http://phys.org/news/2013-02-china-thick-smog-japan.html

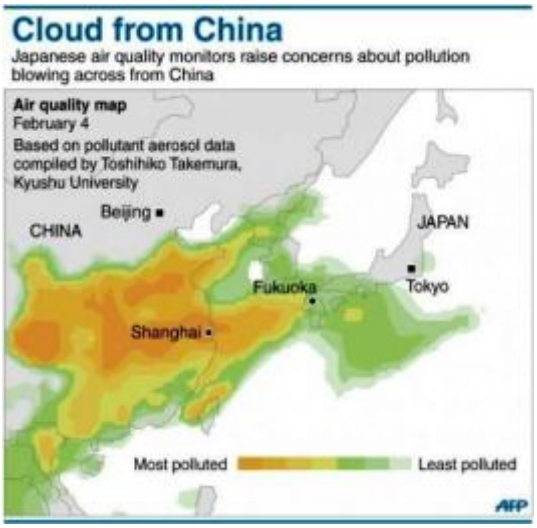
China's thick smog arrives in Japan

The suffocating smog that blanketed swathes of China is now hitting parts of Japan, sparking warnings of health risks for the young and the sick.

The environment ministry's website has been overloaded as worried users log on to try to find out what is coming their way. "Access to our air-pollution monitoring system has been almost impossible since last week, and the telephone here has been constantly ringing because worried people keep asking us about the impact on health," said an environment ministry official.

Pictures of Beijing and other Chinese cities shrouded in thick, choking smog played out across television screens in Japan last week. News programmes have broadcast maps showing a swirl of pollution gathering strength across China and then spreading out over the ocean towards Japan. Pinks, reds and oranges that denote the highest concentrations form a finger of smog that inches upwards to the southern main island of Kyushu.

Relations between Tokyo and Beijing are already strained, over the sovereignty of a chain of islands in the East China Sea. And on the streets of Tokyo, reaction was tart. "China is our neighbour, and all sorts of problems happen between us all the time," said Takaharu Abiko, 50.



Graphic presenting pollution data on air quality over China and Japan on February 4, 2013

"It is very worrying. This is dangerous pollution, like poison, and we can't protect ourselves. It's scary."

Officials were coy about lumping all the blame on their huge neighbour, but Yasushi Nakajima of the environment ministry said "we can't deny there is an impact from pollution in China".

Air pollution over the west of Japan has exceeded government limits over the last few days, with tiny particulate matter a problem, said Atsushi Shimizu of the National Institute for Environmental Studies (NIES). Prevailing winds from the west bring airborne particles from the Asian mainland, he said. Of specific concern is the concentration of a particle 2.5 micrometres or less in diameter, which has been as high as 50 microgrammes per cubic metre of air over recent days in northern Kyushu. The government safe limit is 35 microgrammes. Yellow sand from the deserts of Mongolia and China is a known source for these particles, as are exhausts from cars and smoke from factories. "At this time of year they are definitely not yellow sands, so they're toxic particles," Shimizu said, warning that "people with respiratory diseases should be careful".

The suffocating smog that blanketed swathes of China is now hitting parts of Japan, sparking warnings of health fears for the young and the sick.

Toshihiko Takemura, an associate professor of Kyushu University who runs another air pollution monitoring site, said "the impact of air pollution originating from China on Japan was scientifically discovered more than a decade ago". "Especially in Kyushu, the level of air pollution has been detectable in everyday lives since a few years ago," he told AFP. "People in eastern and northern Japan are now belatedly noticing the cross-border air pollution." Takemura noted that pollution in Japan over the last few days has not been quite as bad as it was in February 2011, when "very hazy days continued for several days in western Japan".

He agreed with Shimizu that people with respiratory diseases, as well as small children, should take extra care to avoid the problems. Takemura's website forecast an "extremely large" amount of air pollutants would arrive in part of Kyushu Monday and Tuesday.

Shimizu said information-sharing with China on air pollution has been difficult but "there are many things Japan can do, for instance encouraging China to use pollutant-filtering equipment in factories".

http://www.eurekalert.org/pub_releases/2013-02/unde-tln020113.php

The last Neanderthals of southern Iberia did not coexist with modern humans

An international study questions the hypothesis that the last Neanderthals persisted in southern Iberia as modern humans advanced in the northern part of the peninsula

The theory that the last Neanderthals –Homo neanderthalensis– persisted in southern Iberia at the same time that modern humans –Homo sapiens– advanced in the northern part of the peninsula, has been widely accepted by the scientific community during the last twenty years. An international study, in which researchers of the Spanish National Distance Education University (UNED) participate, questions this hypothesis.

"It is improbable that the last Neanderthals of central and southern Iberia would have persisted until such a late date, approximately 30,000 years ago, as we thought before the new dates appeared" assures Jesús F. Jordá, researcher of the Department of Prehistory and Archaeology of the UNED and co-author of the study published in Proceedings of the National Academy of Sciences (PNAS).
The scientific team, with researchers from Oxford University (United Kingdom), Australia National University, UNED (Madrid), University of La Laguna (Tenerife), Archaeological Museum of Lucena (Córdoba), and National Museum of National History (Paris), applied a new technique in order to repeat analyses at the sites of Jarama VI (Guadalajara) and Zafarraya (Malaga), considered up to now two of the last refuges of the Iberian Neanderthals.
To the usual radiocarbon dating method, the ultrafiltration protocol was added, which aims to purify the collagen of the bone samples from contaminants. The AMS dating technique was applied that requires minimum sample quantities.
The scientists, by applying this new method, assure that the Neanderthal occupation of the sites did not last until as late as previously thought; instead it should be placed approximately 45,000 years ago.
"The problem with radiocarbon dating alone is that it does not provide reliable dates older than 50,000 years" explains Jordá. An additional problem is contamination; the older the samples are the more residues are accumulated. If contaminants are not removed the obtained dates are incorrect.

Re-writing Prehistory books

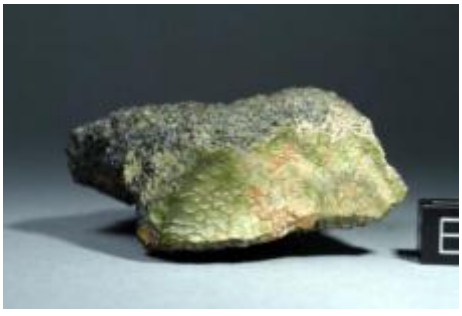
New analyses were applied to bone remains found in the archaeological deposits in association with Middle Paleolithic stone artifacts. Bones bearing clear signs of human manipulation (cut marks, marks of percussion or intentional breakage) were selected in order to rule out possible intrusions by carnivores.
Despite the fact that samples were collected from numerous sites in southern Iberia, it was only possible to date those of Jarama VI and Zafarraya, as the remaining samples did not contain enough collagen to be dated.
Cueva Antón (Murcia) is the only site that still provides recent dates in accordance with what has until now been postulated in relation to the persistence of the Neanderthals. However, neither the technological remains are clearly related to the Neanderthals nor are the dated charcoal samples perfectly associated with the lithics.
In view of the new data according to Jordá "prehistory books would need revision", especially as new results become available. "Although it is still controversial to change the theory in force, the new concept, which presents new data indicating that Neanderthals and H. sapiens did not co-exist in Iberia, is becoming accepted" he adds.
Concerning the possible coincidence of both groups in the Cantabrian area, the researcher is cautious. "Sites as La Güelga (Asturias) are being analyzed anew in order to determine if co-existence occurred. We must wait for the results to verify or not this hypothesis" he concludes.

Rachel E. Wood, Cecilio Barroso-Ruíz, Miguel Caparrós, Jesús F. Jordá Pardo, Bertila Galván Santos and Thomas F. G. Higham. "Radiocarbon dating casts doubt on the late chronology of the Middle to Upper Palaeolithic transition in southern Iberia", Proceedings of the National Academy of Sciences (PNAS). 04-02-2013. DOI: 10.1073/pnas.1207656110

http://phys.org/news/2013-02-meteorite-piece-mercury.html

Is this meteorite a piece of Mercury?

Pieces of the Moon and Mars have been found on Earth before, as well as chunks of Vesta and other asteroids, but what about the innermost planet, Mercury?



That's where some researchers think this greenish meteorite may have originated, based on its curious composition and the most recent data from NASA's MESSENGER spacecraft.
NWA 7325 is the name for a meteorite fall that was spotted in southern Morocco in 2012, comprising 35 fragments totaling about 345 grams. The dark green stones were purchased by meteorite dealer Stefan Ralew (who operates the retail site SR Meteorites) who immediately made note of their deep colors and lustrous, glassy exteriors.

The largest fragment of meteorite NWA 7325. (Credit: Stefan Ralew / sr-meteorites.de

Ralew sent samples of NWA 7325 to researcher Anthony Irving of the University of Washington, a specialist in meteorites of planetary origin. Irving found that the fragments contained surprisingly little iron but considerable amounts of magnesium, aluminum, and calcium silicates—in line with what's been observed by MESSENGER in the surface crust of Mercury.
And even though the ratio of calcium silicates is higher than what's found on Mercury today, Irving speculates that NWA 7325 could have come from a deeper part of Mercury's crust, excavated by a powerful impact event and launched into space, eventually finding their way to Earth.

In addition, exposure to solar radiation for an unknown period of time and shock from its formation could have altered the meteorite's composition somewhat, making it not exactly match up with measurements from MESSENGER. If this is indeed a piece of our Solar System's innermost planet, it will be the first Mercury meteorite ever confirmed.
But the only way to know for sure, according to Irving's team's paper, is further studies on the fragments and, ultimately, sample returns from Mercury. Irving's team's findings on NWA 7325 will be presented at the 44th Lunar and Planetary Science Conference to be held in Houston, TX, on March 18-22.

http://www.eurekalert.org/pub_releases/2013-02/jaaj-hsc020113.php

High supplemental calcium intake may increase risk of cardiovascular disease death in men

A high intake of supplemental calcium appears to be associated with an increased risk of cardiovascular disease death in men but not in women

A high intake of supplemental calcium appears to be associated with an increased risk of cardiovascular disease (CVD) death in men but not in women in a study of more 388,000 participants between the ages of 50 and 71 years, according to a report published Online First by JAMA Internal Medicine, a JAMA Network publication.
Calcium supplementation has become widely used, especially among the elderly population, because of its proposed bone health benefits.
However, beyond calcium's established role in the prevention and treatment of osteoporosis, its health effect on nonskeletal outcomes, including cardiovascular health, remains largely unknown and has become "increasingly contentious," the authors write in the study background.
Qian Xiao, Ph.D., of the National Cancer Institute, Bethesda, Md., and colleagues examined whether the intake of dietary and supplemental calcium was associated with mortality from total CVD, heart disease and cerebrovascular diseases. The study participants were 388,229 men and women ages 50 to 71 years from the National Institutes of Health-AARP Diet and Health Study in six states and two metropolitan areas from 1995 through 1996.
"In this large, prospective study we found that supplemental but not dietary calcium intake was associated with an increased CVD mortality in men but not in women," the authors conclude.
During an average 12 years of follow-up, 7,904 CVD deaths in men and 3,874 CVD deaths in women were identified and supplements containing calcium were used by 51 percent of men and 70 percent of women.
Compared with non-supplement users, men with an intake of supplemental calcium of more than 1,000 mg/day had an increased risk of total CVD death (risk ratio [RR], 1.20), more specifically with heart disease (RR, 1.19), but not significantly with cerebrovascular disease death (RR, 1.14).
For women, supplemental calcium intake was not associated with CVD death, heart disease death or cerebrovascular disease death. Dietary calcium intake also was not associated with CVD death in men or women.
"Whether there is a sex difference in the cardiovascular effect of calcium supplement warrants further investigation. Given the extensive use of calcium supplement in the population, it is of great importance to assess the effect of supplemental calcium use beyond bone health," the authors conclude.
(JAMA Intern Med. Published online February 4, 2013. doi:10.1001/jamainternmed.2013.3283. Available pre-embargo to the media at http://media.jamanetwork.com.)
Editor's Note: *This research was supported by the Intramural Research Program of the National Institutes of Health, National Cancer Institute and National Institute of Aging, National Institutes of Health, U.S. Department of Health and Human Services. Please see the article for additional information, including other authors, author contributions and affiliations, financial disclosures, funding and support, etc.*
Commentary: Are Calcium Supplements Harmful to Cardiovascular Disease
In a related commentary, Susanna C. Larsson, Ph.D., of the Karolinska Institutet, Stockholm, Sweden, writes: "More large studies are needed to further assess the potential health risks or benefits of calcium supplement use on CVD morbidity and mortality."
"Meanwhile, a safe alternative to calcium supplements is to consume calcium-rich foods, such as low-fat dairy foods, beans and green leafy vegetables, which contain not only calcium but also a cocktail of essential minerals and vitamins," Larsson continues.
"These non-dairy food sources of calcium have the added health benefits and have recently been reported to improve glycemic control in persons with diabetes. The paradigm 'the more the better' is invalid for calcium supplementation."
(JAMA Intern Med. Published online February 4, 2013. doi:10.1001/jamainternmed.2013.3769. Available pre-embargo to the media at http://media.jamanetwork.com.)
Editor's Note: Please see the article for additional information, including other authors, author contributions and affiliations, financial disclosures, funding and support, etc.

http://www.eurekalert.org/pub_releases/2013-02/ki-vcs020413.php

Vitamin C supplements linked to kidney stones

New research from Karolinska Institutet in Sweden shows that men who take vitamin C supplements regularly run a higher risk of developing kidney stones.

The study, which is published in the scientific periodical JAMA Internal Medicine, did not however observe an increased risk between kidney stones and multivitamins – which contain lower concentrations of vitamin C.

The research is based on data from a large population-based study of men from Västmanland and Örebro counties, who were monitored for 11 years. A total of 23,355 men were identified who had no history of kidney stones and who took either no dietary supplements or supplements in the form of vitamin C only. During the study period, 436 of the participants developed kidney stones that required medical attention. The researchers then compared the risk of kidney stones in vitamin C-takers with that in men who did not take any supplements. The analysis was then repeated for men who took multivitamins.

The results of the study indicate that men who take vitamin C supplements (typically 1000 mg per tablet) are twice as likely to develop kidney stones as men who do not take any dietary supplements. The risk was also found to increase with the frequency of vitamin C supplement use. The regular use of multivitamins was not found to be associated with the risk of kidney stones.

The researchers believe that both the dose and combination of nutrients with which the vitamin C is ingested are important. For this reason, the observed increase in risk does not apply to a normal dietary intake of vitamin C from fruit and vegetables. In Sweden, the RDI for vitamin C is 75 mg; the vitamin C content of supplements is commonly 1,000 mg per tablet, which is a considerably higher dose than which is obtained through food.

"As with all research, the results should be corroborated by other studies for us to be really sure," says study leader Agneta Åkesson, Associate Professor at Karolinska Institutet's Institute of Environmental Medicine. "Nor can we say anything about whether women run the same risk as men. But given that there are no well-documented benefits of taking high doses of vitamin C in the form of dietary supplements, the wisest thing might be not to take them at all, especially if you have suffered kidney stones previously."

The study was carried out in association with urologists and nephrologists at Karolinska Institutet and Karolinska University Hospital, and was made possible with a grant from the Swedish Research Council and with Karolinska Institutet's KID funding for doctoral education.

Publication: 'Ascorbic acid supplements and kidney stone incidence among men: A prospective study', Laura D K Thomas, Carl-Gustaf Elinder, Hans-Göran Tiselius, Alicja Wolk, Agneta Åkesson, JAMA Internal Medicine, online first publication, 4 January 2013. Embargoed for publication until February 4th, 2013 at 4 p.m. US Eastern Time.

http://www.sciencedaily.com/releases/2013/02/130204130034.htm

AB Blood Type Strong Risk Factor for Venous Blood Clots

The non-O ABO blood type is the most important risk factor for venous thromboembolism

The non-O ABO blood type is the most important risk factor for venous thromboembolism (blood clots in veins), making up 20% of attributable risk for the condition, according to a new study in CMAJ (Canadian Medical Association Journal). This finding has implications for genetic screening for thrombophilia, a genetic predisposition to abnormal blood clotting.

Danish researchers looked at data on 66,001 people who had been followed for 33 years from 1977 through 2010 to determine whether ABO blood type is associated with an increased risk of venous blood clots in the general population. They found that the risk increased when ABO blood type was combined with factor V Leiden R506Q or prothrombin G20210A, genetic mutations associated with an increased risk of venous thromboembolisms. This finding confirms the conclusion of other studies. The researchers also found an 11-fold increased risk of venous thromboembolism for people with the prothrombin G20210A mutation in double dose, something other smaller trials did not pick up.

