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Universe's hidden supermassive black holes revealed

Astronomers have found evidence for a large population of hidden supermassive black holes in the Universe.

Using NASA's Nuclear Spectroscopic Telescope Array (NuSTAR) satellite observatory, the team of international scientists detected the high-energy x-rays from five supermassive black holes previously clouded from direct view by dust and gas.

The research, led by astronomers at Durham University, UK, supports the theory that potentially millions more supermassive black holes exist in the Universe, but are hidden from view.

The findings are being presented at the Royal Astronomical Society's National Astronomy Meeting, in Llandudno, Wales, today (Monday, July 6, 2015).

The scientists pointed NuSTAR at nine candidate hidden supermassive black holes that were thought to be extremely active at the centre of galaxies, but where the full extent of this activity was potentially obscured from view.

High-energy x-rays found for five of the black holes confirmed that they had been hidden by dust and gas. The five were much brighter and more active than previously thought as they rapidly feasted on surrounding material and emitted large amounts of radiation. Such observations were not possible before NuSTAR, which launched in 2012 and is able to detect much higher energy x-rays than previous satellite observatories.

Lead author George Lansbury, a postgraduate student in the Centre for Extragalactic Astronomy, at Durham University, said: "For a long time we have known about supermassive black holes that are not obscured by dust and gas, but we suspected that many more were hidden from our view.

"Thanks to NuSTAR for the first time we have been able to clearly see these hidden monsters that are predicted to be there, but have previously been elusive because of their 'buried' state.

"Although we have only detected five of these hidden supermassive black holes, when we extrapolate our results across the whole Universe then the predicted numbers are huge and in agreement with what we would expect to see."

Daniel Stern, the project scientist for NuSTAR at NASA's Jet Propulsion Laboratory in Pasadena, California, added: "High-energy X-rays are more penetrating than low-energy X-rays, so we can see deeper into the gas burying the black holes. NuSTAR allows us to see how big the hidden monsters are and is helping us learn why only some black holes appear obscured."

The research was funded by the Science and Technology Facilities Council (STFC) and has been accepted for publication in The Astrophysical Journal.

http://www.eurekalert.org/pub_releases/2015-07/uos-adc070215.php

Arthritis drug could be used to treat blood cancer sufferers

Anti-inflammatory drug is one thousandth of the cost of the current drug which works in the same way

Discovery may open up cost effective treatment options not just for the NHS but also cancer patients across the world

Scientists at the University of Sheffield have discovered that a common drug given to arthritis sufferers could also help to treat patients with blood cancers.

Myeloproliferative neoplasms (MPN) are diagnosed in around 3,300 UK patients every year and cause an overproduction of blood cells creating a significant impact on quality-of-life, with symptoms such as night sweats, itching and tiredness.

MPNs are most often diagnosed in people in their 50s and 60s and currently treatment is limited to aspirin, removal of excess blood and mild chemotherapy. Recently, the drug Ruxolitinib has been developed and has been shown to provide relief, but at a cost of over £40,000 per year per patient, it has not been approved by the National Institute for Health and Care Excellence (NICE).

Dr Martin Zeidler from the University's Department of Biomedical Science, working together with colleagues from the Department of Haematology at the Royal Hallamshire Hospital, and funded by Cancer Research UK have discovered that Methotrexate (MTX) can work in the same way.

He said: "Given that a year's course of low-dose MTX costs around £30, the potential to repurpose MTX could provide thousands of patients with a much needed treatment option and also generate substantial savings for health care systems. "Because MTX is a World Health Organisation 'Essential Medicine', this also means that this well understood drug could be used throughout the developing world."

In this study scientists used cells from the fruit fly Drosophila to screen for small molecules that suppress the signalling pathway central to the development of MPNs in humans. Further testing confirmed this in human cells, even those carrying the mutated gene responsible for MPNs in patients.

MTX is commonly used at low doses to treat inflammatory diseases including rheumatoid arthritis, Crohn's disease and psoriasis and has few side effects. It is also used in some cancers at much higher doses where the side effects are substantial and similar to other chemotherapy agents.

Working together with clinical colleagues at the Royal Hallamshire Hospital, Dr Zeidler is now looking to undertake clinical trials to examine the possibility of repurposing low-dose MTX for the treatment of MPNs.

"We have the potential to revolutionise the treatment of this group of chronic diseases - a breakthrough that may ultimately represent a new treatment option able to bring relief to both patients and health funders," he added.

Nell Barrie, senior science information manager at Cancer Research UK, said: "Finding new uses for existing drugs is a great way to speed up improvements in treatment, as these drugs will have previously been through safety tests. Methotrexate is already used as a chemotherapy drug for several types of cancer, and this early research shows that at much lower doses it could have the potential to help treat certain blood disorders."

The paper Methotrexate is a JAK/STAT pathway inhibitor is being published in PLOS One. For a copy of the paper email mediateam@sheffield.ac.uk or call 0114 222 9852.

The research was supported by a Cancer Research UK Senior Cancer Research Fellowship to Martin Zeidler and a joint Cancer Research UK/Yorkshire Cancer Research PhD fellowship awarded via the Sheffield Cancer Centre.

http://www.eurekalert.org/pub_releases/2015-07/uoa-rbt070515.php

Research breakthrough to treat girls-only epilepsy

Discovery expected to help thousands of young girls worldwide suffering from a rare yet debilitating form of epilepsy

An international team, led by a University of Adelaide genetics expert, has made a breakthrough discovery which is expected to help thousands of young girls worldwide who are suffering from a rare yet debilitating form of epilepsy.

Professor Jozef Gecz, from the University of Adelaide's Robinson Research Institute, was a key player in identifying the responsible gene and mutations in this female-only epileptic syndrome, in 2008.

In breakthrough research published in Oxford Journals, Human Molecular Genetics, Professor Gecz has now found a treatment for this disorder.

A United States pharmaceutical company Marinus Pharmaceuticals (NASDAQ: MRNS) is now recruiting affected girls as part of the world's first clinical trial to test the therapy. Professor Gecz says this condition is unique as it presents almost exclusively in girls while boys with mutations in the gene are not affected.

"We discovered that this condition is caused by an inherited mutation of the protocadherin 19 (PCDH19) gene, located on the X-chromosome," says Professor Gecz, Head of Neurogenetics at the University of Adelaide. "And interestingly, both males and females can be born with this mutation but only females suffer from the symptoms of the condition.

"The girls are affected because they have two X-chromosomes, one healthy and one with the PCDH19 mutation, which would usually protect them from a X-chromosome borne disease, but in this case it drives the disorder," he says.

Professor Gecz has worked with the families of girls with this female-only epilepsy from all over the world and says while the condition affects everyone differently, in most cases it is highly incapacitating. "This form of epilepsy affects 15,000-30,000 girls in the US and approximately 1000 in Australia," says Professor Gecz.

"Girls born with this gene mutation appear perfectly normal in the first few months of their lives but when they reach about eight months of age, they start suffering from debilitating and frequent seizures. The girls also commonly suffer from intellectual disability and autism - it's a truly terrible disease which impacts the whole family. "Through our current research we found that sufferers are deficient in a hormone called allopregnanolone.

"We know that hormones play a critical role in this condition because the seizures often stop once the girls reach puberty - however the autism and intellectual disability remain. We expect that the longer we can delay the onset of seizures, the less the sufferer might be affected by the autism and intellectual disability.

"These finding are so promising that Marinus Pharmaceuticals has commenced a clinical trial to test the effect of a synthetic form of the neurosteroid allopregnanolone, called ganaxolone," he says.

This research was supported by the National Health and Medical Research Council and a group of dedicated parents of girls with PCDH19 female epilepsy, Insieme per la Ricerca PCDH19 - ONLUS.

http://www.eurekalert.org/pub_releases/2015-07/ifqa-nsa070615.php

New study again shows: More strokes with intracranial stents

VISSIT study confirms IQWiG's benefit assessment; case studies show no differences between acute and non-acute treatment

The risk of experiencing another stroke is higher if patients, after dilation of their blood vessels in the brain, receive not only clot-inhibiting drugs, but also have stents inserted. The recently published results of the VISSIT study confirm this conclusion of a rapid report by the German Institute for Quality and Efficiency in Health Care (IQWiG) of October 2014. Thus, the available studies still provide no evidence of a benefit of treatment with intracranial stents (also called "percutaneous transluminal angioplasty and stenting", PTAS). This is the conclusion of a working paper by IQWiG published on 18 June 2015.

Stents also problematic in acute treatment

The working paper also provides answers to further questions on the healthcare situation in Germany. According to this, there is no reason why the results of the randomized controlled trials (RCTs) already assessed, which investigated patients who received intracranial stents in non-acute situations, should not be applied to

acute treatment. However, in Germany, if stents are implanted into cerebral vessels, this is mostly done in non-acute situations.

VISSIT also discontinued due to security concerns

Of the total of 4 RCTs that IQWiG analysed for the rapid report in October 2014, the SAMMPRIS study was decisive for the assessment.

The recently published VISSIT study compared the use of stents plus medical therapy versus medical therapy alone in patients with symptomatic intracranial stenosis. In contrast to the SAMMPRIS study, in which so-called wingspan stents (self-expandable stent system, SES) were inserted, the study participants in the VISSIT study received Pharos Vitesse stents (balloon-expandable stent system, BES). After publication of the SAMMPRIS results an unplanned data analysis was conducted in the VISSIT study, which was subsequently discontinued.

VISSIT results confirm SAMMPRIS results

The publication of the VISSIT results was the reason for IQWiG to examine in a working paper whether these results would challenge the conclusion of last year's rapid report. The comparison of VISSIT and SAMMPRIS clearly demonstrates: the study results agree in all important points and in both studies harm is shown through the increased risk of stroke.

This also confirms IQWiG's benefit assessment from 2014 - independent of the type of stent used. Worse results for stent therapy were shown in both studies, especially for periprocedural strokes (all strokes within 30 days after the intervention). None of the studies showed an advantage of treatment with intracranial stents.

Only few case series on acute treatment

As the SAMMPRIS study excluded patients with acute neurological symptoms (acute treatment), it was often challenged whether the results were at all applicable to the healthcare situation in Germany. This is because in this country intracranial stents are primarily used in acute situations. IQWiG also investigated this question in its working paper.

Only 6 small retrospective case series provide information on the outcomes of mortality (overall mortality) and strokes (cerebrovascular morbidity) in acute treatment (? 48 hours after a stroke) with a stent in patients with intracranial stenosis in Germany. Of the total of 31 patients in the case series, most of them with a rather poor prognosis, 13 (42%) died and 11 (35%) experienced impairment of a medium to severe degree. A favourable result was shown in 7 patients (23%).

These data are difficult to interpret due to a lack of informative comparisons. However, they provide no evidence that (intracranial) stenting in acute treatment is to be evaluated completely differently from stenting in non-acute Treatment.

RCT results applicable to acute treatment

Stefan Sauerland, Head of the Non-Drug Interventions Department at IQWiG, notes: "There is no reason why the results of the RCTs already assessed, which investigated patients in non-acute situations, should not be applied to acute treatment in Germany. Whether intracranial stents produce more benefit than harm in acute treatment can only be investigated in comparative, preferably randomized studies. Current results on the use of mechanical thrombectomy procedures in acute stroke show that such studies are possible."

Intracranial stents rarely used in acute treatment

Ten case series in Germany investigated patients with intracranial stenosis in whom stent therapy was indicated. In this context, the proportion of patients treated acutely, that is patients with a stroke within the past 48 hours, was investigated. In 40 of the overall 299 patients (about 13%, i.e. only a small proportion of patients) a stent was inserted in the context of acute treatment.

The Institute Director Jürgen Windeler summarizes: "According to these data the large majority of intracranial stents is not inserted after 1 to 2 days, but several days or weeks after a stroke." The results of the SAMMPRIS and VISSIT study are therefore of great importance for stent therapy, also in Germany.

Legislator increases requirements for medical devices

High-risk medical devices are repeatedly used in Germany, even before the benefit and harm of the intervention have been sufficiently examined. To date, information on their risks is usually obtained only belatedly due to the occurrence of specific detrimental events in patients after treatment, and unfortunately often outside the supervision of a trial.

To avoid similar problems in future as those experienced with intracranial stents, on 11 June 2015 the German Parliament decided on a change in the law: new invasive treatment procedures based on a medical device will as a rule undergo an early benefit assessment. Jürgen Windeler welcomes this change: "If this new law had already existed during the introduction of intracranial stents, the dissemination of harmful treatments could have been avoided. And thanks to high-quality studies we would know more about stents in acute treatment."

Process of report production

The present report was prepared in the form of a working paper within the framework of a general commission. To strengthen the scientific independence of the Institute, the Federal Joint Committee (G-BA) awarded a general commission to IQWiG in December 2004 and extended this commission in 2006 to cover information on the quality and efficiency of the healthcare system. This enables IQWiG to independently select topics and conduct research work. In contrast to other types of reports, there are no deadlines for the publication of working papers. The working paper was sent to the G-BA on 21 May 2015.

The working paper supplements the G-BA's commission of 28 February 2014 for a rapid report on stents for treatment of intracranial arterial stenosis. The rapid report was sent to the contracting agency on 11 September 2014.

An overview of the background, methods and further results of the working paper is provided in the following German executive summary. An English executive summary will soon be available. If you would like to be informed when this document is available, please send an e-mail to » info@iqwig.de.

http://bit.ly/1eFPSrz

Superconductivity Record Bolstered by Magnetic Data

Measurements show that hydrogen sulfide superconducts much closer to room temperature than other materials do

By Edwin Cartlidge and Nature magazine | June 30, 2015

The long-standing quest to find a material that can conduct electricity without resistance at room temperature may have taken a decisive step forward. Scientists in Germany have observed the common molecule hydrogen sulfide superconducting at a record-breaking 203 kelvin (–70 ˚C) when subjected to very high pressures. The result confirms preliminary findings released by the researchers late last year, and is said to be corroborated by data from several other groups.

Some physicists urge caution, however. Ivan Schuller at the University of California in San Diego, says that the results "look promising" but are not yet watertight. However, Antonio Bianconi, director of the Rome International Center for Materials Science Superstripes (RICMASS), thinks that the evidence is compelling. He describes the findings as "the main breakthrough" in the search for a room-temperature superconductor since the 1986 discovery of superconductivity in cuprates—exotic ceramic compounds that exhibit the phenomenon up to 164 K.

Last December, Mikhail Eremets and two other physicists at the Max Planck Institute for Chemistry in Mainz reported that they had discovered hydrogen sulfide superconducting below 190 K. When they placed a 10 micrometre-wide sample of the material in a diamond-anvil cell and subjected it to a pressure of about 1.5 million atmospheres, they found that its electrical resistance dropped by more than a factor of 1,000 when cooled below the threshold, or 'critical', temperature.

At that time, however, the researchers had not been able to demonstrate a second key characteristic of superconductivity, known as the Meissner effect, in which samples expel a magnetic field when cooled below the critical temperature.

In the latest work, the authors got together with two physicists from the University of Mainz to build a non-magnetic cell and acquire a very sensitive type of magnetometer known as a SQUID. They placed 50 micrometre-wide samples of hydrogen sulfide under pressures of up to 2 million atmospheres in an external magnetic field, and slowly warmed them, starting from a few degrees above absolute zero. They observed the tell-tale sign of the Meissner effect—a sudden increase in the sample's 'magnetization signal' - when the temperature rose past 203 K. As to why they measured a higher critical temperature than they did last year, the researchers point to possible tiny variations in the samples' crystal structure. (Under conditions of high pressures and low temperatures, hydrogen sulfide is in a solid state.)

