to crash into its larger neighbor, the Andromeda Galaxy, in about 3 billion years' time and that this will be the first time such a collision has taken place. But now a European team of astronomers led by Hongsheng Zhao of the University of St Andrews propose a very different idea; that the two star systems collided once before, some 10 billion years ago and that our understanding of gravity is fundamentally wrong. Remarkably, this would neatly explain the observed structure of the two galaxies and their satellites, something that has been difficult to account for until now. Dr Zhao will presented the new work at the RAS National Astronomy Meeting in St Andrews on Thursday 4 July.



The Milky Way, made up of about 200 billion stars, is part of a group of galaxies called the Local Group. Astrophysicists often theorize that most of the mass of the Local Group is invisible, made of so-called dark matter. Most cosmologists believe that across the whole universe, this matter outweighs 'normal' matter by a factor of five. The dark matter in both Andromeda and the Milky Way then makes the gravitational pull between the two galaxies strong enough to overcome the expansion of the cosmos, so that they are now moving towards each other at around 100 km per second, heading for a collision 3 billion years in the future.

A schematic diagram showing how the Andromeda Galaxy (at bottom right) collided with the Milky Way (at the intersection of the axes) 10 billion years ago, moved out to a maximum distance of more than 3 million light years and is now approaching our Galaxy once again. The yellow line shows the track of Andromeda with respect to the Milky Way. Credit: Fabian Lueghausen / University of Bonn.

But this model is based on the conventional model of gravity devised by Newton and modified by Einstein a century ago, and it struggles to explain some properties of the galaxies we see around us. Dr Zhao and his team argue that at present the only way to successfully predict the total gravitational pull of any galaxy or small galaxy group, before measuring the motion of stars and gas in it, is to make use of a model first proposed by Prof. Mordehai Milgrom of the Weizmann Institute in Israel in 1983.

This modified gravity theory (Modified Newtonian Dynamics or MOND) describes how gravity behaves differently on the largest scales, diverging from the predictions made by Newton and Einstein.

Dr Zhao (University of St Andrews) and his colleagues have for the first time used this theory to calculate the motion of Local Group galaxies. Their work suggests that the Milky Way and Andromeda galaxies had a close encounter about 10 billion years ago. If gravity conforms to the conventional model on the largest scales then taking into account the supposed additional pull of dark matter, the two galaxies would have merged.

"Dark matter would work like honey: in a close encounter, the Milky Way and Andromeda would get stuck together, figuratively speaking", says team member Prof. Pavel Kroupa from Bonn University. "But if Milgrom's theory is right", says his colleague Dr Benoit Famaey (Observatoire Astronomique de Strasbourg), "then there are no dark particles and the two large galaxies could have simply passed each other thereby drawing matter from each other into long thin tidal arms."

New little galaxies would then form in these arms, "a process often observed in the present-day universe", adds team member Fabian Lueghausen, also from Bonn. Dr Zhao explains: "The only way to explain how the two galaxies could come close to each other without merging is if dark matter isn't there. Observational evidence for a past close encounter would then strongly support the Milgromian theory of gravity."

Just such a signature might already have been found. Astronomers struggle to account for the distribution of dwarf galaxies in orbit around both the Milky Way and Andromeda. The dwarf galaxies could be explained if they were born from gas and stars ripped out of the two parent galaxies during their close encounter.
Pavel Kroupa sees this as the 'smoking gun' for the collision. "Given the arrangement and motion of the dwarf galaxies, I can't see how any other explanation works", he comments. The team now plan to model the encounter using Milgromian dynamics and are developing a computer code at Bonn University for this purpose.
In the new model, the Milky Way and Andromeda are still going to crash into each other again in the next few billion years, but it will feel like 'deja vu'. And the team believes that their discovery has profound consequences for our current understanding of the Universe. Pavel Kroupa concludes, "If we are right, the history of the cosmos will have to be rewritten from scratch."
Publication: accepted for publication in Astronomy and Astrophysics
PDF Copy of the Study: Local Group timing in Milgromian dynamics. A past Milky Way-Andromeda encounter at z>0.8
Source: Royal Astronomical Society

http://www.eurekalert.org/pub_releases/2013-07/asfm-hih070313.php

H7N9 influenza: History of similar viruses gives cause for concern

The H7N9 avian flu strain that emerged in China earlier this year has subsided for now, but it would be a mistake to be reassured by this apparent lull in infections.

The virus has several highly unusual traits that paint a disquieting picture of a pathogen that may yet lead to a pandemic, according to lead scientists from the National Institute of Allergy and Infectious Diseases. David Morens, Jeffery Taubenberger, and Anthony Fauci, in a paper published in mBio®, the online open-access journal of the American Society for Microbiology, describe the history of H7 viruses in animal and human disease and point out that H7 influenza has a tendency to become established in bird, horse, and swine populations and may spillover repeatedly into humans.
"The evidence as a whole is complex and the implications of past outbreaks for predicting the future course of the current H7N9 epizootic [an epidemic among animals] are uncertain," write the authors.
The outbreak of H7N9 earlier this year led China to temporarily close scores of live poultry markets in an effort to limit the spread of the virus. Although this previously unrecognized strain of avian influenza A has now been associated with 132 confirmed human infections and 39 related deaths (as of June 14), the rate at which new cases are recognized has dwindled in recent weeks.
In their minireview, Morens, Taubenberger and Fauci point out that despite this apparent hiatus, viruses like H7N9, which have subtype 7 hemagglutinin, are a cause for heightened concern because of several highly unusual characteristics. First, H7 viruses have repeatedly been involved in numerous explosive poultry outbreaks including incidents in New York, Canada, Mexico, the Netherlands, and Italy, and in almost all of these cases the virus eventually spilled over into humans. Also, H7 viruses have the ability to mutate from a low pathogenicity form to a high pathogenicity form in birds, a scenario that can lead to large-scale culling and ultimately to human exposure to the virus among poultry workers.
H7N9 also shares many characteristics with another influenza strain that continues to spillover into humans: highly pathogenic avian influenza H5N1. Among other commonalities, both viruses have a clinical picture that includes bilateral pneumonia, acute respiratory distress syndrome, and multi-organ failure, and it appears they are both currently unable to easily infect most humans but cause severe disease in individuals with uncharacterized genetic susceptibilities.
The fact that many H7 viruses tend to infect conjunctival cells is also cause for concern. Some, but not all, cases of human H7 infection feature prominent signs and symptoms in the eyes, including itching, swelling, and tearing, that could enhance person-to-person spread in an H7N9 outbreak.
The authors point out that many H7 viruses have adapted to infect mammals, including horses and pigs, which raises the possibility that H7N9 could adapt in a similar fashion. The possibility that H7N9 might infect pigs is particularly troubling, as swine are considered a "mixing vessel" for viruses - a breeding ground for novel viral reassortants like the 2009 H1N1 pandemic influenza strain commonly known as "swine flu".
The sum of these observations is this: we do not know what H7N9 will do next. Although avian influenza viruses have not caused widespread human transmission in 94 years of surveillance, there have been numerous instances of avian influenza spillover and H7N9 "might arguably be more likely than other avian viruses to become human-adapted," write the authors.
Regardless of its future, H7N9 certainly holds lessons for preventing human and animal pandemics. All the unknowns surrounding the virus make a strong case for enhancing basic and applied research into the evolution of influenza viruses and for better integration of influenza virology within human and veterinary public health efforts.

"We have a unique opportunity to learn more of influenza's many secrets, and thereby enhance our ability to prevent and control an important disease that seems destined to appear again and again, in multiple guises, far into the foreseeable future," write the authors.

http://bit.ly/12lFcC0

Expansive Postures May Lead Us to Dishonesty

A study finds that large, expansive body postures may influence people's honesty. Christie Nicholson reports

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Expansive body postures, like stretching one's legs, confer a sense of power. And studies show that the feeling of power can lead to dishonest behavior. Now researchers find that just sitting at a big desk or in a large chair can also influence one's honesty.

Subjects sat at desks with either a large or small working space. They were asked to unscramble anagrams without using an answer key—which was available. And those who had the big desk space cheated more than those who had the confined area.

In another experiment, volunteers played a video driving game, sitting either in a large or little seat. They had to drive through a course as fast as possible and attempt not to hit anyone. If they did make contact, they were supposed to stop playing for 10 seconds. And the big-seat drivers were more likely to hit and run.

In a real-world setting the researchers also found that those who drove cars with expansive seats parked illegally more often that those with smaller driver's seats. The studies are in the journal Psychological Science.

So next time you get behind the wheel, are you in the driver's seat or is the driver's seat controlling you?

http://www.eurekalert.org/pub_releases/2013-07/haoq-scb070913.php

Suspicions confirmed: Brain tumors in children have a common cause

Brain cancer is the primary cause of cancer mortality in children. Even in cases when the cancer is cured, young patients suffer from the stress of a treatment that can be harmful to the developing brain.

In a search for new target structures that would create more gentle treatments, cancer researchers are systematically analyzing all alterations in the genetic material of these tumors. This is the mission of the PedBrain consortium, which was launched in 2010. Led by Professor Stefan Pfister from the German Cancer Research Center (Deutsches Krebsforschungszentrum, DKFZ), the PedBrain researchers have now published the results of the first 96 genome analyses of pilocytic astrocytomas.

Pilocytic astrocytomas are the most common childhood brain tumors. These tumors usually grow very slowly. However, they are often difficult to access by surgery and cannot be completely removed, which means that they can recur. The disease may thus become chronic and have debilitating effects for affected children.

In previous work, teams of researchers led by Professor Dr. Stefan Pfister and Dr. David Jones had already discovered characteristic mutations in a major proportion of pilocytic astrocytomas. All of the changes involved a key cellular signaling pathway known as the MAPK signaling cascade. MAPK is an abbreviation for "mitogen-activated protein kinase." This signaling pathway comprises a cascade of phosphate group additions (phosphorylation) from one protein to the next – a universal method used by cells to transfer messages to the nucleus. MAPK signaling regulates numerous basic biological processes such as embryonic development and differentiation and the growth and death of cells.

"A couple of years ago, we had already hypothesized that pilocytic astrocytomas generally arise from a defective activation of MAPK signaling," says David Jones, first author of the publication. "However, in about one fifth of the cases we had not initially discovered these mutations. In a whole-genome analysis of 96 tumors we have now discovered activating defects in three other genes involved in the MAPK signaling pathway that have not previously been described in astrocytoma."

"Aside from MAPK mutations, we do not find any other frequent mutations that could promote cancer growth in the tumors. This is a very clear indication that overactive MAPK signals are necessary for a pilocytic astrocytoma to develop," says study director Stefan Pfister. The disease thus is a prototype for rare cancers that are based on defects in a single biological signaling process.

In total, the genomes of pilocytic astrocytomas contain far fewer mutations than are found, for example, in medulloblastomas, a much more malignant pediatric brain tumor. This finding is in accordance with the more benign growth behavior of astrocytomas. The number of mutations increases with the age of the affected individuals.

About one half of pilocytic astrocytomas develop in the cerebellum, the other 50 percent in various other brain regions. Cerebellar astrocytomas are genetically even more homogenous than other cases of the disease: In 48 out of 49 cases that were studied, the researchers found fusions between the BRAF gene, a central component of the MAPK signaling pathway, and various other fusion partners.

"The most important conclusion from our results," says study director Stefan Pfister, "is that targeted agents for all pilocytic astrocytomas are potentially available to block an overactive MAPK signaling cascade at various points. We might thus in the future be able to also help children whose tumors are difficult to access by surgery."

The PedBrain Tumor network consists of researchers from seven institutes led by project coordinator Peter Lichter of DKFZ. Alongside the DKFZ, participating project partners in Heidelberg are: the National Center for Tumor Diseases (NCT), Heidelberg University and the University Hospital, and the European Molecular Biology Laboratory (EMBL). In addition, scientists from Düsseldorf University Hospital and the Max Planck Institute for Molecular Genetics in Berlin have taken on tasks in the network project.

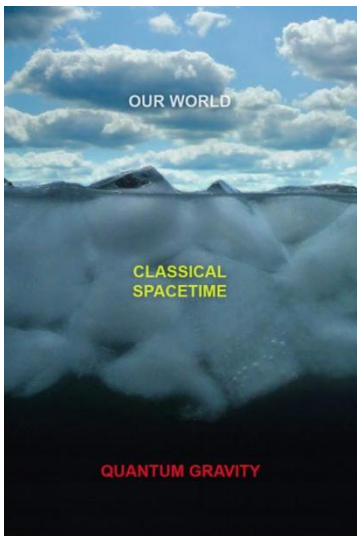
The German Cancer Aid (Deutsche Krebshilfe) provided funds of eight million Euros for PedBrain Tumor. Since July 1, 2012, the project has received another seven million Euros from the Federal Ministry of Education and Research (BMBF).

David T.W. Jones. Barbara Hutter, Natalie Jäger, Andrey Korshunov, Marcel Kool, Hans-Jörg Warnatz, Thomas Zichner, Sally R. Lambert, Marina Ryzhova, Dong Anh Khuong Quang, Adam M. Fontebasso, Adrian M. Stütz, Sonja Hutter, Marc Zuckermann, Dominik Sturm, Jan Gronych, Bärbel Lasitschka, Sabine Schmidt, Huriye Şeker-Ci1, Hendrik Witt, Marc Sultan, Meryem Ralser, Paul A. Northcott, Volker Hovestadt, Sebastian Bender, Elke Pfaff, Sebastian Stark, Damien Faury, Jeremy Schwartzentruber, Jacek Majewski, Ursula D. Weber, Marc Zapatka, Benjamin Raeder, Matthias Schlesner, Catherine L. Worth, Cynthia C. Bartholomae, Christof von Kalle, Charles D. Imbusch, Sylwester Radomski, Chris Lawerenz, Peter van Sluis, Jan Koster, Richard Volckmann, Rogier Versteeg, Hans Lehrach, Camelia Monoranu, Beate Winkler, Andreas Unterberg, Christel Herold-Mende, Till Milde, Andreas E. Kulozik, Martin Ebinger, Martin U. Schuhmann, Yoon-Jae Cho, Scott L. Pomeroy, Andreas von Deimling, Olaf Witt, Michael D. Taylor, Stephan Wolf, Matthias A. Karajannis, Charles G. Eberhart, Wolfram Scheurlen, Martin Hasselblatt, Keith L. Ligon, Mark W. Kieran, Jan O. Korbel, Marie-Laure Yaspo, Benedikt Brors, Jörg Felsberg, Guido Reifenberger, V. Peter Collins, Nada Jabado, Roland Eils, Peter Lichter and Stefan M. Pfister on behalf of the ICGC PedBrain Tumor Project: Recurrent alterations in FGFR1 and NTRK2 represent novel therapeutic targets in childhood astrocytoma. Nature Genetics (2013) DOI:10.1038/ng.2682

http://www.eurekalert.org/pub_releases/2013-07/fopu-gsi070913.php

GR20/Amaldi10: Space-time is not the same for everyone

Before the Big Bang, space-time as we know it did not exist. So how was it born?



The process of creating normal space-time from an earlier state dominated by quantum gravity has been studied for years by theorists at the Faculty of Physics, University of Warsaw. Recent analyses suggest a surprising conclusion: not all elementary particles are subject to the same space-time.

Several billion years ago, in the era soon after the Big Bang, the Universe was so dense and so hot that elementary particles felt the existence of gravity strongly. For decades, physicists around the world have been attempting to discover the laws of quantum gravity describing this phase of the evolution of the Universe. Recently Professor Jerzy Lewandowski's group at the Faculty of Physics, University of Warsaw (FUW) proposed its own model of the quantum Universe. Recent studies of its properties, discussed during the 20th International Conference on General Relativity and Gravitation (GR20), being held in Warsaw in conjunction with the 10th Edoardo Amaldi Conference on Gravitational Waves (Amaldi10), have surprised researchers. The analyses performed by Prof. Lewandowski and his PhD student Andrea Dapor show that different elementary particles "experience" the existence of different space-times.

In the mathematical model constructed by theorists at the Department of Physics, University of Warsaw, classical space-time is created by the interaction of matter with quantum gravity. The process resembles how an ice crystal lattice (symbolizing classical space-time) is formed by freezing liquid water (quantum gravity). Recent studies on the model suggest that different elementary particles generate different classical space-times. **(Source: FUW)Credit: ©Faculty of Physics, University of Warsaw**

One of the attempts to describe quantum gravity is called loop quantum gravity (LQG). This theory assumes that space-time is structurally somewhat similar to a fabric: It consists of a large number of very small fibres entangled in loops. A field with an area of one square centimetre might hold a million trillion trillion trillion trillion trillion (10^66) such fibres.

Three years ago, Prof. Lewandowski's group developed a consistent mathematical model of LQG that combines quantum mechanics with general relativity. The model assumes the existence of two interacting fields. One is a gravitational field, which can be identified with a space (since, according to the general theory of relativity, gravity warps space-time, and this curved space-time gives rise to gravitational effects). The second field in the model is a (scalar) field that assigns a number to each point in space. This field is interpreted as the simplest type of matter.

The image of reality in the model put forward by the Warsaw University physicists is quantum, and so has characteristics extremely different from those of the world we deal with every day. "In this situation, it seemed natural to ask: How does the space-time known to all of us emerge from the primary states of quantum gravity?