"We found an additive effect of ABO blood type on risk of venous thromboembolism when combined with factor V Leiden R506Q and prothrombin G20210A; ABO blood type was the most important risk factor for venous thromboembolism in the general population.," writes Dr. Børge G. Nordestgaard, Herlev Hospital, Copenhagen University Hospital with coauthors. "This suggests that ABO blood type should be included in genetic screening for thrombophilia."

The study was large, followed participants over a long period and follow up was 100% complete for participants. Although the study cohort was genetically homogenous compared with populations with ethnic diversity, the ABO blood type, factor V Leiden R506Q and prothrombin G20210A are found in all ethnicities.

Birgitte F. Sode, Kristine H. Allin, Morten Dahl, Finn Gyntelberg, Børge G. Nordestgaard. Risk of venous thromboembolism and myocardial infarction associated with factor V Leiden and prothrombin mutations and blood type. CMAJ, 2013 DOI: 10.1503/cmaj.121636

http://www.eurekalert.org/pub_releases/2013-02/kcl-ivt020413.php

Injection-free vaccination technique could address global vaccine challenge for HIV, malaria

Scientists demonstrate the ability to deliver a dried live vaccine to the skin without a traditional needle

Scientists at King's College London have demonstrated the ability to deliver a dried live vaccine to the skin without a traditional needle, and shown for the first time that this technique is powerful enough to enable specialised immune cells in the skin to kick-start the immunising properties of the vaccine.

Funded by the Bill & Melinda Gates Foundation and published today in Proceedings of the National Academy of Sciences, researchers say although it is an early study this important technical advance offers a potential solution to the challenges of delivering live vaccines in resource-limited countries globally, without the need for refrigeration. A cheaper alternative to hypodermic needles, it would also remove safety risks from needle contamination and the pain-free administration could lead to more people taking up a vaccination.

The researchers add that it could have an impact beyond infectious disease vaccination programmes, for example managing autoimmune and inflammatory conditions such as diabetes. HIV, malaria and TB represent major global health challenges. Although promising research is underway to develop vaccines for these diseases, considerable stumbling blocks remain for countries where transporting and storing live vaccines in a continuously cold environment (around 2°C to 8°C or below) would not be possible. If a cold chain cannot be maintained for a live vaccine there is a high risk it could become unsafe and lose effectiveness.

The team at King's used a silicone mould developed by US company TheraJect to create a microneedle array – a tiny disc with several micro-needles made of sugar which dissolve when inserted into the skin. The team formulated a dried version of a live modified adenovirus-based candidate HIV vaccine in sugar (sucrose) and used the mould to create the microneedle array. They found that the dried live vaccine remained stable and effective at room temperature.

To test the effectiveness of the microneedle array, they applied it to mice. Using imaging (in collaboration with Professor Frederic Geissmann, King's College London) they observed how the vaccine dissolved in the skin and were able to identify for the first time exactly which specialised immune cells in the skin 'pick up' this type of vaccine and activate the immune system. The researchers found the first evidence that a sub-set of specialised dendritic cells in the skin were responsible for triggering this immune response.

When compared with a traditional needle vaccine method, the immune response generated by the dried microneedle vaccine (kept at room temperature) was equivalent to that induced by the same dose of injected liquid vaccine that had been preserved at -80°C.

Dr Linda Klavinskis from the Peter Gorer Department of Immunobiology at King's College London, said: 'We have shown that it is possible to maintain the effectiveness of a live vaccine by drying it in sugar and applying it to the skin using microneedles – a potentially painless alternative to hypodermic needles. We have also uncovered the role of specific cells in the skin which act as a surveillance system, picking up the vaccine by this delivery system and kick-starting the body's immune processes.

'This work opens up the exciting possibility of being able to deliver live vaccines in a global context, without the need for refrigeration. It could potentially reduce the cost of manufacturing and transportation, improve safety (as there would be no loss in potency), and avoids the need of hypodermic needle injection, reducing the risk of transmitting blood-borne disease from contaminated needles and syringes.

'This new technique represents a huge leap forward in overcoming the challenges of delivering a vaccination programme for diseases such as HIV and malaria. But these findings may also have wider implications for other infectious disease vaccination programmes, for example infant vaccinations, or even other inflammatory and autoimmune conditions such as diabetes.'

The published study from King's College London is part of a larger project funded by the Bill & Melinda Gates Foundation linking other groups, including those at Imperial College London and Royal Holloway University of London, who are working on other aspects of HIV vaccination.

http://www.sciencedaily.com/releases/2013/02/130204142609.htm

Drinking Milk Can Prevent Garlic Breath, Study Finds

If you're planning a romantic Italian dinner this Valentine's Day, you may want to consider drinking a glass of milk along with your meal.

According to a 2010 study in the Journal of Food Science published by the Institute of Food Technologist (IFT), researchers from the department of Food Science and Technology at The Ohio State University discovered that drinking milk while eating garlic-heavy food can reduce the malodorous breath associated with garlic consumption.

Both fat-free and whole milk lowered the concentration of volatile odor-emitting compounds from garlic in the nose and mouth. Due to its higher fat content, whole milk was found to be more effective. Although drinking milk after eating a garlic-infused meal can still help, the study found that drinking it during the meal will have better results.

Garlic is an excellent source of magnesium, vitamin B6, vitamin C, and selenium and is reported to have many health benefits. It also contains a high amount of sulfur compounds, which are responsible for the characteristic odor and flavor of garlic, as well as bad breath.

Areerat Hansanugrum, Sheryl A. Barringer. Effect of Milk on the Deodorization of Malodorous Breath after Garlic Ingestion. Journal of Food Science, 2010; 75 (6): C549 DOI:

http://www.sciencedaily.com/releases/2013/02/130204142319.htm?

Omega-3-Rich Ground Beef Available Soon

Thanks to Kansas State University research, part of a healthy diet can include a hamburger rich with omega-3 fatty acids.

Jim Drouillard, professor of animal sciences and industry, developed a technique that enriches ground beef with omega-3 fatty acids -- fatty acids that have been shown to reduce heart disease, cholesterol and high blood pressure. The enriched ground beef is named GreatO Premium Ground Beef and is being sold through Manhattan, Kan.-based company NBO3 Technologies LLC. It will be available mid-February at select retailers in Buffalo, N.Y., and expand to leading retailers and restaurants nationwide later this year.

Omega-3 fatty acids are found in fish and plant oils. The U.S. currently does not have a recommended daily intake of omega-3s, though many doctors and nutritionists recommend between 1,200-1,600 milligrams daily, depending on a person's age and health. A quarter-pound hamburger made of the enriched ground beef has 200 milligrams of omega-3s and tastes the same as regular ground beef, Drouillard said. This makes the ground beef an alternative for people who want to add or increase their omega-3 fatty acids intake but do not want fish or supplements to do so.

"As a society, Americans' consumption of fish, especially fish that contributes to these omega-3 fats, is quite low compared to other proteins," Drouillard said. "Reasons for this include cost, access to fish and personal preference. Americans do, however, like hamburgers. So if we can give people a hamburger that is rich in omega-3s, it's an alternative form of a product that they already eat and does not require a lifestyle change, which is difficult to make."

The health benefits of omega-3s are not limited to humans. Studies show that dairy and beef cattle with an enriched diet of flaxseed and other omega-3 rich grains have fewer respiratory diseases. The cattle also have higher fertility rates, which helps offset infertility among dairy cattle. The technology to enrich ground beef with omega-3s is a spinoff of flaxseed research Drouillard began in 1998. Drouillard and his students studied flax for several of its omega-3 fatty acids that may suppress inflammation and reduce diabetes in cattle. Research showed that omega-3 levels dramatically increased in the cattle as more flaxseed was introduced into their diet.

Keeping the omega-3s from becoming saturated fats in cattle's digestive system is a challenge, however. Microorganisms in the rumen -- the largest chamber in the cow's stomach -- modify most of the ingested fats and turn them into saturated fats. This causes ground beef to have low levels of omega-3s. Christian Alvarado Gilis, a doctoral candidate in animal sciences and industry, is researching how to improve omega-3 levels in cattle diets to further enhance the fat profile of beef. Gilis is from Chile.

According to Drouillard, substituting omega-3 fatty acids for saturated fats does not change the ground beef's flavor. "Knowing that there are a lot of desirable flavor characteristics associated with the fat in beef, we performed tons of sensory panel tests with Kansas State University's meat science faculty and with the department of human nutrition throughout the years to ensure that the flavor is not compromised," Drouillard said. "We found that our panelists were never able to detect appreciable differences in the flavor profiles of the omega-3 rich beef and non-omega-3 beef, even though the fats are quite different."

The owners of NBO3 Technologies LLC have worked closely with Drouillard in developing the concept, and after more than a decade of research on improving the enrichment process, have started to distribute omega-3 enriched ground beef to retailers and food vendors. The ground beef is part of the company's line of omega-3 enriched foods, which includes pork, chicken, cheese, milk, butter and ice cream. It will be the first ground beef to carry the U.S. Food and Drug Administration's seal of approval for containing omega-3 fatty acids.

Todd Hansen, CEO of NBO3 Technologies LLC, said consumer response has been positive in test markets. "We have to leap two hurdles with GreatO Premium Ground Beef, which are that the omega-3 fatty acids are really in the beef and that it doesn't change the flavor," Hansen said. "Based on our consumer response, we've

cleared those hurdles. We really believe in the health aspect of this product and are using the slogan 'When Every Bite Counts' to emphasize that. I can't wait for consumers to have it available to them."

http://www.eurekalert.org/pub_releases/2013-02/uoc--vdo020513.php

Vitamin D, omega-3 may help clear amyloid plaques found in Alzheimer's

Researchers have pinpointed how vitamin D3 and omega-3 fatty acids may enhance the immune system's ability to clear the brain of amyloid plaques

A team of academic researchers has pinpointed how vitamin D3 and omega-3 fatty acids may enhance the immune system's ability to clear the brain of amyloid plaques, one of the hallmarks of Alzheimer's disease.

In a small pilot study published in the Feb. 5 issue of the Journal of Alzheimer's Disease, the scientists identified key genes and signaling networks regulated by vitamin D3 and the omega-3 fatty acid DHA (docosahexaenoic acid) that may help control inflammation and improve plaque clearance.

Previous laboratory work by the team helped clarify key mechanisms involved in helping vitamin D3 clear amyloid-beta, the abnormal protein found in the plaque. The new study extends the previous findings with vitamin D3 and highlights the role of omega-3 DHA. "Our new study sheds further light on a possible role for nutritional substances such as vitamin D3 and omega-3 in boosting immunity to help fight Alzheimer's," said study author Dr. Milan Fiala, a researcher at the David Geffen School of Medicine at UCLA.

For the study, scientists drew blood samples from both Alzheimer's patients and healthy controls, then isolated critical immune cells called macrophages from the blood. Macrophages are responsible for gobbling up amyloid-beta and other waste products in the brain and body.

The team incubated the immune cells overnight with amyloid-beta. They added either an active form of vitamin D3 called 1alpha,25–dihydroxyvitamin D3 or an active form of the omega-3 fatty acid DHA called resolvin D1 to some of the cells to gauge the effect they had on inflammation and amyloid-beta absorption.

Both 1alpha, 25-dihydroxyvitamin D3 and resolvin D1 improved the ability of the Alzheimer's disease patients' macrophages to gobble-up amyloid-beta, and they inhibited the cell death that is induced by amyloid-beta. Researchers observed that each nutrition molecule utilized different receptors and common signaling pathways to do this.

Previous work by the team, based on the function of Alzheimer's patients' macrophages, showed that there are two groups of patients and macrophages. In the current study, researchers found that the macrophages of the Alzheimer's patients differentially expressed inflammatory genes, compared with the healthy controls, and that two distinct transcription patterns were found that further define the two groups: Group 1 had an increased transcription of inflammatory genes, while Group 2 had decreased transcription. Transcription is the first step leading to gene expression.

"Further study may help us identify if these two distinct transcription patterns of inflammatory genes could possibly distinguish either two stages or two types of Alzheimer's disease," said study author Mathew Mizwicki, an assistant researcher at the David Geffen School of Medicine at UCLA.

While researchers found that 1alpha,25-dihydroxyvitamin D3 and resolvin D1 greatly improved the clearance of amyloid-beta by macrophages in patients in both groups, they discovered subtleties in the effects the two substances had on the expression of inflammatory genes in the two groups. In Group 1, the increased-inflammation group, macrophages showed a decrease of inflammatory activation; in Group 2, macrophages showed an increase of the inflammatory genes IL1 and TLRs when either 1alpha,25-dihydroxyvitamin D3 or resolvin D1 were added.

More study is needed, Fiala said, but these differences could be associated with the severity of patients' nutritional and/or metabolic deficiencies of vitamin D3 and DHA, as well as the omega-3 fatty acid EPA (eicosapentaenoic acid).

"We may find that we need to carefully balance the supplementation with vitamin D3 and omega-3 fatty acids, depending on each patient in order to help promote efficient clearing of amyloid-beta," Fiala said. "This is a first step in understanding what form and in which patients these nutrition substances might work best."

According to Fiala, an active (not oxidized) form of omega-3 DHA, which is the precursor of the resolvin D1 used in this study, may work better than more commercially available forms of DHA, which generally are not protected against the oxidation that can render a molecule inactive.

The next step is a larger study to help confirm the findings, as well as a clinical trial with omega-3 DHA, the researchers said.

The Alzheimer's Association contributed to the initial phase of the study. Fiala is a consultant for the Smartfish Company that is producing a drink with an active form of omega-3 DHA.

Additional study authors include Guanghao Liu, Larry Magpantay, James Sayre, Avi Siani, Michelle Mahanian, Rachel Weitzman, Eric Hayden, Mark J. Rosenthal, Ilka Nemere, John Ringman and David B. Teplow.

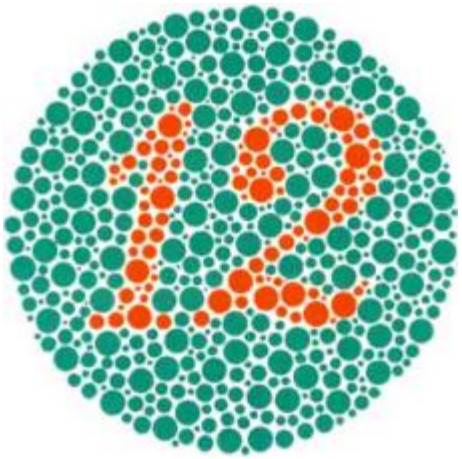
http://bit.ly/YMtO13

New Eyewear Could Help People with Red-Green Color Blindness

Glasses based on a new color vision theory are already being used medically to enhance vasculature and bruising beneath skin. Now they are being tested to aid those with color blindness, although the lenses inhibit the perception of yellows and blues

By Sam McNerney and Txchnologist | Tuesday, February 5, 2013 | 4

Why do humans see colors? For years the leading hypothesis was that color vision evolved to help us spot nutritious fruits and vegetation in the forest. But in 2006, evolutionary neurobiologist Mark Changizi and colleagues proposed that color vision evolved to perceive oxygenation and hemoglobin variations in skin in order to detect social cues, emotions and the states of our friends or enemies. Just think about the reddening and whitening of the face called blushing and blanching. They elicit distinct physiological reactions that would be impossible without color vision.



A few years ago Changizi left Rensselaer Polytechnic Institute where he was professor to co-found 2AI Labs with Dr. Tim Barber. Their Boise, Idaho-based research institute, funded via technology spin-offs coming out of their work, aimed at solving foundational problems in cognitive science and artificial intelligence. The move allowed Changizi to continue to conduct academic work with more intellectual freedom and less of a reliance on grants.

Ishihara color perception Ishihara color perception plate. Image: Wikimedia Commons

Fruits of their labor

Last summer the team at 2AI developed three pairs of glasses called O2Amps based on Changizi's color vision theory. By visually enhancing oxygenated blood and blood pooling, the lenses amplify the social cues that allow users to perceive emotions more clearly.

The eyewear is being used for a number of innovative applications. The first is medical. The lenses enhance vasculature beneath skin, helping nurses identify veins; they also amplify trauma and bruising that might be invisible to the naked eye.

Many hospitals are putting the O2Amps through trials, and seeing positive results. The eyewear is also potentially useful for police and security officers– imagine if a TSA agent could more easily perceive nervousness– as well as poker players.

An answer for red-green colorblindness?

Now a new application for the O2Amps is emerging. Last November, 2AI Labs distributed lenses to people who are color blind to see if they would help. The researchers were particularly interested in their Oxy-Iso variety of lenses, which they predicted would diminish red-green deficiency – a genetic anomaly present in about 10 percent of males.

A string of positive user reviews is confirming their effectiveness. Without the eyewear, one volunteer, a neuroscience professor at the University of Sussex named Daniel Bor, failed the Ishihara Color Test, a means of testing colorblindness.

These recognizable tests involve colored plates with a circle of dots containing a number visible to people with normal color vision but invisible to people who are colorblind (or have difficulties perceiving some colors). With the lenses, Bor received a perfect score. "Without [the Oxy-Iso], I scored almost nothing, but with the specs got all the answers correct," Bor said.