Growing acceptance

Bianconi says that many superconductivity researchers were sceptical of the findings when they were presented at a conference of the American Physical Society in San Antonio, Texas, in March. But the data were "very well accepted" by participants at a RICMASS conference he organized on the Italian island of Ischia in mid-June.

During discussions at the Ischia meeting, he says, it emerged that some groups in China and Japan had reproduced the results, including the drop in electrical resistance and the Meissner effect. Bianconi will not say who the groups are, explaining that they want to delay announcing their results until Eremets and colleagues have published their findings in a peer-reviewed journal (the papers are available in the arXiv online repository).

Katsuya Shimizu, a physicist at Osaka University in Japan, says that he and his colleagues have confirmed the 190 K electrical transition, using their own refrigerator to hold several samples and cells provided by Eremets.

And Schuller argues that the Mainz group should do further checks to make sure that they have not overlooked "an uncontrolled artefact," such as background noise picked up during the delicate measurements of magnetization.

Eremets and his colleagues propose that the superconductivity is likely to originate in the vibrations of the crystal lattice of H_3S, which is created when hydrogen sulfide is compressed. These vibrations bind electrons together in pairs that then move through the lattice without resistance, as described by the Bardeen–Cooper–Schrieffer (BCS) theory that holds true for conventional, low-temperature superconductors.

If so, they point out, other hydrogen compounds might then superconduct at even higher temperatures, and possibly even at room temperature, given that the BCS theory does not place any upper limit on the superconducting transition.

Some theorists, however, are not sure that BCS theory is the correct interpretation. "The question of where the high critical temperature comes from is still wide open in my opinion," says theoretical physicist Jorge Hirsch at the University of California, San Diego.

http://www.eurekalert.org/pub_releases/2015-07/jhm-hat070615.php

Heart attack treatment hypothesis 'busted'

Basic research seriously challenges a long-standing hope that blocking calcium from entering energy-making mitochondria inside heart cells could prevent heart attack damage

Researchers have long had reason to hope that blocking the flow of calcium into the mitochondria of heart and brain cells could be one way to prevent damage caused by heart attacks and strokes. But in a study of mice engineered to lack a key calcium channel in their heart cells, Johns Hopkins scientists appear to have cast a shadow of doubt on that theory. A report on their study is published online this week in Proceedings of the National Academy of Sciences.

"We confirmed that this calcium channel is important for heart function," says senior investigator Mark Anderson, M.D., Ph.D., director of the Department of Medicine at the Johns Hopkins University School of Medicine. "But our results also showed that this is almost certainly not going to be a good pathway to exploit in a long-term therapy, at least for heart attacks."

The experiments by Anderson and his team grew out of increased understanding in recent years of the role of calcium in heart function. With each beat of the organ, molecules of calcium whiz in and out of tiny compartments called mitochondria that are powerhouses of heart and other cells. Inside the mitochondria, calcium is generally a good thing -- it helps generate energy that the cells use to stay alive. But for almost half a century, researchers have also known that too much mitochondrial calcium can overwhelm and cause cells to die. And after a heart attack or stroke, a sudden rush of calcium into the organelles sets off this cell death pathway, leading to long-term damage.

Thus, the possibility of saving heart and brain cells by blocking this influx of calcium, Anderson says, has long been a hope, one fed a few years ago when scientists discovered the specific channel that allows calcium to pass in and out of the mitochondria, known as the mitochondrial calcium uniporter (MCU).

With the new knowledge, Anderson and colleagues set out to test the effects of blocking calcium from mitochondria by generating genetically altered mice with a mutation that disabled heart MCU function over the entire lifetime of the mice and blocked calcium flow to mitochondria in heart muscle cells.

Although almost no calcium passed into the mitochondria of their cardiomyocytes, Anderson says, their hearts still beat and developed normally. But when his team stressed the mice in a way that would normally cause an increase in heart rate, the mice's heart rates only barely rose, and their heart muscles lost efficiency, requiring extra oxygen to function.

In further experiments, when the scientists cut off oxygen to the cardiomyocytes and then restarted it -- mimicking what happens during some heart attacks -- the cells still died, even though calcium in the mitochondria clearly wasn't causing the cell death, Anderson says.

Instead, the cardiomyocytes, Anderson's group discovered, were compensating for the lack of calcium by activating other cell death pathways and turning on a host of new genes to get that job done. Blocking calcium from the mitochondria, it turned out, just changed the way the cells died after a heart attack.

"Despite the predictions that blocking this calcium channel would protect against calcium overload, it didn't protect against cell death," says Anderson. Future studies will be needed to confirm whether the same is true in brain cells, but Anderson suspects the new results will put a damper on the idea of creating drugs to block MCUs in humans requiring long-term treatments to prevent heart attacks.

Other authors on the study are Tyler P. Rasmussen, Mei-ling A. Joiner, Olha M. Koval, Biyi Chen, Zhan Gao, Zhiyong Zhu, Brett A. Wagner, Jamie Soto, Michael L. McCormick, William Kutschke, Robert M. Weiss, Liping Yu, Ryan L. Boudreau, E. Dale Abel, Fenghuang Zhan, Douglas R. Spitz, Garry R. Buettner, Long-Sheng Song and Leonid V. Zingman of the University of Iowa Carver College of Medicine in Iowa City; and Yeujin Wu, Nicholas R. Wilson, Elizabeth D. Luczak and Qinchuan Wang of the Johns Hopkins University School of Medicine.

Funding for the studies described in the PNAS article was provided by the National Heart, Lung, and Blood Institute (grant numbers F30 HL114258-02, R01 HL079031, R01 HL070250, R01 HL096652, R01 HL113001); the National Institute of General Medical Sciences (grant number T32 GM007337); the National Center for Research Resources (grant number S10 RR026293-01); the National Institute of Diabetes and Digestive and Kidney Diseases (grant number R01 DK092412); the Veterans Administration; and the Holden Comprehensive Cancer Center (grant number P30 CA086862).

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Study explains how dengue virus adapts as it travels, increasing chances for outbreaks

Dengue virus has developed to optimize its ability to cause outbreaks as it travels across the globe

A researcher from The University of Texas Medical Branch at Galveston is an integral member of a collaborative group that is the first to explain the mechanisms that the Dengue virus has developed to optimize its ability to cause outbreaks as it travels across the globe to new places and revisits old ones. An early online version of this paper detailing the findings has recently been published in Science.

Dengue virus has been spreading throughout warm regions of the world, prompting the virus to adapt to new environments. This diversification in viral

strains has resulted in the development of strains that appear associated with greater potential for sparking epidemics. Several dengue outbreaks have occurred when new dengue strains emerged and displaced the native strains that the local population had already developed immunity against. Until now, the mechanisms governing how and why some viral strains are better suited for causing widespread disease has been poorly understood.

The investigators examined the different clades of dengue virus-2 known to be circulating around Puerto Rico in 1994 when a severe epidemic broke out. Investigating the differences between the virus strain that was most commonly seen from 1986 to 1995 and a new, more potent viral strain that was first isolated in 1994 was the key to figuring out why this outbreak occurred.

They identified an interaction between the newcomer virus's RNA and proteins within the host that allows the virus to bypass the host's immune response, making it easier for the virus to invade. Based on the findings, the research team devised a model to explain the 1994 dengue outbreak in Puerto Rico.

"This study highlights the critical and oft forgotten role played by non-coding RNAs in the battle between viruses and their human hosts," said author Mariano Garcia-Blanco, UTMB professor and chair of the department of biochemistry and molecular biology and also professor of emerging infectious diseases at the Duke-NUS Graduate Medical School in Singapore. "It emphasizes the importance of multidisciplinary research: a fabulous marriage of basic RNA biology and clinically informed epidemiology uncovered an unexpected route of virus evolution that explained (and perhaps could predict) epidemic potential."

Other authors of this paper include Gayathri Manokaran, Esteban Finol, Jayantha Gunaratne, Eugenia Z. Ong, Hwee Cheng Tan, October M. Sessions, Alex M. Ward, Duane J. Gubler and corresponding author Eng Eong Ooi from the Duke-NUS Graduate Medical School; Chunling Wang, and Eva Harris from the University of California, Berkeley and Justin Bahl from the University of Texas School of Public Health, Houston.

This research was supported by the Singapore National Medical Research Council, the Ministry of Health in Singapore, Institute of Molecular and Cell Biology, Agency of Science, Technology and Research in Singapore and the U.S. National Institutes of Health.

http://www.eurekalert.org/pub_releases/2015-07/sdmc-lfb070615.php

Link found between autoimmune diseases, medications, and a dangerous heartbeat condition

Screening and counseling recommended to decrease risk of life-threatening arrhythmias

Mohamed Boutjdir, PhD, professor of medicine, cell biology, and physiology and pharmacology at SUNY Downstate Medical Center, has led a study with international collaborators identifying the mechanism by which patients with various autoimmune and connective tissue disorders may be at risk for life-threatening cardiac events if they take certain anti-histamine or anti-depressant medications.

Dr. Boutjdir is also director of the Cardiac Research Program at VA New York Harbor Healthcare System.

The researchers published their findings in the online edition of the American Heart Association Journal Circulation in an article titled, "Pathogenesis of the Novel Autoimmune-Associated Long QT Syndrome."

The team established for the first time the molecular and functional mechanism by which adult patients with autoimmune diseases, particularly systemic lupus erythematosus, Sjogren's syndrome, and other connective tissue diseases (CTD), including mixed CTD, undifferentiated CTD, polymyositis/dermatomyositis, systemic sclerosis, and rheumatoid arthritis, develop abnormal electrical activity on their electrocardiogram (ECG) known as Long QT syndrome or QT interval prolongation.

Long QT prolongation can be inherited due to abnormal genes or acquired, often due to medication side effects, all of which affect the heartbeat cycle in a way that increases the risk of irregular heartbeat episodes that originate from the ventricles. These episodes may lead to palpitations, fainting, and sudden death due to ventricular fibrillation.

"We discovered that antibodies called anti-SSA/Ro antibodies picked up in laboratory testing and found in adult patients with connective tissue diseases actually block a specific cardiac channel (called the hERG channel), preventing potassium ions from going out of the cell and resulting in abnormal ECG (Long QT).

The concern is that patients with these 'bad' antibodies can be at risk for even worse heartbeat abnormalities if their electrolytes are abnormal or if they are taking medications such as some anti-histamine or anti-depressant drugs known to cause Long QT on their own," explains Dr. Boutjdir.

"Accordingly, we recommended that adult patients with anti-SSA/Ro antibodies may benefit from routine ECG screening and that those patients with the type of heartbeat irregularities related to Long QT syndrome should receive counseling about taking drugs that may increase the risk for life-threatening arrhythmias. Moreover, we recommend that such screening and counseling be routine care for these patients," he added.

The research was supported by the Biomedical Laboratory Research and Development Service of Veterans Affairs Office of Research and Development, Award Number I01BX007080.

http://www.eurekalert.org/pub_releases/2015-07/tjnj-sfm070215.php

Survey finds many physicians, clinicians work sick despite risk to patients

Many physicians and advanced practice clinicians, including registered nurse practitioners, midwives and physician assistants, reported to work while being sick despite recognizing this could put patients at risk, according to the results of a small survey published online by JAMA Pediatrics.

Health-care associated infections can lead to substantial illness and death and excess costs. This is especially true for immunocompromised patients and others at high risk, including neonates. However, a gap in knowledge exists about the reasons why attending physicians and advanced practice clinicians (APCs) in the United States work while sick.

Julia E. Szymczak, Ph.D., of the Children's Hospital of Philadelphia, and coauthors administered an anonymous survey at the hospital to attending physicians and APCs, including certified registered nurse practitioners, physician assistants, clinical nurse specialists, certified registered nurse anesthetists and certified nurse midwives. They received responses from 280 attending physicians (61 percent) and 256 APCs (54.5 percent).

The survey found that while most respondents (504, 95.3 percent) believed that working while sick put patients at risk, 446 respondents (83.1 percent) reported working while sick at least once in the past year and 50 respondents (9.3 percent) reported working while sick at least five times. Survey respondents reported working with symptoms that included diarrhea, fever and the onset of significant respiratory symptoms.

The reasons why physicians and APCs reported working while sick included not wanting to let colleagues down (98.7 percent), staffing concerns (94.9 percent), not wanting to let patients down (92.5 percent), fear of being ostracized by colleagues (64 percent) and concerns about the continuity of care (63.8 percent).

An analysis of written comments about why respondents work while sick highlighted three areas: logistic challenges in identifying and arranging someone to cover their work and a lack of resources to accommodate sick leave; a strong cultural norm in the hospital to report for work unless one is extremely ill; and ambiguity about what symptoms constitute being too sick to work.

"The study illustrates the complex social and logistic factors that cause this behavior. These results may inform efforts to design systems at our hospital to provide support for attending physicians and APCs and help them make the right choice to keep their patients and colleagues safe while caring for themselves," the study concludes.

(JAMA Pediatr. Published online July 6, 2015. doi:10.1001/jamapediatrics.2015.0684. Available pre-embargo to the media at http://media.jamanetwork.com.)

Editor's Note: This study was supported by a cooperative agreement from the Center for Disease Control and Prevention. Please see article for additional information, including other authors, author contributions and affiliations, etc.

Editorial: When the Health Care Worker is Sick

In a related editorial, Jeffrey R. Starke, M.D., of the Baylor College of Medicine, Houston, and Mary Anne Jackson, M.D., University of Missouri-Kansas City School of Medicine, write: "Creating a safer and more equitable system of sick leave for HCWs [health care workers] requires a culture change in many institutions to decrease the stigma - internal and external - associated with HCW illness. Identifying solutions to prioritize patient safety must factor in workplace demands and variability in patient census and emphasize flexibility. ... Also essential is clarity from occupational health and infection control departments to identify what constitutes being too sick to work."

(JAMA Pediatr. Published online July 6, 2015. doi:10.1001/jamapediatrics.2015.0994. Available pre-embargo to the media at http://media.jamanetwork.com.)

http://www.eurekalert.org/pub_releases/2015-07/uovh-fba070615.php

Fundamental beliefs about atherosclerosis overturned

Complications of artery-hardening condition are No. 1 killer worldwide

Doctors' efforts to battle the dangerous atherosclerotic plaques that build up in our arteries and cause heart attacks and strokes are built on several false beliefs about the fundamental composition and formation of the plaques, new research from the University of Virginia School of Medicine shows. These new discoveries will force researchers to reassess their approaches to developing treatments and discard some of their basic assumptions about atherosclerosis, commonly known as hardening of the arteries.

"The leading cause of death worldwide is complications of atherosclerosis, and the most common end-stage disease is when an atherosclerotic plaque ruptures. If this occurs in one of your large coronary arteries, it's a catastrophic event," said Gary K. Owens, PhD, of UVA's Robert M. Berne Cardiovascular Research Center. "Once a plaque ruptures, it can induce formation of a large clot that can block blood flow to the downstream regions. This is what causes most heart attacks. The clot can also dislodge and cause a stroke if it lodges in a blood vessel in the brain. As such, understanding what controls the stability of plaques is extremely important. "

Until now, doctors have believed that smooth muscle cells - the cells that help blood vessels contract and dilate - were the good guys in the body's battle against atherosclerotic plaque. They were thought to migrate from their normal location in the blood vessel wall into the developing atherosclerotic plaque, where they would attempt to wall off the accumulating fats, dying cells and other nasty components of the plaque. The dogma has been that the more smooth muscle cells

in that wall -- particularly in the innermost layer referred to as the "fibrous cap" -- the more stable the plaque is and the less danger it poses.

