http://www.stonepages.com/news/archives/004324.html

Evidence of ancient brain surgery in Tibetan encyclopedia

Brain surgery was practiced by doctors at least 2,900 years ago, a specialist on Tibetan culture and literature said after four decades of research on the Tibetan Tripitaka, an ancient encyclopedia.

"The 2,900-year-old Tibetan Tripitaka states clearly why and how brain surgery was carried out," said Karma Trinley, an associate professor from the Tibetan language and literature department of Tibet University in Lhasa, capital of southwest China's Tibet Autonomous Region.

Tripitaka describes in detail how a young Indian doctor watched brain surgery being performed by a veteran surgeon. The book said that the patient was suffering from a severe headache and repeatedly knocked his head on hard objects to ease the pain. When the young doctor, whose name was similar in pronunciation to the Tibetan name Tsogyel, saw the surgeon trying to operate on the patient's brain with a pair of tweezers, he shouted that the tweezers had to be heated first. Trinley said Tsogyel's advice on sterilization helped raise the success rate of surgery at the time. Tsogyel later became a skilled surgeon himself.

The Tripitaka is the earliest collection of Buddhist writings. The information contained in the writings was originally passed down orally, and was finally written down in the third century BCE. Trinley said that many of the medical theories in the book are still used by Tibetan doctors today.

Evidence of ancient brain surgery in the area was first found in 1998, when archeologists unearthed human skulls with mended cracks on the Qinghai-Tibet Plateau. These cracks indicated that craniotomies were probably performed by the Chinese over 5,000 years ago.

Before the Tibetan Tripitaka's description of brain surgery was discovered, researchers used to disagree on the purpose of ancient craniotomies, said Karma Trinley. "Some believed it was a religious ritual to dispell evils or bring happiness, while others held that it was a therapy used by witches and wizards," he said.

Edited from Xinhuanet (20 April 2011)

http://www.eurekalert.org/pub_releases/2011-04/osoa-bbr042511.php

Beetle bling: Researchers discover optical secrets of 'metallic' beetles

Article published in new Optical Materials Express journal unveils secrets of how biology recreates look and luster of gold and silver

WASHINGTON - Costa Rica was once regarded as the poorest of all the colonies of the Spanish Empire, sadly deficient in the silver and gold so coveted by conquistadors. As it turns out, all of the glittering gold and silver those explorers could have ever wanted was there all along, in the country's tropical rainforests - but in the form of two gloriously lustrous species of beetle.

Today, the brilliant gold- (Chrysina aurigans) and silver-colored (Chrysina limbata) beetles have given optics researchers new insights into the way biology can recreate the appearance of some of nature's most precious metals, which in turn may allow researchers to produce new materials based on the natural properties found in the beetles' coloring.

The Chrysina aurigans (left) and the Chrysina limbata (right) beetle specimens displaying their brilliant golden and silver appearance, respectively. **Eduardo M. Libby.**

A team of researchers at the University of Costa Rica has found that the beetles' metallic appearance is created by the unique structural arrangements of many dozens of layers of exo-skeletal chitin in the elytron, a hardened forewing that protects the delicate hindwings that are folded underneath. A paper about the discovery appears in the first issue of the Optical Society's (OSA) newest open access journal, Optical Materials Express, which launched this month.

The beetles were captured in the University of Costa Rica's Alberto Brenes Mesén Biological Reserve, a tropical rainforest environment. "The metallic appearance of these beetles may allow them to be unnoticed, something that helps them against potential predators," says physicist and study leader William E. Vargas. The surface of their elytra "reflects light in a way that they look as bright spots seen from any direction," he explains. "In a tropical rainforest, there are many drops of water suspended from the leaves of trees at ground level, along with wet leaves, and these drops and wet leaves redirect light by refraction and reflection respectively, in different directions. Thus, metallic beetles manage to blend with the environment."

To interpret the cause of this metallic look, Vargas and his team assumed that a sequence of layers of chitin appears through the cuticle, with successive layers having slightly different refractive indices. In these beetles,

the cuticle, which is just 10 millionths of a meter deep, has some 70 separate layers of chitin - a nitrogen-containing complex sugar that creates the hard outer skeletons of insects, crabs, shrimps, and lobsters. The chitin layers become progressively thinner with depth, forming a so-called "chirped" structure.

"Because the layers have different refractive indices," Vargas says, "light propagates through them at different speeds. The light is refracted through - and reflected by - each interface giving, in particular, phase differences in the emerging reflected rays. For several wavelengths in the visible range, there are many reflected rays whose phase differences allow for constructive interference. This leads to the metallic appearance of the beetles."

This is similar to the way in which a prism breaks white light into the colors of the rainbow by refraction, but in the case of these beetles, different wavelengths, or colors of light are reflected back more strongly by different layers of chitin. This creates the initial palette of colors that enable the beetles to produce their distinctive hues. The mystery the researchers still needed to understand in more detail, however, was how the beetles could so perfectly create the structure causing the brilliant metallic tones of silver and gold.

Using a device they specially designed to measure the reflection of light when it strikes the curved surface of the beetles' elytra, Vargas and his colleagues found that as light strikes the interface between each successive layer (the first interface being the boundary between the outside air and the top chitin layer), some of its energy is reflected and some is transmitted down to the next interface.

"This happens through the complete sequence of interfaces," Vargas says.

Because a portion of the light is reflected, it combines with light of the exact same wavelength as it passes back through layer upon layer of chitin, becoming brighter and more intense. Ocean waves can exhibit the same behavior, combining to produce rare but powerful rogue waves. In the case of the beetles, this "perfect storm" of light amplification produces not only the same colors but also the striking sheen and glimmer that we normally associate with fine jewelry.

In the two beetle species, interference patterns are produced by slightly different wavelengths of light, thus producing either silver or gold colors. "For the golden-like beetle, the constructive interference is found for wavelengths larger than 515 nm, the red part of the visible wavelength range," Vargas says, "while for the silver-like beetle it happens for wavelengths larger than 400 nm - that is, for the entire visible wavelength range."

"The detailed understanding of the mechanism used by the beetles to produce this metallic appearance opens the possibility to replicate the structure used to achieve it," Vargas says, "and thus produce materials that, for example, might look like gold or silver but are actually synthesized from organic media."

This potentially could lead to new products or consumer electronics that can perfectly mimic the appearance of precious metals. Other products could be developed for architectural applications that require coatings with a metallic appearance. Vargas notes that in the solar industry, for example, chirped multilayer reflectors could be used as back layers supporting the active or light-absorbing medium, to improve the absorption of the back-reflected light.

The article, "Visible light reflection spectra from cuticle layered materials," by Cristian Campos-Fernández, Daniel E. Azofeifa, Marcela Hernández-Jiménez, Adams Ruiz-Ruiz and William E. Vargas appears in the journal Optical Materials Express. It can be accessed at: http://www.opticsinfobase.org/ome/abstract.cfm?URI=ome-1-1-85.

http://www.eurekalert.org/pub_releases/2011-04/fhcr-hpo042511.php

High percentage of omega-3s in the blood may boost risk of aggressive prostate cancer

Conversely, high percentage of trans-fatty acids linked with lower risk

SEATTLE – The largest study ever to examine the association of dietary fats and prostate cancer risk has found what's good for the heart may not be good for the prostate.

Analyzing data from a nationwide study involving more than 3,400 men, researchers at Fred Hutchinson Cancer Research Center found that men with the highest blood percentages of docosahexaenoic acid, or DHA, an inflammation-lowering omega-3 fatty acid commonly found in fatty fish, have two-and-a-half-times the risk of developing aggressive, high-grade prostate cancer compared to men with the lowest DHA levels.

Conversely, the study also found that men with the highest blood ratios of trans-fatty acids – which are linked to inflammation and heart disease and abundant in processed foods that contain partially hydrogenated vegetable oils – had a 50 percent reduction in the risk of high-grade prostate cancer. In addition, neither of these fats was associated with the risk of low-grade prostate cancer risk. The researchers also found that omega-6 fatty acids, which are found in most vegetable oils and are linked to inflammation and heart disease, were not associated with prostate cancer risk. They also found that none of the fats were associated with the risk of low-grade prostate cancer.

These findings by Theodore M. Brasky, Ph.D., and colleagues in the Hutchinson Center's Public Health Sciences Division were published online April 25 in the American Journal of Epidemiology.

"We were stunned to see these results and we spent a lot of time making sure the analyses were correct," said Brasky, a postdoctoral research fellow in the Hutchinson Center's Cancer Prevention Program. "Our findings turn what we know – or rather what we think we know – about diet, inflammation and the development of prostate cancer on its head and shine a light on the complexity of studying the association between nutrition and the risk of various chronic diseases."

The researchers undertook the study because chronic inflammation is known to increase the risk of several cancers, and the omega-3 fatty acids found primarily in fish and fish oil supplements have anti-inflammatory effects. In contrast, other fats, such as the omega-6 fats in vegetable oil and trans-fats found in fast foods, may promote inflammation. "We wanted to test the hypothesis that the concentrations of these fats in blood would be associated with prostate cancer risk," Brasky said. "Specifically, we thought that omega-3 fatty acids would reduce and omega-6 and trans-fatty acids would increase prostate cancer risk."

The mechanisms behind the impact of omega-3s on risk of high-grade prostate cancer are unknown. "Besides inflammation, omega-3 fats affect other biologic processes. It may be that these mechanisms play a greater role in the development of certain prostate cancers," Brasky said. "This is certainly an area that needs more research." Currently there is no official recommended daily allowance for omega-3 fats for adults or children, although many nutrition experts and physicians recommend 450 milligrams of omega-3 DHA per day as part of a healthy diet.

The study was based on data from the Prostate Cancer Prevention Trial, a nationwide randomized clinical trial that tested the efficacy of the drug finasteride to prevent prostate cancer. While the trial involved nearly 19,000 men age 55 and older, the data in this analysis came from a subset of more than 3,000 of the study participants, half of whom developed prostate cancer during the course of the study and half of whom did not. The clinical trial was unique in that prostate biopsy was used to confirm the presence or absence of prostate cancer in all study participants.

Among the study participants, very few took fish oil supplements – the most common non-food source of omega-3 fatty acids, which are known to prevent heart disease and other inflammatory conditions. The majority got omega 3s from eating fish.

So based on these findings, should men concerned about heart disease eschew fish oil supplements or grilled salmon in the interest of reducing their risk of aggressive prostate cancer? Brasky and colleagues don't think so.