One downside is the Oxy-Iso lenses hinder the perception of yellows and blues at the expense of enhancing reds and greens. This is especially problematic for drivers because the eyewear renders yellow lights nearly invisible. Furthermore, it does not correct total color blindness.

2AI Labs is also in the midst of developing interior lighting with the O2Amp technology. Using recently acquired grant money Changizi and his colleagues are studying applications for architectural lighting and windows.

So far they've created a prototype lamp for living spaces that reduces glare and creates "warm" human-friendly illumination they are calling the "O2Lamp." According to their website, the prototype will also "filter the light itself so that everyone in the room experiences the effects, no eyewear needed."

"Whereas the Oxy-Iso gives the colorblind a new enhanced red-green sense, useful among other things for emotions and health on the skin of others, our Oxy-Amp technology enhances the perception of emotions and health for all of those with normal color vision," Changizi said.

http://www.bbc.co.uk/news/health-21339107

Study finds obesity can 'lead to lack of vitamin D'

Obesity can lower vitamin D levels in the body, a study suggests.

The report, in the journal PLOS Medicine, analysed genetic data from 21 studies - a total of 42,000 people.
It found every 10% rise in body mass index (BMI) - used as an indicator of body fat - led to a 4% drop of available vitamin D in the body. As vitamin D is stored in fatty tissue, the authors suggest the larger storage capacity in obese people may prevent it from circulating in the bloodstream.
BMI it is calculated by taking weight (in kilograms) and dividing it by height (in metres) squared. Those with a BMI of 30 or above are considered obese.
Lead author Dr Elina Hypponen, from the University College London Institute of Child Health, said the study "highlights the importance of monitoring and treating vitamin D deficiency in people who are overweight or obese".
Vitamin D is made in the skin after sun exposure and can be taken in dietary supplements.
Healthy levels are about 50 nanomole per litre - less than 30 nanomole per litre can cause the softening and weakening of bones, leading to rickets in children and osteomalacia in adults.
Prof David Haslam, from the National Obesity Forum, said: "Food intake and genetics all play a part in obesity - but this research is a reminder that physical activity, like walking the dog or going for a run out in the sunshine, shouldn't be forgotten and can help correct both weight and lack of vitamin D."

http://www.eurekalert.org/pub_releases/2013-02/uog-soa020613.php

Study of a rare disease making people look like a woman but having male genitals under study

University of Granada researchers have designed a guideline for physicians and patients on the Androgen Insensitivity Syndrome (AIS), a rare disease that makes the subject develop reverse sex, which occurs when a subject looks like a woman but has male genes.

AIS has low prevalence (it only affects one in 2000 people), and it is characterized by the inability of tissues to respond to the action of male hormones. This prevents individuals with XY sex hormones (i.e. 46,XY) to develop male genitalia. This disorder is caused by a mutation in the gene that codifies the receptor of androgens, and diagnosis is confirmed by the identification of such mutation. This disease is transmitted y a recessive gene associated to gender i.e. it is transmitted by women but it is only developed by men.
The researchers examined the most relevant clinical and epidemiological data of AIS in a review study recently published in the journal Gynecological Endocrinology. The guideline for patients includes the follow-up protocols to be applied from birth to adulthood, through childhood and adolescence. The guideline also includes additional information for patients.

Diversity of Symptoms

Clinical symptoms of AIS range from spermatogenic defects causing infertility in men with otherwise normal genitalia, to subjects who look female in appearance but have not menstruation or female internal genitalia. Sometimes, the gender of IAS subjects cannot be identified at birth and a more precise diagnosis is required to determine the sex of the newborn and plan potential treatments.
According to one of the authors of the study, a researcher at the University of Granada Department of Obstetrics and Gynecology, therapy for AIS is based on three pillars:
"The first step is reinforcing the sexual identity of the subject with the help of psychologists. In cases of sexual ambiguity and determination of female gender, the second step is to perform a gonadectomy (removal of testicles), as they may become cancerous. Finally, it is necessary to administer hormone replacement therapy in case the subject is assigned the female sex. "The prognosis of these patients is good if the testicles are timely removed", professor Mendoza states.

http://phys.org/news/2013-02-tree-life-kurdish-roots.html

'Tree of life' has Kurdish roots, study finds

Seen by some as emblematic of the Mediterranean landscape and cuisine, the olive tree in fact has its domesticated roots in Kurdish regions, said a study Wednesday that seeks to settle an age-old debate.

Harvesting of wild olive trees called oleasters has been documented from the Near East (the area around ancient Palestine and Jordan) to Spain since the Neolithic or New Stone Age that started about 10,000 BC.
The tree then became domesticated, a process thought by some researchers to have started in the Near East about 6,000 years ago. Other experts, though, have offered evidence for simultaneous domestication of different olive cultivars across the Mediterranean.

Now an international team of experts used genetic data, molecular dating, fossil records and climate modelling to determine that the iconic tree's roots lie in only one place—somewhat further north and east than many had thought.
"We conclude that the western Mediterranean was not a major primary centre of domestication of the olive tree," the team wrote in the journal Proceedings of the Royal Society B: Biological Sciences.
"The cradle of primary domestication of the olive tree is located in the northeastern Levant."
2011. Seen by some as emblematic of the Mediterranean landscape and cuisine, the olive tree in fact has its domesticated roots in Kurdish regions, said a study Wednesday that seeks to settle an age-old debate.
This refers to the modern-day Kurdish zone between Syria and Turkey, study co-author Guillaume Besnard of the French National Centre for Scientific Research (CNRS) told AFP.
From there, the domesticated olive probably spread through the eastern Mediterranean and Cyprus, westwards to Turkey, Greece, Italy and the rest of the Mediterranean "in parallel to the expansion of civilisations and human exchanges in this part of the world", said the report.
The domesticated olive tree, Olea europaea, is central to Greek, Roman and early Christian mythology, and the olive branch remains a symbol of peace today. The ancient Greeks believed that Athena, goddess of war and wisdom, presented the Athenians with their first domesticated olive tree, from which all others sprouted.
"The importance of the cultivated olive tree in people's lives has turned this species into a symbol of ancient, sacred literature, and the origins of this crop are often subject to controversies," the paper said.
"According to our study, the maternal origin of the majority (about 90 percent) of cultivated olives today is clearly the Near East," or roughly the modern-day Middle East, added Besnard. "I don't think anybody will dispute that any more."
For the study, the team sampled DNA data from 534 cultivated olive types and 1,263 oleasters from 108 locations, as well as 49 trees from a sub-Saharan subspecies. The researchers also concluded that three main branches of wild olive split from a common ancestor at least 1.5 million years ago, said Besnard.
The olive tree has been called "the tree of life" for the sustenance it provides and its non-food uses, ranging from soap to oil for lighting and sculpture. The olive today yields some 2.4 million tonnes of oil in Europe alone, with Spain the top producer. It is farmed as far afield as southern Africa, Australia, Japan and China.

http://bit.ly/XvmVAw

Potential for 'Superquakes' Underestimated

The earthquakes that rocked Tohoku, Japan in 2011, Sumatra in 2004 and Chile in 1960 — all of magnitude 9.0 or greater — should not have happened, according to seismologist's theories of earthquake cycles. And that might mean earthquake prediction needs an overhaul, some researchers say.

Feb 6, 2013 09:00 AM ET // by Becky Oskin, OurAmazingPlanet Contributor

All three earthquakes struck along subduction zones, where two of Earth's tectonic plates collide and one dives beneath the other. Earlier earthquakes had released the pent-up strain along Chile's master fault, meaning no big quakes were coming, scientists had thought. Japan and Sumatra both sat above on old oceanic crust, thought to be too stiff for superquakes.
And records of past quakes, combined with measurements of the speed of Earth's tectonic plates, suggested the Tohoku and Sumatra-Andaman regions couldn't make quakes larger than 8.4, almost nine times smaller than a magnitude 9.0 temblor. "These areas had been written off as places incapable of producing a great earthquake," said Chris Goldfinger, a marine geologist at Oregon State University in Corvallis.
But the events of 1960, 2004 and 2011 showed that these faults were capable of producing some of the most destructive earthquakes in recorded history, suggesting earthquake researchers need to re-think aspects of how they evaluate a fault's earthquake potential. "It's time to come up with something new," Goldfinger told OurAmazingPlanet.

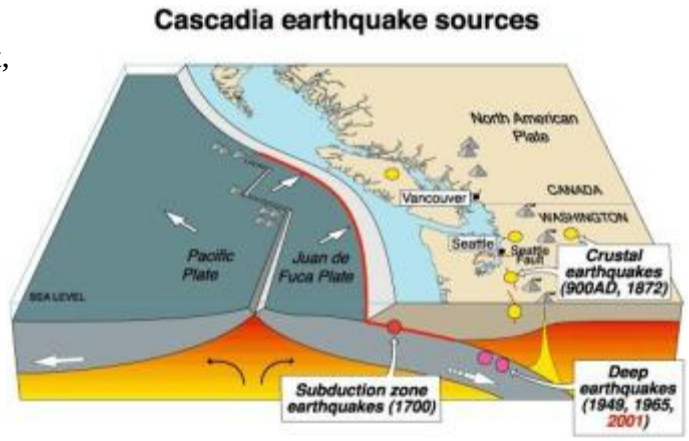
Faults are like batteries

When two tectonic plates collide, they build up strain where a fault sticks, or locks, together. Earthquakes release this strain, which is a form of energy.
For decades, scientists assumed faults acted like rubber bands, steadily building up strain and then releasing it all at once, Goldfinger said. The longer the time since the last earthquake, the larger the next earthquake would be, the model predicted.
The problem was researchers failed to recognize that faults can store energy like a battery, Goldfinger said. And just like batteries, they can discharge energy in small amounts, or all at once, he explained.
Goldfinger and other researchers now think if a "small" quake hits, it may not release all of the accumulated energy in a fault. (On a subduction zone, a small quake can still register in the magnitude-8.0 range, which is devastating to nearby cities.)

Thus, a fault can "borrow" stored energy from previous strain-building cycles, generating larger earthquakes than expected, such as those that hit Sumatra and Tohoku, Goldfinger and his colleagues propose in a study published in the January/February 2013 issue of the journal Seismological Research Letters.
"Those models were already being called into question when Sumatra drove one stake through their heart, and Tohoku drove the second one," said Goldfinger, the lead author of the study.

Superquakes and supercycles

Goldfinger said scientists' failure to recognize that faults could store energy comes from a lack of data. Historic earthquake records go back only 100 years, he noted. Geologists are only now getting histories that reach back thousands of years, via techniques that decode evidence of past earthquakes in sediments.
"What is happening on a short-term timescale is actually imposed on a long-term cycle," he said.
Goldfinger calls these long-term histories supercycles, and the unusually large and rare earthquakes that discharge the battery are superquakes. The sequence, size and location of quakes vary from one supercycle to the next, he said.
Seismologist Marco Cisternas first proposed that faults could store energy in 2005, with a study showing that the magnitude 9.5 Chile earthquake in 1960, the largest on record, released more energy than had been stored since its most recent quake, in 1837. Tsunami deposits in Chile indicate the last superquake occurred in 1575, and smaller quakes since then had only partly released the strain built up on the fault, his study found.
cascadia-subduction-zone-110531-02



The Cascadia subduction zone: producer of massive earthquakes. CREDIT: USGS.

In Sumatra, south of the Andaman region, analyses of corals uplifted and killed during earthquakes also indicated that the subduction zone undergoes supercycles, according to a 2008 study led by geologists at the Earth Observatory Institute in Singapore. Each series of quakes in the region lasts between 30 and 100 years, according to the study. The supercycles unfold every 200 years or so.

Forecasting the future

Goldfinger and his colleagues have evidence that the Cascadia Subduction Zone, which stretches from Northern California to British Columbia, is also in the middle of an earthquake supercycle.
Over the past 10,000 years, 19 superquakes and four supercycles have occurred along the zone, Goldfinger said.
"These would typically be of a magnitude from about 8.7 to 9.2, really huge earthquakes," Goldfinger said.
"We've also determined that there have been 22 additional earthquakes that involved just the southern end of the fault. We are assuming that these are slightly smaller, more like 8.0, but not necessarily. They were still very large earthquakes that if they happened today could have a devastating impact," he said.
The present cycle seems like it's gently ratcheting downward, Goldfinger said. "This would suggest that we're not due for a giant [quake] anytime soon, but the model has no predictive value," he said.
The battery model of earthquake energy storage and discharge makes it difficult for scientists to forecast future earthquakes, as there's no explanation yet for why faults would behave this way, Goldfinger said. Plus, it's hard to say how much energy a fault's battery stores. "We haven't yet figured out how to effectively put a voltmeter on a fault and say how charged it is," Goldfinger said.
But with more detailed records of past earthquakes, such as those in Sumatra and Cascadia, Goldfinger believes scientists can give better estimates of seismic hazards, and prevent surprises like Sumatra and Tohoku.
"The long records are revealing very useful things," he said. "We're not sure what's driving the long-term cycling, but at least we can tell people what to prepare for," Goldfinger said.

http://www.eurekalert.org/pub_releases/2013-02/muhc-iro020413.php

Most common form of heart valve disease linked to unusual cholesterol

Researchers have discovered a gene associated with a form of cholesterol that increases the risk of developing aortic stenosis, the most common form of heart valve disease, by more than half.

Montreal - This international study, involving the Research Institute of the McGill University Health Centre (RI-MUHC), is the first of its kind to uncover a genetic link with aortic valve disease – a condition that affects more than 5 million people in North America.
The results of the study, published in the New England Journal of Medicine, point to the first known cause of aortic stenosis and to a potential treatment to prevent this disease. “We found that an unusual type of cholesterol called Lipoprotein (a) or Lp(a) – that is not normally screened for in current clinical practice –

appears to be a cause of aortic valve disease," says Dr. George Thanassoulis, one of the co-lead authors of the study, who is also director of preventive and genomic cardiology at the MUHC and an Assistant Professor in Medicine at McGill University. "High levels of this type of cholesterol are predicted primarily by an individual's genetic make-up with only modest influence from lifestyle or other factors."

Aortic stenosis (AS) is the third most prevalent form of cardiovascular disease in the western world, after hypertension and coronary artery disease. It mainly affects people over the age of 60 years. AS is caused by calcification and hardening of the aortic valve which impedes blood flow from the heart to the rest of the body leading to chest pain, loss of consciousness and shortness of breath. In severe cases, patients need aortic valve replacement surgery. Currently, there are no medical treatments to prevent this disease or reduce the need for valve replacement. According to the study's lead investigators – from the RI-MUHC, Johns Hopkins University, Harvard University, Washington University, the University of Iceland and the US National Institutes of Health – the findings not only explain why heart valve calcification may run in families, but could also lead to the development of targeted medications that might slow the progression of valve disease and reduce the need for valve surgery in patients. "Previous studies could not differentiate whether Lp(a) was a cause or simply a marker of valve disease," says Dr. Thanassoulis. "But our results strongly suggest a causal link and add to the mounting evidence that Lp(a) may be an important drug target for cardiovascular diseases."

"This is an important step forward in understanding the biology of the development of aortic stenosis and how this common genetic variant, which is found in thirteen per cent of the general population, contributes to that risk," says Dr. Wendy Post, a cardiologist and associate professor of medicine and epidemiology at the Johns Hopkins University School of Medicine who is a senior author of the study. "Advancing age is a major risk factor for aortic stenosis and, with the aging population this will become an even bigger health concern."

Frequently used statin medications, which reduce the common form of cholesterol that clogs arteries, do not reduce Lp(a) or prevent aortic valve calcification. "Therefore, it is very important that these results benefit our patients," says Dr. Thanassoulis. "For this to happen we need to test whether lowering this type of cholesterol with other drugs slows valve calcification in a randomized clinical trial. Our hope is to eventually prevent valve disease with medication and reduce the need for surgery."

This work was funded by grants through the Canadian Institutes of Health Research (CIHR) and the National Heart, Lung, and Blood Institute as well as other funding agencies. Dr. Thanassoulis received funding from the CIHR, the Fonds de recherche du Québec – Santé (FRQS), the Royal College of Physician and Surgeons of Canada, the Association des Cardiologues du Québec and the Montreal General Hospital Foundation of the MUHC.

http://www.eurekalert.org/pub_releases/2013-02/miot-ijw020613.php

India joined with Asia 10 million years later than previously thought

New timeline suggests India's size before this collision was much smaller than generally assumed

Written by Jennifer Chu, MIT News Office

CAMBRIDGE, Mass. -- The peaks of the Himalayas are a modern remnant of massive tectonic forces that fused India with Asia tens of millions of years ago. Previous estimates have suggested this collision occurred about 50 million years ago, as India, moving northward at a rapid pace, crushed up against Eurasia. The crumple zone between the two plates gave rise to the Himalayas, which today bear geologic traces of both India and Asia. Geologists have sought to characterize the rocks of the Himalayas in order to retrace one of the planet's most dramatic tectonic collisions.