And since normal space-time would be born as a result of the interaction between matter and quantum gravity, can we be certain that each type of matter definitely interacts with a space-time that has the same properties?," says Prof. Lewandowski.
To find answers to these questions, theorists first derived patterns of interaction between quantum gravity effects and matter for the two mathematically simplest cases: for zero rest mass particles and for simple (scalar) non-zero rest mass particles. In the Standard Model, which in modern physics describes the elementary particles and their interactions, the relevant massless particles would be photons, and scalar non-zero rest mass particles with mass -- the famous Higgs boson, responsible for the mass of the other particles: quarks and electrons, muons, taus and their associated neutrinos.
After deriving the equations representing the behaviour of particles in accordance with the laws of the quantum gravity model, FUW physicists started to check whether similar equations could be obtained with the use of ordinary space-time with different symmetries. For massless particles this turned out to be possible. The sought-for space-time was isotropic, i.e. it had the same properties in all directions.
"According to the simplified model we researched, regardless of whether the photon has greater momentum or less, more energy or less, space-time appears to it to be the same in all directions," explains Prof. Lewandowski.
For particles with mass, the situation was different. The existence of mass imposes a specific additional condition on the theory. The FUW physicists showed that a classical space-time, which would simultaneously meet the mass condition and have the same properties in all directions, cannot be constructed. The appropriate space-time could be found only among anisotropic space-times. The preferred direction of these space-times was the particle's direction of motion.
"Particles with mass not only experience different space-times than photons do, but each sees its own private version of space-time depending on the direction it moves in. This finding really took us by surprise," says PhD student Andrea Dapor.
Does this latest discovery mean that the Universe of particles with mass is not isotropic? Such an assertion would be of huge experimental and observational importance. However, the answer is no, the Universe does not have a preferred direction. As observers studying the behaviour of elementary particles, we are classical, rather than quantum, systems and in a sense we are "outside" the particles' world. It is not then important what each particle "experiences" of its space-time. Regardless of the direction of flight, all particles recorded in the laboratory will have exactly the same characteristics. For this reason, experimentally confirming the theoretical predictions of the FUW team will be no trivial task.
The work of Professor Lewandowski's team was funded by grants from the Polish Ministry of Science and Higher Education and the Polish National Science Centre.

http://www.eurekalert.org/pub_releases/2013-07/sfhe-cug070913.php

Contaminated ultrasound gel tied to outbreak of healthcare-associated infections

After a 2011 outbreak of P. aeruginosa, investigators at Beaumont Health System near Detroit, Michigan determined contaminated ultrasound gel was the source of bacteria causing the healthcare-associated infection.

CHICAGO – The findings emphasize the need for increased scrutiny of contaminated medical products. This study is published in the August issue of Infection Control and Hospital Epidemiology, the journal of the Society for Healthcare Epidemiology of America.
"Ultrasound is a critical healthcare tool used every day in both diagnostic and interventional procedures," said Paul Chittick, MD, lead author of the study. "Although contaminated gel has been the cause of several documented outbreaks of infection, its potential role as a vehicle for spreading infections to patients is frequently overlooked."
In December 2011, researchers uncovered an unusual cluster of P. aeruginosa in the cardiovascular surgery intensive care unit during routine infection control surveillance. The bug is known to increase the risk of bloodstream and respiratory infections in immune-compromised individuals. Sixteen patients became colonized or infected with the bacteria, with all cases occurring in the respiratory tract. The outbreak was found to have stemmed from bottles of ultrasound transmission gel used during cardiovascular surgery. Following replacement of this gel with a sterile product, no further cases occurred.
Cultures of gel from a bottle in use in the operating room grew P. aeruginosa that was identical to the outbreak strain. It was originally thought that the gel had likely become contaminated during use. However, sealed bottles of gel grew the same P. aeruginosa strain, proving that the product was contaminated during the manufacturing process at the plant of Pharmaceutical Innovations.
As a result of this investigation, the FDA issued a warning about the gel, alerting the risk of infection posed by the product and instructing healthcare providers and systems not to use the infected products.

The Beaumont Health System investigators also recently published proposed guidelines in Infection Control and Hospital Epidemiology for the use of sterile versus nonsterile ultrasound gel. These guidelines include the need for sterile, single-dose ultrasound gel to be used for all invasive procedures and give appropriate storage and warming methods for the gel. Prior to this, no such guidelines existed in the United States.

Paul Chittick, Victoria Russo, Matthew Sims, Barbara Robinson-Dunn, Susan Oleszkowicz, Kara Sawarynski, Kimberly Powell, Jacob Makin, Elizabeth Darnell, Judith A. Boura, Bobby Boyanton, Jeffrey Band. "An Outbreak of Pseudomonas aeruginosa Respiratory Tract Infections Associated with Intrinsically Contaminated Ultrasound Transmission Gel." Infection Control and Hospital Epidemiology 34:8 (August 2013).

http://scitechdaily.com/brain-regions-associated-with-the-successful-spread-of-ideas-identified/

Brain Regions Associated With the Successful Spread of Ideas Identified

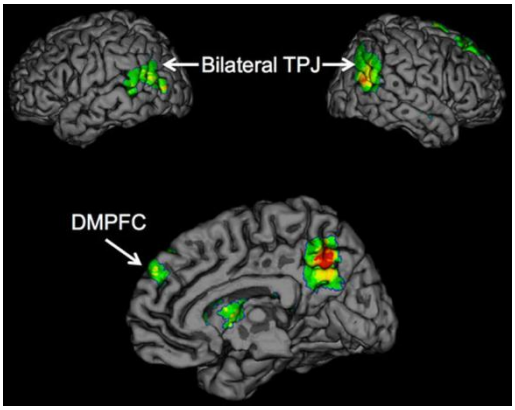
UCLA scientists have identified for the first time the brain regions associated with the successful spread of ideas.

How do ideas spread? What messages will go viral on social media, and can this be predicted?

UCLA psychologists have taken a significant step toward answering these questions, identifying for the first time the brain regions associated with the successful spread of ideas, often called "buzz."

The research has a broad range of implications, the study authors say, and could lead to more effective public health campaigns, more persuasive advertisements and better ways for teachers to communicate with students.

"Our study suggests that people are regularly attuned to how the things they're seeing will be useful and interesting, not just to themselves but to other people," said the study's senior author, Matthew Lieberman, a UCLA professor of psychology and of psychiatry and biobehavioral sciences and author of the forthcoming book "Social: Why Our Brains Are Wired to Connect." "We always seem to be on the lookout for who else will find this helpful, amusing or interesting, and our brain data are showing evidence of that. At the first encounter with information, people are already using the brain network involved in thinking about how this can be interesting to other people. We're wired to want to share information with other people. I think that is a profound statement about the social nature of our minds."



Psychologists report for the first time that the temporoparietal junction (TPJ) and dorsomedial prefrontal cortex (DMPFC) brain regions are associated with the successful spread of ideas, often called 'buzz.' **UCLA Newsroom**

The study findings are published in the online edition of the journal Psychological Science, with print publication to follow later this summer.

"Before this study, we didn't know what brain regions were associated with ideas that become contagious, and we didn't know what regions were associated with being an effective communicator of ideas," said lead author Emily Falk, who conducted the research as a UCLA doctoral student in Lieberman's lab and is currently a faculty member at the University of Pennsylvania's Annenberg School for Communication. "Now we have mapped the brain regions associated with ideas that are likely to be contagious and are associated with being a good 'idea salesperson.' In the future, we would like to be able to use these brain maps to forecast what ideas are likely to be successful and who is likely to be effective at spreading them."

In the first part of the study, 19 UCLA students (average age 21), underwent functional magnetic resonance imaging (fMRI) brain scans at UCLA's Ahmanson–Lovelace Brain Mapping Center as they saw and heard information about 24 potential television pilot ideas. Among the fictitious pilots — which were presented by a separate group of students — were a show about former beauty-queen mothers who want their daughters to follow in their footsteps; a Spanish soap opera about a young woman and her relationships; a reality show in which contestants travel to countries with harsh environments; a program about teenage vampires and werewolves; and a show about best friends and rivals in a crime family.

The students exposed to these TV pilot ideas were asked to envision themselves as television studio interns who would decide whether or not they would recommend each idea to their "producers." These students made videotaped assessments of each pilot. Another group of 79 UCLA undergraduates (average age 21) was asked to act as the "producers." These students watched the interns' videos assessments of the pilots and then made their own ratings about the pilot ideas based on those assessments.

Lieberman and Falk wanted to learn which brain regions were activated when the interns were first exposed to information they would later pass on to others.

"We're constantly being exposed to information on Facebook, Twitter and so on," said Lieberman. "Some of it we pass on, and a lot of it we don't. Is there something that happens in the moment we first see it — maybe

before we even realize we might pass it on — that is different for those things that we will pass on successfully versus those that we won't?"
It turns out, there is. The psychologists found that the interns who were especially good at persuading the producers showed significantly more activation in a brain region known as the temporoparietal junction, or TPJ, at the time they were first exposed to the pilot ideas they would later recommend. They had more activation in this region than the interns who were less persuasive and more activation than they themselves had when exposed to pilot ideas they didn't like. The psychologists call this the "salesperson effect."
"It was the only region in the brain that showed this effect," Lieberman said. One might have thought brain regions associated with memory would show more activation, but that was not the case, he said.
"We wanted to explore what differentiates ideas that bomb from ideas that go viral," Falk said. "We found that increased activity in the TPJ was associated with an increased ability to convince others to get on board with their favorite ideas. Nobody had looked before at which brain regions are associated with the successful spread of ideas. You might expect people to be most enthusiastic and opinionated about ideas that they themselves are excited about, but our research suggests that's not the whole story. Thinking about what appeals to others may be even more important."
The TPJ, located on the outer surface of the brain, is part of what is known as the brain's "mentalizing network," which is involved in thinking about what other people think and feel. The network also includes the dorsomedial prefrontal cortex, located in the middle of the brain.
"When we read fiction or watch a movie, we're entering the minds of the characters — that's mentalizing," Lieberman said. "As soon as you hear a good joke, you think, 'Who can I tell this to and who can't I tell?' Making this judgment will activate these two brain regions. If we're playing poker and I'm trying to figure out if you're bluffing, that's going to invoke this network. And when I see someone on Capitol Hill testifying and I'm thinking whether they are lying or telling the truth, that's going to invoke these two brain regions.
"Good ideas turn on the mentalizing system," he said. "They make us want to tell other people."
The interns who showed more activity in their mentalizing system when they saw the pilots they intended to recommend were then more successful in convincing the producers to also recommend those pilots, the psychologists found. "As I'm looking at an idea, I might be thinking about what other people are likely to value, and that might make me a better idea salesperson later," Falk said.
By further studying the neural activity in these brain regions to see what information and ideas activate these regions more, psychologists potentially could predict which advertisements are most likely to spread and go viral and which will be most effective, Lieberman and Falk said.
Such knowledge could also benefit public health campaigns aimed at everything from reducing risky behaviors among teenagers to combating cancer, smoking and obesity.
"The explosion of new communication technologies, combined with novel analytic tools, promises to dramatically expand our understanding of how ideas spread," Falk said. "We're laying basic science foundations to addressimportant public health questions that are difficult to answer otherwise — about what makes campaigns successful and how we can improve their impact."
As we may like particular radio DJs who play music we enjoy, the Internet has led us to act as "information DJs" who share things that we think will be of interest to people in our networks, Lieberman said.
"What is new about our study is the finding that the mentalizing network is involved when I read something and decide who else might be interested in it," he said. "This is similar to what an advertiser has to do. It's not enough to have a product that people should like."
Co-authors of the study are Sylvia Morelli, a former graduate student in Lieberman's lab who is now a postdoctoral scholar at Stanford University; Locke Welbourn, a UCLA graduate student in Lieberman's laboratory; and Karl Dambacher, a former UCLA undergraduate research assistant.
Publication: Emily B. Falk, et al., "Creating Buzz – The Neural Correlates of Effective Message Propagation," Psychological Science, May 30, 2013; doi: 10.1177/0956797612474670 Source: Stuart Wolpert, UCLA Newsroom

http://phys.org/news/2013-07-climate-years.html

Rocks can restore our climate... after 300,000 years

A study of a global warming event that happened 93 million years ago suggests that the Earth can recover from high carbon dioxide emissions faster than previously thought, but that this process takes around 300,000 years after emissions decline.

Phys.org - Scientists from Oxford University studied rocks from locations including Beachy Head, near Eastbourne, and South Ferriby, North Lincolnshire, to investigate how chemical weathering of rocks 'rebalanced' the climate after vast amounts of carbon dioxide (CO_2) were emitted during more than 10,000 years of volcanic eruptions.

In chemical weathering CO2 from the atmosphere dissolved in rainwater reacts with rocks such as basalt or granite, dissolving them so that this atmospheric carbon then flows into the oceans, where a large proportion is 'trapped' in the bodies of marine organisms.
The team tested the idea that, as CO2 warms the planet, the reactions involved in chemical weathering speed up, causing more CO2 to be 'locked away', until, if CO2 emissions decline, the climate begins to cool again. The Oxford team looked at evidence from the 'Ocean Anoxic Event 2' in the Late Cretaceous when volcanic activity spewed around 10 gigatonnes of CO2 into the atmosphere every year for over 10,000 years. The researchers found that during this period chemical weathering increased, locking away more CO2 as the world warmed and enabling the Earth to stabilise to a cooler climate within 300,000 years, up to four times faster than previously thought. A report of the research is published in this week's Nature Geoscience.
'Looking at this event is rather like imagining what the Earth would be like if humans disappeared tomorrow,' said Dr Philip Pogge von Strandmann of Oxford University's Department of Earth Sciences, who led the research. 'Volcanic CO2 emissions in this period are similar to, if slightly slower than, current manmade emissions so that we can imagine a scenario in which, after human CO2 emissions ceased, the planet's climate would start to recover and cool down. The bad news is that it's likely this would take around 300,000 years.'
Reconstructing a record of past chemical weathering is challenging because of how plants and animals take carbon out of the environment. To get around this the team used a recently-developed technique involving studying lithium isotopes in marine limestone (this lithium could only come from weathering and is not changed by biological organisms).
The Ocean Anoxic Event 2 is believed to have been caused by a massive increase in volcanic activity in one of three regions: the Caribbean, Madagascar, or the Solomon Islands. The event saw the temperature of seawater around the equator warm by about 3 degrees Celsius. It is thought that this warming caused around 53% of marine species to go extinct. Animals like turtles, fish, and ammonites were amongst those severely affected.
'Everyone remembers the mass extinction of land animals caused by the K-T meteorite impact 30 million years later, thought to be responsible for the demise of the dinosaurs, but in many ways this was just as devastating for marine life,' said Dr Pogge von Strandmann. 'Whilst nutrients from weathering caused a population boom of some species near the surface of the oceans, it also led to a loss of oxygen to the deeper ocean, killing off over half of all marine species and creating a 'dead zone' of decaying animals and plants. It's a scenario we wouldn't want to see repeated today.
'Our research is good news, showing that the Earth can recover up to four times faster than we thought from CO2 emissions, but even if we stopped all emissions today this recovery would still take hundreds of thousands of years. We have to start doing something soon to remove CO2 from the atmosphere if we don't want to see a repeat of the kind of mass extinctions that global warming has triggered in the past.'
A report of the research, entitled 'Lithium isotope evidence for enhanced weathering during Oceanic Anoxic Event 2', is published in Nature Geoscience.

http://www.eurekalert.org/pub_releases/2013-07/m-dnh070913.php

Did Neandertals have language?

A recent study suggest that Neandertals shared speech and language with modern humans

Fast-accumulating data seem to indicate that our close cousins, the Neandertals, were much more similar to us than imagined even a decade ago. But did they have anything like modern speech and language? And if so, what are the implications for understanding present-day linguistic diversity? The MPI for Psycholinguistics researchers Dan Dediu and Stephen C. Levinson argue in their paper in Frontiers in Language Sciences that modern language and speech can be traced back to the last common ancestor we shared with the Neandertals roughly half a million years ago.
The Neandertals have fascinated both the academic world and the general public ever since their discovery almost 200 years ago. Initially thought to be subhuman brutes incapable of anything but the most primitive of grunts, they were a successful form of humanity inhabiting vast swathes of western Eurasia for several hundreds of thousands of years, during harsh ages and milder interglacial periods. We knew that they were our closest cousins, sharing a common ancestor with us around half a million years ago (probably Homo heidelbergensis), but it was unclear what their cognitive capacities were like, or why modern humans succeeded in replacing them after thousands of years of cohabitation. Recently, due to new palaeoanthropological and archaeological discoveries and the reassessment of older data, but especially to the availability of ancient DNA, we have started to realise that their fate was much more intertwined with ours and that, far from being slow brutes, their cognitive capacities and culture were comparable to ours.

Dediu and Levinson review all these strands of literature and argue that essentially modern language and speech are an ancient feature of our lineage dating back at least to the most recent ancestor we shared with the Neandertals and the Denisovans (another form of humanity known mostly from their genome). Their interpretation of the intrinsically ambiguous and scant evidence goes against the scenario usually assumed by most language scientists, namely that of a sudden and recent emergence of modernity, presumably due to a single – or very few – genetic mutations. This pushes back the origins of modern language by a factor of 10 from the often-cited 50 or so thousand years, to around a million years ago – somewhere between the origins of our genus, Homo, some 1.8 million years ago, and the emergence of Homo heidelbergensis. This reassessment of the evidence goes against a saltationist scenario where a single catastrophic mutation in a single individual would suddenly give rise to language, and suggests that a gradual accumulation of biological and cultural innovations is much more plausible.

Interestingly, given that we know from the archaeological record and recent genetic data that the modern humans spreading out of Africa interacted both genetically and culturally with the Neandertals and Denisovans, then just as our bodies carry around some of their genes, maybe our languages preserve traces of their languages too. This would mean that at least some of the observed linguistic diversity is due to these ancient encounters, an idea testable by comparing the structural properties of the African and non-African languages, and by detailed computer simulations of language spread.