"Overall, the beneficial effects of eating fish to prevent heart disease outweigh any harm related to prostate cancer risk," Brasky said. "What this study shows is the complexity of nutrition and its impact on disease risk, and that we should study such associations rigorously rather than make assumptions," Brasky said.

The National Cancer Institute funded this study, which also involved researchers from the University of Texas Health Science Center at San Antonio and the NCI.

http://www.nytimes.com/2011/04/26/health/research/26prognosis.html

Prognosis: Testosterone and Prostate Cancer

By NICHOLAS BAKALAR

Doctors have long held that men with prostate cancer should not be given testosterone because the hormone might fuel tumor growth.

But a small study adds to evidence that the fear may be overblown, at least in patients without evidence of recurrent or metastatic disease.

Researchers studied 13 men with scores of 6 or 7 on the 10-point Gleason scale, indicating mildly to moderately aggressive prostate cancer. They all initially chose watchful waiting rather than treatment for their cancers. All the men had low testosterone. The men received testosterone therapy for an average of two and a half years, and had periodic prostate biopsies. None of their cancers progressed or spread to other organs. One subject whose score had increased to 7 from 6 had his prostate removed, but the final pathological exam found no aggressive disease.

The authors acknowledge that the study, published in the April issue The Journal of Urology, was small and retrospective. Still, it is the first to use biopsies to monitor the effects of testosterone in men with untreated, localized prostate cancer. The lead author, Dr. Abraham Morgentaler, an associate clinical professor of surgery at Harvard, said that the findings of this and other recent studies suggest that the risks of testosterone therapy may have been exaggerated.

http://www.physorg.com/news/2011-04-phd.html

A time for a change in the PhD system

April 25, 2011 by Deborah Braconnier

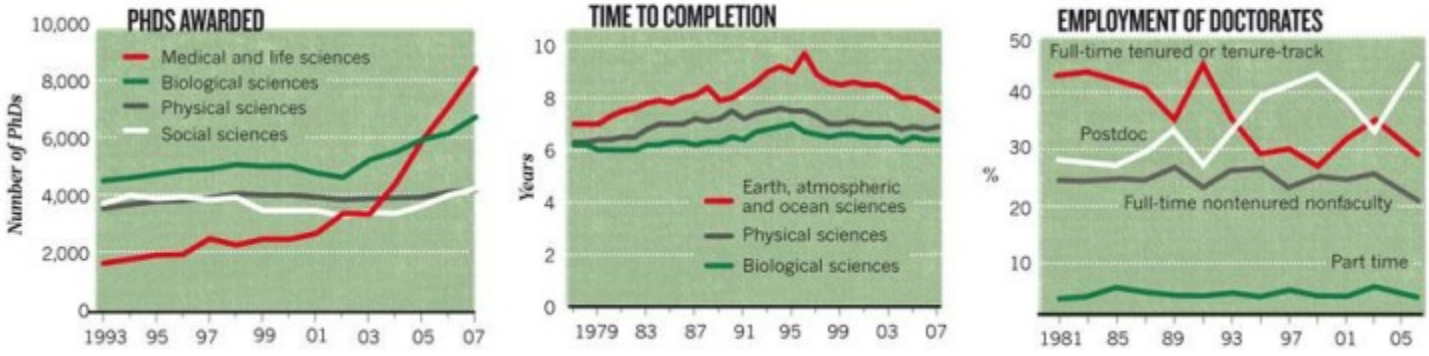
(PhysOrg.com) -- According to a series of articles published in Nature, the world has too many PhDs and not enough academic jobs to sustain them. Researchers point out that it is either time to make changes in the system or eliminate it altogether.

While acquiring a PhD requires many years of study and tens of thousands of dollars, many are finding the opportunities of academia work or any type of employment in their field to be few and far between. Back in the 1980s, predictions of professor retirements and higher college enrollment led to a surge of new PhD students. However, this never happened and the need for more tenured professors was not able to keep up with the supply of PhD graduates, leaving many looking for employment in industrial, government, or not-for-profit sectors.

The United States and Japan are currently the worst for post-PhD employment. Of those receiving PhDs in biological sciences within the last five to six years, 13 percent have secured tenure-track positions, 10 percent are working part-time or unemployed, 33 percent are in other academic positions, 22 percent are working in industry and the remaining are working at community colleges, government or non-profit positions. However, on the flipside, those obtaining PhDs in China are able to find jobs easily as their economy is booming and they have found the ability to provide jobs for those with PhDs.

United States: What shall we do about all the PhDs?

The annual number of science and engineering doctorates graduating from US universities rose to almost 41,000 in 2007 (left), with the biggest growth in medical and life sciences. It took a median of 7.2 years to complete a science or engineering PhD (middle) — yet the proportion finding full time academic jobs within 1–3 years of graduating is dwindling (right).



According to Mark Taylor, the system for PhDs needs to be reformed or shut down. Universities are promoting their PhD programs in order to have the graduate students in the laboratories and as teaching assistants. This works as a benefit to the universities, but in the end provides no benefit to the graduate. The PhD programs have become too specialized in subfields and many find they are unable to talk to colleagues in the same general department because their knowledge is too specialized.

Taylor believes that in order for doctorial programs to keep up with the 21st century, they need to eliminate these specializations and move towards more cross-disciplinary knowledge. Curriculum should focus more on applying knowledge to practical problems providing real world solutions. Areas where programs are inadequate or redundant need to be eliminated. PhD students also need to be educated on the true job prospects acquiring a PhD will give them.

Education: The PhD factory, Published online 20 April 2011 Nature 472, 276-279 (2011) doi:10.1038/472276a
Reform the PhD system or close it down, Published online 20 April 2011 Nature 472, 261 (2011) doi:10.1038/472261a

http://news.discovery.com/space/life-poison-earth-organics-110425.html

Poison Key to Early Life

How did Earth manage to hold onto its organics after being slammed by a Mars-sized object 4.4 billion years ago?

By Irene Klotz | Mon Apr 25, 2011 01:07 PM ET

How baby Earth managed to keep hold of its organic matter after the clubbing it took by a Mars-sized object roughly 4.4 billion years ago has long puzzled scientists. The throttling was so severe scientists believe Earth melted. Splatters that ended up in space eventually came together to form the moon. Lightweight materials, like water and carbon, would have vaporized. How then did the building blocks for life manage to survive?

Scientists think they have found the answer: The organics were locked in stable chains formed from formaldehyde, an ironic finding considering that formaldehyde ended up being poisonous to the very life it may have made possible.

"Formaldehyde is very interesting, very reactive. It can even react with itself and form complex polymers," George Cody, a senior scientist at the Carnegie Institution of Washington, told Discovery News.

Formaldehyde also is plentiful in molecular clouds in space, meaning ample quantities would have been around for incorporation into the solar system's population. Two chains of evidence support this theory. First, organic solids have been found in meteorites and in comets. A sample from NASA's Stardust comet mission gave Cody and colleagues a sign they were on the right path.

"It was about the most chemically complex material I had ever seen in my life," Cody said.

Scientists then turned to lab work to reproduce the type of organic matter found in carbonaceous chondrites, a type of organic-rich meteorite, from formaldehyde. They found their formaldehyde-synthesized material was similar to what has been found in carbonaceous chondrites and from Comet Wild 2, which was sampled by NASA's Stardust probe.

The experiments also showed the organics would survive temperatures of up to 1,400 Centigrade (2,552 degrees Fahrenheit). "The formaldehyde forms these little tiny organic balls," Cody said. Other molecules found in space, such as hydrogen cyanide, also could polymerize with itself, but they fall apart in hot water, Cody added. "Formaldehyde is almost unique in its tendency to hang out -- and hang on -- as the solar system got hotter and dryer," said Cody.

Also buttressing the team's findings is a related study showing that comets may be much more watery than previously thought. "If liquid water environments were common, than there are a lot more places to produce pre-biotic material," Dante Lauretta, associate professor at the University of Arizona's Lunar and Planetary Laboratory, told Discovery News.

"Now that we know what we're working with, we want to understand the chemistry better," added Cody.

Cody's research was reported in the Proceedings of the National Academy of Sciences earlier this month. Lauretta's team, which also studied Stardust samples, is publishing in the online edition of the journal Geochimica et Cosmochimica Acta.

http://news.nationalgeographic.com/news/2011/04/110425-gravity-extreme-bacteria-e-coli-alien-life-space-science/

Bacteria Grow Under 400,000 Times Earth's Gravity

Finding increases places alien life may exist, authors say.

Ker Than for National Geographic News

Proving that you don't have to be big to be tough, some microbes can survive gravity more than 400,000 times that felt on Earth, a new study says. Most humans, by contrast, can tolerate forces equal to about three to five times Earth's surface gravity (g) before losing consciousness.

The extreme "hypergravity" of 400,000 g is usually found only in cosmic environments, such as on very massive stars or in the shock waves of supernovas, said study leader Shigeru Deguchi, a biologist at the Japan Agency for Marine-Earth Science and Technology. Deguchi and his team were able to replicate hypergravity on Earth using a machine called an ultracentrifuge.

The scientists rapidly spun four species of bacteria - including the common human gut microbe Escherichia coli - to create increasingly intense gravity conditions. The bacteria clumped together into pellets as the gravity increased, but their forced closeness didn't seem to deter growth: All four species multiplied normally under thousands to tens of thousands of times Earth's gravity. Two of the species - E. coli and Paracoccus denitrificans, a common soil bacteria - grew under the strain of 403,627 g.

For Extreme Gravity Tolerance, Size Matters

Part of the microbes' ability to withstand hypergravity has to do with their sizes, Deguchi explained.

The larger an organism, the more sensitive it is to gravitational forces. The bodies of multicellular organisms - such as humans - start to collapse and turn to mush under the force of just a few g.

Bacteria are also more biologically suited to extreme gravity conditions, Deguchi said.

Unlike the eukaryotic cells that make up our bodies, bacterial cells don't have specialized structures called organelles. Examples of organelles include cell nuclei, which house the bulk of DNA in humans and other animals, and mitochondria, the energy-production factories of eurkaryotic cells.

When organelles are subjected to hypergravity, they tend to compact, or "sediment," Deguchi said. With their key components tightly jumbled up, the cells basically shut down. "In contrast, prokaryotic cells [like the ones in the study] do not have organelles and are less sensitive to the sedimentation effect," he said in an email.

Still, the study results suggests some bacterial species withstand hypergravity better than others, and the reasons for this are unclear. "Further studies are needed to say if certain groups of microbes are more resistant to hypergravity than others," Deguchi said.

Even More Alien Microbes Out There?