Now researchers at MIT have found that the collision between India and Asia occurred only 40 million years ago — 10 million years later than previously thought. The scientists analyzed the composition of rocks from two regions in the Himalayas, and discovered evidence of two separate collisional events: As India crept steadily northward, it first collided with a string of islands 50 million years ago, before plowing into the Eurasian continental plate 10 million years later.

Oliver Jagoutz, assistant professor of geology in MIT's Department of Earth, Atmospheric and Planetary Sciences, says the results, which will be published in Earth and Planetary Science Letters, change the timeline for a well-known tectonic story.

"India came running full speed at Asia and boom, they collided," says Jagoutz, an author of the paper. "But we actually don't think it was one collision … this changes dramatically the way we think India works."

'How great was Greater India?'

In particular, Jagoutz says, the group's findings may change scientists' ideas about the size of India before it collided with Asia. At the time of collision, part of the ancient Indian plate — known as "Greater India" — slid underneath the Eurasian plate.

What we see of India's surface today is much smaller than it was 50 million years ago. It's not clear how much of India lies beneath Asia, but scientists believe the answer may come partly from knowing how fast the Indian plate migrates, and exactly when the continent collided with Asia.
"The real question is, 'How great was Greater India?'" Jagoutz says. "If you know when India hit, you know the size of Greater India."
By dating the Indian-Eurasian collision to 10 million years later than previous estimates, Jagoutz and his colleagues conclude that Greater India must have been much smaller than scientists have thought.
"India moved more than 10 centimeters a year," Jagoutz says. "Ten million years [later] is 1,000 kilometers less in convergence. That is a real difference."

Leafing through the literature

To pinpoint exactly when the Indian-Eurasian collision occurred, the team first looked to a similar but more recent tectonic example. Over the last 2 million years, the Australian continental plate slowly collided with a string of islands known as the Sunda Arc. Geologists have studied the region as an example of an early-stage continental collision.
Jagoutz and his colleagues reviewed the geologic literature on Oceania's rock composition. In particular, the team looked for telltale isotopes — chemical elements that morph depending on factors like time and tectonic deformation. The researchers identified two main isotopic systems in the region's rocks: one in which the element lutetium decays to hafnium, and another in which samarium decays to neodymium. From their analysis of the literature, the researchers found that rocks high in neodymium and hafnium isotopes likely formed before Australia collided with the islands. Rocks high in neodymium and hafnium probably formed after the collision.

Heading to the Himalayas

Once the team identified the isotopic signatures for collision, it looked for similar signatures in rocks gathered from the Himalayas.
Since 2000, Jagoutz has trekked to the northwest corner of the Himalayas, a region of Pakistan and India called the Kohistan-Ladakh Arc. This block of mountains is thought to have been a string of islands that was sandwiched between the two continents as they collided. Jagoutz traversed the mountainous terrain with pack mules and sledgehammers, carving out rock samples from the region's northern and southern borders. His team has brought back three tons of rocks, which he and his colleagues analyzed for signature isotopes.
The researchers split the rocks, and separated out more than 3,000 zircons — micron-long crystals containing isotopic ratios. Jagoutz and his colleagues first determined the age of each zircon using another isotopic system, in which uranium turns slowly to lead with time. The team then measured the ratios of strontium to neodymium, and lutetium to hafnium, to determine the presence of a collision, keeping track of where each zircon was originally found (along the region's northern or southern border).
The team found a very clear signature: Rocks older than 50 million years contained exactly the same ratio of isotopes in both the northern and southern samples. However, Jagoutz found that rocks younger than 50 million years, along the southern boundary of the Kohistan-Ladakh Arc, suddenly exhibited a range of isotopic ratios, indicating a dramatic tectonic event. Along the arc's northern boundary, the same sudden change in isotopes occurs, but only in rocks younger than 40 million years.
Taken together, the evidence supports a new timeline of collisional events: Fifty million years ago, India collided with a string of islands, pushing the island arc northward. Ten million years later, India collided with the Eurasian plate, sandwiching the string of islands, now known as the Kohistan-Ladakh Arc, between the massive continents.
"If you actually go back in the literature to the 1970s and '80s, people thought this was the right way," Jagoutz says. "Then somehow the literature went in another direction, and people largely forgot this possibility. Now this opens up a lot of new ideas." *This research was supported by a grant from the National Science Foundation.*

http://www.eurekalert.org/pub_releases/2013-02/hcfa-epa020513.php

Earth-like planets are right next door

Using publicly available data from NASA's Kepler space telescope, astronomers at the Harvard-Smithsonian Center for Astrophysics (CfA) have found that six percent of red dwarf stars have habitable, Earth-sized planets.

Since red dwarfs are the most common stars in our galaxy, the closest Earth-like planet could be just 13 light-years away. "We thought we would have to search vast distances to find an Earth-like planet. Now we realize another Earth is probably in our own backyard, waiting to be spotted," said Harvard astronomer and lead author Courtney Dressing (CfA). Dressing presented her findings today in a press conference at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.
Red dwarf stars are smaller, cooler, and fainter than our Sun. An average red dwarf is only one-third as large and one-thousandth as bright as the Sun. From Earth, no red dwarf is visible to the naked eye.

Despite their dimness, these stars are good places to look for Earth-like planets. Red dwarfs make up three out of every four stars in our galaxy for a total of at least 75 billion. The signal of a transiting planet is larger since the star itself is smaller, so an Earth-sized world blocks more of the star's disk. And since a planet has to orbit a cool star closer in order to be in the habitable zone, it's more likely to transit from our point of view.
Dressing culled the Kepler catalog of 158,000 target stars to identify all the red dwarfs. She then reanalyzed those stars to calculate more accurate sizes and temperatures. She found that almost all of those stars were smaller and cooler than previously thought.
Since the size of a transiting planet is determined relative to the star size, based on how much of the star's disk the planet covers, shrinking the star shrinks the planet. And a cooler star will have a tighter habitable zone.
Dressing identified 95 planetary candidates orbiting red dwarf stars. This implied that at least 60 percent of such stars have planets smaller than Neptune. However, most weren't quite the right size or temperature to be considered truly Earth-like. Three planetary candidates were both warm and approximately Earth-sized. Statistically, this means that six percent of all red dwarf stars should have an Earth-like planet.
"We now know the rate of occurrence of habitable planets around the most common stars in our galaxy," said co-author David Charbonneau (CfA). "That rate implies that it will be significantly easier to search for life beyond the solar system than we previously thought."
Our Sun is surrounded by a swarm of red dwarf stars. About 75 percent of the closest stars are red dwarfs. Since 6 percent of those should host habitable planets, the closest Earth-like world is likely to be just 13 light-years away.
Locating nearby, Earth-like worlds may require a dedicated small space telescope, or a large network of ground-based telescopes. Follow-up studies with instruments like the Giant Magellan Telescope and James Webb Space Telescope could tell us whether any warm, transiting planets have an atmosphere and further probe its chemistry.
Such a world would be different from our own. Orbiting so close to its star, the planet would probably be tidally locked. However, that doesn't prohibit life since a reasonably thick atmosphere or deep ocean could transport heat around the planet. And while young red dwarf stars emit strong flares of ultraviolet light, an atmosphere could protect life on the planet's surface. In fact, such stresses could help life to evolve.
"You don't need an Earth clone to have life," said Dressing.
Since red dwarf stars live much longer than Sun-like stars, this discovery raises the interesting possibility that life on such a planet would be much older and more evolved than life on Earth.
"We might find an Earth that's 10 billion years old," speculated Charbonneau.
The three habitable-zone planetary candidates identified in this study are Kepler Object of Interest (KOI) 1422.02, which is 90 percent the size of Earth in a 20-day orbit; KOI 2626.01, 1.4 times the size of Earth in a 38-day orbit; and KOI 854.01, 1.7 times the size of Earth in a 56-day orbit. All three are located about 300 to 600 light-years away and orbit stars with temperatures between 5,700 and 5,900 degrees Fahrenheit. (For comparison, our Sun's surface is 10,000 degrees F.)

http://www.sciencedaily.com/releases/2013/02/130206093547.htm

New Coal Technology Harnesses Energy Without Burning, Nears Pilot-Scale Development

A new form of clean coal technology reached an important milestone recently, with the successful operation of a research-scale combustion system at Ohio State University.

By Pam Frost Gorder.

COLUMBUS, Ohio - For 203 continuous hours, the Ohio State combustion unit produced heat from coal while capturing 99 percent of the carbon dioxide produced in the reaction.
Liang-Shih Fan, professor of chemical and biomolecular engineering and director of Ohio State's Clean Coal Research Laboratory, pioneered the technology called Coal-Direct Chemical Looping (CDCL), which chemically harnesses coal's energy and efficiently contains the carbon dioxide produced before it can be released into the atmosphere.
"In the simplest sense, combustion is a chemical reaction that consumes oxygen and produces heat," Fan said. "Unfortunately, it also produces carbon dioxide, which is difficult to capture and bad for the environment. So we found a way to release the heat without burning. We carefully control the chemical reaction so that the coal never burns—it is consumed chemically, and the carbon dioxide is entirely contained inside the reactor."
Dawei Wang, a research associate and one of the group's team leaders, described the technology's potential benefits. "The commercial-scale CDCL plant could really promote our energy independence. Not only can we

use America's natural resources such as Ohio coal, but we can keep our air clean and spur the economy with jobs," he said.
Though other laboratories around the world are trying to develop similar technology to directly convert coal to electricity, Fan's lab is unique in the way it processes fossil fuels. The Ohio State group typically studies coal in the two forms that are already commonly available to the power industry: crushed coal "feedstock," and coal-derived syngas.
The latter fuel has been successfully studied in a second sub-pilot research-scale unit, through a similar process called Syngas Chemical Looping (SCL). Both units are located in a building on Ohio State's Columbus campus, and each is contained in a 25-foot-high insulated metal cylinder that resembles a very tall home water heater tank.
No other lab has continuously operated a coal-direct chemical looping unit as long as the Ohio State lab did last September. But as doctoral student Elena Chung explained, the experiment could have continued.
"We voluntarily chose to stop the unit. We actually could have run longer, but honestly, it was a mutual decision by Dr. Fan and the students. It was a long and tiring week where we all shared shifts," she said.
Fan agreed that the nine-day experiment was a success. "In the two years we've been running the sub-pilot plants, our CDCL and SCL units have achieved a combined 830 operating hours, which clearly demonstrates the reliability and operability of our design," he said.
At any one time, the units each produce about 25 thermal kilowatts—that is, thermal energy, which in a full-scale power plant would be used to heat water and turn the steam-powered turbines that create electricity.
The researchers are about to take their technology to the next level: a larger-scale pilot plant is under construction at the U.S. Department of Energy's National Carbon Capture Center in Wilsonville, AL. Set to begin operations in late 2013, that plant will produce 250 thermal kilowatts using syngas.
The key to the technology is the use of tiny metal beads to carry oxygen to the fuel to spur the chemical reaction. For CDCL, the fuel is coal that's been ground into a powder, and the metal beads are made of iron oxide composites. The coal particles are about 100 micrometers across—about the diameter of a human hair—and the iron beads are larger, about 1.5-2 millimeters across. Chung likened the two different sizes to talcum powder and ice cream sprinkles, though the mix is not nearly so colorful.
The coal and iron oxide are heated to high temperatures, where the materials react with each other. Carbon from the coal binds with the oxygen from the iron oxide and creates carbon dioxide, which rises into a chamber where it is captured. Hot iron and coal ash are left behind. Because the iron beads are so much bigger than the coal ash, they are easily separated out of the ash, and delivered to a chamber where the heat energy would normally be harnessed for electricity. The coal ash is removed from the system.
The carbon dioxide is separated and can be recycled or sequestered for storage. The iron beads are exposed to air inside the reactor, so that they become re-oxidized be used again. The beads can be re-used almost indefinitely, or recycled.
Since the process captures nearly all the carbon dioxide, it exceeds the goals that DOE has set for developing clean energy. New technologies that use fossil fuels should not raise the cost of electricity more than 35 percent, while still capturing more than 90 percent of the resulting carbon dioxide. Based on the current tests with the research-scale plants, Fan and his team believe that they can meet or exceed that requirement.
The DOE funded this research, and collaborating companies include Babcock & Wilcox Power Generation Group, Inc.; CONSOL Energy, Inc.; and Clear Skies Consulting, LLC.
The above story is reprinted from materials provided by Ohio State University.

http://bit.ly/WLSIO7

Japan Whaling On Choppy Seas

Japan's increasingly beleaguered whaling industry has taken lumps from inside and outside the country in recent day.

Feb 6, 2013 11:08 AM ET // by Kieran Mulvaney

Australia is demanding Tokyo withdraw its "research whaling" fleet from the Southern Ocean, and a new report based on Japanese government data shows that whaling remains afloat only because of massive taxpayer subsidies.
Australia's call came following revelations that a support vessel for Japan's whaling fleet, the Shonan Maru No.2, had entered the 200-mile Exclusive Economic Zone around Australia's subantarctic Macquarie Island en route to the whaling grounds. (Australia also claims the Antarctic waters in which the whaling fleet is operating; it is one of seven nations to claim Antarctic territory, although these claims have been effectively "frozen" – neither recognized nor disputed – by the Antarctic Treaty of 1959.)

"Australia has made it clear to Japan on a number of occasions that vessels associated with its whaling program are not welcome," the country's environment minister Tony Burke said in a statement. "Our embassy in Tokyo has conveyed these sentiments directly to the Japanese government."
Australia has taken its protest against Japan's whaling to the International Court of Justice in The Hague, arguing that Tokyo's claims to be hunting whales for scientific research "can not be justified" under the terms of the International Convention for the Regulation of Whaling, the convention on which the International Whaling Commission is based. New Zealand has subsequently joined that case, which is expected to be heard in June or July.
Japanese officials frequently defend their country's whaling by arguing that it is traditional activity that provides much-needed and much-desired meat for its people – claims that have been found wanting by a new report, which uses Japanese government data to show that whale meat is far from popular and that left to its own devices, the whaling industry would collapse.
The report, called The Economics of Japanese Whaling and published by the International Fund for Animal Welfare (IFAW), was released at a press conference in Tokyo on Tuesday. (Full disclosure – the report was partly written by the author of this blog.) It compiled information collected on its behalf by Japanese companies including E-Square and the Nippon Research Center to demonstrate, among other things, that:

Whale meat consumption in Japan is now a mere 1 percent of its peak in the 1960s

Current stockpiles of unsold whale meat have increased to nearly 5,000 tonnes and are more than four times greater what they were 15 years ago

A majority of Japanese are indifferent to whaling; and 89 percent say they have not bought any whale meat in the past 12 months

The whaling industry is able to survive only because of massive government taxpayer subsidies. Annual government subsidies for Japanese whaling average around 782 million yen (US $9.78m), but in 2011 increased by around 2.28 billion yen (US $28.55m).

That 2011 subsidy increase came from the diversion of earthquake reconstruction funds that had been earmarked for tsunami relief.

IFAW argues that a more productive and potentially profitable whale-based industry meriting Japanese government support is whale watching, which is growing in popularity in that country's waters and in 2008 generated approximately $22 million in income.
"The good people of Japan are paying billions to support a dying industry," said IFAW Whale Program Director Patrick Ramage. "If their government wants to generate income and help coastal communities, it should support whale watching. Whaling is an economic loser in the 21st century."

http://www.sciencedaily.com/releases/2013/02/130206121324.htm

Experimental Drug Combination Selectively Destroys Lymphoma Cells

Laboratory experiments suggest that a novel combination of ibrutinib and bortezomib could be an effective new therapy for several forms of blood cancer

Laboratory experiments conducted by scientists at Virginia Commonwealth University Massey Cancer Center suggest that a novel combination of the drugs ibrutinib and bortezomib could potentially be an effective new therapy for several forms of blood cancer, including diffuse large B-cell lymphoma (DLBCL) and mantle cell lymphoma (MCL).
The study, published in the British Journal of Hematology, showed that the experimental drug combination killed cancer cells through a form of cell suicide known as apoptosis, but was relatively non-toxic to normal, healthy cells. Ibrutinib is a new agent that inhibits the B-cell receptor (BCR) signaling complex, which plays an important role in the survival of malignant B-cells. It has shown very promising initial results in the treatment of patients with B-cell malignancies, including chronic lymphocytic leukemia (CLL), DLBCL and MCL. The synergistic interaction of the two drugs proved lethal even to lymphoma cells that had become resistant to bortezomib, when used alone.
"Bortezomib is currently used to treat MCL and multiple myeloma, but, unfortunately, many patients develop resistance to the drug," says the study's principle investigator Steven Grant, M.D., Shirley Carter Olsson and Sture Gordon Olsson Chair in Oncology Research, associate director for translational research, program co-leader of Developmental Therapeutics and Cancer Cell Signaling research member at VCU Massey Cancer Center. "We are hopeful that this combination therapy may circumvent such resistance and eventually help fill an urgent need for more effective therapies for patients with these uncommon blood disorders."
With cultured DLBCL and MCL cells in laboratory experiments spearheaded by Girija Dasmahapatra, Ph.D., lead author of the study's manuscript and instructor in the Department of Internal Medicine at VCU School of Medicine, the scientists found that ibrutinib blocked several molecular pathways that the cancer cells use for

growth and survival. When ibrutinib was combined with bortezomib, the scientists observed a high level of synergism between the two drugs that resulted in profound cell death due to DNA damage, culminating in apoptosis. The research findings suggest that the effectiveness of the combination therapy against bortezomib-resistant lymphoma cells may stem from ibrutinib's ability to block signaling pathways used by the cancer cells to survive bortezomib exposure.