Dediu, D., & Levinson, S. C. On the antiquity of language: The reinterpretation of Neandertal linguistic capacities and its consequences. Frontiers in Language Sciences, 4: 397. doi:10.3389/fpsyg.2013.00397

Link to publication: http://www.frontiersin.org/Language_Sciences/10.3389/fpsyg.2013.00397/full

http://www.sciencedaily.com/releases/2013/07/130709115340.htm

Double-Barreled Attack On Obesity in No Way a No-Brainer

In the constant cross talk between our brain and our gut, two gut hormones are already known to tell the brain when we have had enough to eat.

New research suggests that boosting levels of these hormones simultaneously may be an effective new weapon in the fight against obesity.

Dr Shu Lin, Dr Yan-Chuan Shi and Professor Herbert Herzog, from Sydney's Garvan Institute of Medical Research, have shown that when mice are injected with PYY3-36 and PP, they eat less, gain less fat, and tend not to develop insulin-resistance, a precursor to diabetes.

At the same time, the researchers have shown that the hormones stimulate different nerve pathways, ultimately, however, affecting complementary brain regions. Their findings are now published online in the journal Obesity.

While the double-barreled approach may seem like a no-brainer, the strongly enhanced effect seen was by no means inevitable. In the complex world of neuroscience, two plus two does not always make four.

Drug companies are in the process of conducting pre-clinical trials to examine the separate effects of boosting the hormones PYY3-36 and PP. Until now, there is no research to indicate the detailed molecular interactions that might occur when they are boosted in tandem.

When used together, the hormones independently, yet with combined force, reduce the amount of neuropeptide Y (NPY) produced by the brain, a powerful neurotransmitter that affects a variety of things including appetite, mood, heart rate, temperature and energy levels.

Each hormone also communicates with a different part of the arcuate nucleus in the hypothalamus, a region of the brain where signals can cross the normally impermeable blood / brain barrier.

The stimulated regions then produce other neuronal signals deep within the hypothalamus, bringing about a powerful combined effect.

"There are many factors that influence appetite control -- and we now realise that there won't be a single molecular target, or a single drug, that will be effective," said Dr Yan-Chuan Shi.

"It will be important for drug companies to try different combinations of targets, to see which combinations are most potent, and at the same time have no side effects, or at least minimal side effects."

"At the moment, the only effective tool against obesity is surgery. Drug companies have so far failed to produce an effective drug without unacceptable side effects, such as mood disorders, nausea or cardiovascular problems."

Yan-Chuan Shi, Zhou Lin, Jackie Lau, Hui Zhang, Miyuki Yagi, Isabella Kanzler, Amanda Sainsbury, Herbert Herzog, Shu Lin. PYY3-36 and pancreatic polypeptide reduce food intake in an additive manner via distinct hypothalamic dependent pathways in mice. Obesity, 2013; DOI: 10.1002/oby.20534

http://www.eurekalert.org/pub_releases/2013-07/uos-5om070913.php

5D optical memory in glass could record the last evidence of civilization

First experimental demonstration of recording and retrieval processes of five dimensional digital data by femtosecond laser writing

Using nanostructured glass, scientists at the University of Southampton have, for the first time, experimentally demonstrated the recording and retrieval processes of five dimensional digital data by femtosecond laser writing. The storage allows unprecedented parameters including 360 TB/disc data capacity, thermal stability up to 1000°C and practically unlimited lifetime.

Coined as the 'Superman' memory crystal, as the glass memory has been compared to the "memory crystals" used in the Superman films, the data is recorded via self-assembled nanostructures created in fused quartz, which is able to store vast quantities of data for over a million years. The information encoding is realised in five dimensions: the size and orientation in addition to the three dimensional position of these nanostructures.

A 300 kb digital copy of a text file was successfully recorded in 5D using ultrafast laser, producing extremely short and intense pulses of light. The file is written in three layers of nanostructured dots separated by five micrometres (one millionth of a metre). The self-assembled nanostructures change the way light travels through glass, modifying polarisation of light that can then be read by combination of optical microscope and a polariser, similar to that found in Polaroid sunglasses.

The research is led by the ORC researcher Jingyu Zhang and conducted under a joint project with Eindhoven University of Technology.

"We are developing a very stable and safe form of portable memory using glass, which could be highly useful for organisations with big archives. At the moment companies have to back up their archives every five to ten years because hard-drive memory has a relatively short lifespan," says Jingyu.

"Museums who want to preserve information or places like the national archives where they have huge numbers of documents, would really benefit."

The Physical Optics group from the ORC presented their ground-breaking paper at the photonics industry's renowned Conference on Lasers and Electro-Optics (CLEO'13) in San Jose. The paper, '5D Data Storage by Ultrafast Laser Nanostructuring in Glass' was presented by the during CLEO's prestigious post deadline session. This work was done in the framework of EU project Femtoprint

Professor Peter Kazansky, the ORC's group supervisor, adds: "It is thrilling to think that we have created the first document which will likely survive the human race. This technology can secure the last evidence of civilisation: all we've learnt will not be forgotten."

The team are now looking for industry partners to commercialise this ground-breaking new technology.

http://www.bbc.co.uk/news/science-environment-23180271

New idea tackles Earth core puzzle

Scientists have proposed a radical new model for the make-up of the Earth's core.

By Simon Redfern BBC News

The study may explain a longstanding puzzle about the most inaccessible part of our planet.

It suggests that differences between the east and west hemispheres of the core are explained by the way iron atoms pack together. Details appear in the journal Scientific Reports.

Lying more than 5,000km beneath our feet, at the centre of the Earth, the core is beyond the reach of direct investigation. Broadly speaking, it consists of a solid sphere of metal sitting within a liquid outer core.

The inner core started to solidify more than a billion years ago. It has a radius of about 1,220km, but is growing by about 0.5mm each year. But the stuff that the core is made from remains a longstanding unresolved problem.

Clues come from the speeds that seismic waves generated by earthquakes pass through the core.

These tell us its density and elasticity, but the precise arrangement of iron atoms forming the crystalline core controls these numbers. How those atoms are arranged remains unclear, since the conditions of extreme pressure and temperature at the core cannot easily be replicated in the laboratory.

Seismic data indicate that the western and eastern hemispheres of Earth's inner core differ, and this has led some to suggest that the core was once subjected to an impulse - presumably from the collision of a space rock or planetoid which shook the whole Earth.

The core, it is suggested, is constantly moving sideways. As it does, the front side is melting and the rear side crystallising, but the core is held centrally by gravity. With all these seismic complexities, the link between the crystal structure and the geophysical observations has yet to be resolved.

In Scientific Reports, Maurizio Mattesini from the Complutense University of Madrid, Spain, and colleagues propose a novel possibility for the structure of the core: that it is composed of mixtures of different iron

arrangements distinguished by the way their atoms pack together. By comparing seismic data from over one thousand earthquakes across the globe with quantum mechanical models for the properties of iron, they suggest that seismic variations directly reflect variations in the iron structure.
They propose that the eastern and western sides of the core differ in the extent of mixing of these distinct structures, and suggest their results account for the dynamic eastward drift of the core through time.
Their complicated picture of the core contrasts with earlier suggestions of a more uniform mineralogy. It has yet to incorporate the effects of minor amounts of other elements in the iron alloy actually thought to be there.
But Dr Arwen Deuss, a seismologist from the University of Cambridge, commented: "This is a step in the right direction, directly comparing seismology with mineral physical properties." She added that it should eventually provide a better understanding of the birth and evolution of our planet.

http://www.scientificamerican.com/article.cfm?id=new-space-engines-interplanetary

New Space Engine Could Turn Tiny CubeSats into Interplanetary Explorers

Researchers have launched a Kickstarter campaign to fund the testing of miniaturized, high-efficiency propulsion technology

By Mike Wall and SPACE.com | Tuesday, July 9, 2013 | 7

Researchers plan to launch a tiny spacecraft to Earth orbit and beyond within the next 18 months, in a key test of new propulsion technology that could help cut the cost of planetary exploration by a factor of 1,000.
The scientists and engineers are developing a new plasma propulsion system designed for ultrasmall CubeSats. If all goes well, they say, it may be possible to launch a life-detection mission to Jupiter's ocean-harboring moon Europa or other intriguing worlds for as little as $1 million in the not-too-distant future.
"We want to enable new missions that right now cost about $1 billion, or maybe $500 million — to go, for example, explore the moons of Jupiter and Saturn," said project leader Ben Longmier, a plasma physicist and assistant professor at the University of Michigan.To get the ball rolling, Longmier and his team launched a crowdfunding campaign on the website Kickstarter Thursday (July 4). They hope to raise a minimum of $200,000 by Aug. 5, which should be enough to loft the miniature thruster on its maiden space voyage.

Miniature thruster technology

CubeSats are cheap and tiny spacecraft that weigh just 11 pounds (5 kilograms) or so. At present, they're generally restricted to Earth orbit, where they circle passively until their orbits decay and they die a fiery death in the planet's atmosphere.
But the new propulsion system - which the team calls the CubeSat Ambipolar Thruster, or CAT - could change all that, turning such bantam spacecraft into interplanetary probes, Longmier and his colleagues say. CAT is a plasma engine, generating thrust by accelerating superheated ionized gas out of a discharge chamber. The CAT thruster is powered by solar panels, and permanent magnets will guide the plasma out the back of the spacecraft.
CAT is similar in concept to the ion engine that powers NASA's Dawn spacecraft, which orbited the protoplanet Vesta for more than a year and is now on its way to study Ceres, the largest body in the main asteroid belt between Mars and Jupiter. Over long periods of time, such thrusters can accelerate spacecraft to higher speeds than typical chemical rockets can achieve.
But with CAT, everything must work on the micro scale. The thruster and power systems will weigh less than 1 pound (0.5 kg), while the supply of propellant — likely either iodine or water, though many different substances could be used — will be capped at about 5.5 pounds (2.5 kg), researchers said.
Most of the CAT components have been built and tested individually, and the team is making good progress toward incorporating them into a unified whole, researchers said.
"The hurdles that exist right now are getting our newly designed thruster up and running. We think we're about three weeks from that," Longmier told SPACE.com. "We're really sort of ramping up and hitting full tilt right now."

To Earth orbit and beyond

The main goal of the new CAT Kickstarter campaign is to raise enough money to space-test the engine in Earth orbit. The team is planning to launch its first probe within the next 18 months, though it may be possible to get off the ground even sooner, Longmier said.
The team plans to send the maiden CAT-equipped probe out into deep space as well — not all the way to Europa or Saturn's geyser-spewing moon Enceladus, but far enough to demonstrate CAT's capabilities.
"Our secondary goal is getting it out of Earth orbit and proving to the community that this thing works," Longmier said. "If it does work, it's a lot easier to get funding and write grants in the traditional sense."
Raising $200,000 should make all of this possible, while meeting other funding milestones will allow the CAT team to tackle "stretch goals." If the Kickstarter campaign nets $500,000, for example, the team will fast-track

its space trip by purchasing a commercial launch, while raising $900,000 will enable a two-CubeSat "space race" to escape Earth orbit.
Longmier and his core team at the University of Michigan are working with experts at a variety of institutions, including three different NASA centers — Ames Research Center in Moffett Field, Calif., the Jet Propulsion Laboratory in Pasadena, Calif., and Glenn Research Center in Cleveland, Ohio.
The asteroid-mining firm Planetary Resources is another partner. The billionaire-backed company, which counts Google execs Larry Page and Eric Schmidt among its investors, is interested in possibly using CAT-equipped probes to do up-close asteroid reconnaissance on the cheap, Longmier said. "That's sort of where we come in - sending that small spacecraft out as a scout, a radio beacon, to go radiotag it," he said.
Asteroid tagging is just one of many potential applications for the technology, CAT team members say. A fleet of CAT-powered CubeSats could also provide cheap global Internet access, for instance, or study the impacts of solar eruptions on Earth's neighborhood, helping scientists better understand and predict space weather.
And then there's the lure of mounting stripped-down, $1 million life-detection missions to Europa, Enceladus or other intriguing and farflung worlds. Such efforts may be possible soon, thanks to CAT, the increasing efficiency of solar panels, the decreasing size of microprocessors and other technological advances, Longmier said.
"I think we have the opportunity - for the first time, more or less, in history - to go and see if we can make these detections of life within our own solar system," Longmier said. "Not just looking at them, but going and taking sensors, doing in situ measurements, flying through the plumes of Enceladus with small spacecraft. We think we can do that in the relatively near future."
To learn more about the CAT engine and Kickstarter campaign, visit: http://www.kickstarter.com/projects/597141632/cat-a-thruster-for-interplanetary-cubesats

http://www.earthmagazine.org/article/iowa-impact-crater-confirmed

Iowa impact crater confirmed

An airborne geophysical survey mapping mneral resources in the Midwest has confirmed that a 470-million-year-old impact crater nearly five times the size of Barringer (Meteor) Crater in Arizona lies buried several hundred meters beneath the town of Decorah, Iowa.

Sara E. Pratt

3D view of Decorah, Iowa and the Upper Iowa River. Created using ESRI's ArcScene. Created by Adam Kiel, Northeast Iowa RC&D. Scene is looking due north.

The crater's existence was first hypothesized in 2008 when geologists examining cuttings from water wells drilled near the town were surprised to find evidence of a previously unknown shale deposit. When geologist Robert McKay from the Iowa Geological Survey investigated further, he found something even more surprising: The shale deposit was nearly a perfect circle, roughly 5.5 kilometers across. Further analysis of sub-shale breccias by Bevan French, a geologist at the Smithsonian's National Museum of Natural History, revealed shocked quartz — a telltale sign of an impact. Together, the evidence added up to an exciting possibility: the existence of a previously unknown impact crater in the Midwest.

An airborne geophysical survey has confirmed the discovery of an impact crater under the town of Decorah in northeastern Iowa. **Adam Kiel, U.S. Geological Survey**

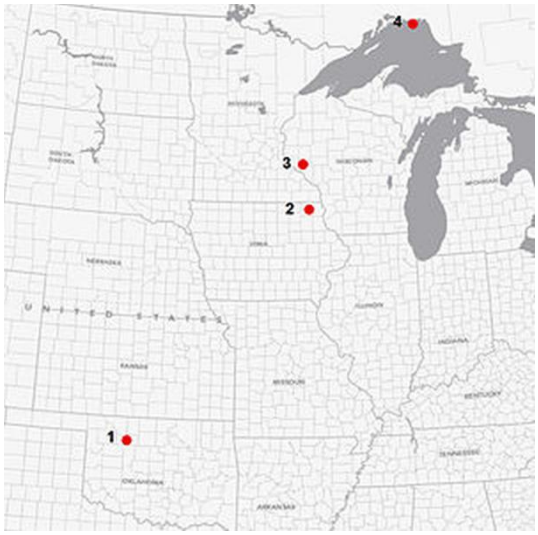
Earlier this year, more evidence accumulated when scientists at the U.S. Geological Survey (USGS) and the Iowa and Minnesota Geological Surveys conducted a high-resolution geophysical survey of the region to assess water resources and mineral resources. They were specifically mapping the Northeast Iowa Igneous Intrusive complex, which lies in the Midcontinent Rift System that formed about 1.1 billion years ago, and may contain valuable copper, nickel and platinum group metal resources.
The effort included electromagnetic and gravimetric surveys to detect conductivity and variations in rock density. The electromagnetic data revealed the full extent of the circular shale layer, likely deposited in the crater when the area was later flooded by an inland sea. Moreover, the gravity data showed "a textbook signature of a low-density feature, due to displaced bedrock in the crater, which corresponded with both the electromagnetic data and the borehole data," says Andy Kass, a geophysicist at USGS in Denver, Colo., who analyzed the new geophysical data. "We now have three distinct datasets that all confirm the presence and geometry of an impact structure."
"We were really lucky in this case that the shale layer was preserved within the crater, as it was eroded away nearly everywhere else," Kass says. "If you travel to Decorah, you see a beautiful town, but certainly no impact structure."

Given the diameter of the crater, it has previously been estimated that the impactor was a meteorite about 250 meters in diameter. The crater joins a suite of Middle Ordovician impact craters in the Midwest - including craters in Ames, Okla., Rock Elm, Wis., and the Slate Islands of Lake Superior in Ontario, Canada - that may, or may not, have resulted from the same impactor. "It's a tantalizing possibility," Kass says. "Unfortunately, it's impossible to use dating techniques to see if all the impactors happened on a single day."

Statistically, he says, impactors of the size of those in the Midwest should hit somewhere on Earth every 30,000 to 60,000 years.

Kass continues to analyze the data to create a 3-D computer model of the crater to better understand its structural features, the geometry and energy of the impact, and whether it might be related to the other Midwest impact structures. "There is a lot of work left to be done," he says.

"This is a major find with both scientific and societal implications," says Douglas Howard, a planetary geologist and the associate program coordinator for StateMap and EdMap at the USGS National Cooperative Geologic Mapping Program, which funded the borehole research. The airborne geophysical survey was funded by the USGS Mineral Resources Program.



North American Middle Ordovician impact craters, which may be part of the Ordovician meteor event. Key: 1: Ames crater, 2: Decorah crater, 3: Rock Elm Disturbance, 4: Slate Islands crater.

The discovery of a new extraterrestrial impact site is not only valuable to planetary geologists, Howard says, but also to hydrologists and resource planners modeling groundwater flow in the region. It also highlights one of the benefits of basic field research. "As with a lot of geology," Howard says, "until you get out there, you don't know what you're going to find under your feet."

http://www.eurekalert.org/pub_releases/2013-07/cp-tds070313.php

The dark side of artificial sweeteners

More and more Americans are consuming artificial sweeteners as an alternative to sugar, but whether this translates into better health has been heavily debated.

An opinion article published by Cell Press on July 10th in the journal Trends in Endocrinology & Metabolism reviews surprising evidence on the negative impact of artificial sweeteners on health, raising red flags about all sweeteners—even those that don't have any calories.