UVA's research reveals those notions are woefully incomplete at best. Scientists have grossly misjudged the number of smooth muscle cells inside the plaques, the work shows, suggesting the cells are not just involved in forming a barrier so much as contributing to the plaque itself. "We suspected there was a small number of smooth muscle cells we were failing to identify using the typical immunostaining detection methods. It wasn't a small number. It was 82 percent," Owens said. "Eighty-two percent of the smooth muscle cells within advanced atherosclerotic lesions cannot be identified using the typical methodology since the lesion cells down-regulate smooth muscle cell markers. As such, we have grossly underestimated how many smooth muscle cells are in the lesion."

Suddenly, the role of smooth muscle cells is much more complex, much less black-and-white. Are they good or bad? Should treatments try to encourage more? It's no longer that simple, and the problem is made all the more complicated by the fact that some smooth muscle cells were being misidentified as immune cells called macrophages, while some macrophage-derived cells were masquerading as smooth muscle cells. It's very confusing, even for scientists, and it has led to what Owens called "complete ambiguity as to which cell is which within the lesion." (The research also shows other subsets of smooth muscle cells were transitioning to cells resembling stem cells and myofibroblasts.)

Researcher Laura S. Shankman, a PhD student in the Owens lab, was able to overcome the limitations of the traditional methodology for detecting smooth muscle cells in the plaque. Her approach was to genetically tag smooth muscle cells early in their development, so she could follow them and their descendants even if they changed their stripes. "This allowed us to mark smooth muscle cells when we were confident that they were actually smooth muscle cells," she said. "Then we let the atherosclerosis develop and progress [in mice] in order to see where those cells were later in disease."

Further, Shankman identified a key gene, Klf4, that appears to regulate these transitions of smooth muscle cells. Remarkably, when she genetically knocked out Klf4 selectively in smooth muscle cells, the atherosclerotic plaques shrank dramatically and exhibited features indicating they were more stable -- the ideal therapeutic goal for treating the disease in people. Of major interest, loss of Klf4 in smooth muscle cells did not reduce the number of these cells in lesions but resulted in them undergoing transitions in their functional properties that appear to be beneficial in disease pathogenesis. That is, it switched them from being "bad" guys to "good" guys.

Taken together, Shankman's findings raise many critical questions about previous studies built on techniques that failed to assess the composition of the lesions accurately. Moreover, her studies are the first to indicate that therapies targeted at controlling the properties of smooth muscle cells within lesions may be highly effective in treating a disease that is the leading cause of death worldwide. The discoveries have been outlined in a paper published online by the journal Nature Medicine: http://www.nature.com/nm/journal/vaop/ncurrent/full/nm.3866.html

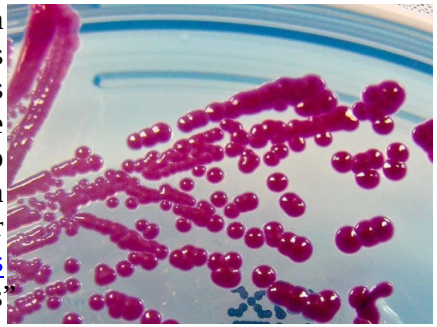
The paper was authored by Shankman, Delphine Gomez, Olga A. Cherepanova, Morgan Salmon, Gabriel F. Alencar, Ryan M. Haskins, Pamela Swiatlowska, Alexandra A.C. Newman, Elizabeth S. Greene, Adam C. Straub, Brant Isakson, Gwendalyn J. Randolph and Owens. The work was funded by National Institutes of Health grants R01 HL057353, R01 HL087867 and R01 HL121008 and American Heart Association fellowship grants 11PRE7170008 and 13POST17080043.

http://bit.ly/1D0WrLq

In 1950, the U.S. Released a Bioweapon in San Francisco

This was one of hundreds of bioweapon simulations carried out in the 1950s and 1960s

By Helen Thompson smithsonian.com



The bacterium *Serratia marcescens* lives in soil and water, and is best known for its ability to produce bright red pigment. This flashy trait makes this particular microbe useful in experiments—because it is so bright, it's easy to see where it is. And in 1950, the U.S. military harnessed that power in a large-scale biowarefare test, writes Rebecca Kreston on her blog "Body Horrors" for *Scientific American.*

As part of a bioweapon experiment, Serratia marcescens (pictured on an agar plate above) was released in San Francisco back in 1950. **(Nathan Reading/Flickr CC BY-NC-ND 2.0)**

Beginning on September 26, 1950, the crew of a U.S. Navy minesweeper ship spent six days spraying *Serratia marcescens* into the air about two miles off the northern California coast. The project was called "Operation Sea Spray," and its aim was to determine the susceptibility of a big city like San Francisco to a bioweapon attack by terrorists.

In the following days, the military took samples at 43 sites to track the bacteria's spread, and found that it had quickly infested not only the city but surrounding suburbs as well. During the test, residents of these areas would have inhaled millions of bacterial spores. Clearly, their test showed, San Francisco and cities

with similar size and topography could face germ warfare threats. “In this regard, the experiment was a success,” writes Kreston.

But there was a catch. At the time, the US military thought that *Serratia* couldn’t harm humans. The bug was mostly known for the red spots it produced on infested foods and had not been widely linked to clinical conditions. That changed when one week after the test, 11 local residents checked into a Stanford University Hospital complaining of urinary tract infections.

Upon testing their pee, doctors noticed that the pathogen had a red hue. “Infection with *Serratia* was so rare that the outbreak was extensively investigated by the University to identify the origins of this scarlet letter bug,” writes Kreston. After scientists identified the microbe, the cases collectively became the first recorded outbreak of *Serratia marcescens.* One patient, a man named Edward Nevin who was recovering from prostate surgery, died, and some have suggested that the release forever changed the area's microbial ecology, as Bernadette Tansey pointed out for the *San Francisco Chronicle* in 2004.

The military had performed similar tests in other cities across the country over the next two decades, until Richard Nixon halted all germ warfare research in 1969. The San Francisco experiment didn’t become public knowledge until 1976.

http://www.eurekalert.org/pub_releases/2015-07/uohc-amd070615.php

Aspirin may delay growth of asbestos-related cancer

Findings reported by University of Hawai'i Cancer Center researchers could eventually improve survival for patients with an aggressive cancer that attacks the lining of the chest wall

HONOLULU - Aspirin may inhibit the growth of mesothelioma, an aggressive and deadly asbestos-related cancer, University of Hawai'i Cancer Center researchers have found.

The finding could eventually give doctors and patients a potential new tool to fight against this devastating disease, which kills about 3,200 people a year nationwide, and advance knowledge of how to fight other cancers.

The study published in Cell Death and Disease showed that aspirin slows down the growth of mesothelioma by blocking the carcinogenic effects of the inflammatory molecule, High-Mobility Group Box 1 (HMGB1). Researchers believe the molecule directly promotes mesothelioma growth.

"HMGB1 is an inflammatory molecule that plays a critical role in the initiation and progression of malignant mesothelioma. Inhibiting HMGB1 dramatically reduced malignant mesothelioma growth in mice and significantly improved survival of treated animals," said Dr. Haining Yang, PhD, an associate professor in the Thoracic Oncology Program at the UH Cancer Center.

Aspirin is mostly used as a nonsteroidal anti-inflammatory drug, which is absorbed by the stomach and upper intestine. Working with collaborators, Dr. Yang and Dr. Michele Carbone, MD, PhD, director of the UH Cancer Center's Thoracic Oncology Program, found that at least some of the so far unknown anti-tumor activity of aspirin is through preventing HMGB1 activity.

Malignant mesothelioma is an aggressive and often deadly cancer that can result from exposure to asbestos and asbestos-like fibers such as erionite. The prolonged presence of asbestos fibers lodged in the organ lining initiates a vicious cycle of chronic cell death and chronic inflammation that, over a period of many years, can lead to mesothelioma.

The researchers theorized that people at high risk of developing mesothelioma could take aspirin as a way to prevent or delay the growth of the cancer, and thus increase their chances of survival. Such individuals would include people occupationally exposed to asbestos, or people who live in areas high in naturally occurring asbestos-like fibers. They also encourage future studies to uncover the precise mechanism by which aspirin blocks HMGB1.

http://bit.ly/1Hk5lHJ

Tetris blocks traumatic flashbacks even after the memory is fixed

Manoeuvring the colourful tiles of Tetris can help block flashbacks of traumatic events, even after the memory has fixed itself in your mind.

17:32 06 July 2015 by Jessica Griggs

Playing the game could be an easy way to reduce the risk of post-traumatic stress disorder (PTSD).

After any event, there is a window of about six hours where memories are consolidated and cemented in the mind, says Emily Holmes at the Medical Research Council Cognition and Brain Sciences Unit in Cambridge, UK. Sleeping on the memory strengthens it further.

If an event is particularly traumatic, vivid memories of it can reoccur. These intrusive flashbacks are distressing for anyone, but in a proportion of cases they can persist and contribute to PTSD. For example, about half of people who have been raped go on to develop PTSD, as do a number of asylum seekers and people who have been tortured. About 20 per cent of people who have been in a serious car accident are affected by the condition.

There are effective treatments for people who are diagnosed with PTSD, but nothing currently exists to help prevent people from developing it in the days and weeks after the initial trauma.

Sleep on it

Holmes and her colleagues think a dose of Tetris could be the answer. In 2009, they showed that playing the game four hours after being exposed to trauma

reduced the number of subsequent flashbacks. But getting the game into a person's hands immediately after they have been raped, for example, won't always be practical, so the team tested whether it could still work a day later – after the memory had been consolidated and slept on.

The team asked 52 people to watch video footage of distressing events. "They were clips from public safety videos, for example, so they were designed to stay with you," says Holmes. A day later, the participants returned to the lab, where half of them looked at still images from the footage, a task designed to reactivate their memories of the video. This puts the memory back into the plastic state it was in before it was fully laid down, giving the team an opportunity to modify it. "It's a bit like hard plasticine that's a certain shape. When you warm it up, it becomes malleable and you can start reshaping it," says Holmes.

Those people who saw the stills then spent 12 minutes playing Tetris while those who hadn't just sat quietly for 12 minutes.

Over the following week, the group that had played the game experienced 51 per cent fewer intrusive memories of the traumatising video than the group that hadn't. They also scored lower on the intrusive memory section of a questionnaire used to diagnose PTSD.

Visually demanding

Holmes thinks playing a game that requires visual processing like Tetris forms a "cognitive blockade", diminishing the strength of the visual component of a trauma memory while it is malleable. The result is that you can still remember and describe what happened but the vivid, detailed images that are most disturbing are less easily triggered. Holmes thinks other visually demanding games such as Candy Crush, or different visual tasks altogether, could also work. "We started with Tetris because there is previous research showing that it uses up visual attention," she says.

There is still a way to go before Tetris can become an established treatment, perhaps by being part of the support given at a police station after a person has been raped or at a detention centre for asylum seekers, for example. But the team is already testing the game in hospital emergency departments on people who have been involved in car accidents.

Checking the "dose" of gameplay required and how long the effect lasts are on the to-do list, but even if the effect is small or short-term it's worthwhile, says Holmes. "Think of it like hand washing. Hand washing is not a fancy intervention, but it can reduce all sorts of illness. This is similar – if the experimental result translates, it could be a cheap preventative measure informed by science."

Journal reference: Psychological Science, DOI: 10.1177/0956797615583071

http://www.eurekalert.org/pub_releases/2015-07/epfd-tna070615.php

The next anti-tuberculosis drug may already be in your local pharmacy

Testing thousands of approved drugs, EPFL scientists have identified an unlikely anti-tuberculosis drug: the over-the-counter antacid lansoprazole (Prevacid®).

Tuberculosis continues to be a global pandemic, second only to AIDS as the greatest single-agent killer in the world. In 2013 alone, the TB bug Mycobacterium tuberculosis caused 1.5 million deaths and almost nine million new infections. Resistance to TB drugs is widespread, creating an urgent need for new medicines. EPFL scientists have now identified lansoprazole, a widely used, over-the-counter antacid, as an excellent candidate against tuberculosis. The study is published in Nature Communications.

It takes well over ten years for a new tuberculosis drug to complete these trials and be approved for human use. Meanwhile, traditional antibiotics have led many strains of tuberculosis bacteria to evolve multi-drug resistance. Millions of new chemical compounds have been tested for their ability to disrupt the growth of M. tuberculosis in the test tube, but discouragingly few are currently in clinical trials.

But we can speed this process up. Compounds that have already been approved for use in humans could be repurposed as anti-tuberculosis medications, and cut down both the time and cost of new drug development.

Screening against tuberculosis

This is the strategy adopted by Stewart Cole's lab at EPFL. The assay uses a robotized system that gives candidate drugs to cultured lung cells that have been infected with M. tuberculosis. Robotized "high-throughput screens" like this are a growing trend in drug development as they can work through massive libraries of candidate drugs quickly and accurately in a day, as opposed to the months required by manual methods.

The EPFL researchers used a method they had previously developed, which can reflect what happens when the bacterium infects a lung much better than conventional screening assays used in tuberculosis research. The scientists screened a large panel of already approved drugs, and identified the blockbuster antacid lansoprazole, known commercially as Prevacid®, as a potential anti-tuberculosis medication.

A new use for an old drug

Lansoprazole was found to be effective against M. tuberculosis but only when the bacterium grows inside cells. The researchers investigated the underlying biology and found that lansoprazole kills the bacterium after the human cells convert it

into a sulfur-containing metabolite. This metabolite targets a particular enzyme that is crucial for the bacterium to produce energy, thereby killing it off. In addition, when the scientists tested lansoprazole against a wide range of other bacteria, it proved to be highly selective for M. tuberculosis.

Lansoprazole belongs to a class of drugs known as "proton-pump inhibitors" that keep the stomach from pumping too much acid, thus preventing heartburn and ulcers. "Proton-pump inhibitors are both safe and widely sold around the world," says Stewart Cole. "Being highly active against drug-resistant strains of M. tuberculosis, this novel class of drugs provides us with an excellent opportunity to treat tuberculosis."

This work was supported by grants from the Swiss National Science Foundation and the German Federal Ministry of Research and Education.

Rybniker J, Vocat A, Sala C, Busso P, Pojer F, Benjak A, Cole ST. Lansoprazole is an antituberculous prodrug targeting cytochrome bc1. Nature Communications 07 July 2015. DOI: 10.1038/ncomms8659

http://www.eurekalert.org/pub_releases/2015-07/rooi-aia070615.php

An improved age for Earth's latest magnetic field reversal using radiometric dating

Age from volcanic ash dates Matuyama-Brunhes boundary to 770.2 ± 7.3 thousand years ago

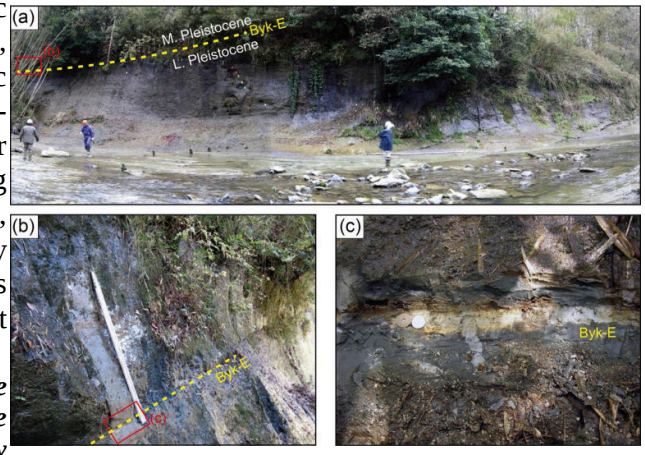
This news release is available in Japanese.

The Earth's magnetic field periodically reverses such that the north magnetic pole becomes the south magnetic pole. The latest reversal is called by geologists the Matuyama-Brunhes boundary (MBB), and occurred approximately 780,000 years ago. The MBB is extremely important for calibrating the ages of rocks and the timing of events that occurred in the geological past; however, the exact age of this event has been imprecise because of uncertainties in the dating methods that have been used.