Specifically, exposure of DLBCL and MCL cells to ibrutinib blocked the cancer-promoting NF-κB, AKT and ERK1/2 signaling pathways. These signaling pathways provide cells with the ability to adapt to otherwise harmful environmental stimuli by transmitting messages from receptors located at the cell's surface to proteins within the cell that trigger a variety of biological processes. In particular, NF-κB, AKT and ERK1/2 have been shown to carry out many functions that allow cancer cells to survive and proliferate. Significantly, each of these pathways has been implicated in the development of resistance to proteasome inhibitors such as bortezomib.

"We have provided a framework for understanding how an agent like ibrutinib might be employed to enhance the activity of an established anti-cancer agent like bortezomib," says Grant. "We are currently working with representatives from the pharmaceutical industry and the National Cancer Institute to develop a new treatment strategy in which ibrutinib will be combined with proteasome inhibitors like bortezomib for the treatment of patients with lymphomas and potentially other blood cancers."

Grant and Dasmahapatra collaborated on this study with Hiral Patel and Tri Nguyen, Ph.D., from the Department of Internal Medicine at VCU School of Medicine; Paul Dent, Ph.D., Universal Corporation Distinguished Professor for Cancer Cell Signaling, vice chair of the department of neurosurgery and member of the Developmental Therapeutics research program at VCU Massey; and Richard I. Fisher, M.D., and Jonathan Friedberg, M.D., from the James T. Wilmot Cancer Center at the University of Rochester.

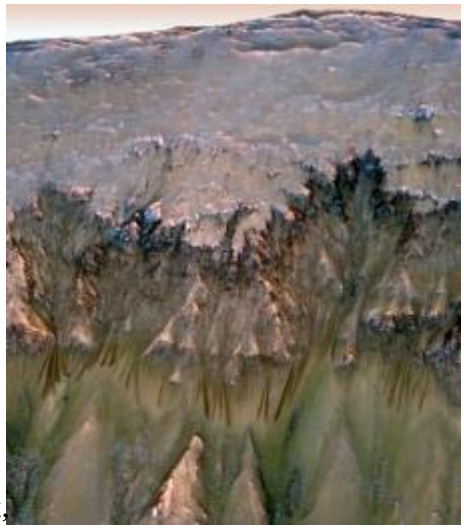
Girija Dasmahapatra, Hiral Patel, Paul Dent, Richard I. Fisher, Jonathan Friedberg, Steven Grant. The Bruton tyrosine kinase (BTK) inhibitor PCI-32765 synergistically increases proteasome inhibitor activity in diffuse large-B cell lymphoma (DLBCL) and mantle cell lymphoma (MCL) cells sensitive or resistant to bortezomib. British Journal of Haematology, 2013; DOI: 10.1111/bjh.12206

http://bit.ly/U1nG6o

The New Way to Look for Mars Life: Follow the Salt

There is probably water on Mars, but you wouldn't want to drink it. It's salty, viscous and quite possibly toxic. But astrobiologists are nonetheless excited about the possibility.

By John Matson | February 6, 2013



LOS ANGELES - Just in the past few years, orbiter cameras and Mars landers have gathered evidence that watery liquid does exist on the Red Planet, at least during some part of the day or some part of the year. The presence of water in such an inhospitable environment—freezing cold, with low atmospheric pressures that drive rapid evaporation—is a bit of a puzzle. But a number of lines of research indicate that perchlorates, a form of salt found in Martian soils by the Phoenix lander in 2008, may play a key role in sustaining liquids on Mars.

Phoenix's discovery, and the subsequent identification from a Mars Reconnaissance Orbiter camera of seasonal surface markings resembling fluid streaks, has significantly reframed the discussion of where, and how, water might exist on Mars today—and with it, perhaps, some form of microbial life. During a scientific workshop this week on the present-day habitability of Mars, Chris McKay of the NASA Ames Research Center in Moffett Field, Calif., noted that perchlorates had become, unofficially at least, "the theme for this conference."

Newton Crater on Mars Recurring slope lineae on Mars (dark streaks in lower third of photograph) may represent the seasonal flow of salty brines. **Credit: NASA/JPL-Caltech/Univ. of Arizona**

"I would say it is probably the most important astrobiological discovery since Viking—the discovery of perchlorate," McKay added. (The Viking landers were NASA's landmark 1970s life-detection missions.) For starters, perchlorates would have reacted at high heat to destroy any organic compounds in the soil samples analyzed by the Vikings, potentially explaining their nondetection of biological molecules, even if Martian soils do record the past presence of life.

Perchlorate salts also appear to greatly extend the environmental conditions under which brines could remain liquid on Mars today. "They do seem to depress the freezing temperature to the point where you could have stable liquid on the surface," said Selby Cull of Bryn Mawr College.

What is more, salts such as perchlorates provide a way for Martian soils to take up water from the atmosphere. When the Martian atmosphere becomes more humid during its daily cycle, perchlorates can undergo a process called deliquescence, pulling water from the air and essentially transforming from a crystal to a droplet. As the humidity decreases again, the salts effloresce, releasing the water vapor back into the atmosphere. Intriguingly, the process is asymmetrical—preliminary laboratory data presented at the conference demonstrated that perchlorate salts deliquesce and effloresce at very different humidity levels. Once a perchlorate has taken in water via deliquescence, which occurs as moderate humidities, it will retain that water until the humidity drops to very low levels. "The salt really likes to maintain its aqueous state," said Raina Gough of the University of Colorado at Boulder. The ready uptake of water by perchlorate salts points the way to the regular emergence of pockets of liquid under typical Martian conditions. "We've expanded the region where you can have an aqueous phase to lower temperatures and lower humidities," Gough said.

But liquidity is not enough to guarantee habitability. Martian salts may be resistant to efflorescence, and may form brines that remain liquid to very low temperatures, but many of those same brines are too dissimilar to pure water to enable life as we know it to grow. (Perchlorates are generally poisonous, to make matters worse.) "Briny water on Mars may or may not be habitable for microbes from Mars or from Earth," acknowledged Alfred McEwen of the University of Arizona.

All the same, McEwen and his colleagues have recently found what appears to be the best evidence for present-day flowing liquid on Mars. In 2011 the researchers used the Mars Reconnaissance Orbiter's HiRISE camera to identify several sites where warm slopes are periodically darkened by linear streaks. Flowing briny water was, and still is, the best explanation for the seasonal appearance of the so-called recurring slope lineae—although McEwen noted that non-perchlorate salts, with less extreme properties, could be in play.

The presence of various salts on Mars, and the apparent ability of those salts to permit the flow of liquids even in Mars's harsh climate, has opened new doors to the possibility of a wet, perhaps even habitable Mars. "I'm struck by how different this discussion is than just a few years ago," said David Paige of the University of California, Los Angeles, the convener of the conference. "There are clearly places that water activity does appear to be occurring on Mars."

Not long ago, McEwen noted, a hypothetical mission seeking out Mars life would have had no obvious target for exploration. Such a search would need to find the proverbial needle in a planet-size haystack. "Now we have some very strong ideas about where to go and what to look for," he said.

John Matson is an associate editor at Scientific American focusing on space, physics and mathematics. Follow on Twitter @jmtsn.

http://www.sciencedaily.com/releases/2013/02/130206130946.htm

Possible Cause Of, and Treatment For, Non-Familial Parkinson's

Researchers have identified a protein trafficking defect within brain cells that may underlie the common form of Parkinson's disease.

Columbia University Medical Center (CUMC) researchers have identified a protein trafficking defect within brain cells that may underlie common non-familial forms of Parkinson's disease. The defect is at a point of convergence for the action of at least three different genes that had been implicated in prior studies of Parkinson's disease. Whereas most molecular studies focus on mutations associated with rare familial forms of the disease, these findings relate directly to the common non-familial form of Parkinson's.

The study was published today in the online edition of the journal Neuron.

The defective pathway is called the "retromer" pathway, in part because it can guide the reutilization of key molecules by moving them back from the cell surface to internal stores. In this study, defects in the retromer pathway also appear to have profound effects on the cell's disposal machinery, which may explain why Parkinson's disease brain cells ultimately accumulate large protein aggregates. The trafficking defects associated with Parkinson's can be reversed by increasing retromer pathway activity, suggesting a possible therapeutic strategy. No current therapies for Parkinson's alter the progression of the disease.

The researchers also found evidence that, even in unaffected individuals who simply carry common genetic variants associated with an increased risk of Parkinson's disease, these molecular changes are at work. This supports the notion that early treatment approaches will be important in tackling Parkinson's disease.

"Taken together, the findings suggest that drugs that target the retromer pathway could help prevent or treat Parkinson's," said study leader Asa Abeliovich, MD, PhD, associate professor of pathology and cell biology and of neurology in the Taub Institute for Research on Alzheimer's Disease and the Aging Brain at CUMC.

In recent years, through genome-wide association studies (GWAS), researchers have identified about 10 common genetic variants that appear to have small effects on the risk of non-familial Parkinson's, However, it has been hard to delve deeper into the impact of these variants. "When you look at patient brain tissue at

autopsy, it's usually too late -- all the critical dopamine neurons are long gone and the damage has been done," said Dr. Abeliovich.
In the current study, Dr. Abeliovich and his CUMC colleagues used an unusually broad array of approaches -- including analyses of Parkinson's disease-associated genetic variations, patient brain tissue, in vitro tissue culture studies of brain neurons, and fruit fly (Drosophila) models that harbor genetic variants related to those associated with Parkinson's disease.
The researchers found that common variants in two genes previously linked to Parkinson's disease, LRRK2 and RAB7L1, led to an unexpectedly similar impact on human brain tissue. The effects of the variants were found to be highly overlapping, pointing to a common pathway of action. Prominent cellular changes were observed in the retromer pathway, which is involved in the trafficking of proteins from the Golgi apparatus (which packages proteins for delivery to other cell components) to the lysosomes (which recycle proteins and other molecules). Mutations that affect the retromer pathway have also been found in familial Parkinson's disease.
Earlier studies from Columbia's Taub Institute have shown that genetic variants in genes associated with retromer function are linked to Alzheimer's disease and retromer component levels appear altered in Alzheimer's disease brains, suggesting a broader role for retromer dysfunction in neurodegenerative diseases of aging, according to Dr. Abeliovich.
The impact of the RAB7L1 and LRRK2 variants was apparent even in individuals with no signs or symptoms of Parkinson's disease. This suggests that there is a pre-disease state in unaffected carriers of the two genetic variants that favors early disease onset and that, in theory, could be targeted therapeutically.
The CUMC researchers also demonstrated that overexpression of one of the variants, RAB7L1, can overcome the effects of the other variant. Similarly, expression of VPS35, a gene involved in the retromer pathway, can suppress LRRK2 mutant pathology. "It will be interesting to look for drugs that directly target these retromer components or that more generally promote flow through the pathway," said Dr. Abeliovich.
The title of the paper is "RAB7L1 interacts with LRRK2 to modify intraneuronal protein sorting and Parkinson's disease risk." The other contributors are David A. Macleod, Herve Rhinn, Tomoki Kuwahara, Ari Zolin, Gilbert Di Paolo, Brian D. McCabe, Lorraine N. Clark, and Scott A. Small, all at CUMC.
The study was supported by grants from the Michael J. Fox Foundation and the National Institutes of Health (NS064433, NS060876, NS060113, A6008702, AG025161, and AG08702-21.
David A. MacLeod, Herve Rhinn, Tomoki Kuwahara, Ari Zolin, Gilbert Di Paolo, Brian D. MacCabe, Karen S. Marder, Lawrence S. Honig, Lorraine N. Clark, Scott A. Small, Asa Abeliovich. RAB7L1 Interacts with LRRK2 to Modify Intraneuronal Protein Sorting and Parkinson's Disease Risk. Neuron, 2013; 77 (3): 425 DOI: 10.1016/j.neuron.2012.11.033

http://nyti.ms/11yOeA4

Scientists Find Life in the Cold and Dark Under Antarctic Ice

For the first time, scientists report, they have found bacteria living in the cold and dark deep under the Antarctic ice

By JAMES GORMAN

For the first time, scientists report, they have found bacteria living in the cold and dark deep under the Antarctic ice, a discovery that might advance knowledge of how life could survive on other planets or moons and that offers the first glimpse of a vast ecosystem of microscopic life in underground lakes in Antarctica. A network of hundreds of lakes lies sandwiched between the continent's land and the ice that covers it, and scientists had thought that it could harbor life. The discovery is the first confirmation. "It transforms the way we view the Antarctic continent," said John C. Priscu of Montana State University, a leader of the scientific expedition.

The first view of the bottom of subglacial Lake Whillans in Antarctica. **Alberto Behar, Jet Propulsion Laboratory/Arizona State University; underwater camera financed by National Science Foundation and NASA**

After drilling through a half-mile of ice into the 23-square-mile, 5-foot-deep Lake Whillans, the expedition scientists recovered water and sediment samples that showed clear signs of life, Dr. Priscu said, speaking from McMurdo Station in Antarctica on Tuesday. They saw cells under a microscope, and chemical tests showed that the cells were alive and metabolizing energy.
Dr. Priscu said that every precaution had been taken to prevent contamination of the lake with bacteria from the surface or the overlying ice. In addition, he said, the concentrations of life were higher in the lake than in the borehole, and there were signs of life in the lake bottom's sediment, which would be sealed off from contamination.
Much more study, including DNA analysis, is needed to determine what kinds of bacteria have been found and how they live, Dr. Priscu said. There is no sunlight, so the bacteria must depend on organic material that has

drifted into the lake from other sources — for instance, decaying microbes from melting glaciers — or on minerals in the rock of the Antarctic continent.
Chris McKay, a NASA senior scientist, said in an e-mail that such analysis could determine if the bacteria in Lake Whillans have implications for the possible discovery of extraterrestrial life. “If it was using a local energy source, it would be interesting,” he said. “If it’s just consuming organics carried in from elsewhere, it is of much less interest.” The reason, he said, is that elsewhere in the solar system where there is good evidence of liquid water under thick ice sheets, life would have to depend on minerals alone. “There is not going to be oxygen on other worlds,” Mr. McKay said.
Slawek Tulaczyk of the University of California, Santa Cruz, another leader of the science expedition, said that samples were drawn from as deep as four feet in the sediment, and that oxygen decreased with the depth of the sample.
The scientific project, called Wissard, for Whillans Ice Stream Subglacial Access Research Drilling, was years in the planning and is one of three efforts to investigate the lakes that lie under the Antarctic ice.
A year ago, a Russian expedition penetrated the surface of Lake Vostok, under two miles of ice. They found hints of life on samples from the drill bit, but contamination from the kerosene drilling fluid was a possibility. This year they recovered samples of frozen lake water that are yet to be analyzed. A British effort to reach Lake Ellsworth, under a mile of ice, was called off in December because of equipment problems.
The American effort, supported by $10 million from the National Science Foundation and other grants, focused on Lake Whillans, which is quite different from the other two lakes. It lies under a half-mile of ice, less than the others, and its water is replenished in about a decade, scientists believe, with meltwater from overlying ice. Lake Vostok is much more sealed off from the surface and is thought to take 10,000 years for its waters to renew. Lake Ellsworth may turn over in about 700 years.
Although Lake Whillans may be more reachable than the other two, doing anything in Antarctica is enormously difficult. It took a tractor convoy 12 days to take the drill and other equipment more than 500 miles over the Ross Ice Shelf to the drilling site from the American research station at McMurdo.
The scientists had four days to collect samples and obtain images of the lake. Several lines of evidence convinced them that they had found microbial life in the lake. First, they saw cells under the microscope and confirmed that DNA was present.
Then they measured evidence of an enzyme that is important in metabolism and a chemical called ATP, for adenosine triphosphate. Molecules of ATP are essentially packets of energy, and their presence was a further indication that the bacteria were living. Further, they found that concentrations of ATP were higher in the lake water than in the water in the borehole, which, Dr. Priscu said, meant that there was more life in the lake and argued against any contamination.
Much further study will be done before scientific results are published and other scientists can look at all the data. Dr. Priscu said that new tests were being done each day, but that DNA tests would have to wait until the scientists returned to the United States. “Our stateside DNA sequence work will tell us who they are,” he said of the microbes, “and, together with other experiments, tell us how they make a living.”
But he said he was confident that the researchers had achieved the first glimpse of an ecosystem that had been completely unknown. “It’s the world’s largest wetland,” Dr. Priscu said.

http://www.eurekalert.org/pub_releases/2013-02/bu-sdh020713.php

Scientists discover how the world's saltiest pond gets its salt

Antarctica's Don Juan Pond might be the unlikeliest body of water on Earth.