The new findings are consistent with an idea called panspermia, which says that life on Earth may be descended from alien microbes that hitched rides to our planet aboard ancient asteroids and comets.

Scientists calculate that pieces of space rock ejected during those early impacts would have been accelerated up to 300,000 g - conditions that it now appears some hitchhiking microbes might have been able to survive.

Still, Deguchi said, "there is no definitive evidence whatever that life exists beyond Earth," and so there's no hard proof for the panspermia theory.

Luckily, the new study also expands the range of places we can look today for alien life - at least in bacterial form, Deguchi added. For example, scientists estimate that the gravity on brown dwarfs - cosmic bodies with masses between those of Jupiter-like planets and small stars - is about ten to a hundred g. "If life does exist outside the solar system, then it can live and exploit more places than we previously thought," Deguchi said. The hypergravity study is detailed in this week's issue of the Proceedings of the National Academy of Sciences.

http://medicalxpress.com/news/2011-04-topical-treatment-melanoma.html

Topical treatment may prevent melanoma

While incidents of melanoma continue to increase despite the use of sunscreen and skin screenings, a topical compound called ISC-4 may prevent melanoma lesion formation, according to Penn State College of Medicine researchers.

"The steady increase in melanoma incidence suggests that additional preventive approaches are needed to complement these existing strategies," said Gavin Robertson, Ph.D., professor of pharmacology, pathology, dermatology and surgery, and director of Penn State Hershey Melanoma Center.

Researchers targeted the protein Akt3, which plays a central role in 70 percent of melanoma by preventing cell death and has the potential to prevent early stages of melanoma. "The Akt3 signaling pathway is deregulated in the majority of melanomas, making it a promising target which, if inhibited, could correct the apoptotic -- or cell death -- defect in melanocytic lesions, thereby preventing this disease," Robertson said.

Isothiocyantes were identified as inhibitors of Akt3. These are naturally occurring compounds found in cruciferous vegetables like broccoli and brussels sprouts that have anticancer properties. Unfortunately, previous research showed they have low chemotherapy potency on melanoma cells because high concentrations are needed to be effective. To create a more potent version, Penn State Hershey Melanoma Center researchers previously developed isoselenocyanates (ISC-4), by replacing sulfur with selenium.

Researchers have now found that repeated topical application of ISC-4 can reduce tumor cell expansion in laboratory-generated human skin by 80 to 90 percent and decrease tumor development in mice skin by about 80 percent. The research also showed that the use of the compound is safe. The research was recently reported in Cancer Prevention Research and featured on the journal cover.

To be an effective preventative agent, a substance needs to kill the melanoma cells while having little effect on normal cells. Researchers learned that ISC-4 kills melanoma cells two to five times more effectively than it kills normal cells. In addition, examination of the treated skin showed no obvious damage to skin cells or skin structure, and treated animals did not show signs of major organ-related toxicity. This indicates a potential for use as a topical application.

"ISC-4 prevented melanoma by decreasing Akt3 signaling that led to a three-fold increase in apoptosis rates," Robertson said. "Thus, topical ISC-4 can delay or slow down melanocytic lesion or melanoma development in preclinical models and could impact melanoma incidence rates, if similar results are observed in humans."

Currently, surgical excision is used to remove melanocytic lesions or prevent development into more aggressive cancer. Topical ISC-4 treatment could potentially be an alternative to surgery for some patients.

"Topical or localized treatments, such as those we propose for ISC-4, could permit the use of high local concentrations with minimal toxicity and be useful for treating cutaneous lesions not amenable to surgical removal or other currently available approaches," Robertson said.

"With more than $1 billion spent on sunscreen every year in the United States, the market for skin cancer prevention is enormous and continues to grow," Robertson said. "Addition of agents such as ISC-4 to sunscreens, body lotions or creams could have a profound impact on this market for preventing melanoma."

Provided by Pennsylvania State University

http://www.eurekalert.org/pub_releases/2011-04/uoc-ccs042611.php

Cold case: Siberian hot springs reveal ancient ecology

Geochemist follows trail from Kamchatka microbes into history of Earth's atmosphere

Exotic bacteria that do not rely on oxygen may have played an important role in determining the composition of Earth's early atmosphere, according to a theory that UChicago researcher Albert Colman is testing in the scalding hot springs of a volcanic crater in Siberia.

He has found that bacteria at the site produce as well as consume carbon monoxide, a surprising twist that scientists must take into account as they attempt to reconstruct the evolution of Earth's early atmosphere.

Colman, an assistant professor in geophysical sciences, joined an American-Russian team in 2005 working in the Uzon Caldera of eastern Siberia's Kamchatka Peninsula to study the microbiology and geochemistry of the region's hot springs. Colman and his colleagues focused on anaerobic carboxydotrophs — microbes with a physiology as exotic as their name. They use carbon monoxide mostly for energy, but also as a source of carbon for the production of new cellular material.

This carbon monoxide-based physiology results in the microbial production of hydrogen, a component of certain alternative fuels. The research team thus also sought to probe biotechnological applications for cleaning carbon monoxide from certain industrial waste gases and for biohydrogen production.

"We targeted geothermal fields," Colman says, "believing that such environments would prove to be prime habitat for carboxydotrophs due to the venting of chemically reduced, or in other words, oxygen-free and methane-, hydrogen-, and carbon dioxide-rich volcanic gases in the springs."

The team did discover a wide range of carboxydotrophs. Paradoxically, Colman found that much of the carbon monoxide at the Kamchatka site was not bubbling up with the volcanic gases; instead "it was being produced by the microbial community in these springs," he says. His team began considering the implications of a strong microbial source of carbon monoxide, both in the local springs but also for the early Earth.

The Great Oxidation Event

Earth's early atmosphere contained hardly any oxygen but relatively large amounts of carbon dioxide and possibly methane, experts believe. Then during the so-called Great Oxidation Event about 2.3 to 2.5 billion years ago, oxygen levels in the atmosphere rose from vanishingly small amounts to modestly low concentrations. This important transition enabled a widespread diversification and proliferation of metabolic strategies and paved the way for a much later climb in oxygen to levels that were high enough to support animal life," Colman says.

The processing of carbon monoxide by the microbial community could have influenced atmospheric chemistry and climate during the Archean, an interval of Earth's history that preceded the Great Oxidation Event.

Previous computer simulations rely on a primitive biosphere as the sole means of removing near-surface carbon monoxide produced when the sun's ultraviolet rays split carbon dioxide molecules. This theoretical sink in the biosphere would have prevented substantial accumulation of atmospheric carbon monoxide. “But our work is showing that you can't consider microbial communities as a one-way sink for carbon monoxide," Colman says. The communities both produce and consume carbon monoxide. "It's a dynamic cycle."

Colman's calculations suggest that carbon monoxide may have nearly reached percentage concentrations of 1 percent in the atmosphere, tens of thousands of times higher than current concentrations. This in turn would have exerted influence on concentration of atmospheric methane, a powerful greenhouse gas, with consequences for global temperatures.

Toxic concentrations

Furthermore, such high carbon monoxide concentrations would have been toxic for many microorganisms, placing evolutionary pressure on the early biosphere. "A much larger fraction of the microbial community would've been exposed to higher carbon monoxide concentrations and would've had to develop strategies for coping with the high concentrations because of their toxicity," Colman says. Colman and UChicago graduate student Bo He have conducted fieldwork in both Uzon and California's Lassen Volcanic National Park. Colman has most recently journeyed to Kamchatka for additional fieldwork in 2007 and 2010.

"This fantastic field site has a wide variety of hot springs," he says. "Different colors, temperatures, chemistries, different types of micro-organisms living in them. It's a lot like Yellowstone in certain respects." Lassen's springs have a narrower range of acidic chemistries, yet microbial production of carbon monoxide appears to be widespread in both settings.

Collaborator Frank Robb of the University of Maryland, Baltimore, lauds Colman for his "boundless enthusiasm" and for his "meticulous preparation," much-needed qualities to ensure the safe transport of delicate instruments into the field.

Some of the microbial life within the caldera's complex hydrothermal system may survive in even more extreme settings than scientists have observed at the surface, Colman says.

"One thing we really don't know very well is the extent to which microbial communities beneath the surface influence what we see at the surface, but that's possible as well," Colman says.

"We know from culturing deep-sea vent microbes that they can live at temperatures that exceed the temperatures we're observing right at the surface, and some of the turn out to metabolize carbon monoxide."

The National Science Foundation and the National Aeronautics and Space Administration's Astrobiology Institute have funded Colman's Kamchatka research. The work offers insights into astrobiology, the study of the potential for life on other worlds, by showing how organisms might thrive in extreme environments beyond Earth, including the subsurface of Mars, Jupiter's moon Europa, or even planets orbiting other stars.

http://www.eurekalert.org/pub_releases/2011-04/ru-uap042611.php

Unique AED pads give hearts a second chance

Rice University, Texas Heart Institute collaborators invent life-saving device

An invention by Rice University bioengineering students in collaboration with the Texas Heart Institute (THI) is geared toward giving immediate second chances to arrhythmia victims headed toward cardiac arrest.

For their capstone design project, a team of Rice seniors created a unique pad system for automated external defibrillators (AEDs), common devices that can shock a victim's heart back into a proper rhythm in an emergency.

Often, the first shock doesn't reset a heart and the procedure must be repeated, but the sticky pads on the chest must first be repositioned. The pads need to be in the right location to send current through the heart, and someone with no experience who tries to provide aid might miss the first time.

The Second-Chance AED Pads let rescuers try again without losing valuable time to remove the pads from the victim's chest. The pads incorporate three electrodes, two in a single pad with an A/B switch attached, and a third in its own pad. If one shock doesn't restart the patient's heart, flipping the switch will change the jolt's path, just a little bit, for the second attempt. The pads were developed by students on the DefibTaskForce -- Lisa Jiang, Joanna Nathan, Justin Lin, Carl Nelson and Brad Otto -- in tandem with Mehdi Razavi, director of electrophysiology clinical research at THI, and their adviser, Renata Ramos, a Rice lecturer in bioengineering.

The potential for their project was clear from the beginning. "We did some calculations that suggested we could save at least 13,000 lives per year," Otto said. "Cardiac defibrillation is very time-sensitive. Thirty seconds can be the difference between life and death in a lot of situations. The time it takes to flip the switch is negligible compared with the time it takes to remove the pads, shave and prep a new area on the body, reapply the pads and administer another shock. And a layman might not even know to try a second position."