"It is not uncommon for people to be given messages that artificially-sweetened products are healthy, will help them lose weight or will help prevent weight gain," says author Susan E. Swithers of Purdue University. "The data to support those claims are not very strong, and although it seems like common sense that diet sodas would not be as problematic as regular sodas, common sense is not always right."

Consumption of sugar-sweetened drinks has been linked to obesity, type 2 diabetes, and metabolic syndrome—a group of risk factors that raises the risk for heart disease and stroke. As a result, many Americans have turned to artificial sweeteners, which are hundreds of times sweeter than sugar but contain few, if any, calories.

However, studies in humans have shown that consumption of artificially sweetened beverages is also associated with obesity, type 2 diabetes, and metabolic syndrome as well as cardiovascular disease. As few as one of these drinks per day is enough to significantly increase the risk for health problems.

Moreover, people who regularly consume artificial sweeteners show altered activation patterns in the brain's pleasure centers in response to sweet taste, suggesting that these products may not satisfy the desire for sweets. Similarly, studies in mice and rats have shown that consumption of noncaloric sweeteners dampens physiological responses to sweet taste, causing the animals to overindulge in calorie-rich, sweet-tasting food and pack on extra pounds.

Taken together, the findings suggest that artificial sweeteners increase the risk for health problems to an extent similar to that of sugar and may also exacerbate the negative effects of sugar. "These studies suggest that telling people to drink diet sodas could backfire as a public health message," Swithers says. "So the current public health message to limit the intake of sugars needs to be expanded to limit intake of all sweeteners, not just sugars."

Trends in Endocrinology & Metabolism, Swithers et al.: "Artificial sweeteners produce the counterintuitive effect of inducing metabolic derangements."

http://www.eurekalert.org/pub_releases/2013-07/fhcr-scl070913.php

Study confirms link between omega-3 fatty acids and increased prostate cancer risk

Consumption of fatty fish and fish-oil supplements linked to 71 percent higher risk

SEATTLE – A second large, prospective study by scientists at Fred Hutchinson Cancer Research Center has confirmed the link between high blood concentrations of omega-3 fatty acids and an increased risk of prostate cancer.

Published July 11 in the online edition of the Journal of the National Cancer Institute, the latest findings indicate that high concentrations of EPA, DPA and DHA – the three anti-inflammatory and metabolically related fatty acids derived from fatty fish and fish-oil supplements – are associated with a 71 percent increased risk of high-grade prostate cancer. The study also found a 44 percent increase in the risk of low-grade prostate cancer and an overall 43 percent increase in risk for all prostate cancers.

The increase in risk for high-grade prostate cancer is important because those tumors are more likely to be fatal.

The findings confirm a 2011 study published by the same Fred Hutch scientific team that reported a similar link between high blood concentrations of DHA and a more than doubling of the risk for developing high-grade prostate cancer. The latest study also confirms results from a large European study.

"The consistency of these findings suggests that these fatty acids are involved in prostate tumorigenesis and recommendations to increase long-chain omega-3 fatty acid intake, in particular through supplementation, should consider its potential risks," the authors wrote.

"We've shown once again that use of nutritional supplements may be harmful," said Alan Kristal, Dr.P.H., the paper's senior author and member of the Fred Hutch Public Health Sciences Division.

Kristal also noted a recent analysis published in the Journal of the American Medical Association that questioned the benefit of omega-3 supplementation for cardiovascular diseases. The analysis, which combined the data from 20 studies, found no reduction in all-cause mortality, heart attacks or strokes.

"What's important is that we have been able to replicate our findings from 2011 and we have confirmed that marine omega-3 fatty acids play a role in prostate cancer occurrence," said corresponding author Theodore Brasky, Ph.D., a research assistant professor at The Ohio State University Comprehensive Cancer Center who was a postdoctoral trainee at Fred Hutch when the research was conducted. "It's important to note, however, that these results do not address the question of whether omega-3's play a detrimental role in prostate cancer prognosis," he said.

Kristal said the findings in both Fred Hutch studies were surprising because omega-3 fatty acids are believed to have a host of positive health effects based on their anti-inflammatory properties. Inflammation plays a role in the development and growth of many cancers.

It is unclear from this study why high levels of omega-3 fatty acids would increase prostate cancer risk, according to the authors, however the replication of this finding in two large studies indicates the need for further research into possible mechanisms.

ne potentially harmful effect of omega-3 fatty acids is their conversion into compounds that can cause damage to cells and DNA, and their role in immunosuppression. Whether these effects impact cancer risk is not known.

The difference in blood concentrations of omega-3 fatty acids between the lowest and highest risk groups was about 2.5 percentage points (3.2 percent vs. 5.7 percent), which is somewhat larger than the effect of eating salmon twice a week, Kristal said.

The current study analyzed data and specimens collected from men who participated in the Selenium and Vitamin E Cancer Prevention Trial (SELECT), a large randomized, placebo-controlled trial to test whether selenium and vitamin E, either alone or combined, reduced prostate cancer risk. That study showed no benefit from selenium intake and an increase in prostate cancers in men who took vitamin E.

The group included in the this analysis consisted of 834 men who had been diagnosed with incident, primary prostate cancers (156 were high-grade cancer) along with a comparison group of 1,393 men selected randomly from the 35,500 participants in SELECT.

The National Cancer Institute and the National Center for Complementary and Alternative Medicine funded the research. Also participating in the study were additional Fred Hutch scientists and researchers from the University of Texas, University of California, University of Washington, National Cancer Institute and the Cleveland Clinic.

Editor's note: Please contact Kristen Woodward, Fred Hutch media relations, to schedule interviews and to obtain an embargoed copy of the paper, "Plasma Phospholipid Fatty Acids and Prostate Cancer Risk in the Selenium and Vitamin E Cancer Prevention Trial."

http://www.eurekalert.org/pub_releases/2013-07/bu-jge071013.php

Jagged graphene edges can slice into cell membranes

Sharp corners and jagged edges on graphene sheets enable them to puncture cell membranes.

PROVIDENCE, R.I. [Brown University] - Researchers from Brown University have shown how tiny graphene microsheets - ultra-thin materials with a number of commercial applications - could be big trouble for human cells.

The research shows that sharp corners and jagged protrusions along the edges of graphene sheets can easily pierce cell membranes. After the membrane is pierced, an entire graphene sheet can be pulled inside the cell where it may disrupt normal function. The new insight may be helpful in finding ways to minimize the potential toxicity of graphene, said Agnes Kane, chair of the Department of Pathology and Laboratory Medicine at Brown and one of the study's authors. "At a fundamental level, we want understand the features of these materials that are responsible for how they interact with cells," Kane said. "If there's some feature that is responsible for its toxicity, then maybe the engineers can engineer it out."

The findings were published online July 9 in Proceedings of the National Academy of Sciences.

Discovered about a decade ago, graphene is a sheet of carbon just one atom thick. It is incredibly strong despite being so thin and has remarkable electronic, mechanical, and photonic properties. Commercial applications in small electronic devices, solar cells, batteries and even medical devices are just around the corner. But not much is known about what effect these materials might have if they get inside the body either during the manufacturing process or during a product's lifecycle.

"These materials can be inhaled unintentionally, or they may be intentionally injected or implanted as components of new biomedical technologies," said Robert Hurt, professor of engineering and one of the study's authors. "So we want to understand how they interact with cells once inside the body."

These latest findings come from an ongoing collaboration between biologists, engineers, and material scientists at Brown aimed at understanding the toxic potential of a wide variety of nanomaterials. Their work on graphene started with some seemingly contradictory findings.

Preliminary research by Kane's biology group had shown that graphene sheets can indeed enter cells, but it wasn't clear how they got there. Huajian Gao, professor of engineering, tried to explain those results using powerful computer simulations, but he ran into a problem. His models, which simulate interactions between graphene and cell membranes at the molecular level, suggested that it would be quite rare for a microsheet to pierce a cell. The energy barrier required for a sheet to cut the membrane was simply too high, even when the sheet hit edge first.

The problem turned out to be that those initial simulations assumed a perfectly square piece of graphene. In reality, graphene sheets are rarely so pristine. When graphene is exfoliated, or peeled away from thicker chunks of graphite, the sheets come off in oddly shaped flakes with jagged protrusions called asperities. When Gao reran his simulations with asperities included, the sheets were able to pierce the membrane much more easily.

Annette von dem Bussche, assistant professor of pathology and laboratory medicine, was able to verify the model experimentally. She placed human lung, skin and immune cells in Petri dishes along with graphene microsheets. Electron microscope images confirmed that graphene entered the cells starting at rough edges and corners. The experiments showed that even fairly large graphene sheets of up to 10 micrometers could be completely internalized by a cell. "The engineers and the material scientists can analyze and describe these materials in great detail," Kane said. "That allows us to better interpret the biological impacts of these materials. It's really a wonderful collaboration."

From here, the researchers will look in more detail into what happens once a graphene sheet gets inside the cell. But Kane says this initial study provides an important start in understanding the potential for graphene toxicity. "This is about the safe design of nanomaterials," she said. "They're man-made materials, so we should be able to be clever and make them safer."

The research was supported by the National Science Foundation (Grants CMMI-1028530 and CBET-1132446) and the Superfund Research Program of the National Institute of Environmental Health Sciences (Grant P42 ES013660). Other contributors to the study were Brown graduate students Yinfeng Li (now a professor at Shanghai Jiao Tong University), Hongyan Yuan, and Megan Creighton.

http://www.eurekalert.org/pub_releases/2013-07/cums-nvd070913.php

New virus discovered in stranded dolphin

Discovery could help protect dolphins, other animals, humans

Researchers at the Center for Infection and Immunity at Columbia University's Mailman School of Public Health and colleagues have identified a new virus associated with the death of a short-beaked dolphin found

stranded on a beach in San Diego. It is the first time that a virus belonging to the polyomavirus family has been found in a dolphin. Results appear online in the journal PLOS ONE.

Polyomavirus is known to cause disease in birds, but in mammals it is usually mild or subclinical, explains lead author Simon Anthony, PhD, a researcher in the Center for Infection and Immunity at the Mailman School. "It is therefore interesting that this particular polyomavirus appears to be what killed this dolphin. It's no immediate cause for alarm, but it's an important data point in understanding this family of viruses and the diseases they cause."

This discovery will help prepare scientists for future disease outbreaks and could even be useful in solving past unsolved cases. "There are many cases of disease in animals that we never have solved," says Dr. Anthony. When we make a new discovery like this, it allows us to ask, Have we seen it before? Will we see it again?"

The dolphin, a female calf, was found dead in October 2010. Judy St. Leger, DVM, of SeaWorld in San Diego, a co-author of the study, conducted a necropsy that identified the cause of death as tracheal bronchitis with signs of an infection, which an electron microscope revealed to be of possible viral origin. To identify the culprit, she sent a biological sample to the Center for Infection and Immunity in New York, where Dr. Anthony used high throughput DNA sequencing and a number of other techniques to identify the novel polyomavirus.

Genetic analysis showed that the polyomavirus in the San Diego dolphin was distinct from other members of the virus family. Drs. Anthony and St. Leger postulate that this might be one of many such viruses that exist in dolphins and other marine mammals. They are now searching for more examples of polyomavirus in dolphins. "It's possible that many dolphins carry this virus or other polyomaviruses without significant problems. Or perhaps it's like the common cold where they get sick for a short while and recover," says Dr. St. Leger.

Dr. Anthony stresses that without more work to study the diversity and prevalence of polyomaviruses in dolphins and other marine mammals, it is difficult to know what the specific threat of this new virus is. "We don't even know if this is even a dolphin virus. It could also represent a spillover event from another species."

While unknown in this case, the possibility intrigues him. "Several important outbreaks in the past have resulted from viruses jumping into new hosts," he says, citing another Anthony-St. Leger collaboration where they documented a case of bird flu in a seal population in New England (findings were published in mBio).

But for now, the significance of the discovery of a polyomavirus in a dolphin is that it appears to be the cause of death of this animal, and as Dr. Anthony notes, "One of our main goals is to protect the health of wildlife."

W. Ian Lipkin, director of the Center for Infection and Immunity (CII), was senior author of the paper. Co-authors included Isamara Navarette-Macias, Maria Sanchez-Leon, Komal Jain, and Thomas Briese from CII; Eliza Liang from CII and EcoHealth Alliance; Tracie Seimon from CII and the Wildlife Conservation Society at the Bronx Zoo; Judy St. Leger and Erica Nilson from SeaWorld; and William Karesh and Peter Daszak at EcoHealth Alliance.

http://www.sciencedaily.com/releases/2013/07/130710114225.htm

Acid Reflux Drug May Cause Heart Disease, Study Suggests

Drugs that help millions of people cope with acid reflux may also cause cardiovascular disease, report scientists from Houston Methodist Hospital and two other institutions in an upcoming issue of Circulation (now online).

It is the first time researchers have shown how proton pump inhibitors, or PPIs, might cause cardiovascular problems. In human tissue and mouse models, the researchers found PPIs caused the constriction of blood vessels. If taken regularly, PPIs could lead to a variety of cardiovascular problems over time, including hypertension and a weakened heart. In the paper, the scientists call for a broad, large-scale study to determine whether PPIs are dangerous.

"The surprising effect that PPIs may impair vascular health needs further investigation," said John Cooke, M.D., Ph.D., the study's principal investigator. "Our work is consistent with previous reports that PPIs may increase the risk of a second heart attack in people that have been hospitalized with an acute coronary syndrome. Patients taking PPIs may wish to speak to their doctors about switching to another drug to protect their stomachs, if they are at risk for a heart attack."

Commonly used proton pump inhibitors in the United States are lansoprazole and omeprazole, and these drugs are purchasable over the counter as brands or generics. The FDA estimates about 1 in 14 Americans has used them. In 2009, PPIs were the third-most taken type of drug in the U.S., accounting for $13 billion in sales. PPIs are used to treat a wide range of disorders, including gastroesophageal reflux disease, or GERD, infection by the ulcer-causing Helicobacter pylori, Zollinger-Ellison syndrome, and Barrett's esophagus.

Recent studies of proton pump inhibitors use by people who've already experienced severe cardiovascular events have raised concern about the anti-reflux drugs, at least for this subgroup of patients, said Cooke, chair of the Department of Cardiovascular Sciences and director of the Center for Cardiovascular Regeneration at Houston Methodist DeBakey Heart & Vascular Center.

PPIs are initially inert. After oral consumption, they are activated by specialized cells in the stomach. Once active, the molecules suppress the movement of protons into the intestine, which reduces the amount of acid present there and in the stomach.
In mouse models and cultures of human endothelial cells, Cooke and lead author Yohannes Ghebramariam, Ph.D., found that PPIs suppressed the enzyme DDAH, dimethylarginine dimethylaminohydrolase. That caused an increase in the blood levels of ADMA (asymmetric dimethylarginine), an important chemical messenger. They found ADMA in turn suppressed the production of another chemical messenger, nitric oxide, or NO, proven by 1998 Nobel Prize winners Furchgott, Ignarro, and Murad to impact cardiovascular function. Quantitative studies in mouse models showed animals fed PPIs were more likely than controls to have tense vascular tissue.
"We found that PPIs interfere with the ability of blood vessels to relax," said Ghebremariam, a Houston Methodist molecular biologist. "PPIs have this adverse effect by reducing the ability of human blood vessels to generate nitric oxide. Nitric oxide generated by the lining of the vessel is known to relax, and to protect, arteries and veins."
The researchers found PPIs led to an approximately 25 percent increase in ADMA in mouse and tissue cultures, and reduced the ability of mouse blood vessels to relax by over 30 percent on average.
Also contributing to this report were Paea LePendu, Ph.D., Jerry Lee, Daniel Erlanson, Ph.D., and Nigam H. Shah, Ph.D. (Stanford University) and Anna Slaviero, Ph.D., and James Leiper, Ph.D. (Imperial College London). Work was funded with grants from the National Institutes of Health, the American Heart Association, the Stanford SPARK program, and the Stanford Translational Research and Applied Medicine (TRAM) program. Circulation is published by the American Heart Association.
The Methodist Hospital recently changed its name to Houston Methodist Hospital.
Y. T. Ghebremariam, P. LePendu, J. C. Lee, D. A. Erlanson, A. Slaviero, N. H. Shah, J. Leiper, J. P. Cooke. An Unexpected Effect of Proton Pump Inhibitors: Elevation of the Cardiovascular Risk Factor ADMA. Circulation, 2013; DOI: 10.1161/CIRCULATIONAHA.113.003602

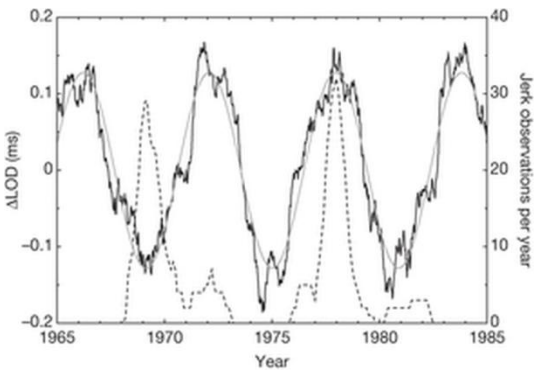
http://bit.ly/12mzyDc

Stutters in Earth's spin change day length

THREE times in the last decade Earth's spin has missed a beat. These seemingly random blips cause days to temporarily stretch and shrink. They have emerged from the clearest ever view of how long a day is.