PROVIDENCE, R.I. [Brown University] - Situated in the frigid McMurdo Dry Valleys, only the pond's high salt content — by far the highest of any body of water on the planet — keeps it from freezing into oblivion.
Now a research team led by Brown University geologists has discovered how Don Juan Pond gets the salty water it needs to exist.
Using time lapse photography and other data, the researchers show that water sucked out of the atmosphere by parched, salty soil is the source of the saltwater brine that keeps the pond from freezing. Combine that with some fresh water flowing in from melting snow, and you've got a pond able to remain fluid in one of the coldest and driest places on Earth. And because of the similarities between the Dry Valleys and the frozen desert of Mars, the findings could have important implications for water flow on the Red Planet both in the past and maybe in the present.
The study, by James Dickson and James Head from Brown, Joseph Levy from Oregon State, and David Marchant from Boston University, is published in Nature Publishing Group's open access journal, Scientific Reports.

The research represents the most detailed observations ever made of Don Juan Pond. "It was a simple idea," Dickson said of the team's approach. "Let's take 16,000 pictures of this pond over the course of two months and then see which way the water's flowing. So we took the pictures, correlated them to the other measurements we were taking, and the story told itself."
What the pictures showed was that water levels in the pond increase in pulses that coincide with daily peaks in temperature, suggesting that the water comes partly from snow warmed just enough by the midday sun to melt. But that influx of fresh water doesn't explain the pond's high salt content, which is eight times higher than that of the Dead Sea. For that explanation, the researchers looked to a second source of liquid documented in the photos.
The second source comes from a channel of loose sediment located to the west of the pond. Previous research had found that sediment to be high in calcium chloride salt. To see if that was the source of the pond's salt, the researchers set up a second time-lapse camera to monitor the channel and synchronized the pictures with data collected from nearby weather stations.
The pictures show dark streaks of moisture called water tracks forming in the soil whenever the relative humidity in the air spiked. Similar water tracks also form on a cliff face north of the pond. What's forming these tracks is the salt in the soil absorbing any available moisture in the air, a process known as deliquescence. Those water-laden salts then trickle down through the loose soil until they reach the permafrost layer below. There they sit until the occasional flow of snowmelt washes the salts down the channel and into the pond.
When the team saw how closely correlated the appearance of water tracks was to their humidity readings, they knew the tracks were the result of deliquescence and that the process was key to keeping the pond salty enough to persist.
The findings refute the dominant interpretation of Don Juan Pond's origin. Since the pond's discovery in 1961, most researchers had agreed that its briney waters must be supplied mainly from deep in the ground. However, these new images show no evidence at all that groundwater contributes to the pond.

Implication for Mars

Head and Dickson mainly study the geology of bodies other than Earth, so they approach Antarctica as a model for the cold, dry desert of Mars. What they have learned about Don Juan Pond could tell us something about the possibilities for flowing water on Mars, both in the past and in the present.
The images of water tracks at Don Juan Pond look a lot like features recently imaged on Mars called recurring slope lineae, the researchers say. The features appear on Mars as dark streaks that seem to flow downslope on cliff faces. They often recur in the same places at the same times of year, hence their name. Some scientists believe these streaks indicate some kind of flowing brine, the best evidence yet that there might be flowing water on present day Mars.
The research in Antarctica strengthens the view that these lineae on Mars are indeed formed by flowing brine. Frost has been observed on Mars, suggesting that the atmosphere contains at least a little water vapor. There have also been chloride-bearing salts detected on Mars, which would be capable of the same kind deliquescence seen in Antarctica. And importantly, the processes at Don Juan Pond require no groundwater, which is not thought to exist currently on Mars.
"Broadly speaking, all the ingredients are there for a Don Juan Pond-type hydrology on Mars," Dickson said. It's not likely that there's enough water currently on Mars for the water to form ponds, but stronger flows in Mars's past might have formed plenty of Don Juan Ponds. "Don Juan Pond is a closed basin pond and we just documented a couple hundred closed basins on Mars," Head said. "So what we found in Antarctica may be a key to how lakes worked on early Mars and also how moisture may flow on the surface today."

http://www.eurekalert.org/pub_releases/2013-02/uadb-urc020713.php

UAB researchers cure type 1 diabetes in dogs

Introducing a 'glucose sensor' by gene therapy eliminates the symptoms of the disease

Researchers from the Universitat Autònoma de Barcelona (UAB), led by Fàtima Bosch, have shown for the first time that it is possible to cure diabetes in large animals with a single session of gene therapy. As published this week in Diabetes, the principal journal for research on the disease, after a single gene therapy session, the dogs recover their health and no longer show symptoms of the disease. In some cases, monitoring continued for over four years, with no recurrence of symptoms.
The therapy is minimally invasive. It consists of a single session of various injections in the animal's rear legs using simple needles that are commonly used in cosmetic treatments. These injections introduce gene therapy vectors, with a dual objective: to express the insulin gene, on the one hand, and that of glucokinase, on the other. Glucokinase is an enzyme that regulates the uptake of glucose from the blood. When both genes act

simultaneously they function as a "glucose sensor", which automatically regulates the uptake of glucose from the blood, thus reducing diabetic hyperglycemia (the excess of blood sugar associated with the disease).
As Fàtima Bosch, the head researcher, points out, "this study is the first to demonstrate a long-term cure for diabetes in a large animal model using gene therapy."
This same research group had already tested this type of therapy on mice, but the excellent results obtained for the first time with large animals lays the foundations for the clinical translation of this gene therapy approach to veterinary medicine and eventually to diabetic patients.
The study was led by the head of the UAB's Centre for Animal Biotechnology and Gene Therapy (CBATEG) Fàtima Bosch, and involved the Department of Biochemistry and Molecular Biology of the UAB, the Department of Medicine and Animal Surgery of the UAB, the Faculty of Veterinary Science of the UAB, the Department of Animal Health and Anatomy of the UAB, the Spanish Biomedical Research Centre in Diabetes and Associated Metabolic Disorders (CIBERDEM), the Children's Hospital of Philadelphia (USA) and the Howard Hughes Medical Institute of Philadelphia (USA).

A safe and efficacious gene therapy

The study provides ample data showing the safety of gene therapy mediated by adeno-associated vectors (AAV) in diabetic dogs. The therapy has proved to be safe and efficacious: it is based on the transfer of two genes to the muscle of adult animals using a new generation of very safe vectors known as adeno-associated vectors. These vectors, derived from non-pathogenic viruses, are widely used in gene therapy and have been successful in treating several diseases.
In fact, the first gene therapy medicine ever approved by the European Medicines Agency, named Glybera®, makes use of adeno-associated vectors to treat a metabolic disease caused by a deficiency of lipoprotein lipase and the resulting accumulation of triglycerides in the blood.

Long-term control of the disease

Dogs treated with a single administration of gene therapy showed good glucose control at all times, both when fasting and when fed, improving on that of dogs given daily insulin injections, and with no episodes of hypoglycemia, even after exercise. Furthermore, the dogs treated with adeno-associated vectors improved their body weight and had not developed secondary complications four years after the treatment.
The study is the first to report optimal long-term control of diabetes in large animals. This had never before been achieved with any other innovative therapies for diabetes. The study is also the first to report that a single administration of genes to diabetic dogs is able to maintain normoglycemia over the long term (more than 4 years). As well as achieving normoglycemia, the dogs had normal levels of glycosylated proteins and developed no secondary complications of diabetes after more than 4 years with the disease.

Application in diabetic patients

There have been multiple clinical trials in which AAV vectors have been introduced into skeletal muscle, so the strategy reported in this study is feasible for clinical translation. Future safety and efficacy studies will provide the bases for initiating a clinical veterinary trial of diabetes treatment for companion animals, which will supply key information for eventual trials with humans. In conclusion, this study paves the way for the clinical translation of this approach to gene therapy to veterinary medicine, and eventually to diabetic patients.

Diabetes mellitus

Diabetes mellitus is the most common metabolic disease, and a large number of patients need insulin treatment to survive. In spite of the use of insulin injections to control the disease, these patients often develop serious secondary complications like blindness, kidney damage or amputation of limbs. Moreover, in order to achieve good blood glucose control, insulin has to be injected two or three times a day, which brings a risk of hypoglycemia episodes (lowering of blood sugar): an additional problem that comes on top of the other hardships of the treatment.

http://www.eurekalert.org/pub_releases/2013-02/amon-pmd020113.php

Placental mammal diversity exploded after age of dinosaurs

Scientists build new tree of life for placentals using 'phylophenomics,' visualize common ancestor

An international team of researchers has reconstructed the common ancestor of placental mammals—an extremely diverse group including animals ranging from rodents to whales to humans—using the world's largest dataset of both genetic and physical traits. In research to be published in the journal Science, the scientists reveal that, contradictory to a commonly held theory, placental mammals did not diversify into their present-day lineages until after the extinction event that eliminated non-avian dinosaurs, and about 70 percent of all species on Earth, some 65 million years ago. This finding, and the visualization of the placental ancestor—a small, insect-eating animal— was made with the help of a powerful cloud-based and publicly accessible database called MorphoBank. The Science article is the result of a multi-year collaborative project funded by the National Science Foundation's Assembling the Tree of Life program.

"Analysis of this massive dataset shows that placental mammals did not originate during the Mesozoic," said lead author Maureen O'Leary, an associate professor in the Department of Anatomical Sciences in the School of Medicine at Stony Brook University and a research associate at the American Museum of Natural History. "Species like rodents and primates did not share the Earth with non-avian dinosaurs but arose from a common ancestor—a small, insect-eating, scampering animal—shortly after the dinosaurs' demise."

There are two major types of data for building evolutionary trees of life: phenomic data, observational traits such as anatomy and behavior; and genomic data encoded by DNA. Some scholars have argued that integration of both is necessary for robust tree-building because examining only one type of data (genomic or phenomic) leaves out significant information. The evolutionary history of placental mammals, for example, has been interpreted in very different ways depending on the data analyzed. One leading analysis based on genomic data alone predicted that a number of placental mammal lineages existed in the Late Cretaceous and survived the Cretaceous-Paleogene (KPg) extinction. Other analyses place the start of placental mammals near this boundary, and still others set their origin after this event.

This is an artist's rendering of the hypothetical placental ancestor, a small insect-eating animal. The research team reconstructed the anatomy of the animal by mapping traits onto the evolutionary tree most strongly supported by the combined phenomic and genomic data and comparing the features in placental mammals with those seen in their closest relatives. **Credit: Carl Buell**

"There are over 5,100 living placental species and they exhibit enormous diversity, varying greatly in size, locomotor ability, and brain size," said Nancy Simmons, paper author and a curator in the Department of Mammalogy at the American Museum of Natural History. "Given this diversity, it's of great interest to know when and how this clade first began evolving and diversifying." The new study combines genomic and phenomic data in a simultaneous analysis for a more complete picture of the tree of life.

"Despite the considerable contributions of DNA sequence data to the study of species relationships, phenomic data have a major role in the direct reconstruction of trees," said author Michael Novacek, senior vice president, provost for science, and a curator of paleontology at the American Museum of Natural History. "Such data include features preserved in fossils where DNA recovery may be impossible. The mammalian record is notably enriched with well-preserved fossils, and we don't want to build trees without using the direct evidence that these fossils contribute."

"Discovering the tree of life is like piecing together a crime scene—it is a story that happened in the past that you can't repeat," O'Leary said. "Just like with a crime scene, the new tools of DNA add important information, but so do other physical clues like a body or, in the scientific realm, fossils, and anatomy. Combining all the evidence produces the most informed reconstruction of a past event."

The tree of life produced in this study shows that placental mammals arose rapidly after the KPg extinction, with the original ancestor speciating 200,000-400,000 years after the event. "This is about 36 million years later than the prediction based on purely genetic data," said Marcelo Weksler, an author and research associate in the Museum's Department of Mammalogy who is now at the Museu Nacional-UFRJ in Brazil.

The finding also contradicts a genomics-based model called the "Cretaceous-Terrestrial Revolution" that argues that the impetus for placental mammal speciation was the fragmentation of supercontinent Gondwana during the Jurassic and Cretaceous, millions of years earlier than the KPg event. "The new tree indicates that the fragmentation of Gondwana came well before the origin of placental mammals and is an unrelated event," said John Wible, paper author and curator of mammals at the Carnegie Museum of Natural History.

As part of the study, researchers used MorphoBank, an initiative funded primarily by the National Science Foundation (NSF) with additional support from Stony Brook University, the American Museum of Natural History, and the National Oceanic and Atmospheric Administration, to record phenomic traits for 86 placental mammal species, of which 40 were fossil species. The resulting dataset has more than 4,500 traits detailing characteristics such as the presence or absence of wings, teeth, and certain bones, type of hair cover, and structures found in the brain, as well as over 12,000 supporting images, all publicly available online. The dataset is an order of magnitude (10 times) larger than what has previously been used for studies of mammal relationships. Because phenomic datasets are built on physical objects like fossils that are limited in number and take time to excavate, prepare, and analyze, evolutionary trees based on anatomy usually don't exceed several hundred traits. Large-scale collection of such data for tree-building is now being called "phylophenomics."

"Cyberinfrastructure for organizing molecular biology has historically outstripped infrastructure for phenomic data, but new technologies like MorphoBank allow scientists working with phenomic data to produce larger and more complex projects and to enrich these databases with images, references, and comments," said Andrea Cirranello, paper author and a postdoctoral research associate at Stony Brook University and the Museum.
The team reconstructed the anatomy of the placental common ancestor by mapping traits onto the tree most strongly supported by the combined phenomic and genomic data and comparing the features in placental mammals with those seen in their closest relatives. This method, known as optimization, allowed the researchers to determine what features first appeared in the common ancestor of placental mammals and also what traits were retained unchanged from more distant ancestors. The researchers conclude that the common ancestor had features such as a two-horned uterus, a brain with a convoluted cerebral cortex, and a placenta in which the maternal blood came in close contact with the membranes surrounding the fetus, as in humans.
In addition, the study reveals that a branch of the placental mammal tree called Afrotheria (because these animals—which range from elephants to aardvarks—live in Africa today) did not originate on that continent but rather in the Americas.
"Determining how these animals first made it to Africa is now an important research question along with many others that can be addressed using MorphoBank and the phylophenomic tree produced in this study," said author Fernando Perini, a former postdoctoral fellow at the American Museum of Natural History who is now a professor at the Minas Gerais Federal University in Brazil.
Added author Mary Silcox, an assistant professor of anthropology at the University of Toronto Scarborough: "This project is not exhaustive, but exposes a way forward to collect data on other phenomic systems and other species." *Funding for this study was provided by NSF grants 0743309, 0827993, 0629959, 0629836, and 0629811.*

http://www.eurekalert.org/pub_releases/2013-02/uoc--epl020713.php

Excess protein linked to development of Parkinson's disease

Accumulation appears to progressively disrupt neuronal function and viability

Researchers at the University of California, San Diego School of Medicine say overexpression of a protein called alpha-synuclein appears to disrupt vital recycling processes in neurons, starting with the terminal extensions of neurons and working its way back to the cells' center, with the potential consequence of progressive degeneration and eventual cell death.
The findings, published in the February 6, 2013 issue of the Journal of Neuroscience, have major implications for more fully understanding the causes and mechanisms of Parkinson's disease (PD), a neurodegenerative movement disorder that affects an estimated one million Americans.
"This is an important new insight. I don't think anybody realized just how big a role alpha-synuclein played in managing the retrieval of worn-out proteins from synapses and the role of alterations in this process in development of PD," said principal investigator Mark H. Ellisman, PhD, professor of neurosciences and bioengineering and director of the National Center for Microscopy and Imaging Research (NCMIR), based at UC San Diego.
Parkinson's disease is characterized by the gradual destruction of select brain cells that produce dopamine, a neurotransmitter involved in regulating movement and emotion. Symptoms include increasing loss of muscle and movement control. While most cases are sporadic – that is, their causes are unknown – there are also inherited forms of PD linked to specific gene mutations and modifications.
The UC San Diego researchers, with colleagues at the University of Illinois, Urbana, focused upon one of those gene products: alpha-synuclein. Using a variety of leading-edge imaging technologies, including a new fluorescent tagging technique developed for electron microscopy by UC San Diego Nobel laureate Roger Tsien's lab and colleagues at NCMIR, the scientists created three-dimensional maps of alpha-synuclein distribution both in cultured neurons and in the neurons of mice engineered to over-express the human protein. They found that excess levels of alpha-synuclein accumulated in the presynaptic terminal – part of the junction where axons and dendrites of brain cells meet to exchange chemical signals.
"The over-expression of alpha-synuclein caused hypertrophy in these terminals," said Daniela Boassa, PhD, a research scientist at NCMIR and the study's first author. "The terminals were enlarged, filled with structures we normally don't see."
Boassa said that as alpha-synuclein accumulates in the terminals, it appears to hinder normal degradation and recycling processes in neurons. This would progressively impair the release of neurotransmitters. In time, the neurons might simply stop functioning and die.
"Other studies have noted that PD is characterized by progressive loss of vesicle traffic, and neurotransmitter release," Boassa said. "Our study provides a structural and mechanistic explanation for why that happens."