Rather than try to build a new type of AED, the team decided early on that it was enough to simply design new pads that would fit devices that are already in use. Manufacturers generally require AED pads be replaced every two years, which provides a ready market for the students' invention. "But well over 100,000 AED units are produced every year, so even if our pads are only paired with new AEDs, we have a significant market," Lin said.

Getting the instructions right turned out to be just as important as the device itself and required a lot of illustrative trial and error. In tests for the final version at Rice's Oshman Engineering Design Kitchen, the team recruited students with no experience using an AED to shock a medical mannequin back to life. "We had 100 percent of the testers place the pads correctly, showing it was very intuitive to use," Jiang said. All five team members, along with Razavi and Ramos, are listed on the provisional patent. They hope an AED manufacturer will pick up the rights to the Second-Chance pads for clinical trials and ultimately FDA approval.

A video of students demonstrating the Second-Chance pads is available at http://www.youtube.com/watch?v=FYChUo1oJM4
high-resolution photos of the team and device: http://www.media.rice.edu/images/media/NEWSRELS/0425_AED1.jpg
http://www.media.rice.edu/images/media/NEWSRELS/0425_AED2.jpg

http://news.discovery.com/tech/rainbow-poo-110426.html

Rainbow Poo Coming to a Toilet Bowl Near You

Analysis by Nic Halverson

Though its certainly not filled with gold, turns out there is a pot at the end of the rainbow, and it's made of porcelain.

For years, sagely, health-conscious individuals have read the contents of toilet bowls, seeking oracles of good or bad health. But never before has this practice been more colorful. Scientists have genetically engineered E. coli bacteria to work safely as a biosensor that can detect the presence of toxins and secret an indicator pigment. The synthetically engineered bacteria (which has had its bad bacteria parts removed) could be used to test water or air samples for pollutants such as arsenic or carbon dioxide. Arsenic in the water, the sample turn blue, for example. But that's not all.

By the year 2039, the scientists -- who hail from Cambridge University --think that their so-called E. Chromi could be mixed in with a special probiotic yogurt, which when eaten, would colonize the bowels and release

pigments in the presence of diseases such as cancer, stomach ulcers and salmonella. If your poo was green, for example, you might have an ulcer, or if it turned orange, you may want to get tested for colon cancer.

The scientists designed E. Chomi using standardized sequences of DNA, known as BioBricks, and inserted them into E. coli bacteria. In 2009, they won the Grand Prize at the International Genetically Engineered Machine Competition (iGEM). Since then, the original team from Cambridge University in the UK has joined with designers Alexandra Daisy Ginsberg and James King to explore the possibilities of their technology.

If E.Chromi's vision of future pans out, can you imagine the Double Rainbow guy's reaction?

http://medicalxpress.com/news/2011-04-amyotrophic-lateral-sclerosis.html

Researchers make strides in understanding amyotrophic lateral sclerosis

Brandeis researchers have made a significant advance in the effort to understand amyotrophic lateral sclerosis (ALS) by successfully reversing the toxicity of the mutated protein in the familial type of the disease.

Currently there is no cure or prevention for the disease, which affects nerve cells in the brain and the spinal cord. Most frequently referred to as Lou Gehrig's disease, after its most famous victim, ALS typically causes death due to respiratory paralysis within three to five years of onset. The only approved drug, Riluzole, can extend the lifespan of some patients by three months. In a paper published Tuesday, April 26 in PLoS Biology, the Pestko/Ringe laboratory reports success in blocking the lethal effects of the gene by placing several human genes into a yeast cell that shows many similar features to the disease-causing proteins.

Genes have been identified for many of the 10 percent of ALS cases that run in families. People with one of those mutant genes are likely to develop the disease. While a few of those genes might also contain mutations that increase risk for the more common forms of ALS, it's one of those genes, FUS/TLS, which got the attention of the Pesko/Ringe team.

"We started to work on this project when we learned that mutations of FUS/TLS gene were linked to familial ALS by our collaborators, Dr. Robert Brown's group, at the University of Massachusetts medical school," says Shulin Ju, a post-doctoral researcher and first author of the paper. The collaboration also includes members of Whitehead Institute for Biomedical Research, MIT, Harvard University, University of Rochester and the University of Pennsylvania. Here is some of the biology and chemistry behind the research:

Post-mortem examinations of certain ALS victims show that the dying neurons contain clumps of the FUS/TLS protein. What's interesting, says Gregory A. Petsko, professor of chemistry and biochemistry, is where these inclusions are.

"Normally this protein lives in the nucleus of the cell, which is where the chromosomes are," says Petsko. "In this disease, it seems to move from the nucleus out into the cytoplasm of the cell, the main part, and that's where it forms the inclusions that are associated with the disease."

Petsko and Ringe's team wanted to study this process in an organism on which they could perform sophisticated genetic screenings and detailed biochemical experiments, which can not be done in human cells. So they chose yeast. "It may seem kind of crazy to think of doing yeast experiments on a human neurologic disease, since yeast has no brain or spinal cord or any neurons at all," says Petsko, "But a yeast cell isn't that different from a typical human cell."

The team inserted the FUS/TLS gene into a yeast cell with the hope that it would create the same observable characteristics as the mutant protein does in a human cell. When they did, Petsko says, two remarkable things happened. "First thing is that the human protein wasn't in the nucleus, it moved to the cytoplasm of the cell just like it did in the human disease— and it formed inclusions," says Petsko. "The second thing is that it killed the yeast cell, so we got in yeast a pretty faithful replication of some of the features of the human disease caused by mutation of this gene."

The next step was to find out what part of the protein was necessary in order to keep it in the nucleus and what part was necessary to send it to the cytoplasm. Petsko then asked, "If we started deleting sections of the protein could we force the protein to always be in the cytoplasm or always be in the nucleus?"

When they performed the experiment with yeast they found that the area of the gene where the disease-causing mutations occur was the area responsible for keeping it in the nucleus; when that area is mutated, the gene leaves the nucleus for the cytoplasm.

"We want to keep it in the nucleus but you can't do that with the mutants easily because the part responsible for keeping it in the nucleus has been destroyed by the mutation, which is why you have the disease," says Petsko. They then asked whether they could prevent the yeast cells from being killed by this protein by placing some other protein inside. In other words, Petsko says, could they find a protein that would rescue the cell from the toxicity of FUS/TLS?

By a series of genetic experiments described in the paper, they were able to identify several human genes which, when inserted along with FUS/TLS gene, rendered FUS/TLS protein no longer toxic to yeast. The cells survived. "And then we got the surprise of our life," says Petsko. "When we looked at those cells, FUS/TLS protein was still in the cytoplasm, and still forming inclusions. In other words, we were able to eliminate the toxicity of the protein without sending it back to the nucleus."

What this told them was that aggregating and being in the cytoplasm didn't necessarily have to be toxic as long as the rescue protein that they found was introduced. That, says Petsko, got them really excited, because "if you can do that with the expression with another human gene you could probably do that with a drug."

http://www.eurekalert.org/pub_releases/2011-04/uow-br042511.php

Brain regions can take short naps during wakefulness, leading to errors

Madison, Wis. – *If you've ever lost your keys or stuck the milk in the cupboard and the cereal in the refrigerator, you may have been the victim of a tired brain region that was taking a quick nap.*

Researchers at the University of Wisconsin-Madison have a new explanation. They've found that some nerve cells in a sleep-deprived yet awake brain can briefly go "off line," into a sleep-like state, while the rest of the brain appears awake.

"Even before you feel fatigued, there are signs in the brain that you should stop certain activities that may require alertness," says Dr. Chiara Cirelli, professor of psychiatry at the School of Medicine and Public Health. "Specific groups of neurons may be falling asleep, with negative consequences on performance."

Until now, scientists thought that sleep deprivation generally affected the entire brain. Electroencephalograms (EEGs) show network brain-wave patterns typical of either being asleep or awake.

"We know that when we are sleepy, we make mistakes, our attention wanders and our vigilance goes down," says Cirelli. "We have seen with EEGs that even while we are awake, we can experience shorts periods of 'micro sleep.' "

Periods of micro sleep were thought to be the most likely cause of people falling asleep at the wheel while driving, Cirelli says. But the new research found that even before that stage, brains are already showing sleep-like activity that impairs them, she says.

As reported in the current issue of Nature, the researchers inserted probes into specific groups of neurons in the brains of freely-behaving rats. After the rats were kept awake for prolonged periods, the probes showed areas of "local sleep" despite the animals' appearance of being awake and active. "Even when some neurons went off line, the overall EEG measurements of the brain indicated wakefulness in the rats," Cirelli says.

And there were behavioral consequences to the local sleep episodes.

"When we prolonged the awake period, we saw the rats start to make mistakes," Cirelli says.

When animals were challenged to do a tricky task, such as reaching with one paw to get a sugar pellet, they began to drop the pellets or miss in reaching for them, indicating that a few neurons might have gone off line.

"This activity happened in few cells," Cirelli adds. "For instance, out of 20 neurons we monitored in one experiment, 18 stayed awake. From the other two, there were signs of sleep—brief periods of activity alternating with periods of silence." The researchers tested only motor tasks, so they concluded from this study that neurons affected by local sleep are in the motor cortex.

Co-authors on the paper include Vladyslav Vyavovskiy, Umberto Olcese, Erin Hanlon, Yuval Nir and Giulio Tononi.

http://www.eurekalert.org/pub_releases/2011-04/uoa-mct042711.php

Mercury converted to its most toxic form in ocean waters

University of Alberta-led research has confirmed that a relatively harmless inorganic form of mercury found worldwide in ocean water is transformed into a potent neurotoxin in the seawater itself.

After two years of testing water samples across the Arctic Ocean, the researchers found that relatively harmless inorganic mercury, released from human activities like industry and coal burning, undergoes a process called methylation and becomes deadly monomethylmercury.

Unlike inorganic mercury, monomethylmercury is bio-accumulative, meaning its toxic effects are amplified as it progresses through the food chain from small sea creatures to humans. The greatest exposure for humans to monomethylmercury is through seafood. The researchers believe the methylation process happens in oceans all over the world and that the conversion is carried out by microbial life forms in the ocean.

The research team, led by recent U of A biological sciences PhD graduate Igor Lehnherr, incubated seawater samples collected from the Canadian Arctic Archipelago. Lehnherr says conversion of inorganic mercury to monomethylmercury accounts for approximately 50 per cent of this neurotoxin present in polar marine waters

and could account for a significant amount of the mercury found in Arctic marine organisms. The researchers say this is the first direct evidence that inorganic mercury is methylated in seawater.