A team of researchers based in Japan and Canada have obtained an improved age for the MBB. The team studied volcanic ash that was deposited immediately before the MBB. This volcanic ash contains small crystals called zircons. Some of these crystals formed at the same tme as the ash; thus, radiometric dating of these zircons using the uranium-lead method provided the exact age of the ash.

To verify their findings, the researchers also used a different method to date sedimentary rock from the same place that was formed at the time of the MBB. The combined results demonstrate that the age of the MBB is 770.2 ± 7.3 thousand years ago. The research has been published in the journal Geology.

Dr. Yusuke Suganuma of the National Institute of Polar Research, Tokyo, who is the lead author on the paper, commented: "This study is the first direct comparison of radiometric dating, dating of sediments, and the geomagnetic reversal for the Matuyama-Brunhes boundary. Our work contributes calibrating the geological time scale, and will be extremely important in future studies of the events that occurred at this time."



This is a photograph of the geological section across the Matuyama-Brunhes boundary in Chiba Prefecture, Japan. (a) Overview of the Chiba section. (b) and (c) Detail of a volcanic ash layer (Byk-E) just below the MBB in the Chiba section. The length of the ruler (b) and diameter of the coin (c) are 1.25 m and 2 cm, respectively. **NIPR/Ibaraki University/JAMSTEC**

Source: National Institute of Polar Research (NIPR), Ibaraki University, JAMSTEC

http://www.eurekalert.org/pub_releases/2015-07/acoa-sss070215.php

Study shows second severe allergic reaction can occur hours after first

Affects almost 15 percent of kids

ARLINGTON HEIGHTS, Ill. - Parents of kids with severe allergies know how scary a severe allergic reaction (anaphylaxis) is. New research offers clues as to why some kids can have a second, related reaction hours later - and what to do about it.

A study in the Annals of Allergy, Asthma and Immunology, the scientific publication of the American College of Allergy, Asthma and Immunology (ACAAI), examined records of 484 children seen in an emergency department (ED) for anaphylaxis. The researchers tracked whether there was a second, follow-up reaction. Delayed reactions occur when the initial symptoms of an allergic reaction go away but then return hours later without exposure to the substance that caused the reaction.

"We found that 75 percent of the secondary reactions occurred within six hours of the first," said Waleed Alqurashi, MD, lead author of the study. "A more severe first reaction was associated with a stronger possibility of a second reaction. Children aged six to nine, children who needed more than one dose of epinephrine and children who do not get immediate epinephrine treatment were among the most likely to develop secondary reactions."

Children who developed a second reaction had evidence of anaphylactic shock in the ED, required multiple doses of epinephrine and required multiple other therapies to treat the first reaction. At least half of the second reactions were considered serious, and also required treatment with epinephrine.

"The key message here for parents, caregivers and first-responders is to administer epinephrine at the first sign of a severe allergic reaction to prevent anaphylaxis from worsening," said allergist James Sublett, MD, ACAAI president. "Anaphylaxis symptoms occur suddenly and can progress quickly. Always have a second dose with you and, when in doubt, administer it too. Anaphylaxis can be fatal if left untreated."

The early symptoms may be mild, such as a runny nose, a skin rash or a "strange feeling," but these symptoms can quickly lead to more serious problems, including trouble breathing, hives or swelling, tightness of the throat, nausea, abdominal pain or even cardiac arrest. An emergency room visit for anaphylaxis should be followed up with a visit to an allergist, as allergists provide the most comprehensive follow-up care and guidance.

http://www.eurekalert.org/pub_releases/2015-07/uow-cd4070715.php

Cancer drug 49 times more potent than Cisplatin

Effectiveness shown in tests on ovarian and bowel cancer

Drug can shut down a cancer cell's metabolism

Developed by researchers at the University of Warwick's Warwick Cancer Research Centre

Tests conducted by the Wellcome Trust Sanger Institute's Cancer Genome Project

New drug could be cheaper to produce and less harmful to healthy cells

Tests have shown that a new cancer drug, FY26, is 49 times more potent than the clinically used treatment Cisplatin.

Based on a compound of the rare precious metal osmium and developed by researchers at the University of Warwick's Department of Chemistry and the Warwick Cancer Research Unit, FY26 is able to shut down a cancer cell by exploiting weaknesses inherent in their energy generation.

The researchers argue that the drug could be cheaper to produce, less harmful to healthy cells than existing treatments and has been shown to be active against cancer cells which have become resistant to platinum-based drugs.

The experiments conducted by the Wellcome Trust Sanger Institute comprising 809 cancer cell lines found that FY26 was 49 times more potent than cisplatin. Similar results were obtained by the National Cancer Institute USA in tests conducted on 60 cell lines.

The new drug works by forcing cancer cells to use their mitochondria, the 'power house' of a cell, to generate the energy necessary to function. Whilst healthy cells use mitochondria to generate energy, cancer cells contain defective mitochondria which are incapable of sustaining the cell's energy requirements.

In the absence of FY26, cancer cells switch from using their defective mitochondria to using metabolic activity in their cytoplasm to generate energy. By stopping this switch of energy source, the drug causes the cancer cell to die.

Lead researcher Professor Peter Sadler, of the University of Warwick's Department of Chemistry, said explains: "Healthy cells generate their energy in organelles called mitochondria, but cancer cells have defective mitochondria and are forced to generate energy through glycolysis in the cytoplasm. Our new compounds work by attacking the energy balance in cancer cells".

Commenting on the drug's benefits when compared to existing platinum-based drugs, such as Cisplatin, Professor Sadler says:

"Platinum-based drugs are used in nearly 50% of all chemotherapeutic regimens and exert their activity by damaging DNA and cannot select between cancerous and non-cancerous cells. This can lead to a wide-range of side-effects from renal failure to neurotoxicity, ototoxicity, nausea and vomiting."

"Existing platinum-based cancer treatments often become less effective after the first course, as cancer cells learn how they are being attacked, but our new osmium compound with its different mechanism of action, remains active against cancer cells that have become resistant to drugs such as Cisplatin".

The research could also lead to substantial improvements in cancer survival rates, suggests co-researcher Dr Isolda Romero-Canelon: "Current statistics indicate that one in every two people will develop some kind of cancer during their life time, with approximately one woman dying of ovarian cancer every two hours in the UK according to Cancer Research UK and two deaths every hour from bowel cancer.

"It is clear that a new generation of drugs is necessary to save more lives and our research points to a highly effective way of defeating cancerous cells".

The research, supported by the European Research Council and titled Potent organo-osmium compound shifts metabolism in epithelial ovarian cancer cells, is published by PNAS. The paper describes the comprehensive systems biology approach used to elucidate the mechanism of osmium action of FY26, led by PhD student Jess Hearn.

Importantly this analysis also pinpointed 3 mutations in the mitochondrial DNA of ovarian cancer cells. Following the successful test results the researchers have been awarded a Wellcome Trust Pathfinder grant to begin preclinical development of organo-osmium compounds.

Notes: The researchers thank the Biotechnology and Biological Sciences Research Council (Grant 324594, Systems Biology studentship for J.M.H.), the European Research Council (Grants 247450 and 324594), and the Wellcome Trust (Grants 086357 and 102696) for support, as well as the European Union COST Action CM1105.

http://www.eurekalert.org/pub_releases/2015-07/sfts-sft070215.php

Study finds that high fat diet changes gut microbe populations

Study finds that high fat diet changes gut microbe populations and the brain's ability to recognize fullness

Denver, CO - Have you ever wondered why eating one good-tasting French fry may lead you to eat the whole batch and leave you wanting more? According to a new study with rats, that high-fat indulgence literally changes the populations of bacteria residing inside the gut and also alters the signaling to the brain. The result? The brain no longer senses signals for fullness, which can cause overeating--a leading cause of obesity.

The findings from this study conducted by researchers at the University of Georgia, Washington State University and Binghamton University, are to be presented this week at the Annual Meeting of the Society for the Study of Ingestive Behavior, the society for research into all aspects of eating and drinking behavior.

"When we switch the rats to a high fat diet, it reorganizes brain circuits," explained Krzysztof Czaja, DVM, PhD, a principal investigator on the study who is an associate professor of neuroanatomy at the University of Georgia College of Veterinary Medicine. "The brain is changed by eating unbalanced foods. It induces inflammation in the brain regions responsible for feeding behavior. Those reorganized circuits and inflammation may alter satiety signaling."

So what happens to the microbiota in the intestines after a switch to a high fat diet? Dr. Czaja likens the phenomenon to how a sudden significant shift in temperature might impact the people who live in the affected area: Some people will be fine. Others will become ill.

"In the regular physiological state, many different strains of bacteria live in a balanced environment in the intestinal tract," said Dr. Czaja. "They don't overpopulate. There are little shifts, but in general this population is quite stable. When we start feeding the rats a different diet, there is an immediate effect. Suddenly, different nutrients are changing the microenvironment in the gut and some bacteria begin to overpopulate. Some sensitive bacteria begin to die and some populations may even vanish. So, introducing a significant change in the gut microenvironment triggers a cascade of events that leads to this population switch."

These changes can cause inflammation that damages the nerve cells that carry signals from the gut to the brain, resulting in gut-brain miscommunication. It is not yet known whether this change is permanent or reversible, but Dr. Czaja and his colleagues plan to address this question in the future.

When it comes to diet and how it impacts health, Dr. Czaja says we should "think systemically." "All of the components and receptors in our body are interconnected and should work in harmony. There is not a single receptor responsible for huge physiological outcomes."

Throughout most of history until just a few decades ago, our bodies were accustomed to whole foods derived from natural sources, rather than artificial and highly processed foods. The research provides new insight into how balance in the intestinal microbiota and gut-brain communication--which was well-adjusted over millennia - might be disturbed by the introduction of modified foods high in fat and sugar. Disrupting that balance leads to the confused brain and inappropriate satiety feedback that can result in obesity.

This research was supported by the National Institute on Deafness and Other Communication Disorders, grant number 1R01DC013904.

More information:

Research: Diet-induced obesity is associated with a change in the intestinal microbiota, activation of microglia, and reorganization of the nucleus of the solitary tract

http://www.eurekalert.org/pub_releases/2015-07/uotw-mee070715.php

Mass extinction event from South Africa's Karoo

New date of rocks links land and sea fossil records in one extinction event

An international team led by researchers from the Evolutionary Studies Institute (ESI) at the University of the Witwatersrand, Johannesburg, has obtained an age from rocks of the Great Karoo that shed light on the timing of a mass extinction event that occurred around 260 million years ago.

This led to the disappearance of a diverse group of early mammal-like reptiles called dinocephalians, which were the largest land-living animals of the time.

The project was led by Dr Michael Day, a postdoctoral fellow at Wits University, and the findings are contained in paper, titled: When and how did the terrestrial mid-Permian mass extinction occur? Evidence from the tetrapod record of the Karoo Basin, South Africa, published today, 8 July 2015, in the latest issue of the Royal Society's biological journal, Proceedings of the Royal Society B.

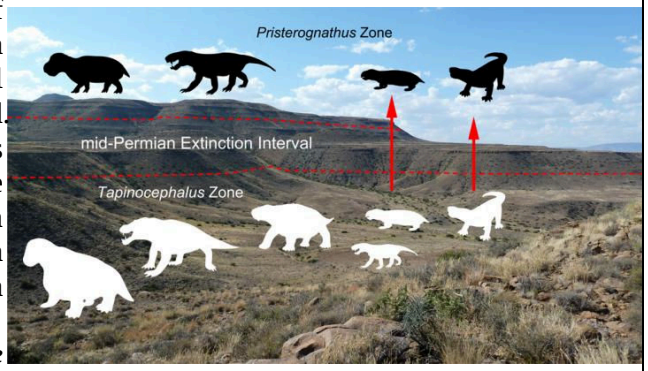
The Karoo is very rich in fossils of terrestrial animals from the Permian and Triassic geological periods, which makes it one of the few places to study extinction events on land during this time. As a result South Africa's Karoo region provides not only a historical record of biological change over a period of Earth's

history but also a means to test theories of evolutionary processes over long stretches of time.

By collecting fossils in the Eastern, Western and Northern Cape Provinces the team was able to show that around 74-80% of species became extinct along with the dinocephalians in a geologically short period of time.

The new date was obtained by high precision analyses of the relative abundance of uranium and lead in small zircon crystals from a volcanic ash layer close to this extinction horizon in the Karoo.

This provides a means of linking the South African fossil record with the fossil record in the rest of the world. In particular, it helps correlate the Karoo with the global marine record, which also records an extinction event around 260 million years ago.



This is an illustration of the Guadalupian extinction. **Wits University**

"A mid-Permian extinction event on land has been known for some time but was suspected to have occurred earlier than those in the marine realm. The new date suggests that one event may have affected marine and terrestrial environments at the same time, which could mean its impact was greater than we thought," says Day.

The mid-Permian extinction occurred near the end of what geologists call the Guadalupian epoch that extended from 272.3 to around 259.1 million years ago. It pre-dated the massive and much more famous end-Permian mass extinction event by 8 million years.

"The South African Karoo rocks host the richest record of middle Permian land-living vertebrate animals. This dataset, the culmination of 30 years of fossil collecting and diligent stratigraphic recording of the information, for the first time provides robust fossil and radioisotopic data to support the occurrence of this extinction event on land," says Day. "The exact age of the marine extinctions remains uncertain," says Jahandar Ramezani of Massachusetts Institute of Technology and who was responsible for dating the rocks, "but this new date from terrestrial deposits of the Karoo, supported by palaeontological evidence, represents an important step towards a better understanding of the mid-Permian extinction and its effect on terrestrial faunas."

http://www.eurekalert.org/pub_releases/2015-07/kcl-mbo070615.php

Mammography benefits overestimated

An in-depth review of randomised trials on screening for breast, colorectal, cervical, prostate and lung cancers, published in the Journal of the Royal Society of Medicine, shows that the benefits of mammographic screening are likely to have been overestimated.

This overestimation results from the use of an unconventional statistical method which differs from that used for other cancer screening trials, concludes the paper co-authored by researchers at King's College London and the University of Strathclyde Institute of Global Public Health at iPRI, France.

Started in the 1960s and 70s, the Swedish randomised trials suggested that mammography screening could reduce breast cancer mortality by 20 to 25% in populations where screening is widespread. These findings were, and remain, extremely influential in decisions taken to establish population breast cancer screening programmes using mammography.

The goal of cancer screening is principally to reduce the mortality from the disease in question by enabling cancers to be found at an early stage. Early detection reduces the risk of being diagnosed with an advanced cancer that is often deadly. In 2002, WHO recommended that when population screening for breast cancer was implemented in any region, the rate of advanced breast cancers should be monitored: if the programme is successful, these rates should show a fall over time indicating that mammography screening is contributing effectively to reducing breast cancer mortality. Moreover, with increased screening, more rapid and more pronounced falls in breast cancer mortality would be expected in countries that implemented mammography screening programmes at end of the 1980s than in countries that implemented programmes ten to fifteen years later.

"Contrary to expectations, numerous studies in North America, Europe and Australia have shown that the rates of advanced breast cancer have not declined in countries where most women regularly attend mammography screening" observed Professor Philippe Autier, lead author from University of Strathclyde Institute of Global Public Health at iPRI. He went on to note that "other studies have shown that declines in breast cancer mortality were the same in countries that implemented mammography screening end of the 1980s as those that did so ten to twenty years later. The absence of differences in mortality reductions could not be explained by differences in access to modern therapies."

Professor Richard Sullivan, from the Institute of Cancer Policy, King's College London observed that "these findings were in sharp contrast with screening for cervical and colorectal cancers, two cancers for which studies have clearly shown the capacity of screening to reduce the numbers of advanced cancers in

populations. This has major implications for policy-makers in middle income countries who are now making decisions about where to prioritise cancer screening efforts".