10 July 2013 by Mark Viney

Earth's spin fluctuates as the oceans and the atmosphere push and tug on the planet's spin But these small daily variations hide longer-term patterns, some well known, some not.
Richard Holme of the University of Liverpool, UK, looked at 50 years of GPS and astronomical data to see how day length varied during that time.
The analysis threw up a well-known cycle due to slow changes at the Earth's core, which lengthen days by a few milliseconds over roughly a decade, then shrink them down again.
There's also a 5.9-year cycle, due to a persistent wobble between the fluid outer core and surrounding mantle, which changes day length by fractions of milliseconds a year.



Focus on 1965-1985 to show correlation between the 5.9-year LOD oscillation and a histogram of wavelet-determined geomagnetic jerk occurrence times. Solid black line, detrended ΔLOD; grey line, fit; dashed line, jerk observation rate.

When Holme stripped away both of these regular cycles, sudden unexpected jumps in day length emerged from the calculations.
Three times in recent years – in 2003, 2004, and 2007 – our planet's spin has stuttered. The jumps interrupt the longer-term changes by a fraction of a millisecond, and last several months before going back to normal (Nature, DOI: 10.1038/nature12282).
Satellite readings of the planet's magnetic field over the last 20 years show that the field also undergoes sudden jerks, and Holmes found that they coincide with the jumps in the Earth's spin. He says the sudden changes probably occur when a patch of molten outer core temporarily sticks to the mantle, causing a step change in angular velocity.
Jon Mound of the University of Leeds, UK, says we need to rethink the dynamics of the Earth's core in the light of these findings.

http://www.sciencedaily.com/releases/2013/07/130710182420.htm

One More Homo Species? 3D-Comparative Analysis Confirms Status of Homo Floresiensis as Fossil Human

Analysis of 3-D landmark data from skull surfaces provide compelling support for the hypothesis that Homo floresiensis was a distinct Homo species

Ever since the discovery of the remains in 2003, scientists have been debating whether Homo floresiensis represents a distinct Homo species, possibly originating from a dwarfed island Homo erectus population, or a pathological modern human. The small size of its brain has been argued to result from a number of diseases, most importantly from the condition known as microcephaly.

Based on the analysis of 3-D landmark data from skull surfaces, scientists from Stony Brook University New York, the Senckenberg Center for Human Evolution and Palaeoenvironment, Eberhard-Karls Universität Tübingen, and the University of Minnesota provide compelling support for the hypothesis that Homo floresiensis was a distinct Homo species. The study, titled "Homo floresiensis contextualized: a geometric morphometric comparative analysis of fossil and pathological human samples," is published in the July 10 edition of PLOS ONE.

The ancestry of the Homo floresiensis remains is much disputed. The critical questions are: Did it represent an extinct hominin species? Could it be a Homo erectus population, whose small stature was caused by island dwarfism? Or, did the LB1 skull belong to a modern human with a disorder that resulted in an abnormally small brain and skull? Proposed possible explanations include microcephaly, Laron Syndrome or endemic hypothyroidism ("cretinism").

The scientists applied the powerful methods of 3-D geometric morphometrics to compare the shape of the LB1 cranium (the skull minus the lower jaw) to many fossil humans, as well as a large sample of modern human crania suffering from microcephaly and other pathological conditions. Geometric morphometrics methods use 3D coordinates of cranial surface anatomical landmarks, computer imaging, and statistics to achieve a detailed analysis of shape. This was the most comprehensive study to date to simultaneously evaluate the two competing hypotheses about the status of Homo floresiensis.

The study found that the LB1 cranium shows greater affinities to the fossil human sample than it does to pathological modern humans. Although some superficial similarities were found between fossil, LB1, and pathological modern human crania, additional features linked LB1exclusively with fossil Homo. The team could therefore refute the hypothesis of pathology.

"Our findings provide the most comprehensive evidence to date linking the Homo floresiensis skull with extinct fossil human species rather than with pathological modern humans. Our study therefore refutes the hypothesis that this specimen represents a modern human with a pathological condition, such as microcephaly," stated the scientists.

Karen L. Baab, Kieran P. McNulty, Katerina Harvati. Homo floresiensis Contextualized: A Geometric Morphometric Comparative Analysis of Fossil and Pathological Human Samples. PLoS ONE, 2013; 8 (7): e69119 DOI: 10.1371/journal.pone.0069119

http://www.sciencedaily.com/releases/2013/07/130710182944.htm

Location of Body Fat Can Elevate Heart Disease, Cancer Risk

Individuals with excessive abdominal fat have a greater risk of heart disease and cancer than individuals with a similar body mass index (BMI) who carry their fat in other areas of the body, according to a study published online today in the Journal of the American College of Cardiology.

Death and disease risk associated with excess body weight can vary among individuals with similar BMI. Ectopic fat, or fat located where it is not supposed to be, in this case being visible in the abdominal area, could be the cause of this difference in risk. It's widely known that abdominal fat can be more dangerous than fat in other areas, but this study is the first to use CT scan to study specifically located fat depots for direct associations with disease risk. "Given the worldwide obesity epidemic, identification of high-risk individuals is important, as it allows targeting of preventive and therapeutic measures," said Kathryn A. Britton, MD, MPH, lead author of the study and an instructor of medicine at Brigham and Women's Hospital in Boston.

With this study, researchers sought to find a link between the location of body fat and specific risk factors for heart disease and cancer, which could explain why individuals with different body types and similar BMIs have varied obesity related health conditions.

Researchers assessed ectopic fat in the abdominal area, around the heart tissue and around the aortic artery of 3,086 participants from the Framingham Heart Study and followed the participants for heart disease and cancer for up to seven years. The average age of participants was 50 years and nearly half were women.

Each patient was assessed, using a CT scan to identify areas of fat accumulation. Over the follow-up period, patients were assessed for heart disease, cancer and death risk while adjusting for standard risk factors. Overall, there were 90 cardiovascular events, 141 cancer cases and 71 deaths. Abdominal fat, which is typically an indicator of fat around internal organs, was associated with incident heart disease and cancer after adjusting for clinical risk factors and general obesity.

"Contrary to previously published studies comparing BMI and waist circumference, the presence of abdominal fat improved the ability to predict for cardiovascular disease, supporting the hypothesis that abdominal fat may partially underlie the association of body fat and heart disease and cancer," said Caroline S. Fox, MD, MPH, senior author on the study and a senior investigator at the National Heart, Lung and Blood Institute Laboratory for Metabolic and Population Health in Framingham, Mass.

Kathryn A. Britton, Joseph M. Massaro, Joanne M. Murabito, Bernard E. Kreger, Udo Hoffmann, Caroline S. Fox. Body Fat Distribution, Incident Cardiovascular Disease, Cancer, and All-cause Mortality. Journal of the American College of Cardiology, 2013; DOI: 10.1016/j.jacc.2013.06.027

http://www.bbc.co.uk/news/health-23260057

'Stop families' from overriding donor consent

The NHS is considering preventing families from overriding the consent of people who have signed the organ donor register.

NHS Blood and Transplant (NHSBT) says it wants to ensure a person's wish to donate is honoured if they die. In a strategy document it also asks whether those on the organ donor register should receive higher priority on the transplant waiting list. The strategy has the backing of the four UK health ministers. It aims to build on the 50% increase in deceased donation rates since 2008.

NHSBT says it wants a "revolution in public attitudes and behaviour" so that individuals and families will be proud to support donation. It says knowledge of organ donation remains low outside the NHS but this can be increased through education and publicity campaigns.

The aims of the strategy are to:

Improve consent rates from relatives to above 80% (currently 57%) in all cases (families are asked to give consent whether their relative has signed the organ donor register or not)

Bring the deceased donor rate up to 26 per million of the population (currently 19 pmp)

Increase the number of patients receiving a transplant to 74 per million of the population (currently 49 pmp)

Almost everyone would accept a transplant organ if they needed one - but only 57% of families agree to donation when asked. Grieving relatives sometimes overrule the wishes of patients who have signed the organ donor register - although this usually happens when families are not aware of a loved one's wishes.

NHSBT says a shift in behaviour is needed comparable to the changes achieved in preventing drink-driving or smoking cessation. It says the UK will examine systems - such as in the US - where families are not permitted to override pre-existing consent so people can be confident their pledge to donate will be respected.

Dr Paul Murphy, from NHSBT, said: "When a family says no to donation it means someone's hopes of a life-saving transplant are dashed. They need to understand the consequences of refusal."

Although there are more than 19.5 million people on the Organ Donor Register, most will die in circumstances where organ donation is not possible. NHSBT says it should also be possible to increase the numbers of people who are able to donate by reviewing end-of-life care procedures. One example is a pilot study in Scotland which gives the option of donation following cardiac arrest and failed resuscitation.

Serious debate

The strategy calls for a national debate on proposals to increase organ donation. For example it wants to know whether the public would support a system similar to the one in Israel and Singapore where those on the organ donor register get higher priority if they ever need a transplant.

Sally Johnson, Director of Organ Donation and Transplantation at NHSBT said: "We need to have a serious debate in our society about our attitudes - is it fair to take if you won't give? Is it acceptable that three people die a day in need of an organ? Is it right to allow our organs to be buried or cremated with us when they could save or improve the lives of up to nine people?"

Last week the Welsh assembly voted to change to law to bring in an opt-out system of organ donation in 2015. Wales will be only UK country where individuals will be presumed to have consented for their organs to be donated unless they opt out.

There are around 7,300 people in the UK waiting for a transplant. Last year there were 1,212 deceased donors. NHSBT says the waiting list "considerably under-represents the true number of people who could benefit from an organ transplant". It says evidence suggests the demand for transplants is likely to continue to increase in years to come.

BMA response to UK wide strategy on organ donation

Dr Tony Calland, chair of the British Medical Association's ethics committee, said donation should become a natural and expected event. He added: "The BMA believes the best way to achieve this is through the introduction of an opt-out system for organ donation, similar to that planned for Wales from 2015.

"We need to monitor the situation in Wales but we cannot wait until 2015 to take action, we should be encouraging an informed public debate about opt-out now so that once the data are available we are ready to move forward in other parts of the UK."

http://nyti.ms/18amMMA

Study Finds Benefits in Delaying Severing of Umbilical Cord

Newborns with later clamping had higher hemoglobin levels 24 to 48 hours postpartum and were less likely to be iron-deficient three to six months after birth, the study determined.

By CATHERINE SAINT LOUIS

In most hospital delivery rooms, doctors routinely clamp and sever the umbilical cord less than a minute after an infant's birth, a practice thought to reduce the risk of maternal hemorrhaging. But a new analysis has found that delaying clamping for at least a minute after birth, which allows more time for blood to move from the placenta, significantly improves iron stores and hemoglobin levels in newborns and does not increase the risks to mothers.

Doctors usually clamp the umbilical cord in two locations, near the infant's navel and then farther along the cord, then cut it between the clamps. The timing of the procedure has been controversial for years, and the new analysis adds to a substantial body of evidence suggesting that clamping often occurs too quickly after delivery.

The new paper, published on Wednesday in The Cochrane Database of Systematic Reviews, may change minds, though perhaps not immediately. "I suspect we'll have more and more delayed cord clamping," said Dr. Jeffrey Ecker, the chair of committee on obstetrics practice for the American College of Obstetricians and Gynecologists.

Newborns with later clamping had higher hemoglobin levels 24 to 48 hours postpartum and were less likely to be iron-deficient three to six months after birth, compared with term babies who had early cord clamping, the analysis found. Birth weight also was significantly higher on average in the late clamping group, in part because babies received more blood from their mothers. Delayed clamping did not increase the risk of severe postpartum hemorrhage, blood loss or reduced hemoglobin levels in mothers, the analysis found.

"It's a persuasive finding," said Dr. Ecker. "It's tough not to think that delayed cord clamping, including better iron stores and more hemoglobin, is a good thing."

The World Health Organization recommends clamping of the cord after one to three minutes because it "improves the iron status of the infant." Occasionally delayed clamping can lead to jaundice in infants, caused by liver trouble or an excessive loss of red blood cells, and so the W.H.O. advises that access to therapy for jaundice be taken into consideration.

By contrast, in December a committee opinion by the American College of Obstetricians and Gynecologists reviewed much of the same evidence as the new analysis but found it "insufficient to confirm or refute the potential for benefits from delayed umbilical cord clamping in term infants, especially in settings with rich resources." The committee cited the risks of jaundice and the relative infrequency of iron deficiency in the United States as reasons for not changing longstanding practice.

But Dr. Tonse Raju, a neonatologist and an author of the guidelines, said he personally favored delayed cord clamping, even more so after this "very strong paper."

The new report assessed data from 15 randomized trials involving 3,911 women and infant pairs. Eileen Hutton, a midwife who teaches obstetrics at McMaster University in Ontario and published a systematic review on cord clamping, called the report "comprehensive and well done" but said she felt the conclusion was "weakly worded," considering the sum of evidence on the benefits of delayed cord clamping for neonates.

"The implications are huge," Dr. Hutton said. "We are talking about depriving babies of 30 to 40 percent of their blood at birth — and just because we've learned a practice that's bad."

Said Dr. Raju, a medical officer at the National Institute of Child Health and Human Development: "It's a good chunk of blood the baby is going to get, if you wait a minute and a half or two minutes. They need that extra amount of blood to fill the lungs." Healthy babies manage to compensate if they do not get the blood from the cord, he said, but researchers do not know how.

American doctors hesitate to recommend delaying cord clamping universally, Dr. Raju said, because there can be situations in which early clamping is required — if an infant requires resuscitation, for example, or aspirates meconium, or infant stool.

The new analysis also found a 2 percent increase in jaundice among babies who got delayed cord clamping, compared with those who did not. Dr. Raju noted that the risk, although slight, increases the need for follow-up testing three to five days postpartum.
Susan McDonald, the lead author of the Cochrane review and a professor of midwifery at La Trobe University in Melbourne, Australia, said, “In terms of a healthy start for a baby, one thing we can do by delaying cord clamping is boost their iron stores for a little bit longer.”
The new analysis did not include many women who had Caesarean sections, some experts noted.
“We don’t have enough information on the effects of delayed cord clamping for someone undergoing a Caesarean delivery in terms of postpartum hemorrhage,” said Dr. Cynthia Gyamfi-Bannerman, medical director of the perinatal clinic at Columbia University. “Waiting 30 or 60 seconds in a vaginal delivery in a low-risk patient is probably something we could do and wouldn’t have maternal consequences, but in a caesarean delivery, you’re cutting into a pregnant uterus that has a huge amount of blood.” In some scenarios, “there’s an increased risk of postpartum hemorrhage.”
Dr. McDonald acknowledged that the review did not include data on the long-term neurological outcomes for babies. “What will sway A.C.O.G. are a couple of studies in progress showing a potential long-term neurological benefit,” Dr. Raju said. Improved iron stores in theory could help reduce the risk of learning deficiencies and cognitive delay in children, which have been linked to iron-deficiency anemia in school-age children.

http://www.bbc.co.uk/news/health-23252763

Over-90s 'defying mental decline'

Today's 90-year-olds are surviving into very old age with better mental performance than ever before, Danish research suggests.

By Helen Briggs BBC News

People born in 1915 scored higher in cognitive tests in their 90s compared with those born a decade earlier, according to a study in The Lancet.
Better living standards and intellectual stimulation may be key factors, experts say.
The number of people reaching very old age is on the rise globally.
In the US, for example, the number of people aged 90 or above has more than doubled in 30 years.
In Denmark, where the study took place, the chance of surviving into the 10th decade of life has gone up by about 30% each decade for people born in 1895, 1905 and 1915.
However, there has been little research on the quality of life that people reaching such an old age can look forward to.
The researchers, led by Prof Kaare Christensen, of the University of Southern Denmark in Odense, surveyed all Danes born in 1905 who were still alive and living in the country in 1998 (3,600 people, aged 92-93).
They assessed their physical strength, mental functioning, ability to carry out daily living tasks such as walking inside and outside, and any symptoms of depression.
Twelve years later, they repeated the study with Danes born in 1915 (2,509 people, aged 94-95).
The researchers found that men and women born in 1915 performed better than those born in 1905 in terms of cognitive ability and activities of daily living, even after correcting for changes like better education.
Prof Christensen and colleagues said: "Our results show that the Danish cohort born in 1915 had better survival and scored significantly better on both the cognitive tests and the activities of daily living scale than the cohort born in 1905, despite being two years older at the time of assessment.
"This finding suggests that more people are living to older ages with better overall functioning."
The research addresses the key question of whether living into very old age is accompanied by more years of poor health, or whether overall health at an advanced age is improving.

Improved education

Commenting on the study, Prof Tom Kirkwood, associate dean for ageing at Newcastle University, said the data from Denmark was "encouraging".
"It seems that among those born in 1915, cognitive function in advanced old age is measurably better than for those born in 1905, even when underlying changes like improved education are taken into account," he said.
In the UK, the most complete picture of health in advanced old age comes from the Newcastle 85+ study, which has been looking at people born in 1921.
The investigations will be repeated in those born a decade later, giving the chance to see if the Danish findings apply in other populations.

http://www.medscape.com/viewarticle/807670?src=rss

Overall Health in US Lags Behind Other Wealthy Nations

Overall health in the United States has improved during the last 2 decades but lags behind health in other wealthy nations, according to findings from a new study that analyzed 1990-2010 data from 34 countries.

Steven Fox

The study was authored by Christopher J.L. Murray, MD, DPhil, from the Institute for Health Metrics and Evaluation, University of Washington, Seattle, along with the US Burden of Disease Collaborators, and was published online July 10 in JAMA.

"The United States spends the most per capita on health care across all countries, lacks universal health coverage, and lags behind other high-income countries for life expectancy and many other health outcome measures," the authors write.

They say that the current situation, characterized by high costs with only mediocre health outcomes, is made even worse by disparities across communities, socioeconomic groups, and race and ethnic groups.