Boassa said the findings shed greater light upon how PD is caused, at least in some heritable forms. Researchers plan to now probe more deeply into how the disease is propagated and how dysfunctional alpha-synuclein proteins spread from one neuron to another, hastening the advance of the disorder. "The better we understand the mechanisms of PD, the easier it will be to develop clinical interventions," she said.

Co-authors are Monica L. Berlanga, Masako Terada, Junru Hu, Eric A. Bushong and Minju Hwang, National Center for Microscopy and Imaging Research and Center for Research on Biological Systems; Mary Ann Yang and Julia M. George, Department of Cell and Developmental Biology, University of Illinois, Urbana; and Eliezer Masliah, Department of Neurosciences, UCSD.

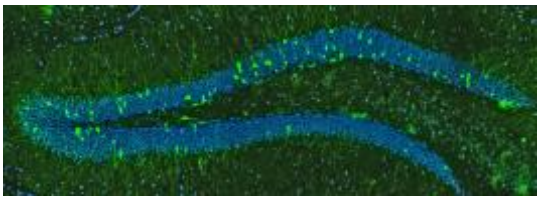
Funding for this research came, in part, from the NIH National Center for Research Resources (5P41RR004050-24), the National Institute of General Medical Sciences (8 P41 GM103412-24), National Institutes of Health grants R01 GM086197-05, AG184440 and AG022074, as well as support from the Branfman Family Foundation and the Institute for Systems Biology, as part of the activities of a consortium of researchers linked to the Luxembourg Center for Systems Biomedicine's research program on neurodegenerative disease.

http://www.sciencedaily.com/releases/2013/02/130207131511.htm

Potential Target for Age-Related Cognitive Decline Identified

Researchers have discovered a molecule that accumulates with age and inhibits the formation of new neurons

As the elderly age, their ability to concentrate, reason, and recall facts tends to decline in part because their brains generate fewer new neurons than they did when they were younger. Now, researchers reporting in the February 7th issue of the Cell Press journal Cell Stem Cell have discovered a molecule that accumulates with age and inhibits the formation of new neurons. The finding might help scientists design therapies to prevent age-related cognitive decline.



Newborn neurons (in green) in the brain of a 3 month old mouse. **(Credit: German Cancer Research Center)**

The investigators identified the molecule, called Dickkopf-1 or Dkk1, in the brains of aged mice. By blocking production of Dkk1, "We released a brake on neuronal birth, thereby resetting performance in spatial memory tasks back to levels observed in younger animals," says senior author Dr. Ana Martin-Villalba, of the German Cancer Research Center in Heidelberg.

Aged mice that lacked Dkk1 performed just as well as young mice in memory and recognition tests because the ability of the neural stem cells in their brains to self-renew and generate immature neurons was restored to youthful levels.

The investigators also found that young mice lacking Dkk1 were less susceptible to developing acute stress-induced depression than normal mice. This suggests that, in addition to slowing memory loss during aging, neutralizing Dkk1 (which is also present in human brains) could be beneficial in counteracting symptoms of depression.

Dr. Martin-Villalba notes that there are ongoing clinical trials of biological inhibitors of Dkk1 for other medical purposes. "The design of inhibitors that reach the brain might enable the prevention of cognitive decline in the aging population and depression in the general population," she says.

Désirée R.M. Seib, Nina S. Corsini, Kristina Ellwanger, Christian Plaas, Alvaro Mateos, Claudia Pitzer, Christof Niehrs, Tansu Celikel, Ana Martin-Villalba. Loss of Dickkopf-1 Restores Neurogenesis in Old Age and Counteracts Cognitive Decline. Cell Stem Cell, 2013; 12 (2): 204 DOI: 10.1016/j.stem.2012.11.010

http://phys.org/news/2013-02-precise-dates-comet-asteroid-impact.html

Most precise dates yet suggest comet or asteroid impact was last straw for dinosaurs

New evidence suggests comet or asteroid impact was last straw for dinosaurs

While many assume that a comet or asteroid impact killed off the dinosaurs, the actual dates of the impact and extinction are imprecise enough that some have questioned the connection. UC Berkeley and Berkeley Geochronology Center scientists have now dated the extinction with unprecedented precision and concluded that the impact and extinction where synchronous. While global climate change probably brought dinosaurs and other creatures to the brink, the impact likely was the final blow.

The demise of the dinosaurs is the world's ultimate whodunit. Was it a comet or asteroid impact? Volcanic eruptions? Climate change?

In an attempt to resolve the issue, scientists at the Berkeley Geochronology Center (BGC), the University of California, Berkeley, and universities in the Netherlands and the United Kingdom have now determined the most precise dates yet for the dinosaur extinction 66 million years ago and for the well-known impact that occurred around the same time.

The dates are so close, the researchers say, that they now believe the comet or asteroid, if not wholly responsible for the global extinction, at least dealt the dinosaurs their death blow.
"The impact was clearly the final straw that pushed Earth past the tipping point," said Paul Renne, BGC director and UC Berkeley professor in residence of earth and planetary science. "We have shown that these events are synchronous to within a gnat's eyebrow, and therefore the impact clearly played a major role in extinctions, but it probably wasn't just the impact."
The revised dates clear up lingering confusion over whether the impact actually occurred before or after the extinction, which was characterized by the almost overnight disappearance from the fossil record of land-based dinosaurs and many ocean creatures. The new date for the impact – 66,038,000 years ago – is the same within error limits as the date of the extinction, said Renne, making the events simultaneous.
He and his colleagues will report their findings in the Feb. 8 issue of the journal Science.
The extinction of the dinosaurs was first linked to a comet or asteroid impact in 1980 by the late UC Berkeley Nobel Laureate Luis Alvarez and his son, Walter, who is a UC Berkeley professor emeritus of earth and planetary science. A 110-mile-wide crater in the Caribbean off the Yucatan coast of Mexico is presumed to be the result of that impact. Called Chicxulub (cheek'-she-loob), the crater is thought to have been excavated by an object six miles across that threw into the atmosphere debris still found around the globe as glassy spheres or tektites, shocked quartz and a layer of iridium-enriched dust.
Renne decided last year to re-date the dinosaur extinction, which occurred at the boundary between the Cretaceous and Tertiary periods – the KT boundary – after recalibrating the 20-year-old accepted date and discovering that it now occurred 180,000 years BEFORE the impact. That earlier date was obtained in 1993 by BGC researchers using the same argon-argon method, which relies on the decay rate of a radioactive isotope of potassium.
"Everybody had always looked at the age for the KT boundary and compared it with the ages that we had gotten for the tektites and the melt rock from the Chicxulub crater and said, 'Ooh yeah, this is pretty much the same age,'" Renne said. "But they are not. They differ by 180,000 years, actually. So, from simply this esoteric calibration issue, I started to realize, 'Wow, there is a real problem here.'"
"Accurately dating the major Cretaceous-Paleogene extinction, including that of the dinosaurs, has been controversial," says H. Richard Lane, program director in the National Science Foundation (NSF)'s Division of Earth Sciences, which funded the research.
Renne and his BGC colleagues dated tektites from Haiti, analyzing them using a recalibrated argon-argon technique to determine how long ago the impact occurred. The tektite results agreed with recalibrated previous data but were more precise. They did the same for altered volcanic ash collected from the Hell Creek Formation in Montana, the source of many dinosaur fossils and one of the best sites to study the change in fossils from before and after the extinction.
The new extinction date is precise to within 11,000 years.
"When I got started in the field, the error bars on these events were plus or minus a million years," added paleontologist William Clemens, a UC Berkeley professor emeritus of integrative biology who has led research in the Hell Creek Formation for more than 30 years but was not directly involved in the study. "It's an exciting time right now, a lot of which we can attribute to the work that Paul and his colleagues are doing in refining the precision of the time scale with which we work so that we can integrate what we see from the fossil record with data on climate change and changes in flora and fauna that we see around us today."
Despite the synchronous impact and extinction, Renne cautions that this doesn't mean that the impact was the sole cause. Dramatic climate variation over the previous million years, including long cold snaps amidst a general Cretaceous hothouse environment, probably brought many creatures to the brink of extinction and the impact kicked them over the edge.
"These precursory phenomena made the global ecosystem much more sensitive to even relatively small triggers, so that what otherwise might have been a fairly minor effect shifted the ecosystem into a new state," he said. "The impact was the coup de grace."
One cause of the climate variability could have been a sustained series of volcanic eruptions in India that produced the extensive Deccan Traps. Renne plans to re-date those volcanic rocks to get a more precise measure of their duration and onset relative to the dinosaur extinction.
Renne and his colleagues also dated rocks above the KT boundary where previous researchers had looked at carbon isotopes, and concluded that Earth's atmospheric carbon cycle returned to normal within about 5,000 years of the impact. This is in stark contrast to the world's oceans, which studies show took between 1 and 2 million years to return to normal. Renne attributes this to a sluggish recovery of pre-impact ocean circulation patterns, though he concedes that this remains poorly understood.

The study's results also clarify some inconsistencies between different estimates for the age of the KT boundary based on Earth's orbital rhythms recorded in sedimentary rocks. The new independent results agree within the margins of error with an age of 65,957,000 years determined using this approach by Dutch colleagues Frederik J Hilgen of Utrecht University and Klaudia F. Kuiper of Vrije University.
"This study shows the power of high precision geochronology," said coauthor Darren F. Mark of the Scottish Universities Environmental Research Center in Kilbride, UK, who conducted independent argon-argon analyses on samples provided by Renne. "Many people think precision is just about adding another decimal place to a number. But it's far more exciting than that. It's more like getting a sharper lens on a camera. It allows us to dissect the geological record at greater resolution and piece together the sequence of Earth history."
More information: "Time Scales of Critical Events Around the Cretaceous-Paleogene Boundary," by P.R. Renne et al., Science, 2013.

http://bit.ly/12DEuUv

Can Hitchhiking Earth Microbes Thrive on Mars?

When the Curiosity rover lifted off toward Mars, the spacecraft carried a few stowaways - 278,000 bacterial spores, by NASA's best estimate.

By John Matson | February 7, 2013 | Comments7

LOS ANGELES - That is sparkling clean, by spacecraft standards—the mission's components had been sterilized, wiped, baked and coddled in clean rooms to drastically reduce the bacterial burden.
Mars missions such as Curiosity are subject to strict planetary protection policies intended to preserve habitats in the solar system that might harbor life of their own. After all, invasive species are a big enough problem on Earth, and one can only speculate about how terrestrial microorganisms would fare on Mars.
That speculation is getting a bit more grounded, however. At a conference held here this week on the present-day habitability of Mars, numerous researchers described experiments carried out in Mars simulation chambers that can replicate some of the environmental conditions of the Red Planet. Perhaps most intriguingly, a new set of experiments described by Andrew Schuerger of the University of Florida indicate that three of the most hostile elements of the Martian environment—low pressure, low temperature, and a carbon dioxide atmosphere largely devoid of oxygen gas—are not insurmountable blockades for Earth organisms. On the contrary, some microbes don't just hunker down and hibernate but actually grow under such conditions.
Schuerger, along with University of Florida colleague Wayne Nicholson and their collaborators, collected 24 microbial strains that have been found on spacecraft surfaces, in clean rooms and around Kennedy Space Center in Florida, as well as two extremophile species tolerant of hostile environments. The bacteria included common species such as Bacillus subtilis and Escherichia coli, but "our winner in this set of experiments," as Schuerger put it, was Serratia liquefaciens, a widespread generalist microbe.
Most of the selected microbial species shut down at temperatures of zero degrees Celsius (which falls in the upper range of Martian surface temperatures), even without being subjected to low pressure or anoxic conditions. But S. liquefaciens succeeded not only in the low temperatures but also under the simultaneous exposure to a carbon dioxide–dominated atmosphere and Mars-like pressures of only seven millibars. (Sea-level atmospheric pressure on Earth is roughly 1,000 millibars.) The researchers reported their findings in January in the journal Astrobiology.
Whereas S. liquefaciens actually grew under the trio of harsh conditions, the others did not perish—they simply lay dormant. "All of these bacteria were not killed by the conditions they were exposed to," Schuerger said. When returned to ambient laboratory conditions, the inactive bacterial species all resumed growth.
In a separate study, bacteria pre-adapted to survive in frigid conditions fared even better. In a study published in December in the Proceedings of the National Academy of Sciences, Schuerger, Nicholson and their colleagues reported that bacteria isolated from the Siberian permafrost thrived in Mars-like conditions. Those species, from the genus Carnobacterium, actually seemed to favor the low-pressure conditions. "When they grew at zero [degrees C] under CO2, seven millibar atmospheres, they seemed to grow better, at higher rates, than under CO2 at 1,000 millibars or under oxygen at 1,000 millibars," Schuerger said.
But bacteria need not hail from extreme habitats to flourish under Mars-like conditions. Schuerger shared preliminary, unpublished research during the conference that indicates that low-pressure, or hypobaric, environments actually stimulated the growth of microbes harvested from an unusual source: human saliva. In petri dishes incubated at low temperature under carbon dioxide atmospheres, the salivary flora failed to grow at Earth-like pressures. "Yet these hypobarophiles have popped out" under Mars-like pressures of seven millibars, he said. The specific organisms that thrived in hypobaric conditions have not yet been identified, Schuerger noted in an email, but "the human oral cavity is not a place that one would expect to find microbes that yield such a strange response."

Proving that some bacteria fare well under Mars-like pressures, temperatures and atmospheric compositions is nonetheless a long way from proving terrestrial life can flourish on Mars. Schuerger and his colleagues count 17 environmental factors on Mars that could be hostile to life, of which pressure, temperature and anoxia are only three. Two important threats to life that went unaddressed in the two bacterial studies were ultraviolet irradiation from sunlight, which on Earth is thankfully attenuated by ozone in our planet's atmosphere, and the extreme dryness of the Red Planet's surface. Schuerger noted that accurately simulating Martian desiccation would rapidly degrade the growth medium for the bacteria. "We had to reduce evaporation to carry out these experiments," he said.

Which brings us back to those hundreds of thousands of spores on the Curiosity rover and its flight hardware. Even in light of the new research, the rover's landing site appears extremely unlikely to suffer contamination by terrestrial biology. Direct and reflected sunlight likely sterilized the outside of the rover within the first day or two of the mission, Schuerger said. And any survivors are unlikely to find purchase at the Curiosity landing site, Gale Crater. "Even if the UV radiation doesn't sterilize or kill off microbes on the outside of the vehicle or on the wheels, even if the microbes are dispersed, the extreme desiccating conditions of Gale Crater argue strongly against" the proliferation of stowaways from Earth, he added.

John Matson is an associate editor at Scientific American focusing on space, physics and mathematics. Follow on Twitter @jmtsn.

http://www.bbc.co.uk/news/health-21372793

Skin 'may restore' diseased MS brain

It may be possible to use a patient's own skin to repair the damage caused by multiple sclerosis (MS), which is currently incurable, say researchers.

By James Gallagher Health and science reporter, BBC News

Nerves struggle to communicate in MS as their insulating covering is attacked by the immune system - causing fatigue and damaging movement. Animal tests, described in the journal Cell Stem Cell, have now used modified skin cells to repair the insulation. Experts said there was an "urgent need" for such therapies.

Just like electrical wires, nerves have insulation - but instead of plastic, the body uses a protein called myelin. However, diseases that result in damage to the myelin, including MS, leave the nerves exposed and electrical signals struggle to travel round the body.

Stem cells

A team of scientists at the University of Rochester Medical Center, in the US, used advances in stem-cell research to attempt to repair the myelin. They took a sample of human skin cells and converted it into stem cells, which are capable of becoming any other type of cell in the body. The next step was to transform the stem cells into immature versions of cells in the brain that produce myelin. When these cells had been injected into mice born without any myelin it had had a significant effect, said researchers.

Dr Steven Goldman told the BBC that "myelin was produced throughout the nervous system" and some mice had achieved "normal life spans". He said: "In MS the underlying nerves fibres are still there, the objective is to re-myelinate them." However, MS patients would still have the problem of their immune system attacking their myelin. Any treatment would need to be used alongside other therapies to tame the immune system - or would need to be repeatedly performed.