These discrepancies led Professor Autier and his colleagues to undertake an in-depth review of all randomised trials of cancer screening. Professor Autier concluded that "if the Swedish trials had used similar statistical analyses to other cancer screening trials, reductions in the risk of breast cancer death associated with mammography screening would have been much smaller, probably less than 10 per cent."

"The reduction seen in the mortality from breast cancer in many countries is one of the major contributions to Cancer Control in recent times" noted Peter Boyle, Professor and Director of the University of Strathclyde Institute of Global Public Health at iPRI. "Many factors have contributed to this success including earlier presentation and better diagnosis, as well as major improvements in the organisation of care (multidisciplinary teams) to specific improvements in surgery, radiotherapy and chemotherapy/endocrine therapy. Currently, assessment of the impact of mammographic screening programmes cannot be made without taking advances in breast cancer treatment into account."

http://www.eurekalert.org/pub_releases/2015-07/nu-rft070715.php

Researchers find the organization of the human brain to be nearly ideal

New research reveals that the structure of the human brain has an almost ideal network of connections

Have you ever wondered why the human brain evolved the way it did?

A new study by Northeastern physicist Dmitri Krioukov and his colleagues suggests an answer: to expedite the transfer of information from one brain region to another, enabling us to operate at peak capacity.

The paper, published in the July 3 issue of Nature Communications, reveals that the structure of the human brain has an almost ideal network of connections--the links that permit information to travel from, say, the auditory cortex (responsible for hearing) to the motor cortex (responsible for movement) so we can do everything from raise our hand in class in response to a question to rock out to the beat of The 1975.

The findings represent more than a confirmation of our evolutionary progress. They could have important implications for pinpointing the cause of neurological disorders and eventually developing therapies to treat them.

"An optimal network in the brain would have the smallest number of connections possible, to minimize cost, and at the same time it would have maximum navigability--that is, the most direct pathways for routing signals from any possible source to any possible destination," says Krioukov. It's a balance, he explains, raising and lowering his hands to indicate a scale. The study presents a new strategy to find the connections that achieve that balance or, as he puts it, "the sweet spot."

Krioukov, an associate professor in the Department of Physics, studies networks, from those related to massive Internet datasets to those defining our brains. In the new research, he and his co-authors used sophisticated statistical analyses based on Nobel laureate John Nash's contributions to game theory to construct a map of an idealized brain network--one that optimized the transfer of information. They then compared the idealized map of the brain to a map of the brain's real network and asked the question "How close are the two?"

Remarkably so. They were surprised to learn that 89 percent of the connections in the idealized brain network showed up in the real brain network as well. "That means the brain was evolutionarily designed to be very, very close to what our algorithm shows," says Krioukov.

The scientists' strategy bucks tradition: It lets function--in this case, navigability--drive the structure of the idealized network, thereby showing which links are essential for optimal navigation. Most researchers in the field, says Krioukov, build models of the real network first, and only then address function, an approach that does not highlight the most crucial links.

The new strategy is also transferable to a variety of disciplines. The study, whose co-authors are at the Budapest University of Technology and Economics, mapped six diverse navigable networks in total, including that of the Internet, U.S. airports, and Hungarian roads. The Hungarian road network, for example, gave travelers the "luxury to go on a road trip without a map," the authors wrote.

Future applications of the research cross disciplines, too. Knowing what links in a network are the most critical for navigation tells you where to focus protective measures, whether the site is the Internet, roadways, train routes, or flight patterns. "Conversely, if you're a good guy facing a terrorist network, you know what links to attack first," says Krioukov. A systems designer could locate the missing connections necessary to maximize the navigability of a computer network and add them.

In the brain, the links existing in the idealized network are likely those required for normal brain function, says Krioukov. He points to a maze of magenta and turquoise tangles coursing through a brain illustration in his paper and traces the magenta trail, which is present in both the ideal and real brains. "So we suspect that they are the primary candidates to look at if some disease develops--to see if they are dam-aged or broken."

Looking to the future, he speculates that once such links are identified, new drugs or surgical techniques could perhaps be developed to target them and repair, or circumvent, the damage. "At the end of the day, what we are trying to do is to fix the diseased network so that it can resume its normal function," says Krioukov.

http://www.eurekalert.org/pub_releases/2015-07/acs-poa070815.php

Peppermint oil and cinnamon could help treat and heal chronic wounds

Antimicrobial compounds from peppermint and cinnamon can kill biofilms and actively promote healing

Infectious colonies of bacteria called biofilms that develop on chronic wounds and medical devices can cause serious health problems and are tough to treat. But now scientists have found a way to package antimicrobial compounds from peppermint and cinnamon in tiny capsules that can both kill biofilms and actively promote healing. The researchers say the new material, reported in the journal ACS Nano, could be used as a topical antibacterial treatment and disinfectant.

Many bacteria clump together in sticky plaques in a way that makes them difficult to eliminate with traditional antibiotics. Doctors sometimes recommend cutting out infected tissues. This approach is costly, however, and because it's invasive, many patients opt out of treatment altogether. Essential oils and other natural compounds have emerged recently as alternative substances that can get rid of pathogenic bacteria, but researchers have had a hard time translating their antibacterial activity into treatments. Vincent M. Rotello and colleagues wanted to address this challenge.

The researchers packaged peppermint oil and cinnamaldehyde, the compound in cinnamon responsible for its flavor and aroma, into silica nanoparticles. The microcapsule treatment was effective against four different types of bacteria, including one antibiotic-resistant strain. It also promoted the growth of fibroblasts, a cell type that is important in wound healing.

The authors acknowledge funding from Firmenich, the National Institutes of Health and the National Science Foundation.

http://www.eurekalert.org/pub_releases/2015-07/dri-vet070215.php

Volcanic eruptions that changed human history

Researchers find new evidence that large eruptions were responsible for cold temperature extremes recorded since early Roman times

RENO - It is well known that large volcanic eruptions contribute to climate variability. However, quantifying these contributions has proven challenging due to inconsistencies in both historic atmospheric data observed in ice cores and corresponding temperature variations seen in climate proxies such as tree rings.

Published today in the journal Nature, a new study led by scientists from the Desert Research Institute (DRI) and collaborating international institutions, resolves these inconsistencies with a new reconstruction of the timing and associated radiative forcing of nearly 300 individual volcanic eruptions extending as far back as the early Roman period.

"Using new records we are able to show that large volcanic eruptions in the tropics and high latitudes were the dominant drivers of climate variability, responsible for numerous and widespread summer cooling extremes over the past 2,500 years," said the study's lead author Michael Sigl, Ph.D., an assistant research professor at DRI and postdoctoral fellow with the Paul Scherrer Institute in Switzerland.

"These cooler temperatures were caused by large amounts of volcanic sulfate particles injected into the upper atmosphere," Sigl added, "shielding the Earth's surface from incoming solar radiation."

The study shows that 15 of the 16 coldest summers recorded between 500 BC and 1,000 AD followed large volcanic eruptions - with four of the coldest occurring shortly after the largest volcanic events found in record.

This new reconstruction is derived from more than 20 individual ice cores extracted from ice sheets in Greenland and Antarctica and analyzed for volcanic sulfate primarily using DRI's state-of-the-art, ultra-trace chemical ice-core analytical system.

These ice-core records provide a year-by-year history of atmospheric sulfate levels through time. Additional measurements including other chemical parameters were made at collaborating institutions.

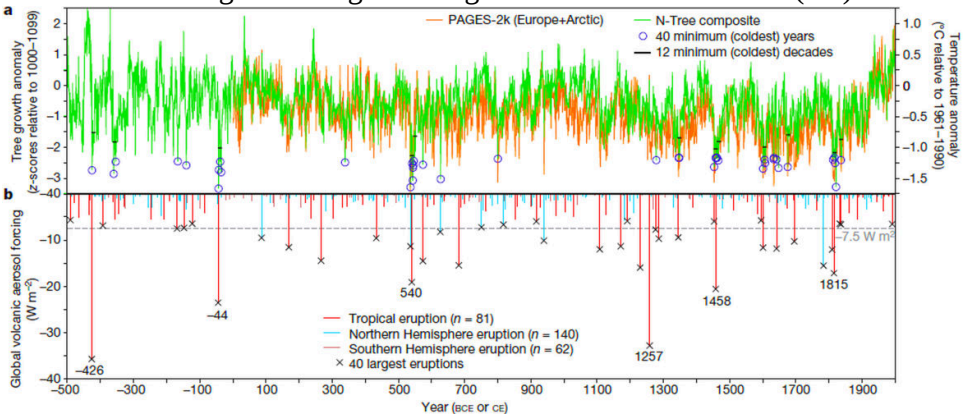
"We used a new method for producing the timescale," explained Mai Winstrup, Ph.D., a postdoctoral researcher at the University of Washington, Seattle. "Previously, this has been done by hand, but we used a statistical algorithm instead. Together with the state-of-the-art ice core chemistry measurements, this resulted in a more accurate dating of the ice cores."

"Using a multidisciplinary approach was key to the success of this project," added Sigl.

In total, a diverse research group of 24 scientists from 18 universities and research institutes in the United States, United Kingdom, Switzerland, Germany, Denmark, and Sweden contributed to this work - including specialists from the solar, space, climate, and geological sciences, as well as historians.

The authors note that identification of new evidence found in both ice cores and corresponding tree rings allowed constraints and verification of their new age scale.

"With the discovery of a distinctive signature in the ice-core records from an extra-terrestrial cosmic ray event, we had a critical time marker that we used to significantly improve the dating accuracy of the ice-core chronologies," explained Kees Welten, Ph.D., an associate research chemist from the University of California, Berkeley. A signature from this same event had been identified earlier in various tree-ring chronologies dating to 774-775 Common Era (CE).



Global volcanic aerosol forcing and Northern Hemisphere temperature variations for the past 2,500 years. 2,500-year record of tree-growth anomalies (N-Tree[42, 43, 76, 77, 78]; relative to 1000–1099 ce) and reconstructed summer temperature anomalies for Europe and the Arctic[3] with the 40 coldest single years and the 12 coldest decades

"Ice-core timescales had been misdated previously by five to ten years during the first millennium leading to inconsistencies in the proposed timing of volcanic eruptions relative to written documentary and tree-ring evidence recording the climatic responses to the same eruptions," explained Francis Ludlow, Ph.D., a postdoctoral fellow from the Yale Climate & Energy Institute.

Throughout human history, sustained volcanic cooling effects on climate have triggered crop failures and famines. These events may have also contributed to pandemics and societal decline in agriculture-based communities.

Together with Conor Kostick, Ph.D. from the University of Nottingham, Ludlow translated and interpreted ancient and medieval documentary records from China, Babylon (Iraq), and Europe that described unusual atmospheric observations as early as 254 years before Common Era (BCE). These phenomena included diminished sunlight, discoloration of the solar disk, the presence of solar coronae, and deeply red twilight skies.

Tropical volcanoes and large eruptions in the Northern Hemisphere high latitudes (such as Iceland and North America) - in 536, 626, and 939 CE, for example - often caused severe and widespread summer cooling in the Northern Hemisphere by injecting sulfate and ash into the high atmosphere.

These particles also dimmed the atmosphere over Europe to such an extent that the effect was noted and recorded in independent archives by numerous historical eyewitnesses.

Climatic impact was strongest and most persistent after clusters of two or more large eruptions.

The authors note that their findings also resolve a long-standing debate regarding the causes of one of the most severe climate crises in recent human history, starting with an 18-month "mystery cloud" or dust veil observed in the Mediterranean region beginning in March, 536, the product of a large eruption in the high-latitudes of the Northern Hemisphere.

The initial cooling was intensified when a second volcano located somewhere in the tropics erupted only four years later. In the aftermath, exceptionally cold summers were observed throughout the Northern Hemisphere.

This pattern persisted for almost fifteen years, with subsequent crop failures and famines - likely contributing to the outbreak of the Justinian plague that spread throughout the Eastern Roman Empire from 541 to 543 CE, and which ultimately decimated the human population across Eurasia.

"This new reconstruction of volcanic forcing will lead to improved climate model simulations through better quantification of the sensitivity of the climate system to volcanic influences during the past 2,500 years," noted Joe McConnell, Ph.D., a DRI research professor who developed the continuous-flow analysis system used to analyze the ice cores.

"As a result," McConnell added, "climate variability observed during more recent times can be put into a multi-millennial perspective - including time periods such as the Roman Warm Period and the times of significant cultural change such as Great Migration Period of the 6th century in Europe."

This reconciliation of ice-core records and other records of past environmental change will help define the role that large climatic perturbations may have had in the rise and fall of civilizations throughout human history.

"With new high-resolution records emerging from ice cores in Greenland and Antarctica, it will be possible to extend this reconstruction of volcanic forcing probably all the way back into the last Ice Age," said Sigl.

This research was largely funded by the U.S. National Science Foundation's Polar Program; with contributions from additional funding agencies and institutions in Belgium, Canada, China, Denmark, France, Germany, Iceland, Japan, Korea, The Netherlands, Sweden, Switzerland, and the United Kingdom.

http://www.eurekalert.org/pub_releases/2015-07/tl-tlf070715.php

The Lancet: First real-life trial finds oral cholera vaccine protects against endemic disease and could speed up global control efforts

Findings lend support to use of the vaccine in routine mass vaccination programmes to control cholera in endemic countries

An oral cholera vaccine (Shanchol) given as part of routine health services is safe and protects against severe cholera in children and adults in urban Bangladesh where the disease is endemic, according to the first real-life trial of this vaccine published in The Lancet. The findings lend support to the use of the vaccine in routine mass vaccination programmes to help to control cholera in endemic countries.

The study shows that even with moderate vaccination coverage, cases of severe, life-threatening cholera were reduced by nearly 40% among the vaccinated, including children aged 5 years and under who are especially vulnerable to severe cholera. Surprisingly, a supplementary campaign to encourage hand-washing and to provide clean drinking water provided little additional protection.

Over 1 billion people are estimated to be at risk of cholera in more than 50 countries where it is endemic. Around 2.8 million cases and 91000 deaths occur every year in endemic regions. Cholera is an infectious disease that causes acute watery diarrhoea, which spreads from person to person through water or food contaminated by Vibrio cholerae bacteria. Up to 40% of people with cholera develop severe dehydration that, if untreated, can be fatal.

While oral cholera vaccines have been used to protect travellers from high-income countries for more than a decade, they have not been used for widespread control of the disease in endemic regions. Shanchol is one of two internationally licensed killed whole-cell oral cholera vaccines currently available. Although the vaccine is effective, easy to administer, and relatively inexpensive at US$ 1.85 per dose [1], its feasibility and effectiveness in a real-life setting was not known until now.

The 'Introduction of Cholera Vaccine in Bangladesh' feasibility study included almost 270000 residents aged 1 year and older from the urban slums of Mirpur in Dhaka who were at high risk of cholera infection due to overcrowding and poor sanitation. Residents were cluster-randomised by dwelling to receive either oral cholera vaccine (94675), oral cholera vaccine plus a behavioural change programme to improve hand-washing and to provide clean drinking water (92539), or no intervention (80056).

The vaccine was given in two doses 14 days apart through routine government health services. The vaccination campaign was well accepted by the local community. Despite a highly mobile population, 65% of the vaccination only group and 66% of the vaccination and behavioural change group received two complete doses. Vaccination with two doses reduced the overall incidence of severely dehydrating cholera by 37% after 2 years in the vaccination group and by 45% when used in combination with the hand washing and clean drinking water programme. Analysis of individual protection showed the vaccine gave 53% protection against cholera during the 2 year follow-up. The vaccine was well tolerated with no serious adverse effects reported. The majority of adverse events were mild or moderate--the most common were acute watery diarrhoea, vomiting, abdominal pain, and fever.