The researchers set out to pinpoint which diseases, injuries, and risk factors are associated with the most significant negative effects on health. They also sought to find out how those risk factors and health outcomes are shifting over time. Therefore, they compared outcomes in the United States with those in countries that are part of the Organization for Economic Cooperation and Development (OECD).

From 1990 to 2010, life expectancy in the United States for both sexes combined rose from 75.2 years to 78.2 years. In 2010, the diseases and injuries that contributed most to years of life lost (YLL) were heart disease, lung cancer, stroke, chronic obstructive pulmonary disease, and road injury. During the study period, age-adjusted YLL increased for Alzheimer disease, drug use, chronic kidney disease, kidney cancer, and accidental falls. Morbidity and chronic disability now account for nearly half of the health burden in the United States, according to the researchers.

In addition, the investigators report, improvements in healthcare in the United States have failed to keep pace with those in other wealthy countries. "Among 34 OECD countries between 1990 and 2010, the US rank for the age-standardized death rate changed from 18th to 27th, for the age-standardized YLL rate from 23rd to 28th, for the age-standardized YLD rate from 5th to 6th, for life expectancy at birth from 20th to 27th, and for [healthy life expectancy] from 14th to 26th," they write.

The authors stress that given their findings, perhaps the best investments for improving the nation's health would be in public health programs that focus on sedentary lifestyles, diet, air pollution, and alcohol and tobacco use.

In an editorial accompanying the research article, Harvey V. Fineberg, MD, PhD, from the Institute of Medicine, Washington, DC, comments, "Setting the United States on a healthier course will surely require leadership at all levels of government and across the public and private sectors and actively engaging the health professions and the public."

This study is supported in part by the Intramural Program of the National Institutes of Health, the National Institute of Environmental Health Sciences, and the Bill and Melinda Gates Foundation. The authors and Dr. Fineberg have disclosed no relevant financial relationships.

JAMA. Published online July 10, 2013. *Article full text, Editorial full text*

http://www.eurekalert.org/pub_releases/2013-07/uota-scd071113.php

Scientists cast doubt on theory of what triggered Antarctic glaciation

A team of U.S. and U.K. scientists has found geologic evidence that casts doubt on one of the conventional explanations for how Antarctica's ice sheet began forming.

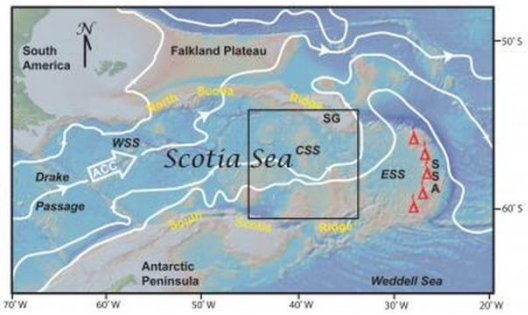
Ian Dalziel, research professor at The University of Texas at Austin's Institute for Geophysics and professor in the Jackson School of Geosciences, and his colleagues report the findings today in an online edition of the journal Geology.

The Antarctic Circumpolar Current (ACC), an ocean current flowing clockwise around the entire continent, insulates Antarctica from warmer ocean water to the north, helping maintain the ice sheet. For several decades, scientists have surmised that the onset of a complete ACC played a critical role in the initial glaciation of the continent about 34 million years ago.

Now, rock samples from the central Scotia Sea near Antarctica reveal the remnants of a now-submerged volcanic arc that formed sometime before 28 million years ago and might have blocked the formation of the ACC until less than 12 million years ago. Hence, the onset of the ACC may not be related to the initial glaciation of Antarctica, but rather to the subsequent well-documented descent of the planet into a much colder "icehouse" glacial state.

"If you had sailed into the Scotia Sea 25 million years ago, you would have seen a scattering of volcanoes rising above the water," says Dalziel. "They would have looked similar to the modern volcanic arc to the east, the South Sandwich Islands."

Using multibeam sonar to map seafloor bathymetry, which is analogous to mapping the topography of the land surface, the team identified seafloor rises in the central Scotia Sea. They dredged the seafloor at various points on the rises and discovered volcanic rocks and sediments created from the weathering of volcanic rocks. These samples are distinct from normal ocean floor lavas and geochemically identical to the presently active South Sandwich Islands volcanic arc to the east of the Scotia Sea that today forms a barrier to the ACC, diverting it northward.



This is a physiographic map of the present-day Scotia Sea, Drake Passage and adjacent land masses. The white arrows show the present path of the several branches of the deep Antarctic Circumpolar Current (ACC) centered on its core. The area of study in the central Scotia Sea (CSS) is shown by the black box to the south of South Georgia island (SG). The volcano symbols mark the active South Sandwich volcanic arc (SSA). (WSS = western Scotia Sea; ESS = eastern Scotia Sea) **University of Texas at Austin**

Using a technique known as argon isotopic dating, the researchers found that the samples range in age from about 28 million years to about 12 million years. The team interpreted these results as evidence that an ancient volcanic arc, referred to as the ancestral South Sandwich arc (ASSA), was active in the region during that time and probably much earlier. Because the samples were taken from the current seafloor surface and volcanic material accumulates from the bottom up, the researchers infer that much older volcanic rock lies beneath. Combined with models of how the seafloor sinks vertically with the passage of time, the team posits that the ASSA originally rose above sea level and would have blocked deep ocean currents such as the ACC.

Two other lines of evidence support the notion that the ACC didn't begin until less than 12 million years ago. First, the northern Antarctic Peninsula and southern Patagonia didn't become glaciated until less than approximately 12 million years ago. And second, certain species of microscopic creatures called dinoflagellates that thrive in cold polar water began appearing in sediments off southwestern Africa around 11.1 million years ago, suggesting colder water began reaching that part of the Atlantic Ocean.

The research team also includes Larry Lawver and Marcy Davis at The University of Texas at Austin's Institute for Geophysics; Julian Pearce at Cardiff University (U.K.); P.F. Barker at the University of Birmingham (U.K.) (deceased); Alan Hastie at Cardiff University and the University of Edinburgh (U.K.); Dan Barfod at the Natural Environment Research Council's Argon Research Facility (U.K.); and Hans-Werner Schenke at the Alfred Wegener Institute (Germany).

Support was provided by the U.S. National Science Foundation's Office of Polar Programs, the U.K. Natural Environment Research Council, the Alfred Wegener Institute (Germany) and the British Antarctic Survey.

http://www.eurekalert.org/pub_releases/2013-07/asu-ntu071113.php

New theory uncovers cancer's deep evolutionary roots

Tracing cancer back to the dawn of multicellularity could explain its mysterious properties and transform therapy

TEMPE, Ariz. - A new way to look at cancer - by tracing its deep evolutionary roots to the dawn of multicellularity more than a billion years ago - has been proposed by Paul Davies of Arizona State University's Beyond Center for Fundamental Concepts in Science in collaboration with Charles Lineweaver of the Australian National University. If their theory is correct, it promises to transform the approach to cancer therapy, and to link the origin of cancer to the origin of life and the developmental processes of embryos.

Davies and Lineweaver are both theoretical physicists and cosmologists with experience in the field of astrobiology -- the search for life beyond Earth. They turned to cancer research only recently, in part because of the creation at Arizona State University of the Center for the Convergence of Physical Science and Cancer Biology. The Center is one of twelve established by the National Cancer Institute to encourage physical scientists to lend their insights into tackling cancer.

The new theory challenges the orthodox view that cancer develops anew in each host by a series of chance mutational accidents. Davies and Lineweaver claim that cancer is actually an organized and systematic response to some sort of stress or physical challenge. It might be triggered by a random accident, they say, but thereafter it more or less predictably unfolds.

Their view of cancer is outlined in the article "Exposing cancer's deep evolutionary roots," written by Davies. It appears in a special July issue of Physics World devoted to the physics of cancer.

"We envisage cancer as the execution of an ancient program pre-loaded into the genomes of all cells," says Davies, an Arizona State University Regents Professor. "It is rather like Windows defaulting to 'safe mode' after suffering an insult of some sort." As such, he describes cancer as a throwback to an ancestral phenotype.
The new theory predicts that as cancer progresses through more and more malignant stages, it will express genes that are more deeply conserved among multicellular organisms, and so are in some sense more ancient. Davies and Lineweaver are currently testing this prediction by comparing gene expression data from cancer biopsies with phylogenetic trees going back 1.6 billion years, with the help of Luis Cisneros, a postdoctoral researcher with Arizona State University's Beyond Center.
But if this is the case, then why hasn't evolution eliminated the ancient cancer subroutine?
"Because it fulfills absolutely crucial functions during the early stages of embryo development," Davies explains. "Genes that are active in the embryo and normally dormant thereafter are found to be switched back on in cancer. These same genes are the 'ancient' ones, deep in the tree of multicellular life."
The link with embryo development has been known to cancer biologists for a long time, says Davies, but the significance of this fact is rarely appreciated. If the new theory is correct, researchers should find that the more malignant stages of cancer will re-express genes from the earliest stages of embryogenesis. Davies adds that there is already some evidence for this in several experimental studies, including recent research at Harvard University and the Albert Einstein College of Medicine in New York.
"As cancer progresses through its various stages within a single organism, it should be like running the evolutionary and developmental arrows of time backward at high speed," says Davies.
This could provide clues to future treatments. For example, when life took the momentous step from single cells to multicellular assemblages, Earth had low levels of oxygen. Sure enough, cancer reverts to an ancient form of metabolism called fermentation, which can supply energy with little need for oxygen, although it requires lots of sugar.
Davies and Lineweaver predict that if cancer cells are saturated with oxygen but deprived of sugar, they will become more stressed than healthy cells, slowing them down or even killing them. ASU's Center for the Convergence of Physical Science and Cancer Biology, of which Davies is principal investigator, is planning a workshop in November to examine the clinical evidence for this.
"It is clear that some radically new thinking is needed," Davies states. "Like aging, cancer seems to be a deeply embedded part of the life process. Also like aging, cancer generally cannot be cured but its effects can certainly be mitigated, for example, by delaying onset and extending periods of dormancy. But we will learn to do this effectively only when we better understand cancer, including its place in the great sweep of evolutionary history."

http://www.eurekalert.org/pub_releases/2013-07/t-hut070913.php

HIV used to cure 2 genetic diseases: The idea of an Italian scientist proves successful

Science publishes the results of the team of Luigi Naldini, director of the San Raffaele Telethon Institute for Gene Therapy, in Milan (Italy)

The AIDS virus can be used to treat two severe hereditary diseases. After an Italian scientist's "stroke of genius" in 1996, and after years of promising results in the laboratory, double official recognition by one of the most important international scientific journals has now arrived. And six children from all over the world, after three years of treatment, are well and show significant benefits. The announcement was made in two studies published today in Science* by researchers at the San Raffaele Telethon Institute for Gene Therapy (TIGET) in Milan, led by Luigi Naldini, demonstrating that gene therapy vectors derived from the HIV virus works against two severe genetic diseases, metachromatic leukodystrophy and Wiskott-Aldrich syndrome.
"Three years after the start of the clinical trial," says Naldini, "the results obtained from the first six patients are very encouraging: the therapy is not only safe, but also effective and able to change the clinical history of these severe diseases. After 15 years of effort and our successes in the laboratory, but frustration as well, it's really exciting to be able to give a concrete solution to the first patients," explains the director of TIGET.
At the origin of both diseases is a genetic defect that results in the deficiency of a protein essential for the organism in the early years of life. In the case of metachromatic leukodystrophy, which currently lacks any effective treatment, it is the nervous system to be affected: babies with this disease are apparently healthy at birth, but at some point they begin to gradually lose the cognitive and motor skills they have acquired, with no possibility of arresting the neurodegenerative process. Children with Wiskott-Aldrich syndrome, on the other hand, have a faulty immune system that makes them much more vulnerable than normal to the development of infections, autoimmune diseases and cancer, as well as having a defect in the platelets which causes frequent bleeding.

After the positive results obtained in the course of many years of study in the laboratory, researchers at the San Raffaele Telethon Institute in Milan tried to correct the genetic defect that causes these diseases with gene therapy. The technique consists in withdrawing hematopoietic stem cells from the bone marrow of the patient and introducing a corrected copy of the gene that is defective using viral vectors derived from HIV (which began to be developed in 1996, thanks to Luigi Naldini's work). Once re-injected into the body, the treated cells are able to restore the missing protein to key organs.

"In patients with Wiskott-Aldrich syndrome, blood cells are directly affected by the disease and the corrected stem cells replace the diseased cells creating a properly functioning immune system and normal platelets. Thanks to gene therapy, the children no longer have to face severe bleeding and infection. They can run, play and go to school," explains Alessandro Aiuti, coordinator of the clinical study on these patients and Head of Research of the Pediatric Clinic at TIGET. "In the case of metachromatic leukodystrophy, however," says Alessandra Biffi, who heads the other study, "the therapeutic mechanism is more sophisticated: the corrected hematopoietic cells reach the brain through the blood and release the correct protein that is 'gathered' there by the surrounding nerve cells. The winning card was to make engineered cells able to produce a quantity of protein much higher than normal, and thus effectively counteract the neurodegenerative process." Eugenio Montini, who coordinated the molecular analysis of patients' cells, adds, "Until now we have never seen a way to engineer stem cells using gene therapy that is as effective and safe as this one. These results pave the way for new therapies for other more common diseases."

Both trials, which involved a team of over 70 people including researchers and clinicians, began in the spring of 2010, and called for the participation of 16 patients in total, 6 suffering from Wiskott-Aldrich syndrome and 10 from metachromatic leukodystrophy. The results published in Science refer only to the first 6 patients (three from each study), i.e. those for whom sufficient time has passed after administration of the therapy to allow scientists to draw the first significant conclusions regarding its safety and efficacy. In total, the Telethon Foundation has invested 19 million Euro for research on these two diseases (11 on metachromatic leukodystrophy and 8 on Wiskott-Aldrich syndrome).

"These preliminary results are promising and confirm the effectiveness of our efforts, which we have sustained over the years with great conviction," says the general manager of Telethon, Francesca Pasinelli. "We can say that we have created a model in which the charity organization acts not only as a funding agency, but plays a primary role in managing the development of research to ensure that each step of the process leads to the final objective, which is to provide accessible therapy to patients. To this end, we also chose to contribute towards the creation of a dedicated clinical unit and to select an Italian partner such as MolMed for vector development and production."

For Maria Grazia Roncarolo, scientific director of the San Raffaele Institute and the woman who designed and led the preparatory studies of the clinical trials of therapy for Wiskott-Aldrich syndrome, "the results described in these two studies make me very proud, both as scientific director and as pediatrician who has dedicated her entire professional life to children affected by genetic diseases. These goals are an example of how research conducted with accuracy, determination and total commitment can produce the desired results and lead to new frontiers in medicine. The translational path, from the bench in lab to the bedside of patients affected by Wiskott-Aldrich syndrome and metachromatic leukodystrophy, has also presented obstacles and frustrations, both for researchers and for parents and children who understandably find it hard to accept science 'slowness'. But the results we're showing today repay us of all the efforts and give us a great hope for the future of these children and for the possible cure of other genetic diseases".

"For years ago, when I was appointed president of Telethon – says Luca di Montezemolo – the two clinical trials at TIGET were about to start. It was a great scientific gamble and, overall, it represented an answer to the expectations of many families and patients. Today my first thought goes to them, to all those parents who contributed to our studies in the last years, although they knew research couldn't get there in time to save their own children. I also want to thank the scientists who achieved this extraordinary success and the million of Italians who have supported us with their donations".

Professor Gabriele Pelissero, Vice President of the San Raffaele Hospital concludes: "Once again our hospital proves to be a centre of excellence for the Italian healthcare system. We need to make these important realities grow in order to accept the challenge presented by the opening of the European healthcare boarders, so that we will be able to develop know-how, technologies and skills, to both continue treating Italian patients and attract patients from other countries as all the major European hospitals are about to do."

http://www.eurekalert.org/pub_releases/2013-07/nsfc-nhf071113.php

NASA Hubble finds a true blue planet

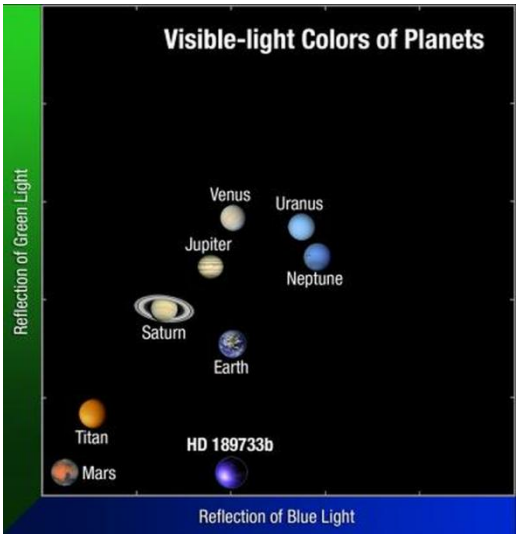
Astronomers making visible-light observations with NASA's Hubble Space Telescope have deduced the actual color of a planet orbiting another star 63 light-years away.

The planet is HD 189733b, one of the closest exoplanets that can be seen crossing the face of its star. Hubble's Space Telescope Imaging Spectrograph measured changes in the color of light from the planet before, during and after a pass behind its star. There was a small drop in light and a slight change in the color of the light. "We saw the light becoming less bright in the blue but not in the green or red. Light was missing in the blue but not in the red when it was hidden," said research team member Frederic Pont of the University of Exeter in South West England. "This means that the object that disappeared was blue."

Earlier observations have reported evidence for scattering of blue light on the planet. The latest Hubble observation confirms the evidence.

If seen directly, this planet would look like a deep blue dot, reminiscent of Earth's color as seen from space. That is where the comparison ends.