The research was published earlier this month online in Nature Geoscience.

http://www.eurekalert.org/pub_releases/2011-04/bumc-ss042711.php

Study suggests lower risk of coronary heart disease from alcohol, even with hazardous drinking

The analysis assesses the 12-month prevalence of coronary heart disease (CHD) in individuals according to their category of alcohol use.

The 2001 National Epidemiologic Survey on Alcohol and Related Conditions study (the NESARC study, n = 43,093) identified 16,147 abstinent individuals, 15,884 moderate consumers, 9,578 hazardous drinkers — defined as exceeding sex-specific weekly limits established by the World Health Organization, and 1,484 alcohol-dependent subjects. Diagnoses were generated using the Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV version. Both moderate and hazardous drinking were associated with decreased odds of CHD when compared with abstinence, whereas odds of CHD were not significantly different between alcohol-dependent and abstinent participants. A moderate or even a hazardous consumption of alcohol was associated with a decreased likelihood of CHD after controlling for socio-demographic, psychiatric, and addictive risk factors. Our study shows that alcohol may have cardio-protective effects not only in moderate drinkers, but also in individuals with patterns of use traditionally considered as hazardous.

International Scientific Forum on Alcohol Research Comments

There were adequate numbers of subjects in most analysis groups, in that 36% of subjects were abstinent in the last year and almost one quarter of subjects were in the group classified as "hazardous drinking." One Forum reviewer commented: "This exhibition of a rightward extension of the revered J-shaped curve for coronary heart disease (CHD) has been reported before. I find the results acceptable. I wonder, however, what happens to the rates of cirrhosis and other directly alcohol-related disorders and what might be the long-term total mortality experience in this group." An interesting finding in this study is that participants with CHD were more likely to have lifetime mood disorder, lifetime anxiety disorder, and personality disorder than those without CHD.

If indeed the risk of coronary disease does not increase despite consuming alcohol at a level often classified as "hazardous," it is possible that the increase in cardiovascular disease from heavy drinking reported in many studies may be due to arrhythmias, cardiomyopathy, or other heart conditions that are not actually coronary artery disease.

Limitations to paper: Appropriate socio-economic variables were available for adjustment for confounding, with good assessments for alcohol intake, tobacco use, and drug abuse. However, sick quitters and unhealthy hazardous drinkers dying earlier than the healthy ones may have confounded the results. Further, unmeasured factors such as exercise and diet that were not adjusted for may have led to further confounding.

A key concern of Forum reviewers related to the method used to diagnose CHD in this analysis. Not only was it self-reported, but only 1.0% of cases stated that they had had a myocardial infarction, the primary "hard" criterion for CHD. Most reported angina pectoris, a "softer" criterion for coronary disease. Further, "arteriosclerosis" is a vague term and not one generally used in normal communication with patients. It could have referred to conditions other than CHD.

Most studies have found that frequent, light-to-moderate drinking is the healthiest approach for alcohol intake, and the average amount per week is an inadequate measure of intake. In this study, it is unclear whether or not the frequency of drinking was informative regarding CHD. Further, both rare, occasional, and regular drinkers who did not meet criteria for "hazardous drinking" were included in the "moderate" group, so it is not possible to separate daily drinkers from occasional drinkers.

The authors state that "Hazardous drinking was defined as exceeding sex-specific weekly limits as defined by the NIAAA (men, more that14 drinks of 14g per week; women, more than 7 drinks per week) or exceeding daily drinking limits (men,≥5 drinks per day;women,≥4 drinks per day) at least once in the past year." One possibility is that this definition of "hazardous drinking" is too restrictive, including some people who might better be classified as moderate drinkers. As a Forum reviewer commented: "The definition of "moderate drinking" is very strict and the subgroup with 'hazardous drinking' would include many European drinkers with no alcohol problems. The 'hazardous' subgroup includes really hazardous drinking associated with liver disease mortality and detrimental effects on other organs. The heterogeneity of the subgroup of 'hazardous drinkers' is a serious problem of the study."

The authors acknowledge this shortcoming, stating that " . . .the criteria used for the definition of the 'hazardous drinking' subgroup of subjects is too broad. Indeed, women having a little more than one drink every

day and men having used five drinks in a single day only once in the previous year are both included in this group. This suggests that alcohol dependence and hazardous drinking should be routinely distinguished, and that a quantitative assessment of alcohol use may be more relevant than a qualitative approach when assessing the risk of cardiovascular disorders.'

Forum Summary: Using data from The 2001 National Epidemiologic Survey on Alcohol and Related Conditions study (the NESARC study, n = 43,093), the authors of this paper conclude that alcohol may have cardioprotective effects not only in moderate drinkers, but also in individuals with patterns of use traditionally considered as "hazardous." While such a finding has been shown in some population studies, there were questions by Forum reviewers as to the adequacy of the method for diagnosing coronary artery disease: self-report, with most subjects listing angina pectoris, a "soft" criterion for coronary disease.

In addition, the categories of drinking used in this study were very broad: rare or only occasional drinkers were combined with regular drinkers up to 7 or 14 drinks per week in the "moderate" category, and the "hazardous category" included a broad range of drinkers, from a minimal increase over the recommended limits to very heavy drinkers. The pattern of drinking (especially the number of days per week that alcohol was consumed) was not reported, making it difficult to separate regular from heavy week-end only drinkers. The effects of heavier drinking on other conditions (such as alcohol-related liver disease, mortality, etc.) were not included in this analysis.

It is physiologically possible that even hazardous use of alcohol, like moderate use, may well lead to cleaner arteries and therefore lower rates of coronary artery disease. If this is the case, an explanation for the increases in cardiovascular mortality reported for heavy drinkers in many studies may relate not directly to coronary artery disease, but to conditions such as cardiomyopathy or cardiac arrhythmias. However, the rates of accidents, suicide and other morbidity associated with hazardous alcohol use may well overcome any protective effects on coronary disease.

***Reference**: Le Strat Y, Gorwood P. Hazardous drinking is associated with a lower risk of coronary heart disease: Results from a national representative sample. Am J Addict 2011;20:257.*

Contributions to this critique by the International Scientific Forum on Alcohol Research were made by the following members:
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http://www.eurekalert.org/pub_releases/2011-04/epfd-stf042211.php

Swiss-US team finds indigenous cases of leprosy in the Southern United States

Study confirms human contamination through contact with armadillos

Using advanced DNA analysis and extensive field work, an international research team has confirmed the link between leprosy infection in Americans and direct contact with armadillos. In a joint collaboration between the Global Health Institute at EPFL in Switzerland and Louisiana State University, clear evidence was found that a never-before-seen strain of Mycobacterium leprae has emerged in the Southern United States and that it is transmitted through contact with armadillos carrying the disease. The results will be published on April 28th in the New England Journal of Medicine.

There are only around 150 cases of leprosy in the United States each year. Most of these victims have worked abroad in areas in which leprosy is endemic, making it likely that they may have acquired the disease while outside the US. But, to the alarm of health authorities, a third of all patients infected appear to have contracted the disease locally. The hypothesis that the disease is transmitted though contact with armadillos—aside from humans, the only other known carriers of the leprosy-causing bacteria—was confirmed by fine-grained DNA analysis of both armadillo and human samples done at EPFL.

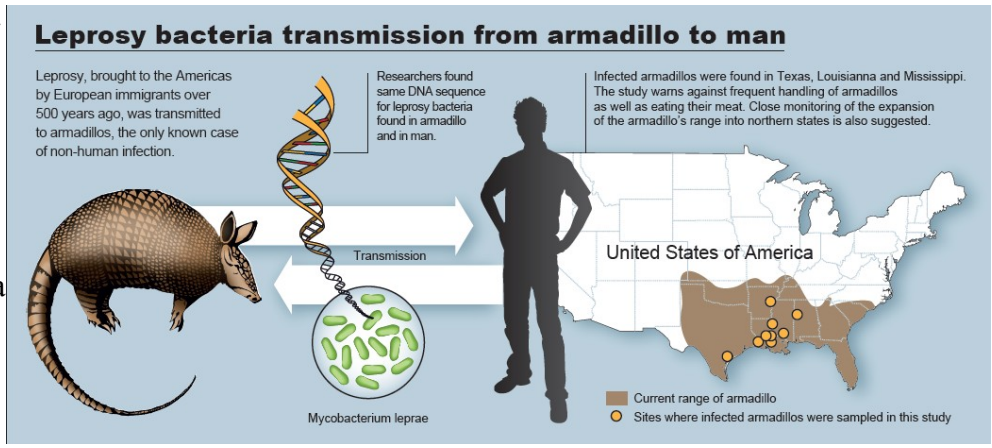
Leprosy bacilli found in armadillos

It has been known since the 1970s that armadillos are potential carriers of the disease, most likely introduced by European immigrants 500 years ago. But the current study shows inter-species contamination and the presence of a unique strain. "There is a very strong association between the geographic location of the presence of this particular strain of M. leprae and the presence of armadillos in the Southern US," explains Stewart Cole, head of the Global Health Institute in Lausanne and world-leader in the field of genomics of leprosy bacilli.

"Our research provides clear DNA evidence that the unique strain found in armadillos is the same as the one in certain humans."

The study included 33 wild armadillos known to have the disease and 50 leprosy patients. The new strain of the bacteria, named 3I, was found in 28 armadillos and in 22 patients who reported no foreign residence. The researchers used genome sequencing to identify the new strain and cross check it with other known strains from Europe, Brazil and Asia, and used genotyping to identify and classify the population infected. It became clear that leprosy patients who never travelled outside the US but lived in areas where infected armadillos are prevalent were infected with the same strain as the armadillos. These findings prompted the researchers to state in the article that "Frequent direct contact with armadillos and cooking and consumption of armadillo meat should be discouraged." The study also suggests that armadillo range expansion should be monitored.

It is not known exactly why armadillos contract and carry leprosy. While their low body temperature (89° F / 32° C) makes them perfect incubators for the bacteria, which grow in temperatures between 86° F and 89° F (30° C to 32° C), there are almost certainly other factors such as immune deficiency that also play a role. Similarly, the bacteria attack the extremities of humans because our core body temperature is too high for a generalized infection, and over 90% of humans who come into direct contact with the disease spontaneously fight it off. "The last thing we want is to induce panic in the population and incite a slaughter of armadillos. The best way to combat further infection is though education and prudence," says Cole.