Dr Goldman said he could see "no reason to be pessimistic" although further safety tests would be needed and the technique still needed to be refined before being used in people. He expects to begin trials within a couple of years.

Dr Emma Gray, from the MS Society, said: "Myelin repair therapies are urgently needed in MS and we're pleased to see researchers have been able to generate myelin making cells from human stem cells.

"This is still very early stage research, but with more development could one day be used to repair damage to myelin in people with MS. We look forward to seeing more research in this promising area."

http://phys.org/news/2013-02-energy-australian-farms-cheaper-coal.html

Energy from new Australian wind farms cheaper than from new coal or gas plants, report shows

A new study has found that in Australia electricity from new wind farms will be cheaper than that from new coal or gas power plants, which overturns the common presumption that renewables are more expensive than coal or gas.

Phys.org - The analysis of Australia's energy options was carried out by a Sydney team belonging to the research company Bloomberg New Energy Finance (BNEF). The team modeled the prices of electricity from a variety of sources, and found electricity from a new wind farm could be supplied at $80 (AUD) per MWh, while electricity supplied by a new gas power plant would cost $116, and a new coal plant $143.

These prices included the Labor government's carbon tax, but wind was cheaper even without carbon pricing being factored in. The analysis also predicted that large solar photovoltaic installations will be cheaper than coal or gas by 2020, and solar thermal and biomass systems will be at least competitive by 2030.
The costs of renewables such as wind and solar are dropping but the costs of new coal and gas plants are rising, especially as the study found the four major banks in Australia were less likely to finance new fossil fuel power plants unless an expensive risk premium was included. The prices of coal and gas are also rising because of the carbon tax and export markets, especially for liquid natural gas, pushing local prices up.
The CEO of BNEF, Michael Liebreich, said their findings that electricity from new wind farms is cheaper than new fossil fuel plants even in a country like Australia with its vast reserves of coal and gas, and this result "promises to turn the economics of power systems on its head." It also makes it likely that Australia will move increasingly towards investing in renewables and away from fossil fuels in the coming decades, unless the prices of fossil fuels drop and remain low.
Kobad Bhavnagri of BNEF added that new coal-fired power plants are too expensive in Australia now and therefore no new ones are likely to be built, especially as the carbon price is expected to rise substantially, possibly tripling by 2030 from its current level of 23 AUD per tonne. By the time Australia needs to consider building new power plants (2020-30), renewables will be even more attractive, and new technologies may have been developed to deal with the intermittency problems of these renewable source of power.
At present, electricity from the existing coal and gas power plants is cheaper than from new renewable sources because the fossil fuel plants were built in the 1970s and 80s and their construction costs have been paid off.
Policies such as the Large-scale Renewable Energy Target will be needed to ensure Australia develops the infrastructure and skills needed to meet the target of 20 percent renewables by 2020, and to transition to renewable energy as the primary source of power. The current figure is 9.6 percent.

http://www.sciencedaily.com/releases/2013/02/130208105307.htm

Innovative Water Purification Tablet for Developing World

PureMadi, a nonprofit University of Virginia organization, has invented a simple ceramic water purification tablet.

Written by Fariss Samarrai.

Called MadiDrop, the tablet -- developed and extensively tested at U.Va. -- is impregnated with silver or copper nanoparticles. It can repeatedly disinfect water for up to six months simply by resting in a vessel where water is poured. It is being developed for use in communities in South Africa that have little or no access to clean water.
"Madi" is the Tshivenda South African word for water. PureMadi brings together U.Va. professors and students to improve water quality, human health, local enterprise and quality of life in the developing world. The organization includes students and faculty members from engineering, architecture, medicine, nursing, business, commerce, economics, anthropology and foreign affairs.
During the past year, PureMadi has established a water filter factory in Limpopo province, South Africa, employing local workers. The factory produced several hundred flowerpot-like water filters, according to James Smith, a U.Va. civil and environmental engineer who co-leads the project with Dr. Rebecca Dillingham, director of U.Va.'s Center for Global Health.
"Eventually that factory will be capable of producing about 500 to 1,000 filters per month, and our 10-year plan is to build 10 to 12 factories in South Africa and other countries," Smith said. "Each filter can serve a family of five or six for two to five years, so we plan to eventually serve at least 500,000 people per year with new filters."
The idea is to create sustainable businesses that serve their communities and employ local workers. A small percentage of the profits go back to PureMadi and will be used to help establish more factories.
The filters produced at the factory are made of a ceramic design refined and extensively tested at U.Va. The filters are made of local clay, sawdust and water. Those materials are mixed and pressed into a mold. The result is a flowerpot-shaped filter, which is then fired in a kiln. The firing burns off the sawdust, leaving a ceramic with very fine pores. The filter is then painted with a thin solution of silver or copper nanoparticles that serve as a highly effective disinfectant for waterborne pathogens, the type of which can cause severe diarrhea, vomiting and dehydration.
The design allows a user to pour water from an untreated source, such as a river or well, into the pot and allow it to filter through into a five-gallon bucket underneath. The pot has a flow rate of one to three liters per hour, enough for drinking and cooking. The filtered water is accessed through a spigot in the bucket.
U.Va. medical school studies are showing that use of the filters significantly improves health outcomes for users and are particularly beneficial to people with compromised immune systems, such as people living with AIDS. HIV prevalence is more than 17 percent among the general population in South Africa, and millions

suffer each year from waterborne diseases. Smith said testing has shown that 99.9 percent of the pathogens in water can be removed or killed by the filter.
MadiDrop is an alternative to the flowerpot filter, but ideally would be used in conjunction with it. The plan is to mass-produce the product at the same factories where the PureMadi filters are produced.
"MadiDrop is cheaper, easier to use, and is easier to transport than the PureMadi filter, but because it is placed into the water, rather than having the water filter through it, the MadiDrop is not effective for removing sediment in water that causes discoloration or flavor impairment," Smith said. "But its ease of use, cost-effectiveness and simple manufacturing process should allow us to make it readily available to a substantial population of users, more so than the more expensive PureMadi filter."
Testing shows that the filters are safe to use and release only trace amounts of silver or copper particles, well within the safe water standards of the developed world. The filters also would be useful in rural areas of developed countries such as the United States where people rely on untreated well water. *University of Virginia*

http://www.sciencedaily.com/releases/2013/02/130208105857.htm

Implants Make Light Work of Fixing Broken Bones

Artificial bone, created using stem cells and a new lightweight plastic, could soon be used to heal shattered limbs.

The use of bone stem cells combined with a degradable rigid material that inserts into broken bones and encourages real bone to re-grow has been developed at the Universities of Edinburgh and Southampton.
Researchers have developed the material with a honeycomb scaffold structure that allows blood to flow through it, enabling stem cells from the patient's bone marrow to attach to the material and grow new bone. Over time, the plastic slowly degrades as the implant is replaced by newly grown bone.
Scientists developed the material by blending three types of plastics. They used a pioneering technique to blend and test hundreds of combinations of plastics, to identify a blend that was robust, lightweight, and able to support bone stem cells. Successful results have been shown in the lab and in animal testing with the focus now moving towards human clinical evaluation. This new discovery is the result of a seven-year partnership between the University of Southampton and the University of Edinburgh.
Richard Oreffo, Professor of Musculoskeletal Science at the University of Southampton, comments: "Fractures and bone loss due to trauma or disease are a significant clinical and socioeconomic problem. This collaboration between chemistry and medicine has identified unique candidate materials that support human bone stem cell growth and allow bone formation. Our collaborative strategy offers significant therapeutic implications."
Professor Mark Bradley, of the University of Edinburgh's School of Chemistry, adds: "We were able to make and look at a hundreds of candidate materials and rapidly whittle these down to one which is strong enough to replace bone and is also a suitable surface upon which to grow new bone.
"We are confident that this material could soon be helping to improve the quality of life for patients with severe bone injuries, and will help maintain the health of an aging population."
The study, published in the journal Advanced Functional Materials, was funded by the Biotechnology and Biological Sciences Research Council.
Ferdous Khan, James O. Smith, Janos M. Kanczler, Rahul. S. Tare, Richard O.C. Oreffo, Mark Bradley. Discovery and Evaluation of a Functional Ternary Polymer Blend for Bone Repair: Translation from a Microarray to a Clinical Model. Advanced Functional Materials, 2013; DOI: 10.1002/adfm.201202710

http://arstechnica.com/security/2013/02/ibms-supercomputer-jeopardy-was-too-easy-time-to-cure-cancer/

IBM's supercomputer: Jeopardy was too easy, time to cure cancer

Watson brought down our best humans in Jeopardy; now the real work begins.

by Casey Johnston - Feb 9 2013, 1:00pm TST

IBM's Watson, the supercomputer that gave our best two Jeopardy-playing humans what-for in three nights of play two years ago, is now showing mortals how to do better at another classic human struggle: curing cancer. Watson has spent the last year parsing data on cancer treatments from the Sloan-Kettering Memorial Center, and is now being offered as a cloud-based application for determining the best course of action for cancer patients.
While Watson's turn at Jeopardy was entertaining and a true battle of man versus machine, the computer's higher purpose was always in medicine. During a panel discussion of Watson held as the computer did battle with Jeopardy champions Ken Jennings and Brad Rutter, Dr. Chris Welty, a member of Watson's algorithms team, noted that the computer had a future in helping diagnose medical conditions (as well as in tech support).
According to the Associated Press, Watson has improved its performance by 240 percent since its Jeopardy stint. In March 2012, scientists at Sloan-Kettering set Watson about the task of internalizing 600,000 pieces of

medical evidence, 1.5 million patient records, 2 million pages of texts from medical journals, and 1,500 lung-cancer cases.
Synthesized together, Watson can see connections and trends that humans, or even humans and databases, may not be able to. Now that the data has been compiled, Watson is being offered as an app that can be accessed through a tablet or computer that will compare a cancer patient's medical records with Watson's index. The results Watson returns are recommendations on treatment, in descending order of confidence on effectiveness.
The algorithm can actually be run in two ways. Operating strictly on cancer, Watson stacks treatments in the order of likelihood that they'll succeed. But the results can also be augmented by insurance coverage, in which case Watson considers which treatments will be authorized for payment.
The application is owned by WellPoint, and is set to be adopted by medical groups at the Maine center for Cancer Medicine and WestMed in Westchester County, New York, according to the AP. WellPoint will sell the applications to other institutions at a price yet to be determined, and IBM will receive a cut.

http://www.eurekalert.org/pub_releases/2013-02/uom-odm020613.php

Old drug may point the way to new treatments for diabetes and obesity

Researchers at the University of Michigan's Life Sciences Institute have found that amlexanox, an off-patent drug currently prescribed for the treatment of asthma and other uses, also reverses obesity, diabetes and fatty liver in mice.

ANN ARBOR - The findings from the lab of Alan Saltiel, the Mary Sue Coleman director of the Life Sciences Institute, are scheduled to be published online Feb. 10 in the journal Nature Medicine.
"One of the reasons that diets are so ineffective in producing weight loss for some people is that their bodies adjust to the reduced calories by also reducing their metabolism, so that they are 'defending' their body weight," Saltiel said. "Amlexanox seems to tweak the metabolic response to excessive calorie storage in mice."
Different formulations of amlexanox are currently prescribed to treat asthma in Japan and canker sores in the United States. Saltiel is teaming up with clinical-trial specialists at U-M to test whether amlexanox will be useful for treating obesity and diabetes in humans. He is also working with medicinal chemists at U-M to develop a new compound ¬¬based on the drug that optimizes its formula.
The study appears to confirm and extend the notion that the genes IKKE and TBK1 play a crucial role for maintaining metabolic balance, a discovery published by the Saltiel lab in 2009 in the journal Cell.
"Amlexanox appears to work in mice by inhibiting two genes—IKKE and TBK1—that we think together act as a sort of brake on metabolism," Saltiel said. "By releasing the brake, amlexanox seems to free the metabolic system to burn more, and possibly store less, energy."
Using high-throughput chemical screening at LSI's Center for Chemical Genomics to search for compounds that inhibit IKKE and TBK1, the researchers hit upon an approved off-patent drug: amlexanox. They then demonstrated that amlexanox had profound beneficial effects in both genetic and dietary-induced obese mice. The chemical lowered the weight of obese mice and reversed related metabolic problems such as diabetes and fatty liver.
"These studies tell us that, at least in mice, the IKKE/TBK1 pathway plays an important role in defending body weight by increasing storage and decreasing burning of calories, and that by inhibiting that pathway with a compound, we can increase metabolism and induce weight loss, reverse diabetes and reduce fatty liver," Saltiel said.
The drug has been on the market in Japan for more than 25 years.
However, the researchers don't yet know if humans respond with the same pathway, or if the discovery of amlexanox's effectiveness in mice can lead to a compound that is safe and effective for treating obesity and diabetes in humans.
"We will be working hard on that," Saltiel said.

Saltiel's search for a drug targeting the IKKE/TBK1 pathway was supported by the Life Science Institute's Innovation Partnership, which provides philanthropic funding and business mentorship to help move promising research toward commercialization.
The research was also supported by the National Institutes of Health, the Michigan Diabetes Research and Training Center, the Michigan Institute for Clinical and Health Research, and the Nathan Shock Center in the Basic Biology of Aging. Additional authors were Shannon M. Reilly, Shian-Huey Chiang, Stuart J. Decker, Louise Chang, Martha J. Larsen, John R. Rubin, Nicole M. White and Irit Hochberg from the Life Sciences Institute; Maeran Uhm and Jonathan Mowers from the Life Sciences Institute and Departments of Internal Medicine and Molecular and Integrative Physiology at the University of Michigan; Michael Downes, Ruth Yu and Ronald M. Evans from the Salk Institute for Biological Sciences; Christopher Liddle from the Storr Liver Unit, Westmead Millennium Institute and University of Sydney, Australia; and Dayoung Oh, Pingping Li, and Jerrold M. Olefsky from the Department of Medicine, University of California, San Diego.

http://bit.ly/WTbaV5

Liver cancer survival time tripled by virus

The virus used in the vaccine that helped eradicate smallpox is now working its magic on liver cancer.

18:00 10 February 2013 by Andy Coghlan

A genetically engineered version of the vaccinia virus has trebled the average survival time of people with a severe form of liver cancer, with only mild, flu-like side effects.

Thirty people with hepatocellular carcinoma received three doses of the modified virus – code-named JX-594 – directly into their liver tumour over one month. Half the volunteers received a low dose of the virus, the other half a high dose. Members of the low and high-dose groups subsequently survived for, on average, 6.7 and 14.1 months respectively. By contrast, trials several years ago showed that sorafenib, the best existing medication for this cancer, prolonged life by only three months.

Two of the patients on the highest viral dose were still alive more than two years after the treatment. "It's a very substantial survival benefit," says Laurent Fischer, president of Jennerex, the company in San Francisco developing the treatment under the trade name Pexa-Vec.

Besides shrinking the primary tumour, the virus was able to spread to and shrink any secondary tumours outside the liver. "Some tumours disappeared completely, and most showed partial destruction on MRI scans," says David Kirn, head of the study at Jennerex. Moreover, the destruction was equally dramatic in the primary and secondary tumours.

"This clinical trial is an exciting step forward to help find a new way of treating cancers," says Alan Melcher of the University of Leeds, UK, who was not involved in the study. "It helps demonstrate the cancer-fighting potential of viruses, which have relatively few side effects compared with traditional chemo or radiotherapy," he says. "If it proves effective in larger trials, it could be available to patients within five years."

The fact that the virus appears able to spread to secondary tumours suggests that simply injecting the virus into the bloodstream may be effective. A trial to compare this treatment with injecting the virus directly into a tumour is under way.

Targeted at cancer

The virus has had a gene coding for an enzyme called thymidine kinase snipped out. The enzyme enables the virus to recognise and infect dividing cells. By removing the gene, the virus's developers have reduced the likelihood of healthy dividing cells being infected.

Instead, the virus exclusively attacks cancerous tissue, by targeting two genes that have increased activity in tumour cells. One genes is associated with an epidermal growth factor receptor, which stimulates the cancer to grow. The other is associated with a vascular endothelial growth factor, which enables the cancer to recruit its own blood supply. The virus reduces the activity of both genes, causing the infected cancer cell to wither and die.

What's more, the virus carries extra genes to prod the body's own immune system into action against the cancer. One produces granulocyte colony stimulating factor, a protein that encourages production of extra white blood cells at sites of infection. The other produces a protein not naturally found in humans, called Lac-Z, that earmarks infected cells for destruction.

Fischer says that to date, more than 200 people have received the virus, which has also shown promise against other types of cancer, including those of the kidney and skin. But he warns that not everyone sees a benefit. "We know why patients respond, but not why they don't," he says.

Journal reference: Nature Medicine, DOI: 10.1038/nm.3089