On this turbulent alien world, the daytime temperature is nearly 2,000 degrees Fahrenheit, and it possibly rains glass -- sideways -- in howling, 4,500-mph winds. The cobalt blue color comes not from the reflection of a tropical ocean as it does on Earth, but rather a hazy, blow-torched atmosphere containing high clouds laced with silicate particles. Silicates condensing in the heat could form very small drops of glass that scatter blue light more than red light.



Hubble and other observatories have made intensive studies of HD 189733b and found its atmosphere to be changeable and exotic.

HD 189733b is among a bizarre class of planets called hot Jupiters, which orbit precariously close to their parent stars. The observations yield new insights into the chemical composition and cloud structure of the entire class.

Clouds often play key roles in planetary atmospheres. Detecting the presence and importance of clouds in hot Jupiters is crucial to astronomers' understanding of the physics and climatology of other planets.

This plot compares the colors of planets in our solar system to exoplanet HD 189733b. The exoplanet's deep blue color is produced by silicate droplets, which scatter blue light in its atmosphere. **NASA, ESA, and A. Feild (STScI)**

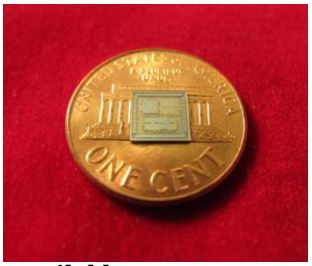
HD 189733b was discovered in 2005. It is only 2.9 million miles from its parent star, so close that it is gravitationally locked. One side always faces the star and the other side is always dark.

In 2007, NASA's Spitzer Space Telescope measured the infrared light, or heat, from the planet, leading to one of the first temperature maps for an exoplanet. The map shows day side and night side temperatures on HD 189733b differ by about 500 degrees Fahrenheit. This should cause fierce winds to roar from the day side to the night side.

http://phys.org/news/2013-07-gps-speck-electronic-device.html

When GPS fails, this speck of an electronic device could step in

In a pellet of glass the size of an apple seed, University of Michigan engineering researchers have packed seven devices that together could potentially provide navigation in the absence of the satellite-based Global Positioning System (GPS.)



This tiny "timing inertial measurement unit" could take over when GPS is unavailable. **Becky Peterson**

Phys.org - Space-based GPS – convenient for civilians and essential for the military – is far from fail-proof. It doesn't work indoors, near tall buildings or in heavy cloud cover, and it's relatively easy to jam, researchers say.

"In some cases, there is no good solution for that yet," said Khalil Najafi, the Schlumberger Professor of Engineering and chair of electrical and computer engineering. "That's one of the reasons there's interest in developing this technology."

So-called "timing and inertial measurement units" similar to this new one are used nowadays as motion sensors in cell phones, game controllers and automotive systems, but the performance of these silicon sensors isn't good enough for navigation, positioning and guidance across larger distances or long times. Inertial sensors have been used to navigate ships and aircraft since long before GPS. Those still in use today in these vehicles are much larger.

"In the smallest commercial inertial systems, the volume is about the size of an apple, and most are larger – about the volume of four apples," Najafi said. "The volume of our device is less than an apple seed. The main breakthrough is that the technology we developed is hopefully going to allow us to build very high performing devices in extremely small sizes."
At 13 cubic millimeters, the package contains a highly-precise master clock and six sensors that detect movement in six different axes.
To make their advanced inertial measurement unit, Najafi and his research group developed special fabrication processes that allows them to stack and bond the seven different devices in layers. And to make their unit more robust, they built it out of fused silica – a high quality glass – rather than silicon, which is commonly used for these types of devices.
Timing and inertial measurement units track a path by measuring speed, time, direction and distance from a starting point. "In order to measure position, you need to know where you are and then how far you've moved in so much time and in what direction," Najafi said.
GPS receivers, on the other hand, calculate location based on their movement in relation to a network of satellites. The satellites continuously ping the receiver. Najafi envisions that the two approaches could be combined so navigation systems would have a backup component and seamless operation both outdoors and indoors. But that, he believes, is at least five years away.
Other researchers who contributed to the work include: post-doctoral research fellow Zongliang Cao; graduate student Yi Yuan; assistant research scientist Becky Peterson; and visiting assistant research scientist Guohong He, all in the department of electrical engineering and computer science. Najafi and his colleagues presented a paper on the device, "Fabrication of Multi-Layer Vertically Stacked Fused Silica Microsystems" on June 18 at the 17th International Conference on Solid-State Sensors, Actuator and Microsystems Conference (Transducers '2013) in Barcelona, Spain. Mina Rais-Zadeh, assistant professor of electrical and computer engineering, and her group developed the timing unit for this system. Najafi is also an Arthur F. Thurneau professor and a professor of biomedical engineering. *More information: transducers-eurosensors2013.org/*

http://www.sciencedaily.com/releases/2013/07/130711084137.htm

Surprising Detail About Skin Cancer Uncovered

Chances of dying from skin cancer depend strongly upon how thick the primary tumor is, while those having more than one primary tumor have better survival odds

We've heard the warning many times before: wear sunscreen or cover up before going out into the sun. It's an alert worth paying attention to; the American Cancer Society expects 460 new cases to be diagnosed in 2013 in New Mexico alone. Now Marianne Berwick, PhD, and her international team of melanoma researchers support these warnings with some interesting discoveries about skin cancer. Their findings confirmed that the chances of dying from skin cancer depend strongly upon how thick the primary tumor is. But -- unexpectedly -- the team also found that those having more than one primary tumor have better survival odds.
The Journal of the American Medical Association Dermatology recently published their study on its online site. "First, we wanted to know if people with a single primary tumor were more likely to die from melanoma than people with multiple primary tumors," says Dr. Berwick. "They're not. But, if you match the thickness of the tumor, people with multiple primary tumors survive better." Dr. Berwick is a University of New Mexico Distinguished Professor of Epidemiology at the UNM Cancer Center.
The team included researchers in Australia, Italy, Canada and elsewhere in the United States. For this study, they asked 3,578 participants, newly-diagnosed with skin cancer, to answer a lengthy set of questions about their personal history, family history and lifestyle. The team also fully analyzed tissue and DNA samples from each person to obtain information about how many tumors and what mutations each person had, how thick the tumors were, how actively each tumor was growing, and whether or not the tumor surface had broken. Because of the large number of people, Dr. Berwick and her team could draw meaningful relationships between tumor qualities and people's health.
"Usually, we try to match a person who's just been diagnosed with a healthy person from the general population," says Dr. Berwick. "But that's impossible to do anymore." She explains that to find healthy people to participate in a study, researchers used to randomly dial phone numbers. "Do you answer the phone?" Dr. Berwick asks with a sly grin. So, the researchers chose instead to look at how different aspects of skin cancer affect survival and made some compelling discoveries.
The team evaluated several different factors, including the age and sex of the person, where the skin cancer was on the body, and whether they had only one tumor or more than one tumor when initially diagnosed. Most of the factors weren't statistically significant. But if the tumor created an ulcer in the inner layer of skin, called the

dermis, or if the tissue sample analysis showed that the tumor was rapidly growing, surviving melanoma was a little less likely. The most significant factor was tumor thickness. People whose tumors had grown 4 millimeters or more into the dermis, were 7.7 times more likely to die than someone whose tumor had penetrated only 1 millimeter into their dermis.
The research team then compared tumor thickness with the number of tumors at initial diagnosis. They got a surprise. They found that for people with multiple primary tumors, those whose tumors were 4 millimeters or deeper were almost three times more likely to die than those whose tumors were only 1 millimeter. But for people who had a single primary tumor, those whose tumor was 4 millimeters or deeper were 13.6 times more likely to die than those whose single tumor was only 1 millimeter. "Many people would think the opposite," says Dr. Berwick, "because they think having more tumors is worse. It seems that those people with multiple melanoma have some sort of native immune factor that's helping them. It's keeping the melanoma in check."
To learn more about why people with single primary tumors die at a much higher rate, Dr. Berwick and her international team are planning more studies to search for important immune biomarkers and to analyze how sun exposure affects skin cancer survival, an area in which Dr. Berwick is particularly interested. They will also examine tumors in more detail. "You can't tell by looking [at a tumor] how thick it is," she says. Dr. Berwick strongly recommends visiting a dermatologist if a blemish looks amiss or if a mole is growing.
"It's very exciting work," she explains enthusiastically, "because there has been no cure for people who have deep melanomas. We're just at that point where we can start to make a difference and that's very motivating."
Kricker A, Armstrong BK, Goumas C, et al. Survival for Patients With Single and Multiple Primary MelanomasThe Genes, Environment, and Melanoma StudySurvival in Patients With Primary Melanomas. JAMA Dermatology, 2013; DOI: 10.1001/jamadermatol.2013.4581

http://www.sciencenews.org/view/generic/id/351489/title/Four-question_test_IDs_women_with_depression

Four-question test ID's women with depression

Simple decision tool shows potential to detect whether a person has mood disorder

By Bruce Bower

A surprisingly simple decision-making tool shows promise as a way for physicians to identify people with depression.
An answer to the first of four questions was all that researchers usually needed to identify women who weren't depressed, say psychologist Mirjam Jenny of the Max Planck Institute for Human Development in Berlin and her colleagues. Using all four questions, this tool spotted depressed women about as well as two more-complex methods, Jenny's team reports June 24 in the Journal of Applied Research in Memory and Cognition.
If the findings hold up in other studies, physicians and other professionals with no mental-health training could use this brief technique to tag individuals who need thorough depression evaluations. "This decision tree can be used to screen for depression, but not to reach a final diagnosis," Jenny says.
Her team drew on data from 1,382 German women who completed a 21-item screening questionnaire for depression on two occasions, separated by 18 months. Based on this measure, depression initially affected 3.6 percent of the sample, or 50 individuals, and later appeared in 1.9 percent of the sample, or 26 individuals. Women's initial responses to a handful of items that best predicted whether they would rank as depressed 18 months later were used to create a four-question decision tree.
The first question in the tree — "Have you cried more than usual in the last week?" — led the pack in identifying cases of depression. A "no" response to this or any of the other three questions — which inquired about feelings in the last week of disappointment or self-hate, discouragement about the future and personal failure — exempted women from being categorized as depressed. Those who responded "yes" to all four questions were classified as depressed.
The tool is impressive, remarks physician and health care researcher Glyn Elwyn of the Dartmouth Center for Health Care Delivery Science in Hanover, N.H. But it may not be sensitive to depression in men, he says.
M. Jenny et al. Simple rules for detecting depression. Journal of Applied Research in Memory and Cognition. Published online June 24, 2013. doi:10.1016/j.jarmac.2013.06.001. Abstract available: [Go to]

http://www.eurekalert.org/pub_releases/2013-07/nu-itw071213.php

Interspecies transplant works in first step for new diabetes therapy

Animal-to-human transplant of insulin-producing cells without use of drugs is ultimate goal

CHICAGO --- In the first step toward animal-to-human transplants of insulin-producing cells for people with type 1 diabetes, Northwestern Medicine® scientists have successfully transplanted islets, the cells that produce insulin, from one species to another. And the islets survived without immunosuppressive drugs.
Northwestern scientists developed a new method that prevented rejection of the islets, a huge problem in transplants between species, called xenotransplantation.

"This is the first time that an interspecies transplant of islet cells has been achieved for an indefinite period of time without the use of immunosuppressive drugs," said study co-senior author Stephen Miller. "It's a big step forward."
"Our ultimate goal is to be able to transplant pig islets into humans, but we have to take baby steps," said Xunrong Luo, M.D., also co-senior author of the study that will be published online July 12 in the journal Diabetes. "Pig islets produce insulin that controls blood sugar in humans."
Luo is an associate professor of nephrology at Northwestern University Feinberg School of Medicine and medical director of the Human Islet Cell Transplantation Program at Northwestern Memorial Hospital. Miller is the Judy Gugenheim Research Professor of Microbiology-Immunology at Feinberg.
For people with hard-to-control type 1 diabetes, a transplant of insulin-producing islets from a deceased donor is one important way to control their chronic disease, in which their bodies do not produce insulin. However, there is a severe shortage of islet cells from deceased donors. Many patients on waiting lists don't receive the transplant or suffer damage to their heart, nerves, eyes and kidneys while they wait.
Using islets from another species would provide wider access to transplants for humans and solve the problem. But concerns about controlling rejection of transplants from a different species have made that approach seem insurmountable until now.
In the new study, scientists persuaded the immune systems of mice to recognize rat islets as their own and not reject them. Notably, the method did not require the long-term use of drugs to suppress the immune system, which have serious side effects. The islets lived and produced insulin in the mice for at least 300 days, which is as long as scientists followed the mice.
While the barrier from rats to mice is probably lower than from pigs to humans, the study showed interspecies islet transplants are possible and without immunosuppressive drugs, Luo said.
In the study, the rat splenocytes, a type of white blood cell located in the spleen, were removed and treated with a chemical that caused their deaths. Next, the dead splenocytes were injected into the mice. The cells entered the spleen and liver and were mopped up by scavenger cells. The scavengers processed the splenocytes and presented fragments of them on their cell surface, triggering a reaction that told the T cells to accept the subsequently transplanted rat islets and not attack them.
But rejection was still a threat. A unique challenge of an interspecies transplant is controlling the B cells, immune cells that are major producers of antibodies. Initially, when scientists transplanted the rat islets into the mice, the mouse immune system started producing antibodies against the rat cells causing rejection.
To solve the problem, Luo realized she needed to kill off the B-cells at the same time she injected the donor islets into the mice. Thus, she gave the mice B-cell depleting antibodies -- already used in a clinical setting in human transplants. When the B-cells naturally returned after the transplant, they no longer attacked the rat islets.
"With this method, 100 percent of the islets survived indefinitely," Luo said. "Now we're trying to figure out why the B-cells are different when they come back."
The study lead author is Shusen Wang, formerly a postdoctoral student in Luo's lab.

http://www.medscape.com/viewarticle/807760?src=rss

Maternal Antibodies May Trigger up to 25% of Autism Cases

Maternal antibodies that interfere with fetal brain proteins during pregnancy may be responsible for roughly one quarter of cases of autism spectrum disorder (ASD), a new study suggests.

Megan Brooks

Lead researcher Judy Van de Water, PhD, and colleagues have coined the term "maternal autoantibody–related," or MAR, autism for these cases.
"These findings are incredibly important because they establish a cause for a significant portion of autism cases, thereby opening up new lines of inquiry into possible biological treatments," Leonard Abbeduto, PhD, director of the University of California, Davis, MIND Institute, in Sacramento, said in a statement. Dr. Abbeduto was not involved in the study. "In addition, the findings demonstrate that a diagnostic test is within reach," he said.
In an earlier study, Dr. Van de Water and colleagues discovered a group of autoantibodies that are common in mothers of children with ASD; women with these autoantibodies had a greater risk of having a child with ASD, and the presence of these antibodies was associated with a greater severity of ASD symptoms.
The researchers have now identified 7 specific target antigens that these autoantibodies bind to. Each antigen is highly expressed in the human fetal brain and has an established role in neurodevelopment.
The study was published online July 9 in Translational Psychiatry.

Critical Role in Brain Development

The antigens include the following: lactate dehydrogenase A and B (LDH), cypin, stress-induced phosphoprotein 1 (STIP1), collapsin response mediator proteins 1 and 2 (CRMP1, CRMP2), and Y-box-binding

protein. In 246 mothers of children with ASD and 149 mothers of typically developing children, maternal reactivity to any of these antigens, individually or in combination, was statistically significantly associated with having a child with ASD (odds ratio, 3.26; 95% confidence interval, 1.92 - 5.53), the researchers found. Exclusive reactivity to specific antigen combinations was noted in 23% of mothers of children with ASD and in only 1% of mothers of typically developing children.

Behaviorally, the researchers found that children with ASD whose mothers have autoantibodies targeting a subset of these antigens had greater overall impairment compared with children with ASD whose mothers lack these particular antibodies.

This study, coupled with several prior studies, provides "compelling evidence" that placental transfer of maternal antibodies could alter fetal neurodevelopment and could play a role in autism, they note.

"Each of the target autoantigens...is known to have a critical role in the developing brain and interference with the level or function of more than one of them could act synergistically to change the trajectory of brain development," the investigators write.

"The effect of MAR autoantibodies could occur through a direct antigen–antibody interaction, thereby either decreasing the abundance of or causing functional interference of the target proteins. Alternatively, the presence of these maternal antibodies may merely serve as a biomarker of cell destruction," they point out.

Clinical Implications

Dr. Van de Water told Medscape Medical News that their new findings have potential implications for diagnosis and treatment. "We can work toward the development of a clinical test to determine the risk of having a child with autism preconception or during the early postnatal period, which would be especially important in the high-risk population of those women who already have at least 1 child on the spectrum," she said.

"It's important to note that this would be a rule-in test, as a negative result would not necessarily mean that you would have a typically developing child, but if you are positive, your risk of having a child with ASD is greater than 99%," she added. "The second implication is that we can explore a target therapeutic approach in the future through a better understanding of the specific antibody targets," Dr. Van de Water said.

She said her group is now working on identifying the specific sites on the protein targets that are recognized by the MAR antibodies (the epitopes), "which will allow us to build a more specific animal model. We will use this model to determine the mechanism through which these antibodies affect neurodevelopment, or their true pathologic significance."

The study was funded by the National Institute of Environmental Health Sciences, the US Environmental Protection Agency, the UC Davis MIND Institute, and Autism Speaks. Dr. Van de Water and a fellow author have a patent on the proteins described in the study. Dr. Van de Water is a consultant for Pediatric Bioscience, a company that has licensed this technology from UC Davis. Transl Psychiatry. Published online July 9, 2013. Full article

http://www.bbc.co.uk/news/health-23252784

Six questions that could save your life

Making a series of simple checks such as ensuring that the correct patient is on the table and operating on the right part of the body, could help surgical teams save almost half a million lives a year across the world.