Graphic by École Polytechnique Fédérale de Lausanne

The stigma of leprosy

José Ramirez, a former migrant worker from Houston who contracted the disease after hunting and eating armadillo meat and took part in the study, has consecrated his life to combating social stigmas. He hopes that the study brings to light the stigma attached to leprosy. "We need to take this opportunity to give leprosy patients a voice and to learn to not use the word 'leper' that has negative connotations around the world, a stigma that should be replaced with an understanding of the disease and its causes." Ramirez, who struggled over five years with the disease before it was properly diagnosed, is now disease-free after receiving antibiotic treatment. Proving what few know to be true—that leprosy is a bacterial infection that can be cured.

"Probable Zoonotic Leprosy in the Southern United States," Authors: Richard W. Truman, Ph.D., Pushpendra Singh, Ph.D., Rahul Sharma, Ph.D., Philippe Busso, Jacques Rougemont, Ph.D., Alberto Paniz-Mondolfi, M.D., Adamandia Kapopoulou, M.S., Sylvain Brisse, Ph.D., David M. Scollard, M.D., Ph.D., Thomas P. Gillis, Ph.D., and Stewart T. Cole, Ph.D. New England Journal of Medicine, April 28, 2011.

http://www.bbc.co.uk/news/health-13195209

Heart attacks 'are worse' if they happen in the morning

People who have a heart attack in the morning tend to fare worse than those who have one at other times of the day and night, experts have discovered.

Heart attacks occurring between 0600 and noon are more likely to create a larger area of damaged heart tissue. The findings in Heart journal come from a study of over 800 patients in Spain. Experts say the body's natural sleep-awake cycle could explain the differences seen, but advise more research to confirm the findings.

It is well established that a person's 24-hour body clock can influence heart attack risk. For example, doctors know that people are more likely to have a heart attack around the time when they are waking up from sleep than at other times, but what is less known is the extent of damage that this leads to.

To investigate, Dr Borja Ibanez and colleagues analysed data on 811 patients at their hospital who had suffered a type of heart attack known as an ST elevation myocardial infarction, which occurs when there is a prolonged period of blocked blood supply to the heart muscle.

The researchers split the patients into four groups based on what time segment of the 24-hour clock the heart attack occurred. They found that one group in particular - the 0600 to midday or "morning" heart attack group - had the most severe heart attacks.

This morning group had much higher levels of an enzyme in their blood that is a marker of dying heart tissue than patients whose heart attack had occurred in the evening (between 6pm and midnight).

Judging by the blood enzyme levels, the researchers estimate that the area of the heart damaged in the morning group was, on average, a fifth larger in comparison.

Judy O'Sullivan, senior cardiac nurse at the British Heart Foundation, said: "This study provides some interesting observations on the association between the time of day a heart attack occurs and the degree of subsequent damage to the heart muscle. "However further research is needed before we can draw firm conclusions. "Regardless of the time of day, the quicker someone having a heart attack is treated, the less the damage they will have, which is why it is essential that anyone who experiences heart attack symptoms should call 999 immediately."

http://www.bbc.co.uk/news/world-us-canada-13190376

Plants found in ancient pills offer medicinal insight

By Jane O'Brien BBC News, Washington

DNA extracted from 2,000-year-old plants recovered from an Italian shipwreck could offer scientists the key to new medicines.

Carrots, parsley and wild onions were among the samples preserved in clay pills on board the merchant trading vessel that sank around 120 BC. It's believed the plants were used by doctors to treat intestinal disorders among the ship's crew. Such remedies are described in ancient Greek texts, but this is the first time the medicines themselves have been discovered.

"Medicinal plants have been identified before, but not a compound medicine, so this is really something new," says Alain Touwaide, director of the Institute for the Preservation of Medical Traditions, which has the world's largest digital database of medical manuscripts.

Prof Touwaide is working with scientists at the Smithsonian's Natural History Museum, who carried out the DNA analysis. They discovered traces of carrot, parsley, alfalfa, celery, wild onion, radish, yarrow and hibiscus contained in the ancient pills. The pills, which researchers believe were diluted with vinegar or water to make them easier to ingest, were preserved inside tin boxes and were the size of coins.

"I was always wondering if the texts were only theoretical notions without practical application," he says. "Now we know they were applied."

'Written evidence'

In May, Prof Touwaide's conclusions, based on the DNA findings and his own study of medicinal texts, will be formally presented to an international gathering of archaeologists, historians of medicines and other experts in Rome.

"What is remarkable is that we have written evidence [from the ancient Greeks] of what plants were used for which disorders," says Alisa Machalek, a science writer for the National Institutes of Health, one of the world's leading research centres. "This research is interesting, especially for medical historians, because it confirms that what we eat affects our bodies."

Prof Touwaide hopes his research will help to develop modern treatments. "We extract the information from these texts so that scientists can see if they can make shortcuts to pharmacological discoveries," he says.

"We re-purpose ancient medical information and jump from the past to the future."

For instance, the Roman statesman Cato recommended eating broccoli to stay healthy and Prof Touwaide has found references to the Greek physician Galen using it in the 2nd Century AD to treat intestinal cancer.

Prof Touwaide says modern research is now under way to isolate a compound found in broccoli that may be a source for the treatment of cancer today.

"This is a huge field in chemistry and pharmaceutical science," says Ms Machalek.

"Native Americans chewed on willow bark to relieve pain - now we pop open a bottle and chew on aspirin which contains similar compounds. Taxol, a cancer medicine, is derived from the bark of the Pacific Yew."

Early Greek writings

To understand the significance of the plants contained in the 2,000-year-old pills, Prof Touwaide studied a number of medical works, including the Hippocratic Collection. The collection is one of the earliest sets of Greek writings still in existence and is attributed to Hippocrates, considered to be the founder of Western medicine. He cross-referenced those findings with other works, such as the Encyclopaedia of Natural Substances, written in the 1st Century AD by Dioscorides.

Dioscorides noted that "the large onion is sharper than the round onion. All onions are pungent and apt to cause flatulence. They stimulate the appetite. They are thirst making. They cleanse the bowel."

"They are good for opening outlets for various secretions as well as haemorrhoids, and they are used as suppositories, pilled and dipped in olive oil," Dioscorides wrote.

A significant percentage of commercial medicines are derived from natural sources, but the active compound has been isolated, concentrated, standardised and packaged into measured doses.

The shift toward synthetic chemical medicines occurred in the 20th Century, but according to Mark Blumenthal, the founder and executive director of the American Botanical Council, there is renewed interest in the medicinal benefits of natural foods - including those found in the pills.

"A lot of ancient plants have modern functions," he says. "There's a lot of marketing going on for so-called functional foods - foods with high levels of antioxidants, for improving the cardiovascular system or reducing the risk of cancer. "Hibiscus tea is growing in popularity and research shows that it lowers blood pressure. Garlic and to some degree onions, continue to have cardiovascular benefits and reduce the build-up of plaque."

But Prof Touwaide says the traditional cures based on plants and minerals are in danger of being forgotten.

He says part of the problem is that too few people now study classical Greek, Latin or Arabic and there are not enough experts to interpret the original texts.

Prof Touwaide is proficient in 12 languages and has spent years collecting his library of 15,000 books on plants and their uses. He believes such ancient knowledge should become protected by Unesco as part of the world's heritage.

http://www.eurekalert.org/pub_releases/2011-04/uobc-aup042711.php

Astronomers unveil portrait of 'super-exotic super-Earth:' Densest known rocky planet

An international team of astronomers today revealed details of a "super-exotic" exoplanet that would make the planet Pandora in the movie Avatar pale in comparison.

The planet, named 55 Cancri e, is 60 per cent larger in diameter than Earth but eight times as massive. Twice as dense as Earth – almost as dense as lead – it is the densest solid planet known, according to a team led by astronomers from the Massachusetts Institute of Technology (MIT), the University of British Columbia (UBC), the Harvard-Smithsonian Center for Astrophysics and the University of California at Santa Cruz (UCSC).

The research, based on observations from Canada's MOST (Microvariability & Oscillations of STars) space telescope, was released online today at arXiv.org and has been submitted for publication in The Astrophysical Journal Letters. MOST is a Canadian Space Agency mission.

Approximately 40 light years from Earth, 55 Cancri e orbits a star – called 55 Cancri A – so closely that its year is less than 18 hours long. "You could set dates on this world by your wrist watch, not a calendar," says UBC astronomer Jaymie Matthews. The temperature on the planet's surface could be as high as 2,700 degrees Celsius. "Because of the infernal heat, it's unlikely that 55 Cancri e has an atmosphere," says lead author Josh Winn of MIT. "So this is not the type of place where exobiologists would look for life."

However, 55 Cancri e is the type of place exoplanetary scientists will be eager to "visit" with their telescopes, says Winn. "The brightness of the host star makes many types of sensitive measurements possible, so 55 Cancri e is the perfect laboratory to test theories of planet formation, evolution and survival."

While the planet isn't visible, even through a telescope, its host star, 55 Cancri A, can be observed with the naked eye for the next two months on a clear dark night.

"On this world – the densest solid planet found anywhere so far, in the Solar System or beyond – you would weigh three times heavier than you do on Earth. By day, the sun would look 60 times bigger and shine 3,600 times brighter in the sky," says Matthews, MOST Mission Scientist and second author on the paper.

The first planet discovered around 55 Cancri A – designated "b" – was found by a California-based team in 1997. Over the next five years, two more planets ("c" and "d") were found by the same team around the star. In 2004, a Texas-based team found 55 Cancri e, the subject of the latest paper and (a fifth planet, f, was discovered in 2008.)

All five planets were detected using the Doppler technique, where a star's "wobbles" due to the gravities of its unseen planets are measured in the shifting wavelengths of the spectra of the starlight.

Last year, Rebekah Dawson, an astronomy PhD student at Harvard and Daniel Fabrycky, a Hubble Fellow at UCSC, re-analyzed the data and proposed that the orbital period of 55 Cancri e could be much shorter than others had assumed.

MIT's Winn, along with Smithsonian astronomer Matt Holman, brought the problem to Matthews, who ordered the astronomical equivalent of a police stakeout using MOST, which was able to detect subtle dips in the brightness of star 55 Cancri A as planet e passed in front of it during each orbit.

The research team found that these "transits" occur like clockwork every 17 hours and 41 minutes, just as Dawson and Fabrycky predicted. The starlight is dimmed by only 1/50th of a per cent during each transit, telling the astronomers that the planet's diameter is about 21,000 km – only 60 per cent larger than Earth.

"It's wonderful to be able to point to a naked-eye star and know the mass and radius of one of its planets, especially a distinctive one like this," says Winn.