According to lead author Dr Firdausi Qadri from the International Centre for Diarrhoeal Disease Research Bangladesh (icddr,b) in Dhaka, "Our findings show that a routine oral cholera vaccination programme in cholera-endemic countries could substantially reduce the burden of disease and greatly contribute to cholera control efforts. The vaccine is cheap, two doses cost US$3.7, around a third of the price of the other licensed vaccine Dukoral."

She adds, "Ultimately, the key to controlling cholera is clean water and adequate sanitation, which half the developing world (around 2.5 billion people) lack, but this remains a rather difficult reality for the world's poorest nations as well as those affected by climate change, war, and natural disasters."

Writing in a linked Comment, Maureen O'Leary and Kim Mulholland from the London School of Hygiene & Tropical Medicine, London, UK say, "Ongoing monitoring to assess the duration of protection should be an essential component of any mass vaccination programme, to inform the need for booster doses and to evaluate intervention cost-effectiveness...Furthermore, oral cholera vaccine is only one part of the larger programme needed to control cholera. It should not supersede efforts to reduce risky behaviours, and to improve sanitation and provide safe drinking water to people living in cholera-endemic areas."

This study was funded by the Bill & Melinda Gates Foundation.

http://www.thelancet.com/journals/laninf/article/PIIS1473-3099%2813%2970273-1/fulltext and http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4264394/

http://www.bbc.com/news/health-33442820

Deafness could be treated by virus, say scientists

Scientists say they have taken a significant step towards treating some forms of deafness after restoring hearing in animals.

By James Gallagher Health editor, BBC News website

Defects in a baby's DNA are behind roughly half of cases of hearing loss in early life. The mouse study, published in Science Translational Medicine, showed a virus could correct the genetic fault and restore some hearing. Experts said the results could lead to treatments within a decade. The team in the US and

Switzerland focused on the tiny hairs inside the ear, which convert sounds into electrical signals that can be interpreted by the brain. But mutations in our DNA can leave hairs unable to create the electrical signal - leaving people unable to hear.

Viral therapy

The research team developed a genetically modified virus that could infect the hair cells and correct the error. It was tested on "profoundly deaf" mice, which would not notice being at a loud rock concert (with sound levels at 115 dB).

Injections of the virus into the ears led to a "substantial improvement" in hearing, although not to normal levels. The animals could hear the equivalent of the noise inside a moving car (85 dB). They also altered their behaviour in response to sounds throughout the 60-day study.

Dr Jeffrey Holt, one of the researchers from Boston Children's Hospital, told the BBC News website: "We're very excited about it, but we're also cautiously optimistic as we don't want to give false hope. It would be premature to say we've found a cure. "But in the not-too-distant future it could become a treatment for genetic deafness so it is an important finding."

The team are not yet ready for human clinical trials. They want to prove the effect is long-lasting. They know it works for a few months, but are aiming for a life-long change. The viral therapy alters most of the inner hair cells in the ear, but not the outer hair cells. The inner hairs allow you to hear sound, but the outer hairs alter the sensitivity to sounds, so the ear becomes more sensitive to faint noises.

Personalised

The study repaired a mutation in a gene called TMC1, which is behind roughly 6% of deafness that is passed through families. However, there are more than 100 separate genes that have been linked to deafness. "I can envision patients with deafness having their genome sequenced and a tailored, precision medicine treatment injected into their ears to restore hearing," said Dr Holt.

However, the findings will not benefit adults who have hearing loss as a result of listening to too much loud music. Commenting on the findings, Dr Tobias Moser from University Medical Center Gottingen in Germany said the results were "promising". The study provided "hope that restoration of hearing will become available for select forms of deafness within the next decade".

UK scientists Prof Karen Steel, from King's College London, said: "I think this paper represents a really exciting advance in our understanding of what could be achieved using gene transfer approaches into the inner ear to reduce the impact of damaging mutations.

"At the moment, the function is only partially rescued, but this is a start and presumably the methodology could be developed to improve the outcome."

Dr Ralph Holme, the head of biomedical research at the charity Action on Hearing Loss, said: "The genetic diagnosis of hearing loss has greatly improved in the last few years, enabling children and their families to understand the cause of their deafness and predict how it may change over time. However, treatments are still limited to hearing aids and cochlear implants.

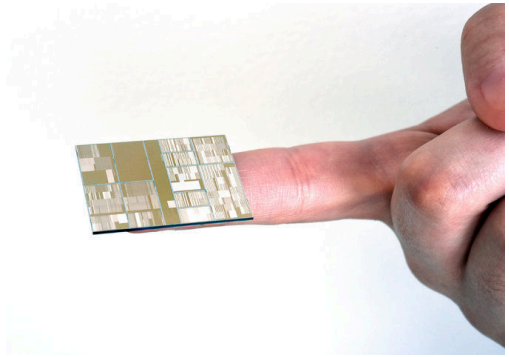
"These findings are encouraging and open the door for other gene therapies, providing hope for people with certain types of genetic hearing loss that, following diagnosis, gene therapy could be available in the not-too-distant future."

http://nyti.ms/1Rr9qSq

IBM Discloses Working Version of a Much Higher-Capacity Chip

IBM said on Thursday that it had made working versions of ultradense computer chips, with roughly four times the capacity of today's most powerful chips.

By JOHN MARKOFF JULY 9, 2015



The announcement, made on behalf of an international consortium led by IBM, the giant computer company, is part of an effort to manufacture the most advanced computer chips in New York's Hudson Valley, where IBM is investing $3 billion in a private-public partnership with New York State, GlobalFoundries, Samsung and equipment vendors.

A working sample of a chip with seven-nanometer transistors. IBM said it made the advance by using silicon-germanium instead of pure silicon. **Darryl Bautista/IBM**

The development lifts a bit of the cloud that has fallen over the semiconductor industry, which has struggled to maintain its legendary pace of doubling transistor density every two years.

Intel, which for decades has been the industry leader, has faced technical challenges in recent years. Moreover, technologists have begun to question whether the longstanding pace of chip improvement, known as Moore's Law, would continue past the current 14-nanometer generation of chips.

Each generation of chip technology is defined by the minimum size of fundamental components that switch current at nanosecond intervals. Today the industry is making the commercial transition from what the industry generally describes as 14-nanometer manufacturing to 10-nanometer manufacturing.

Each generation brings roughly a 50 percent reduction in the area required by a given amount of circuitry. IBM's new chips, though still in a research phase,

suggest that semiconductor technology will continue to shrink at least through 2018.

The company said on Thursday that it had working samples of chips with seven-nanometer transistors. It made the research advance by using silicon-germanium instead of pure silicon in key regions of the molecular-size switches.

The new material makes possible faster transistor switching and lower power requirements. The tiny size of these transistors suggests that further advances will require new materials and new manufacturing techniques.

As points of comparison to the size of the seven-nanometer transistors, a strand of DNA is about 2.5 nanometers in diameter and a red blood cell is roughly 7,500 nanometers in diameter. IBM said that would make it possible to build microprocessors with more than 20 billion transistors.

“I’m not surprised, because this is exactly what the road map predicted, but this is fantastic,” said Subhashish Mitra, director of the Robust Systems Group in the Electrical Engineering Department at Stanford University.

Even though IBM has shed much of its computer and semiconductor manufacturing capacity, the announcement indicates that the company remains interested in supporting the nation’s high technology manufacturing base.

“This puts IBM in the position of being a gentleman gambler as opposed to being a horse owner,” said Richard Doherty, president of Envisioneering, a Seaford, N.Y., consulting firm, referring to the fact that IBM’s chip manufacturing facility was acquired by GlobalFoundries effective last week. “They still want to be in the race,” he added.

IBM now licenses the technology it is developing to a number of manufacturers and GlobalFoundries, owned by the Emirate of Abu Dhabi, to make chips for companies including Broadcom, Qualcomm and Advanced Micro Devices.

The semiconductor industry must now decide if IBM’s bet on silicon-germanium is the best way forward. It must also grapple with the shift to using extreme ultraviolet, or EUV, light to etch patterns on chips at a resolution that approaches the diameter of individual atoms. In the past, Intel said it could see its way toward seven-nanometer manufacturing. But it has not said when that generation of chip making might arrive.

IBM also declined to speculate on when it might begin commercial manufacturing of this technology generation. This year, Taiwan Semiconductor Manufacturing Company said that it planned to begin pilot product of seven-nanometer chips in 2017. Unlike IBM, however, it has not demonstrated working chips to meet that goal.

It is uncertain whether the longer exposure times required by the new generation of EUV photolithographic stepper machines would make high-speed manufacturing operations impossible. Even the slightest vibration can undermine the precision of the optics necessary to etch lines of molecular thicknesses, and the semiconductor industry has been forced to build specialized stabilized buildings to try to isolate equipment from vibration.

An IBM official said that the consortium now sees a way to use EUV light in commercial manufacturing operations. “EUV is another game changer,” said Mukesh Khare, vice president for semiconductor research at IBM. To date, he noted, the demonstration has taken place in a research lab, not in a manufacturing plant. Ultimately the goal is to create circuits that have been reduced in area by another 50 percent over the industry’s 10-nanometer technology generation scheduled to be introduced next year.

http://www.eurekalert.org/pub_releases/2015-07/isu-isf070915.php

ISU study finds it's not what you do, but how you get yourself to exercise that matters

Developing any habit--good or bad--starts with a routine, and exercise is no exception.

AMES, Iowa - The trick is making exercise a habit that is hard to break. According to a new Iowa State University study, that may be easier to accomplish by focusing on cues that make going for a run or to the gym automatic.

Some interventions designed to help people start and continue exercising may focus on the execution habit, or an exact routine to follow at the gym, said Alison Phillips, an assistant professor of psychology at Iowa State.

However, Phillips' research, published in the journal Health Psychology, found that it's the instigation habit - or cues that prompt people to automatically go to the gym - that increases exercise frequency.

"From a health perspective, we want people to engage in physical activity frequently, and so instigation habit is the type of habit to promote that to happen," Phillips said.

"Regardless of the type of exercise you're going to do on a particular day, if you have an instigation habit, you'll start exercising without having to think a lot about it or consider the pros and cons."

For example, Phillips says many people exercise after work. The end of the work day presents their cue to drive to the gym and workout instead of driving home. For others, the cue may be the alarm clock going off in the morning signaling that it is time to go for a run or a bike ride.

Some research suggests that it may take a month or longer of repeated behavior before a cue reliably and automatically triggers a behavior; sticking with the same time of day might help initially, Phillips said.

The most common cues used with interventions are external, she added.

But what works best might vary from person to person. Internal cues, such as a feeling that you need to move after sitting for several hours at your desk, form the strongest habits, Phillips speculates, but are harder to train in people and must develop over time.

The study is the first to explore the importance of different habit components in predicting exercise frequency.

Phillips and Benjamin Gardner, King's College London, asked 118 healthy adults to rate their exercise instigation and execution habit strength. They then tracked how often they exercised over the course of the month.

Approximately 25 percent of participants were overweight or obese. Around 5 percent reported not exercising, while nearly 50 percent said they had regularly exercised longer than 12 months.

Finding a cue that works for you

While the study found execution habit had no effect on exercise frequency, after controlling for instigation habit, Phillips stressed it still may be an effective option for some people starting a new routine.

For anyone who is new to exercise or uncomfortable going to the gym, following the same routine can help build self-confidence at the activity and being active in general. However, for others the repetitiveness of sticking to a specific routine may be detrimental.

"This study shows that you don't have to be afraid of trying new things. You can have an instigation habit and try new types of exercise without worrying about losing the habit," Phillips said.

"It might be important for people just starting out to do the same thing until they realize they can do this, but in the long-term there does not seem to be a benefit of doing the same things over and over again."

Phillips says more research is needed to determine what cues work best.

"I would caution people to not draw too many personal conclusions from this research because it is so preliminary," she said.

"This doesn't mean that one way is necessarily bad or this is the way you have to do it. It's really just the first clue that maybe what we have been doing isn't right for everyone. And, I think it's hopeful that the research shows you can keep up an 'exercise habit' without having to stick to the same boring activities over time."

http://www.eurekalert.org/pub_releases/2015-07/mali-bsi070915.php

Biomaterial scaffold implanted after spinal cord injury promotes nerve regeneration

Implanting a biomaterial scaffold bridging a spinal cord lesion creates a tissue environment more favorable for nerve regeneration

New Rochelle, NY - Researchers from the Mayo Clinic demonstrated that implantation of a biomaterial scaffold designed to bridge the lesion caused by a spinal cord injury creates a tissue environment more favorable for nerve regeneration. The desirable tissue reaction to the implant did not appear to depend on whether the scaffold was seeded with tissue-specific cells, according to the study published in Tissue Engineering, Part A, a peer-reviewed journal from Mary Ann Liebert, Inc., publishers. The article is available free on the Tissue Engineering website until August 9, 2015.

Anthony Windebank, MD and coauthors, Mayo Clinic, Rochester, MN, evaluated the response of nerve tissue over time to an implanted biomaterial scaffold, with or without Schwann cells, at the site of a full transection spinal cord injury in rats. In the article "Positively Charged Oligo[Poly(Ethylene Glycol) Fumarate] Scaffold Implantation Results in a Permissive Lesion Environment after Spinal Cord Injury in Rat," the authors report reduced scarring, cyst formation, and deposition of debris and protein complexes that can inhibit nerve regeneration. Seeding of Schwann cells in the scaffold channels did not have a significant effect on the lesion environment. Future research to discover therapeutic agents able to block the fibrotic response to these scaffolds could improve their ability to bridge spinal cord lesions.

"In their study of spinal cord transection injury in rats, Hakim et al. discovered that bare scaffold implantation--but not implantation of scaffold plus Schwann cells--temporarily enabled a 'regeneration permissive' environment, in which immediate scarring of the spinal cord was forestalled," says Peter C. Johnson, MD, Vice President, Research and Development and Medical Affairs, Vancive Medical Technologies and President and CEO, Scintellix, LLC, Raleigh, NC. "While scaffold fibrosis ultimately ensued, the notion that proper scaffold design alone could provide sufficient time for axonal growth across spinal cord gaps has reemerged as an interesting target of study."

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http://bit.ly/1L7Gx8q

Researchers Just Found a Surprising Stash of Dinosaur Eggshells in Japan

The eggs belonged to a slew of different species and represent the first nesting site discovered in Japan

By Helen Thompson

In Japan, a patch of rock the size of a tennis court has yielded 90 fragments of fossilized dinosaur eggs, researchers reported June 29 in the journal *Cretaceous Research*. The find includes five types of eggs and hints at the first dinosaur nesting site discovered in the Japanese Islands.

Dinosaur eggs have turned up at hundreds of fossil sites around the world, but such finds are rare in Japan. Just like modern bird eggs, dinosaur eggs can be easily destroyed, smashed or flattened. On top of that, Japan's geology and volcanism compresses rock layers, making fossilized eggs hard to distinguish.

Researchers found pieces of dinosaur egg shells at a possible nesting site in Kamitaki, Japan. (Takeshi Ito)

"It is difficult to find fossil eggshell fragments in Japan because the rock is so hard and needs to be broken apart manually," Darla Zelenitsky, a paleontologist at the University of Calgary and co-author on the study, explained in a statement.

In 2006, an amateur fossil hunter led researchers to a riverside site in southern Japan. Over the last few years, the site has yielded the remains of ancient mammals, frogs, lizards and a few dinosaurs. Sifting through samples from the site, Zelenitsky and her colleagues stumbled upon fragments of 110-million-year-old eggshells from different dinosaurs. Under a microscope, the structural patterns of eggs can point to the species that produced them.