By Cathy Edwards BBC Health Check

Patients have died when surgeons have removed the wrong organ, left instruments inside the body, or even operated on the wrong patient.

In 2008 the World Health Organization launched the Surgical Safety Checklist to counter human errors like these. Studies showed it was so effective in reducing complications that many hospitals quickly adopted it.

But although it was developed as a global tool, it has proved harder to roll out in poorer countries.

The Lifebox Foundation is training staff in one Rwandan hospital how to use the checklist, and hope to roll out the training to the rest of the country's 45 hospitals. So what are the questions that could save your life?

1. Are you operating on the right patient?

Making sure the right patient is on the operating table is on the checklist twice

Incredible as it sounds, surgical teams don't always operate on the right patient, with an estimated 200-300 'wrong-person' operations taking place in the USA each year. Checking the right person is on the operating table is so critical that it is on the list twice: once before the patient goes under anaesthetic and again before the incision is made.

A UK hospital trust recently performed eye surgery on the wrong patient, despite the Surgical Safety Checklist being compulsory in UK hospitals since 2010. It's not enough just to have the checklist to hand. The questions seem simple but using the list properly means really thinking each step through, says Dr Iain Wilson, a consultant anaesthetist who was involved in the development of the checklist.

"If you create a 'tickbox culture' it doesn't necessarily get introduced in the right spirit. It's a problem if you move the focus from the patient to the procedure."

2. Are you performing the right operation?

Checking the right operation is being performed can save a lot of time and distress

This is another double-check on the list. 'Wrong-site' operations are, not surprisingly, more common when there's a choice of left or right. In a case where a man died when his only healthy kidney was removed, the surgeon said he studied the X-ray the wrong way round before the operation.

In Rwanda, where very few hospitals currently use the checklist, an elderly man went in for an operation for his fractured right hip. He woke up some time later to be told they had put the screw in the the wrong side and would have to start all over again the next day.

3. Do you know the name and job of everyone on the team?

Team introductions help everyone understand what they are doing

This is something surgical teams under time pressure might balk at: why do they need to introduce each other? But group introductions not only let everyone know each other's role in the operation, they also encourage people to speak up later on in the operation, says consultant paediatric anaesthetist Dr Isabeau Walker. "There's often someone who's noticed something that's not quite right. If that person's been introduced and they've got a voice, they're much more inclined to speak up."

4. Has the anaesthetic machine been checked?

Well-functioning equipment dramatically reduces deaths from anaesthesia

Although the checklist itself only takes a few minutes to run through, it refers to inspections that should have already taken place, like thorough machine checks. This is especially important in developing countries where an estimated 40% of healthcare equipment is out of action, compared with less than 1% in high-income countries. Modern techniques and monitoring have seen deaths from anaesthesia fall to 1 in 200,000 in the developed world.

But in Togo the risk of anaesthesia mortality is as high as 1 in 133, according to a study from 2005, and the vast majority of the deaths were considered to be avoidable.

5. Are the patient's oxygen levels being monitored?

Pulse oximeters, which measure blood levels, are essential for safe surgery

Oxygen levels in the patient's blood can be monitored by a pulse oximeter, a device which clips onto a finger or earlobe and sounds an alarm if the level drops. While they are acknowledged as a standard safety device and are ubiquitous in Western operating theatres, 70% of operating theatres in Sub-Saharan Africa work without them. It is the only item on the checklist that refers to new technology not widely available throughout the world. To address this 'pulse oximetry gap", the Lifebox Foundation distributes pulse oximeters cheaply or even for free to lower income countries.

In the Rwandan project, pulse oximeter distribution goes hand in hand with Surgical Safety List training.

6. Have you removed all instruments from the patient?

One of the last steps on the checklist is to count all instruments, sponges and needles

A woman in Uganda died when a 12in mop was left in her body after a caesarean section. A mop is a large swab often used instead of suction in low-resource hospitals. By the time the mistake was discovered, the mop had completely embedded itself in the woman's intestines.

There are three stages to the checklist: "sign in", checks carried out before the patient goes under anaesthesia; "time out", before the first incision is made; and "sign out", before the patient leaves theatre.

One of the last checks before the patient leaves is a complete count of all instruments, sponges and needles - aimed at ensuring those kinds of life-and-death mistakes do not happen.

http://www.sciencedaily.com/releases/2013/07/130713122803.htm

Plant-Made Drug Reverses Breathing Paralysis, Study Suggests

Paralytic drugs like succinylcholine are often used during surgery or when critically ill patients require endotracheal intubation. But if the drug is not swiftly cleared from the patient's system, the results can be deadly.

In a new study, Tsafrir Mor, a researcher at Arizona State University's Biodesign Institute and assistant professor in the School of Life Sciences, shows that the plant-produced recombinant human enzyme butyrylcholinesterase (BChE) can rapidly reverse paralysis of the airways -- or apnea -- caused by succinylcholine.

The results, recently reported in the journal PLOS ONE, suggest an expanded role for trauma techniques, like rapid sequence intubation, as well as other methods involving the use of succinylcholine, particularly in the pre-

hospital arena, where a speedy intervention can mean the difference between life and death. Given the variety and frequency of conditions involving failed airways, a means of reversing succinylcholine-induced apnea may have profound implications. "BChE is a promiscuous enzyme that can function as an effective, safe and versatile bioscavenger, but its use has been hampered by its availability," Mor says. "Plants expressing recombinant human BChE may provide the answer for this limitation."

The new findings build on earlier work by Mor's group, which demonstrated the potential for plant-made BChE to reverse the effects of organophosphate poisons, including pesticides and weaponized nerve agents. Possibilities also exist for reversing the effects of acute cocaine overdose or using plant-derived BChE as a cocaine prophylactic, dampening the drug's euphoric effects and thereby discouraging use.

Succinylcholine is a neuromuscular blocking agent, commonly used in conjunction with a sedative during anesthesia or to allow intubation to be carried out on an emergency basis. Succinylcholine is the drug of choice for such procedures due to the rapid onset and short duration of its effects, as it is rapidly cleared by the patient's serum BChE.

In certain patients however, clearance can be dangerously prolonged, leading to succinylcholine-induced apnea that can last several hours. The phenomenon has been recognized since the 1950s and may occur as a result of genetic factors or as an acquired condition. In either case, it is generally the result of a deficiency in the serum enzyme BChE.

Because of concerns regarding patient sensitivity to succinylcholine, use of the drug as an anesthetic in pre-hospital situations has been controversial. Lacking hospital resources to deal with patients exhibiting butyrylcholinesterase deficiency, first responders are often reluctant to undertake the risks involved in emergency endotracheal intubation. Currently, cases of post-succinylcholine apnea are typically managed in hospital settings through supportive care, due to a lack of safe, effective and plentiful reversing agents.

About one in 1800 administrations of succinylcholine result in prolonged apnea. Around 65 percent of these cases result from decreased hydrolysis of succinylcholine by BChE and its variants. Inability to hydrolyze succinylcholine can have a hereditary basis, with some patients carrying an abnormal variant of one or more genes responsible for succinylcholine hydrolysis. Depending on the particular mutation, these individuals can experience periods of apnea ranging from around two hours for those carrying one copy of the non-functional allele, to three to four hours or more for those carrying two copies.

Additionally, BChE deficiency can be acquired as a result of conditions including cirrhosis, burns, liver cancer or malnutrition, or as a side effect of some commonly prescribed drugs, including oral contraceptives. The authors of the current study note that the ability to reverse hereditary or acquired apnea could significantly improve the safety margin for succinylcholine, rapidly restoring normal breathing to an affected patient.

Rapidly and safely reversing succinylcholine-induced apnea may open new possibilities for respiratory management, including new devices or medications for acute trauma situations. Such strategies could be particularly useful in cases of upper airway obstruction, where neuromuscular blockage carries a risk of airway collapse and suffocation.

Although missing or nonfunctional serum BChE could potentially be replaced using blood products, including stabilized serum, fresh frozen plasma or purified enzyme, such treatment carries the risk of blood-borne pathogens and prions as well as more common complications associated with transfusion. Mor notes that purification of the enzyme for various applications would necessitate dedicating the entire annual U.S. blood supply to produce a sufficient number of doses.

The solution underlined in the new study involves producing recombinant butyrylcholinesterase in transgenic tobacco plants. The plants are modified to synthesize the BChE enzyme in their leaves. In a series of experiments involving both mice and guinea pigs, Mor demonstrates the ability of plant-derived BChE to reverse post-succinylcholine apnea. The method can be rapidly scaled up to provide a significant stockpile of the apnea-reversing agent, without the costs and attendant risks associated with purifying butyrylcholinesterase from blood products.

Brian C. Geyer, Katherine E. Larrimore, Jacquelyn Kilbourne, Latha Kannan, Tsafrir S. Mor. Reversal of Succinylcholine Induced Apnea with an Organophosphate Scavenging Recombinant Butyrylcholinesterase. PLoS ONE, 2013; 8 (3): e59159 DOI: 10.1371/journal.pone.0059159

http://www.eurekalert.org/pub_releases/2013-07/gumc-uph070513.php

Undiagnosed pre-diabetes highly prevalent in early Alzheimer's disease study

Researcher "shocked" by how many with early Alzheimer's also found to have pre-diabetes

BOSTON – When Georgetown University neurologist R. Scott Turner, MD, PhD, began enrolling people with mild to moderate Alzheimer's disease into a nationwide study last year, he expected to find only a handful of participants with undiagnosed glucose intolerance, as all the patients were already under a doctor's care and

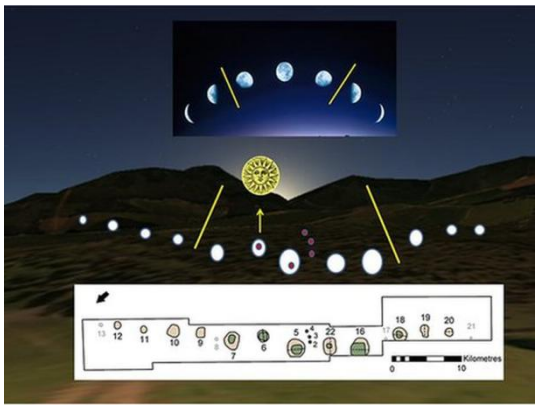
those with known diabetes were excluded. But Turner says he was "shocked" by how many study participants were found to have pre-diabetes — a finding that is triggering important questions.
Turner's study examines resveratrol, a compound found in red grapes and red wine, to see if it might change glucose levels in patients with mild to moderate Alzheimer's disease (AD). Turner says resveratrol is thought to act on proteins in the brain in a way that mimics effects of a low-calorie diet.
"We know from animal studies that caloric restriction prevents diseases of aging such as diabetes and Alzheimer's," explains Turner, director of the Georgetown University Medical Center's Memory Disorders Program. "On the flip side of the coin, having diabetes increases one's risk of developing AD. So perhaps by improving glucose tolerance, we will prevent or delay both diabetes and Alzheimer's."
To join the resveratrol study, participants were first given a fasting glucose tolerance test to obtain a baseline level, and then retested two hours after eating. During digestion, the blood sugar level increases, but the pancreas produces insulin to lower it. A high sugar level after two hours reveals glucose intolerance (pre-diabetes) or diabetes if the level is very high.
"The number of people with glucose intolerance (pre-diabetes) was much higher than expected," says Turner. "I was surprised by how many people didn't know they were pre-diabetic, and these are individuals who already get the best medical care."
Five (4 percent) of 128 participants had impaired fasting glucose levels while three others (2 percent) had findings consistent with type 2 diabetes mellitus. Of the 125 subjects who completed the two-hour test, 38 (30 percent) demonstrated glucose intolerance while 16 (13 percent) had results consistent with diabetes. Thus, the overall prevalence of impaired glucose tolerance or diabetes at two hours was 43 percent – or almost half of the individuals recruited to the study.
Turner asks, "How does glucose intolerance or diabetes lead to AD? Does the inflammation associated with AD trigger glucose intolerance? Or do both events create a vicious cycle of Alzheimer's and glucose intolerance?"
Turner's study isn't designed to answer these questions, but it might provide important clues. Turner says while a glucose tolerance test is not typically ordered by neurologists, "this result suggests that perhaps we should test all our patients with early Alzheimer's. It's a simple, inexpensive study that reveals critical health information."
Turner will discuss his findings at the Alzheimer's Association International Congress in Boston on July 14.
The resveratrol study is sponsored by the Alzheimer's Disease Cooperative Study through a grant from the National Institute on Aging. Turner reports no personal financial interests related to the study.

http://www.bbc.co.uk/news/uk-scotland-north-east-orkney-shetland-23286928

'World's oldest calendar' discovered in Scottish field

Archaeologists believe they have discovered the world's oldest lunar "calendar" in an Aberdeenshire field.

Excavations of a field at Crathes Castle found a series of 12 pits which appear to mimic the phases of the moon and track lunar months. A team led by the University of Birmingham suggests the ancient monument was created by hunter-gatherers about 10,000 years ago. The pit alignment, at Warren Field, was first excavated in 2004. The experts who analysed the pits said they may have contained a wooden post.
The Mesolithic "calendar" is thousands of years older than previous known formal time-measuring monuments created in Mesopotamia. The analysis has been published in the journal, Internet Archaeology.
The pit alignment also aligns on the Midwinter sunrise to provided the hunter-gatherers with an annual "astronomic correction" in order to better follow the passage of time and changing seasons.
Vince Gaffney, Professor of Landscape Archaeology at Birmingham, led the analysis project.
He said: "The evidence suggests that hunter-gatherer societies in Scotland had both the need and sophistication to track time across the years, to correct for seasonal drift of the lunar year and that this occurred nearly 5,000 years before the first formal calendars known in the Near East. "In doing so, this illustrates one important step towards the formal construction of time and therefore history itself."



An illustration of how the pits would have worked ***An illustration of how the pits would have worked***

The universities of St Andrews, Leicester and Bradford were also involved. Dr Richard Bates, of the University of St Andrews, said the discovery provided "exciting new evidence" of the early Mesolithic Scotland.
He added: "This is the earliest example of such a structure and there is no known comparable site in Britain or Europe for several thousands of years after the monument at Warren Field was constructed."
The Warren Field site was first discovered as unusual crop marks spotted from the air by the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS).

Dave Cowley, aerial survey projects manager at RCAHMS, said: "We have been taking photographs of the Scottish landscape for nearly 40 years, recording thousands of archaeological sites that would never have been detected from the ground. "Warren Field stands out as something special, however. It is remarkable to think that our aerial survey may have helped to find the place where time itself was invented."
Crathes Castle and its estate is in the care of the National Trust for Scotland (NTS).
From 2004 to 2006, trust staff and Murray Archaeological Services excavated the site.
NTS archaeologist Dr Shannon Fraser said: "This is a remarkable monument, which is so far unique in Britain. "Our excavations revealed a fascinating glimpse into the cultural lives of people some 10,000 years ago - and now this latest discovery further enriches our understanding of their relationship with time and the heavens."

http://www.eurekalert.org/pub_releases/2013-07/afps-esr071213.php

Early spatial reasoning predicts later creativity and innovation, especially in STEM fields

Exceptional spatial ability at age 13 predicts creative and scholarly achievements over 30 years later

Exceptional spatial ability at age 13 predicts creative and scholarly achievements over 30 years later, according to results from a new longitudinal study published in Psychological Science, a journal of the Association for Psychological Science.
The study, conducted by psychology researcher David Lubinski and colleagues at Vanderbilt University, provides evidence that early spatial ability — the skill required to mentally manipulate 2D and 3D objects — predicts the development of new knowledge, and especially innovation in science, technology, engineering, and mathematics (STEM) domains, above and beyond more traditional measures of mathematical and verbal ability.
"We live in the age of human capital," says Lubinski. "Creativity is the currency of the modern era, especially in STEM disciplines. Having a better understanding of the human attributes that facilitate innovation has clear practical implications for education, training, business, and talent development."
And yet, despite longstanding speculation that spatial ability may play an important role in supporting creative thinking and innovation, there are very few systems in place to track skill in spatial reasoning:
"Current procedures for identifying intellectually precocious youth currently miss about half of the top 1% in spatial ability," Lubinski explains.
Using data from a study that began in the late 1970s, Lubinski and colleagues followed up with 563 students who had scored exceptionally well — in the top 0.5% — on the SATs at age 13. The researchers also examined data on the participants' spatial ability at age 13, as measured by the Differential Aptitude Test.
Confirming previous research, the data revealed that participants' mathematical and verbal reasoning scores on the SAT at age 13 predicted their scholarly publications and patents 30 years later.
But spatial ability at 13 yielded additional predictive power, suggesting that early spatial ability contributes in a unique way to later creative and scholarly outcomes, especially in STEM domains.
Importantly, these results confirm longstanding speculation in the psychological sciences that spatial ability offers something important to the understanding of creativity that traditional measures of cognitive abilities used in educational and occupational selection don't capture.
Lubinski believes cultivating these skills is imperative for ensuring scientific innovation.
"These students have exceptional and under-challenged potential, especially for engineering and technology," Lubinski explains. "We could do a much better job of identifying these students and affording them better opportunities for developing their talents."

Co-authors on this research include Harrison Kell, Camilla Benbow, and James Steiger of Vanderbilt University.
For more information about this study, please contact: David Lubinski at david.lubinski@vanderbilt.edu.
For a copy of the article "Creativity and Technical Innovation: Spatial Ability's Unique Role" and access to other Psychological Science research findings, please contact Anna Mikulak at 202-293-9300 or amikulak@psychologicalscience.org.