Matthews agrees. "That's the kind of thing Captain Kirk would do in an old episode of Star Trek, We're finally catching up with – maybe starting to surpass – the science fiction I dreamed about as a kid."

http://www.eurekalert.org/pub_releases/2011-04/cp-tue042511.php

Through unique eyes, box jellyfish look out to the world above the water

Box jellyfish may seem like rather simple creatures, but in fact their visual system is anything but. They've got no fewer than 24 eyes of four different kinds.

Now, researchers reporting online on April 28 in Current Biology, a Cell Press publication, have evidence revealing that four of those eyes always peer up out of the water, regardless of the way the rest of the animal is oriented. What's more, it appears that those eyes allow the jellies to navigate their way around the mangrove swamps in which they live.

"It is a surprise that a jellyfish—an animal normally considered to be lacking both brain and advanced behavior—is able to perform visually guided navigation, which is not a trivial behavioral task," said Anders Garm of the University of Copenhagen. "This shows that the behavioral abilities of simple animals, like jellyfish, may be underestimated."

In fact, scientists have known for more than a century that box jellyfish had a unique array of eyes. It was known that they could rely on vision to respond to light, avoid obstacles, and control their rate of swimming. But box jellyfish generally live in shallow waters with plenty of obstacles. The species Garm's team studied, Tripedalia cystophora, lives between the prop roots in Caribbean mangrove swamps, where they stay close to the surface to catch and eat copepods that gather in high densities in light shafts formed by openings in the mangrove canopy. They are never found out in the open, where they might risk starvation. That means they must stay within a rather restricted area, less than two meters wide. And it now appears that they have eyes that help them do this.

The researchers examined the function of one of two types of "upper lens eyes," already known to form images, to work out just what those eyes can see and how well. It turns out that those four eyes cover precisely the visual field needed to see through the water's surface up into the world above. The researchers calculated that the jellies should be able to detect the mangrove canopy from a distance of at least eight meters. Behavioral experiments of the jellies in the field supported those conclusions, revealing that the jellyfish can use those eyes to navigate based on their view of the canopy alone. When the canopy was obscured from view, they could no longer get around.

"We have shown that the box jellyfish can use vision to navigate in their habitat, and we now want to understand how their simple nervous system supports such advanced behaviors," Garm said. They also want to know if other box jellyfish species do the same thing in the places where they live.

Overall, this new understanding of the upper lens eyes points to a more general strategy for managing complex sensory tasks without a big brain. "Instead of having a single pair of general-purpose eyes like most other animals, box jellyfish have several different types of eyes used for special purposes," Garm said. "This means that each individual eye type is dedicated to support only a limited number of behaviors. The eyes can then be built to collect precisely the information needed, minimizing the need for further processing in a big brain. The automatic orientation of the upper lens eyes to constantly look through the water surface is a clear example of this."

http://medicalxpress.com/news/2011-04-antibiotics-surgery-appendicitis.html

Study: Antibiotics, not surgery, may sometimes better treat appendicitis

(Medical Xpress) -- ***Antibiotics rather than surgery may be the better treatment for cases of appendicitis in which the appendix hasn't burst, according to a new study.***

The study's authors say the findings suggest that nonperforating appendicitis, as the disease is called when the appendix hasn't burst, may be unrelated to perforating appendicitis, in which the appendix has burst.

Instead, the study found that nonperforating childhood appendicitis, which historically has been treated with emergency surgery, seems to be a disease similar to nonperforating adult diverticulitis, which is often treated with antibiotics. "It is assumed, but has never been proved, that appendicitis always perforates unless appendectomy is performed early in its course," said the authors. "There is a growing body of evidence to suggest that this is not the case." The study, "Epidemiological similarities between appendicitis and diverticulitis suggesting a common underlying pathogenesis," was reported in the Archives of Surgery.

Hospital discharge records reveal correlation

Childhood appendicitis and adult diverticulitis share many similarities, including association with colon hygiene and a low intake of fiber in the diet.

Those shared epidemiological features prompted researchers to examine whether the two might be similar, according to economist Thomas B. Fomby at Southern Methodist University in Dallas.

A statistical sampling of data from U.S. hospital discharge records revealed a correlation between nonperforating appendicitis and nonperforating diverticulitis.

"We used a technique called cointegration to investigate common movements in epidemiologic data series," said Fomby, a professor in SMU's Department of Economics, who led the statistical analysis with statistician Wayne A. Woodward, professor and department chair in SMU's Department of Statistical Science.

Lead author on the study was Edward H. Livingston, M.D., in the division of Gastrointestinal and Endocrine Surgery at University of Texas Southwestern Medical School, Dallas; with the Department of Surgery, Veterans Affairs Medical Center Dallas; and in the Department of Bioengineering, University of Texas at Arlington. Also co-authoring was Robert W. Haley, M.D., in the Department of Internal Medicine-Epidemiology, UT Southwestern Medical School, and a past recipient of the SMU Distinguished Alumni Award.

Regional and national data move together over time

The study looked at 27 years of data from the National Hospital Discharge Survey, which is compiled annually by the Centers for Disease Control and Prevention. The analysis specifically compared national data and regional data for children with appendicitis and adults with diverticulitis who were admitted to U.S. hospitals between 1979 and 2006.

The statistical methodology called panel cointegration allowed the researchers to sift through eight different combinations of the two diseases, both by region and nationally, to see whether they vary together across time and to eliminate the possibility of coincidence or a chance correlation, Fomby said.

"We analyzed all the national data, and then found the same thing in every region also," Fomby said. "That reinforced what we were finding at the national level."

The authors' analysis shows that although the annual incidence rates of adult nonperforating diverticulitis and child nonperforating appendicitis changed greatly during the past 25 years, their secular patterns — long-term trends — followed the same general patterns, overall as well as region by region, according to the authors.

"These secular changes were significantly cointegrated, meaning that the incidence rates changed in time together, suggesting that nonperforating appendicitis and nonperforating diverticulitis could be different manifestations of the same underlying process."

Statisticians and economists have applied this kind of analysis to international finance, macroeconomics and other areas, but it's not been used to any extent in medical epidemiology, Fomby said. Two economists, Clive Granger and Robert Engel, won the 2003 Nobel Prize in Economics for their invention of the technique.

Appendicitis, diverticulitis may be similar diseases

"Childhood appendicitis and adult diverticulitis seem to be similar diseases, suggesting a common underlying pathogenesis," write the authors. Secular trends for the nonperforating and perforating forms are strikingly different, they said. "At least for appendicitis, perforating disease may not be an inevitable outcome from delayed treatment of nonperforating disease. If appendicitis represents the same pathophysiologic process as diverticulitis, it may be amenable to antibiotic rather than surgical treatment."

Appendicitis is a painful infection in the area of the lower right abdomen that typically affects younger people, age 10 to 30, according to the National Digestive Diseases Information Clearinghouse within the National Institutes of Health. It is the No. 1 cause of emergency abdominal surgeries, according to NDDIC.

Appendicitis is caused by blockage in the appendix, a fingerlike pouch jutting from the large intestine, according to NDDIC. Among the various causes of the blockage can be feces, abdominal trauma or inflammatory bowel disease, the agency says.

Diverticulitis, which is more common among people older than 60, occurs when pouches that have developed in the lining of the gastrointestinal tract become inflamed and sometimes infected, according to NDDIC. It is often treated with antibiotics, the authors say.

Perforating appendicitis not a progression of nonperforating appendicitis?

"These findings seem incompatible with the long-held view that perforating appendicitis is merely the progression of nonperforating disease where surgical intervention was delayed too long," write the authors. "If perforating appendicitis was simply a manifestation of nonperforating appendicitis not treated in a timely manner, the secular trends should have been statistically similar, which they were not."

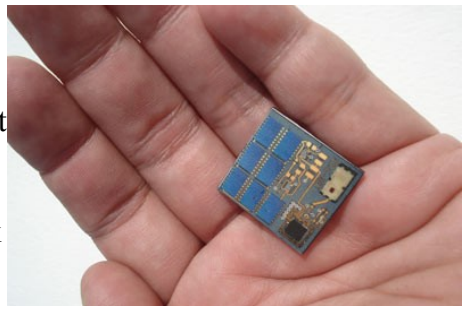
Both diseases have increased in incidence as cleanliness in the Western world has improved, in populations with higher socioeconomic status, and where grain-processing technologies have lowered dietary fiber content, the authors say.

In a previous study, the researchers demonstrated changes in the annual incidence rates of appendicitis. The new study demonstrated changes for nonperforating diverticulitis as well. *Provided by Southern Methodist University*

http://www.physorg.com/news/2011-04-fingernail-sized-satellites-depart-endeavor.html

Fingernail-sized satellites depart on Endeavor's last run

(PhysOrg.com) -- *A group of Cornell-developed, fingernail-sized satellites may travel to Saturn within the next decade, and as they flutter down through its atmosphere, they will collect data about chemistry, radiation and particle impacts.*



Three prototypes of these chip satellites, named "Sprite," will be mounted on the International Space Station after the space shuttle Endeavour delivers them on its final flight, which is scheduled to launch at 3:47 p.m. EDT on Friday, April 29.

President Barack Obama and alumna U.S. Rep. Gabrielle Giffords, MRP '97, (D-Ariz.), who has not been seen publicly since the Jan. 8 attack in Tucson, Ariz., plan to attend the launch. The Endeavour crew is led by Commander Mark Kelly, Giffords' husband.

Stamp-size satellites, developed at Cornell, are getting a test run aboard the space shuttle Endeavour when it launches April 29.

The thin, 1-inch-square chips, in development for three years in the lab of Mason Peck, associate professor of mechanical and aerospace engineering, will be mounted to the Materials International Space Station Experiment (MISSE-8) pallet, which will be attached to the space station, exposing them to the harsh conditions of space to see how they hold up and transmit data.

Although grapefruit-size satellites have been launched before, they have functioned much like larger satellites. The flight dynamics of a chip satellite are fundamentally different from these larger "CubeSats."

"Their small size allows them to travel like space dust," said Peck. "Blown by solar winds, they can 'sail' to distant locations without fuel. ... We're actually trying to create a new capability and build it from the ground up. ... We want to learn what's the bare minimum we can design for communication from space," Peck said.

When the MISSE-8 panel is removed and returned to Earth in a few years, the survival of the prototypes will be assessed.

The trip to space is the result of a phone call about a year ago, when one of Peck's colleagues called to ask if he had anything small that could be ready within a few weeks time to put on the MISSE-8 pallet, as a small patch of space had opened up. "He didn't know that we had been working on the satellite-on-a-chip program for a long time, and over the next week we put together these prototypes," Peck said.