Most of these eggs likely came from meat-eaters called theropods (the group that produced *T. rex* and modern birds), but a few came from an ornithopod, a larger dinosaur that munched on plants. Some of the theropod eggs they discovered were extremely small — researchers estimate their eggs weighed between one and five ounces — making them some of the tiniest theropod eggs ever unearthed.

The presence of so many eggs suggests that the site may have been used as a nesting site for lots of different species. "[These eggshell fragments] can tell us a lot about the evolution, reproduction, and biology of dinosaurs in this region," Kohei Tanaka, a paleontology grad student in Zelenitsky's lab who did most of the analysis, noted in a statement.

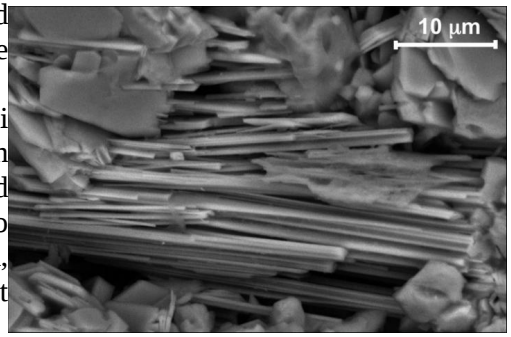
In the meantime, researchers plant to continue the hunt for more dino eggs and perhaps even fully preserved nests at this rare riverside site in Japan.

http://www.eurekalert.org/pub_releases/2015-07/ssoe-vrr070215.php

Volcanic rocks resembling Roman concrete explain record uplift in Italian caldera

Inspiration for Roman concrete came from observing interactions between the volcanic ash at Pozzuoli and seawater

The discovery of a fiber-reinforced, concrete-like rock formed in the depths of a dormant supervolcano could help explain the unusual ground swelling that led to the evacuation of an Italian port city and inspire durable building materials in the future, Stanford scientists say.



The "natural concrete" at the Campi Flegrei volcano is similar to Roman concrete, a legendary compound invented by the Romans and used to construct the Pantheon, the Coliseum, and ancient shipping ports throughout the Mediterranean.

The presence of the mineral actinolite in the caprock of Campi Flegrei provided the crucial clue to unraveling the chemical processes that formed the concrete-like rock beneath the caldera. **Courtesy of Tiziana Vanorio**

"This implies the existence of a natural process in the subsurface of Campi Flegrei that is similar to the one that is used to produce concrete," said Tiziana Vanorio, an experimental geophysicist at Stanford's School of Earth, Energy & Environmental Sciences.

Campi Flegrei lies at the center of a large depression, or caldera, that is pockmarked by craters formed during past eruptions, the last of which occurred nearly 500 years ago. Nestled within this caldera is the colorful port city of Pozzuoli, which was founded in 600 B.C. by the Greeks and called "Puteoli" by the Romans.

Beginning in 1982, the ground beneath Pozzuoli began rising at an alarming rate. Within a two-year span, the uplift exceeded six feet-an amount unprecedented

anywhere in the world. "The rising sea bottom rendered the Bay of Pozzuoli too shallow for large craft," Vanorio said.

Making matters worse, the ground swelling was accompanied by swarms of micro-earthquakes. Many of the tremors were too small to be felt, but when a magnitude 4 quake juddered Pozzuoli, officials evacuated the city's historic downtown. Pozzuoli became a ghost town overnight.

A teenager at the time, Vanorio was among the approximately 40,000 residents forced to flee Pozzuoli and settle in towns scattered between Naples and Rome. The event made an impression on the young Vanorio, and inspired her interests in the geosciences. Now an assistant professor at Stanford, Vanorio decided to apply her knowledge about how rocks in the deep Earth respond to mechanical and chemical changes to investigate how the ground beneath Pozzuoli was able to withstand so much warping before cracking and setting off micro-earthquakes.

"Ground swelling occurs at other calderas such as Yellowstone or Long Valley in the United States, but never to this degree, and it usually requires far less uplift to trigger earthquakes at other places," Vanorio said. "At Campi Flegrei, the micro-earthquakes were delayed by months despite really large ground deformations."

To understand why the surface of the caldera was able to accommodate incredible strain without suddenly cracking, Vanorio and a post-doctoral associate, Waruntorn Kanitpanyacharoen, studied rock cores from the region. In the early 1980s, a deep drilling program probed the active geothermal system of Campi Flegrei to a depth of about 2 miles. When the pair analyzed the rock samples, they discovered that Campi Flegrei's caprock-a hard rock layer located near the caldera's surface-is rich in pozzolana, or volcanic ash from the region.

The scientists also noticed that the caprock contained tobermorite and ettringite-fibrous minerals that are also found in manmade concrete. These minerals would have made Campi Flegrei's caprock more ductile, and their presence explains why the ground beneath Pozzuoli was able to withstand significant bending before breaking and shearing. But how did tobermorite and ettringite come to form in the caprock?

Once again, the drill cores provided the crucial clue. The samples showed that the deep basement of the caldera-the "wall" of the bowl-like depression-consisted of carbonate-bearing rocks similar to limestone, and that interspersed within the carbonate rocks was a needle-shaped mineral called actinolite.

"The actinolite was the key to understanding all of the other chemical reactions that had to take place to form the natural cement at Campi Flegrei," said Kanitpanyacharoen, who is now at Chulalongkorn University in Thailand.

From the actinolite and graphite, the scientists deduced that a chemical reaction called decarbonation was occurring beneath Campi Flegrei. They believe that the combination of heat and circulating mineral-rich waters decarbonates the deep basement, prompting the formation of actinolite as well as carbon dioxide gas. As the CO_2 mixes with calcium-carbonate and hydrogen in the basement rocks, it triggers a chemical cascade that produces several compounds, one of which is calcium hydroxide. Calcium hydroxide, also known as portlandite or hydrated lime, is one of the two key ingredients in manmade concrete, including Roman concrete. Circulating geothermal fluids transport this naturally occurring lime up to shallower depths, where it combines with the pozzolana ash in the caprock to form an impenetrable, concrete-like rock capable of withstanding very strong forces.

"This is the same chemical reaction that the ancient Romans unwittingly exploited to create their famous concrete, but in Campi Flegrei it happens naturally," Vanorio said.

In fact, Vanorio suspects that the inspiration for Roman concrete came from observing interactions between the volcanic ash at Pozzuoli and seawater in the region. The Roman philosopher Seneca, for example, noted that the "dust at Puteoli becomes stone if it touches water."

"The Romans were keen observers of the natural world and fine empiricists," Vanorio said. "Seneca, and before him Vitruvius, understood that there was something special about the ash at Pozzuoli, and the Romans used the pozzolana to create their own concrete, albeit with a different source of lime."

Pozzuoli was the main commercial and military port for the Roman Empire, and it was common for ships to use pozzolana as ballast while trading grain from the eastern Mediterranean. As a result of this practice, volcanic ash from Campi Flegrei-and the use of Roman concrete-spread across the ancient world. Archeologists have recently found that piers in Alexandria, Caesarea, and Cyprus are all made from Roman concrete and have pozzolana as a primary ingredient.

Interestingly, the same chemical reaction that is responsible for the unique properties of the Campi Flegrei's caprock can also trigger its downfall. If too much decarbonation occurs-as might happen if a large amount of saltwater, or brine, gets injected into the system-an excess of carbon dioxide, methane and steam is produced. As these gases rise toward the surface, they bump up against the natural cement layer, warping the caprock. This is what lifted Pozzuoli in the 1980s. When strain from the pressure buildup exceeded the strength of the caprock, the rock sheared and cracked, setting off swarms of micro-earthquakes. As pent-up gases and fluids vent into the atmosphere, the ground swelling subsided. Vanorio and Kanitpanyacharoen suspect that as more calcium hydroxide was produced at depth and transported to the surface, the damaged caprock was slowly repaired, its cracks "healed" as more natural cement was produced.

Vanorio believes the conditions and processes responsible for the exceptional rock properties at Campi Flegrei could be present at other calderas around the world. A better understanding of the conditions and processes that formed Campi Flegrei's caprock could also allow scientists to recreate it in the lab, and perhaps even improve upon it to engineer more durable and resilient concretes that are better able to withstand large stresses and shaking, or to heal themselves after damage.

"There is a need for eco-friendly materials and concretes that can accommodate stresses more easily," Vanorio said. "For example, extracting natural gas by hydraulic fracturing can cause rapid stress changes that cause concrete well casings to fail and lead to gas leaks and water contamination."

http://www.bbc.com/news/health-33464480

Smoking 'may play schizophrenia role'

Smoking could play a direct role in the development of schizophrenia and needs to be investigated, researchers say.

By James Gallagher Health editor, BBC News website

The team at King's College London say smokers are more likely to develop the disorder and at a younger age. Published in the Lancet Psychiatry, their analysis of 61 separate studies suggests nicotine in cigarette smoke may be altering the brain. Experts said it was a "pretty strong case" but needed more research.

Smoking has long been associated with psychosis, but it has often been believed that schizophrenia patients are more likely to smoke because they use cigarettes as a form of self-medication to ease the distress of hearing voices or having hallucinations. The team at King's looked at data involving 14,555 smokers and 273,162 non-smokers.

It indicated:

57% of people with psychosis were already smokers when they had their first psychotic episode

Daily smokers were twice as likely to develop schizophrenia as non-smokers

Smokers developed schizophrenia a year earlier on average

The argument is that if there is a higher rate of smoking before schizophrenia is diagnosed, then smoking is not simply a case of self-medication.

Dr James MacCabe, from the Institute of Psychiatry, Psychology and Neuroscience at King's, said: "It's very difficult to establish causation [with this style of study], what we're hoping that this does is really open our eyes to the possibility that tobacco could be a causative agent in psychosis, and we hope this will then lead to other research and clinical trials that would help to provide firmer evidence."

Clearly most smokers do not develop schizophrenia, but the researchers believe it is increasing the risk. The overall incidence of the condition is one in every 100 people normally, which may be increased to two per 100 by smoking. The researchers said nicotine altered levels of the brain chemical dopamine, which has already been implicated in the psychosis.

Prof Michael Owen, the director of the Institute of Psychological Medicine at Cardiff University, said the researchers had made a "pretty strong case" that smoking may increase the risk of schizophrenia. "The fact is that it is very hard to prove causation without a randomised trial, but there are plenty of good reasons already for targeting public health measures very energetically at the mentally ill."

The charity Rethink Mental Illness said: "We know that 42% of all cigarettes smoked in England are by people with mental health problems, and so any new findings about the link between smoking and psychosis is a potential worry.

"However, longer-term studies are needed to fully understand this potential link."

http://bbc.in/1Jc22At

Surge of Ebola in Liberia May Be Linked to a Survivor

Resurgence of Ebola in Liberia, , may have originated with a survivor still carrying the virus

By SHERI FINK JULY 9, 2015

A resurgence of Ebola in the last week in Liberia, which had been declared free of the disease, may have originated with a survivor still carrying the virus, according to scientists who analyzed the genetic sequence of the virus from the body of a 17-year-old Liberian boy who died of Ebola last week.

The boy's virus did not match strains still circulating in the continuing outbreak in Guinea and Sierra Leone, meaning he was unlikely to have caught the virus through cross-border travel.

"The origin of this virus is Liberian," said Stuart Nichol of the Centers for Disease Control and Prevention. "Based on the absence of reported cases for several months, this does push us toward thinking about a possible sexual event as an early step in this cluster of cases."

Liberia's last confirmed case, in March, was also suspected to be linked to sexual transmission, because the virus isolated from that patient, Ruth Tugbah, who died, closely matched that detected in the semen of her boyfriend, who had recovered from Ebola months before she fell ill. The genome of Ms. Tugbah's virus was different from the newly sequenced case and not thought to be connected to it.

The Times produced more than 400 articles, including about 50 front-page stories from inside the Ebola-afflicted countries themselves. Here is a sample of work.

Instead, the sequence in the new case most closely matches viruses found circulating in Liberia last July and August, said Michael R. Wiley, a research scientist with the Geneva Foundation and a contractor with the United States Army Medical Research Institute of Infectious Diseases, who flew to Liberia last

weekend to help sequence the virus at the Liberia Institute for Biomedical Research.

Scientists had previously shown that the Ebola virus can sometimes persist for months in certain areas of the body that are relatively protected from the immune system, including the testes, the placenta and the inner portion of the eye. Studies of survivors in Liberia and Sierra Leone are working to determine how often this occurs. Experts recommend that survivors practice protected sex until more is known.

Liberian officials and international experts are still exploring other possibilities that could explain the new findings, including that the virus existed in an unknown reservoir before infecting at least five villagers. Experts believe it is unlikely that the virus has been spreading silently in recent months, given the strength of Liberia's surveillance system, including frequent testing of bodies and sick people.

Given that the virus degrades quickly, within hours to days, in the tropical heat, Dr. Nichol said it was implausible that Ebola had been lying dormant in the environment. He said the close similarity with other viruses found in people in Liberia last year argues against the virus having been reintroduced from wildlife. Dr. Nichol said that an initial suspicion among villagers that the illnesses might be connected to a dog "we think is a red herring."

The developments showed the power and potential of real-time genetic sequencing done in recent weeks by virologists in West Africa, said Fatorma K. Bolay, director of the Liberia Institute for Biomedical Research. The technique is also being used in Sierra Leone and Guinea, with 27 new cases last week.

In one recent example, scientists used sequencing to connect Ebola cases in two areas of Guinea with cases in the capital, which guided epidemiologists and anthropologists. "It helped to go back and untangle exactly how it got from one place to another," said Dr. Bruce Aylward, who leads the Ebola response for the World Health Organization.

Dr. Aylward said that while secret burials and hidden illnesses were still complicating the response in Guinea and Sierra Leone, responders had been increasingly able to link new illnesses with exposure to known cases and decrease the number of chains of transmission.

The recurrence in Liberia shows the need to be vigilant, Dr. Aylward said, adding that he does not believe the disease will continue indefinitely. "I can't accept that and I don't accept that," he said.

Tolbert Nyenswah, incident commander for the Ebola response units in Liberia, who was in New York on Thursday for a United Nations donors conference, agreed, saying, "We are confident we can stop this from further spreading."

http://nyti.ms/1NXZOZ3

Empathy Is Actually a Choice

ONE death is a tragedy. One million is a statistic.

By DARYL CAMERON, MICHAEL INZLICHT and WILLIAM A. CUNNINGHAM

You've probably heard this saying before. It is thought to capture an unfortunate truth about empathy: While a single crying child or injured puppy tugs at our heartstrings, large numbers of suffering people, as in epidemics, earthquakes and genocides, do not inspire a comparable reaction.

Studies have repeatedly confirmed this. It's a troubling finding because, as recent research has demonstrated, many of us believe that if more lives are at stake, we will — and should — feel more empathy (i.e., vicariously share others' experiences) and do more to help.

Not only does empathy seem to fail when it is needed most, but it also appears to play favorites. Recent studies have shown that our empathy is dampened or constrained when it comes to people of different races, nationalities or creeds. These results suggest that empathy is a limited resource, like a fossil fuel, which we cannot extend indefinitely or to everyone.

What, then, is the relationship between empathy and morality? Traditionally, empathy has been seen as a force for moral good, motivating virtuous deeds.

Yet a growing chorus of critics, inspired by findings like those above, depict empathy as a source of moral failure. In the words of the psychologist Paul Bloom, empathy is a "parochial, narrow-minded" emotion — one that "will have to yield to reason if humanity is to survive."

We disagree.

While we concede that the exercise of empathy is, in practice, often far too limited in scope, we dispute the idea that this shortcoming is inherent, a permanent flaw in the emotion itself. Inspired by a competing body of recent research, we believe that empathy is a *choice* that we make whether to extend ourselves to others. The "limits" to our empathy are merely apparent, and can change, sometimes drastically, depending on what we want to feel.

Two decades ago, the psychologist Daniel Batson and colleagues conducted a study that showed that if people expected their empathy to cost them significant money or time, they would avoid situations that they believed would trigger it. More recently, one of us, Daryl Cameron, along with the psychologist Keith Payne, conducted an experiment to see if similar motivational factors could explain why we seem more empathetic to single victims than to large numbers of them.

Participants in this study read about either one or eight child refugees from the Darfur region of Sudan. Half of the participants were led to expect that they

would be asked to make a donation to the refugee or refugees, whereas the other half were not. When there was no financial cost involved in feeling empathy, people felt more empathy for the eight children than for the one child, reversing the usual bias.

If insensitivity to mass suffering stemmed from an intrinsic limit to empathy, such financial factors shouldn't have made a difference.

Likewise, in another recent study, the psychologists Karina Schumann, Jamil Zaki and Carol S. Dweck found that when people learned that empathy was a skill that could be improved — as opposed to a fixed personality trait — they engaged in more effort to experience empathy for racial groups other than their own. Empathy for people unlike us can be expanded, it seems, just by modifying our views about empathy.

Some kinds of people seem generally less likely to feel empathy for others — for instance, powerful people. An experiment conducted by one of us, Michael Inzlicht, along with the researchers Jeremy Hogeveen and Sukhvinder Obhi, found that even people temporarily assigned to high-power roles showed brain activity consistent with lower empathy.

But such experimental manipulations surely cannot change a person's underlying empathic capacity; something else must be to blame. And other research suggests that the blame lies with a simple change in motivation: People with a higher sense of power exhibit less empathy because they have less incentive to interact with others.

Even those suffering from so-called empathy deficit disorders like psychopathy and narcissism appear to be capable of empathy when they want to feel it. Research conducted by one of us, William A. Cunningham, along with the psychologist Nathan Arbuckle, found that when dividing money between themselves and others, people with psychopathic tendencies were more charitable when they believed that the others were part of their in-group.

Psychopaths and narcissists are able to feel empathy; it's just that they don't typically want to.

Arguments against empathy rely on an outdated view of emotion as a capricious beast that needs to yield to sober reason.

Yes, there are many situations in which empathy appears to be limited in its scope, but this is not a deficiency in the emotion itself. In our view, empathy is only as limited as we choose it to be.

Daryl Cameron is an assistant professor of psychological and brain sciences at the University of Iowa. Michael Inzlicht is a professor of psychology, and William A. Cunningham is an associate professor of psychology, both at the University of Toronto.

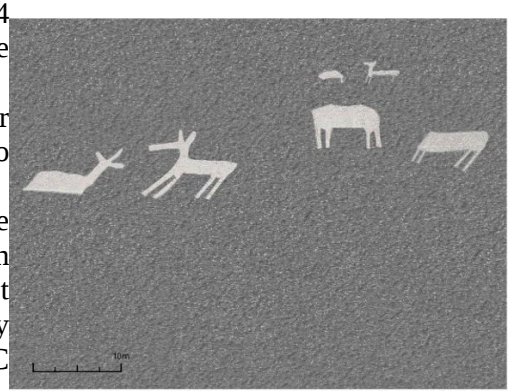
http://bit.ly/1HxjqXW

Japanese team discovers 24 new geoglyphs at Nazca, including llamas

Smaller than their famous peers, but estimated to be several centuries older

By Jessica, RocketNews24

TOKYO - A team of researchers from Yamagata University in Japan announced last week that they have identified 24 new geoglyphs in Nazca, Peru, site of the UNESCO World Heritage Nazca lines.



The newly found geoglyphs are smaller than their famous peers, but estimated to be several centuries older.

The more famous Nazca geoglyphs are estimated to have been created between 400 and 650 AD with the largest spanning 270 meters, while the newly discovered images date from 400-200 BC and range from just five to 20 meters.

Japanese team discovers 24 new geoglyphs at Nazca, including llamas Image from Yamagata University

These smaller glyphs were carved into the side of hills so they could be clearly seen at the time of their creation.

Over time, natural and human erosion have degraded the lines of the artwork, making them difficult to spot, but the team used a 3-D scanner and photos to locate them.

However, some are only partially visible and it's difficult to tell what they are supposed to represent.

Others are clearly llamas, an animal almost synonymous with the Andes.

The university has been studying the Nazca lines since 2004, setting up a full research center in Peru in 2012.

Including 17 new geoglyphs found last year, the Japanese team has discovered 41 previously unknown glyphs in the area.

With the site just 1.5 kilometers from the expanding city of Nazca and in an area where mining takes place, the research team is now calling for conservation measures to preserve these new discoveries and protect the area for further research.

http://nyti.ms/1O06YMw

Astronomer's Ashes Nearing Icy World He Discovered: Pluto

Come Tuesday, Clyde Tombaugh will pass within 7,800 miles of the icy world he discovered 85 years ago.

By THE ASSOCIATED PRESS JULY 12, 2015, 12:13 P.M. E.D.T.

CAPE CANAVERAL, Fla. - His ashes are flying on NASA's New Horizons spacecraft on humanity's first journey to Pluto. New Horizons also is carrying a 1991 U.S. postage stamp that's about to become obsolete — it trumpets "Pluto Not Yet Explored" - as well as two state quarters, one representing Florida, home of the launch site, and the other Maryland, headquarters for the spacecraft developers and flight control. In all, nine small mementos are tucked aboard New Horizons.

There's a good reason there are nine. When New Horizons rocketed away from Cape Canaveral on Jan. 19, 2006, Pluto was the ninth planet in our solar system. It was demoted to dwarf planet a scant seven months later.

Tombaugh's widow and two children offered up an ounce of his ashes for the journey to Pluto. The ashes of the farm boy-turned-astronomer are in a 2-inch aluminum capsule inscribed with these words:

"Interned herein are remains of American Clyde W. Tombaugh, discoverer of Pluto and the solar system's 'third zone.' Adelle and Muron's boy, Patricia's husband, Annette and Alden's father, astronomer, teacher, punster, and friend: Clyde Tombaugh (1906-1997)"

Annette Tombaugh-Sitze and her younger brother Alden, now in their 70s, plan to be at the flight operation base at Johns Hopkins University's Applied Physics Laboratory in Laurel, Maryland, for Tuesday's historic encounter. Their mother died in 2012 at age 99. "I think my dad would be thrilled with the New Horizons. I mean, who wouldn't be?" Annette says in a NASA interview posted online. "When he looked at Pluto, it was just a speck of light."

As for the 29-cent stowaway stamp, Pluto is depicted as grayish with orange flecks, an artist's rendering based on what NASA knew about the tiny orb prior to 1991, which wasn't much. New Horizons' better and better views reveal a copper-colored, icy bright world. "No stamp has ever traveled this far!" Mark Saunders, a spokesman for the U.S. Postal Service, said in an email last week.

A small cutout of SpaceShipOne is attached to New Horizons; the first manned private space plane achieved suborbital flights in 2004 and won the $10 million Ansari X Prize. Also on the spacecraft are two U.S. flags as well as two CDs. One contains the photos of team members. The other contains 434,738 names of people who signed up online in advance, including this reporter, holder of Certificate No. 64,646.

Online:*Johns Hopkins University: http://pluto.jhuapl.edu/Participate/index.php*

http://www.bbc.com/news/health-33479114

Ultrasound may heal chronic wounds, suggests study

A blast of ultrasound can help stubborn chronic wounds heal more quickly, a study suggests.

By James Gallagher Health and science reporter, BBC News website

Tests on animals, published in the Journal of Investigative Dermatology, showed healing times could be cut by nearly a third. Experts said the early results were "quite impressive" but needed to be tested on people.

More than 200,000 people in the UK have chronic wounds which can take weeks to heal. Ultrasound is already used to heal some bone injuries.

A team from the Universities of Sheffield and Bristol tried the technology on mice with chronic wounds, which do not close readily and often become infected. Pressure sores from lying or sitting in the same position for too long, and diabetic foot ulcers which can lead to amputation, are both types of chronic wound. They become more common when we age due to a decline in our body's ability to repair itself.

Ultrasound

The high frequency sound waves physically vibrate cells in and around the wound. The process effectively wakes up the cells to make them more responsive to the wound. The study showed that in both old and diabetic mice, healing times were reduced from nine to six days.

The report said ultrasound was "restoring healing rates to those observed in young healthy animals". In the tests the team were treating the wounds before they become chronic, so they will need to test the power of ultrasound on wounds that have been there for weeks.

Dr Mark Bass, one of the researchers from Sheffield University, told the BBC News website: "At the moment, treatment is based around stopping the infection and hoping it heals, with ultrasound we are promoting the healing of the wound."

"It's activating the normal healing process, that's why it's an attractive therapy; the ultrasound is simply waking up cells to do what they do normally."

The researchers now need to study the approach in people, which they expect to do in the next year. "We're looking at 200,000 patients currently with a chronic wound, all those may well benefit from the technology," Dr Bass said.

The researchers are using broadly the same equipment that is used in an ultrasound scan during pregnancy. Dr John Connelly, from Queen Mary, University of London, said: "They're getting almost complete reversal of impaired wound healing which is quite impressive."

So does it have potential as a treatment?

"I think it could, but that's a major question as wound healing is quite different between humans and mice," he said. "One of the big wound-healing treatments is negative pressure - putting the wound under a vacuum - that acts through mechanical stimulation, so it's entirely reasonable that ultrasound may also work."

http://www.bbc.com/news/science-environment-33500681

Pluto flyby: Meet the 'King of the Kuiper Belt'

Sometimes it is hard to comprehend the size of things in astronomy.

Jonathan Amos Science correspondent

Just our Solar System, the little corner of the Milky Way in which we live, is vast.

Venetia Burney, the 11-year-old girl who in 1930 suggested the name "Pluto" for the newly discovered "planet", remembered playing games in Oxford's University Parks that would try to convey this scale. She and her school chums would hang a two-foot-wide orb on the gates to represent the Sun, and then space out a caraway seed for Mercury and peas to signify Venus and the Earth. Neptune was a lump of clay and sited a mile and a quarter from the gates. "And then we were told the nearest star would be in China, and that really stuck with me," she recalled in a BBC interview.

Before she died in 2009, Venetia got to see the launch of Nasa's New Horizons probe to Pluto. It's even got an instrument on it that is named after her. New Horizons was the fastest spacecraft ever dispatched from Earth. And on Tuesday, after nine-and-a-half years of travel at immense speed, it will finally reach the diminutive world, some 4.7 billion km away. A few things have changed in the intervening years.

The first surely everyone now knows: Pluto is no longer regarded as a main planet and has been re-categorised as a "dwarf planet". The second feeds into the first, and that is the recognition of just how numerous planetary bodies of all sizes are, not just within our Solar System, but around all the stars we see "beyond China".

Who'd have thought that some of these stars would have super-Earths and colossal Jupiters?

The arguments still rage over whether Pluto should be included in the planetary mnemonics that children learn in school. But in many ways this is a distraction - and a distraction from something that is actually more interesting and really quite exciting.

Think about it for a moment: If the "classical nine" planets were all there were, then Tuesday would represent an ending. It would be the completion of a quest to map out our Solar System.

As it is, we now like to think of the reconnaissance of Pluto as just the start of something, as the beginning of the exploration of the "third zone".

If the first and second zones encompass the rocky inner planets like Earth and the outer gas giants like Saturn, then this third sector covers all the smaller bodies like Pluto that orbit billions of km from the Sun. And they are legion.

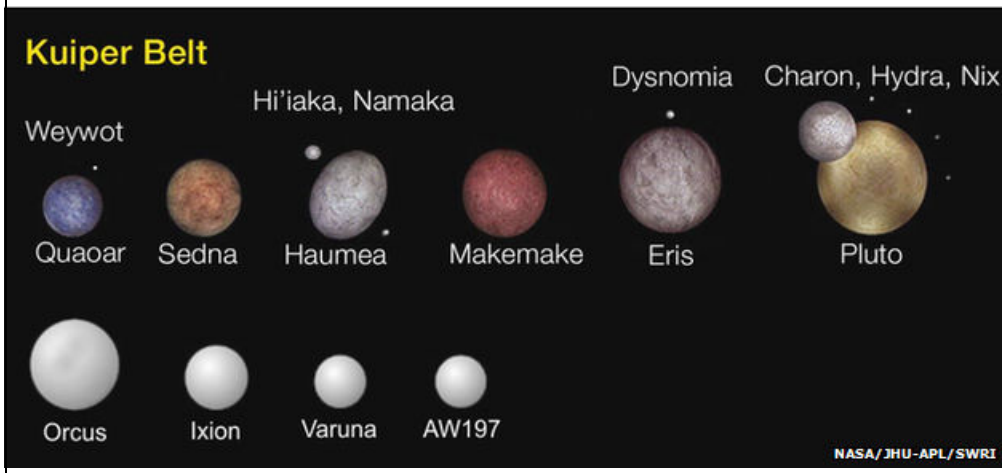
This third zone, known as the Kuiper Belt, probably contains hundreds of thousands of objects 100km and more across. Pluto, at about 2,300km wide, just happens to be the current "King of Kuiper Belt".

"Pluto is the biggest and brightest, and, as far as we know, it's the most interesting of this third class of planets," Alan Stern, the principal investigator on New Horizons, told BBC Newsnight. "It was a wonderful discovery that our Solar System has this extra class and that - surprise, surprise - it is the most populous class. It's amazing: we had a completely upside-down view until the 1990s."

And not just in our Solar System. It is very probable that the dwarf planets are the most abundant type of planet in the Milky Way as a whole.

And remember, they will not all be dull balls of ice and rock. "Right now we're just standing under the waterfall and enjoying it," Alan Stern told BBC Newsnight As we're seeing on the approach to Pluto, many will have active processes shaping their surfaces. Some, just like Pluto, will even have atmospheres with evolving climates.

New Horizons should be thought of then as a sentinel. It's the first mission designed to go and investigate this third domain. After passing Pluto, it will be directed to a second Kuiper Belt object, which it will reach in another four years or so. More missions will no doubt follow. Our problem currently is knowing where to direct them.



All manner of objects are now starting to turn up in the Kuiper Belt

Present telescopes struggle to see the third zone, to pick out the candidates most worthy of a spacecraft encounter. But this is all about to change. We're now building a new generation of monster observatories whose primary mirrors will be 30-40m across. These new telescopes will have the sensitivity and the resolution to open up the Kuiper Belt to a new era of study.

If you run the models, based on our best understanding, you would have expected a thousand or so Plutos to have been around in the early days of the Solar System, more than four billion years ago. But then we think there was a big re-organisation, and many of these objects would either have been destroyed in collisions, or scattered by close encounters with their own kind and the bigger planets.

Some will still be there, albeit perhaps further away than the Kuiper Belt, in an even more distant realm called the Oort Cloud. "If these models are correct, we should expect to find dramatically more small planets, and possibly some large planets that were also scattered out there - Earth-sized and Mars-sized," says Prof Stern.

Just a final aside on Pluto's demotion from "full" planet status. I got the chance the other day to talk about New Horizons with the famous radio astronomer Jocelyn Bell Burnell. It was she who facilitated the technical meeting a few months after the probe's launch in 2006 that downgraded Pluto.

She could not be more excited about the next few days. "I think New Horizons has come out of it very well," she told BBC Newsnight. "By going to visit Pluto and one or two other objects in the Kuiper Belt, it is going to a zone that hasn't previously been explored. And I think it's brilliant. "Being able to send spacecraft out that far is going to lead to a lot of new information and, hopefully, new understanding."