The three prototypes were built entirely by Cornell undergraduates Zac Manchester '11 and Ryan Zhou '10 and doctoral candidate Justin Atchison '10.

The prototypes are physically identical, but each transmits differently. "They all emit at the same frequency ... [but] they are different and distinct from each other in ways that we can recognize on the ground," said Peck. "That's very important because it's a pathfinder for something we hope to do in the future. We want to launch a huge number of these things simultaneously but still sort out which is which."

The current prototypes are mostly made of commercial parts, but Peck's group has partnered with Draper Lab in Boston to work on making a more space-ready prototype. "We're seeing such an explosion in personal electronics ... all these components are super high performance, and they have far outstripped what the aerospace industry has at its disposal," said Peck, noting that these technologies were used on the small satellites. Cornell, he added, plays a leading role in the field of chip satellites. "We are definitely the first to launch something, and we are the first to be looking at the flight dynamics as a way to enable new ways to explore space," he said. *Provided by Cornell University*

http://www.newscientist.com/article/mg21028095.800-baby-brain-expert-ums-and-ers-help-children-learn.html

Baby brain expert: 'Ums' and 'ers' help children learn

*** 28 April 2011 by Alison George**

Parents shouldn't worry about always speaking in perfectly formed sentences, says Richard Aslin. Disfluencies have their uses

You have been studying the "ums" and "ers" that litter our speech. Tell me about them.

We use "ums" and "ers" because we are having difficulties conjuring up the next word we want to say, or deciding between two alternative words. Technically they are known as disfluencies. They appear in a systematic way in our speech.

Say we are looking at a toolbox and I say: "Can you pick up the... um..." In front of me there is a wrench, pliers, a screwdriver, and I'm having trouble deciding which one I want you to pick up. That's when disfluencies occur. They also frequently crop up before a word that the speaker doesn't often use.

I had always assumed "ums" and "ers" were useless noises, an indication that my brain isn't working quickly enough. What does your research show?

It's one of those things your mother tells you: "Speak in full sentences. Don't um and er." I think it's a view that most people have, that disfluencies are not a good thing because they don't really communicate anything; they are just fillers.

Our latest study shows that disfluencies in speech directed to young children have an interesting benefit. What children have learned, surprisingly early, is when there is an "um" or "er", the word that follows is almost always one they don't know. When you are fumbling for the correct word, you are sending a message to the child that they should pay attention. That's very useful.

How did you find this out?

The methodology is fairly straightforward. We put pairs of photographs of objects in front of a child. One is an object familiar to the child, say a ball or banana. The other is one that they have never seen, say, a wrench. Using an eye-tracking device we can measure precisely where the child is looking. A voice says: "Look at the ball" (in a fluent way). The next sentence is disfluent: "Look at the... er... wrench."

We found that when there is a disfluency, the baby will look at the object they don't know, not the familiar one. It helps teach them new words.

Do all young children have this ability?

We showed that by two-and-a-half years of age, toddlers have developed this ability, but not at age 2. It is clearly something they have learned from listening to adults. There has been similar work which shows that adults also use "ums" and "ers" to their advantage when trying to understand speech.

Why is this important?

When we listen to someone speak, the words come rapidly and there is a lot of information to process, especially for children, who don't know many words. The more predictions the listener can make about the words being communicated, the better they can understand. Disfluencies are useful because they help us predict which words to pay attention to.

What is the take-home message?

Parents shouldn't worry about modest levels "ums" and "ers" in what they say to their children. Disfluencies have a benefit. They help your child to learn language.

http://www.eurekalert.org/pub_releases/2011-04/mc-mcf042811.php

Mayo Clinic finds robotic surgery effective for removing hard-to-reach throat cancer

ROCHESTER, Minn. -- ***Robotic surgery has become a mainstream tool for removing an ever-increasing variety of head and neck tumors.***

Now, a team of head and neck surgeons from Mayo Clinic has found robotic surgery can treat cancer in the narrow, hard-to-reach area beyond the tongue at the top of the voice box. Some patients were able to avoid further treatment with chemotherapy or radiation, and most could resume normal eating and speaking.

"We've known it's useful for tongue base and tonsil cancers, but we wanted to assess its effectiveness in the larynx," says Kerry Olsen, M.D., Mayo Clinic otolaryngologist and senior author of the study that was presented April 29 at the Combined Otolaryngological Spring Meetings in Chicago.

The investigation of transoral robotic surgery (TORS) followed nine patients for up to three years following removal of supraglottic squamous cell carcinoma, which affects the area of the larynx above the vocal cords. Most of the patients had advanced-stage disease. The results showed TORS effectively removed cancer, with "clean," disease-free margins, and was easier to perform than the approach of transoral laser microsurgery via a laryngoscope. The patients also underwent the surgical removal of their adjacent neck nodes at the same operation.

"We were pleased with the cancer outcomes," Dr. Olsen says. "We also found patients had minimal trouble after surgery, in most cases resuming normal eating, swallowing and speaking."

With TORS, the robotic arms that enter the mouth include a thin camera, an arm with a cautery or laser, and an arm with a gripping tool to retract and grasp tissue. The surgeon sits at a console, controlling the instruments and viewing the three-dimensional surgical field on a screen. "The camera improves visibility," Dr. Olsen says. "We also gain the ability to maneuver and see around corners and into tight spaces, and we believe we'll now be able to take out more throat tumors than with traditional approaches of the past."

The new application of TORS comes at the right time, Dr. Olsen notes. Cancers of the tongue and throat are on the rise. Not all patients will be candidates for robotic surgery; its use will depend on the architecture of a

patient's throat and neck, along with the type and extent of the tumor. "What we know from this study is that for larynx cancer, we have another effective surgical tool available to us," he says. "We can further tailor the cancer treatment for each patient and provide individualized care."

http://www.newscientist.com/article/mg21028095.500-ultrafast-fibre-optics-set-new-speed-record.html

Ultrafast fibre optics set new speed record

*** 29 April 2011 by Jeff Hecht**

THINK your broadband internet connection is fast? Two separate research groups have just lapped the field, setting a world record by sending more than 100 terabits of information per second through a single optical fibre.

That's enough to deliver three solid months of HD video- or the contents of 250 double-sided Blu-ray discs.

This marks "a critical milestone in fibre capacity", says Ting Wang at NEC Laboratories in Princeton, New Jersey.

Such lab results are far beyond today's commercial needs. Total capacity between New York and Washington DC, one of the world's busiest routes, is only a few terabits per second, says Tim Strong, of Telegeography Research in Washington. But "traffic has been growing about 50 per cent a year for the last few years", he adds. With bandwidth-hungry video-streaming and social media growing relentlessly, network planners are always searching for ways to expand capacity.

Today's fibre optics use several tricks to enhance bandwidth. Like the radio band, the optical spectrum can be sliced into many distinct channels that can simultaneously carry information at different frequencies. The laser light is pulsed on and off rapidly, with each pulse further sliced up into different polarities, amplitudes and phases of light, each of which contains a bit of information. The trick is to pack all these signals together in one fibre so that they hit the receiver as one pulse without interference.

At the Optical Fiber Communications Conference in Los Angeles last month, Dayou Qian, also of NEC, reported a total data-sending rate of 101.7 terabits per second through 165 kilometres of fibre. He did this by squeezing light pulses from 370 separate lasers into the pulse received by the receiver. Each laser emitted its own narrow sliver of the infrared spectrum, and each contained several polarities, phases and amplitudes of light waves to code each packet of information.

At the same conference, Jun Sakaguchi of Japan's National Institute of Information and Communications Technology in Tokyo also reported reaching the 100-terabit benchmark, this time using a different method. Instead of using a fibre with only one light-guiding core, as happens now, Sakaguchi's team developed a fibre with seven. Each core carried 15.6 terabits per second, yielding a total of 109 terabits per second. "We introduced a new dimension, spatial multiplication, to increasing transmission capacity," Sakaguchi says.

Multi-core fibres are complex to make, as is amplifying signals for long-distance transmission in either technique. For this reason, Wang thinks the first application of 100-terabit transmission will be inside the giant data centres that power Google, Facebook and Amazon.

http://medicalxpress.com/news/2011-04-mechanism-cells-insulin-making.html

Researchers discover mechanism that could convert certain cells into insulin-making cells

Simply put, people develop diabetes because they don't have enough pancreatic beta cells to produce the insulin necessary to regulate their blood sugar levels.

But what if other cells in the body could be coaxed into becoming pancreatic beta cells? Could we potentially cure diabetes?

Researchers from UCLA's Larry L. Hillblom Islet Research Center have taken an important step in that direction. They report in the April issue of the journal Developmental Cell that they may have discovered the underlying mechanism that could convert other cell types into pancreatic beta cells.

While the current standard of treatment for diabetes - insulin therapy - helps patients maintain sugar levels, it isn't perfect, and many patients remain at high risk of developing a variety of medical complications. Replenishing lost beta cells could serve as a more permanent solution, both for those who have lost such cells due to an immune assault (Type 1 diabetes) and those who acquire diabetes later in life due to insulin resistance (Type 2).

"Our work shows that beta cells and related endocrine cells can easily be converted into each other," said study co-author Dr. Anil Bhushan, an associate professor of medicine in the endocrinology division at the David Geffen School of Medicine at UCLA and in the UCLA Department of Molecular, Cell and Developmental Biology.

It had long been assumed that the identity of cells was "locked" into place and that they could not be switched into other cell types. But recent studies have shown that some types of cells can be coaxed into changing into

others — findings that have intensified interest in understanding the mechanisms that maintain beta cell identity.

The UCLA researchers show that chemical tags called "methyl groups" that bind to DNA — where they act like a volume knob, turning up or down the activity of certain genes — are crucial to understanding how cells can be converted into insulin-secreting beta cells. They show that DNA methylation keeps ARX, a gene that triggers the formation of glucagon-secreting alpha cells in the embryonic pancreas, silent in beta cells.

Deletion of Dnmt1, the enzyme responsible for DNA methylation, from insulin-producing beta cells converts them into alpha cells.

These findings suggest that a defect in beta cells' DNA methylation process interferes with their ability to maintain their "identity." So if this "epigenetic mechanism," as the researchers call it, can produce alpha cells, there may be an analogous mechanism that can produce beta cells that would maintain blood sugar equilibrium.

"We show that the basis for this conversion depends not on genetic sequences but on modifications to the DNA that dictates how the DNA is wrapped within the cell," Bhushan said. "We think this is crucial to understanding how to convert a variety of cell types, including stem cells, into functional beta cells."

According to the American Diabetes Association, 25.8 million children and adults in the U.S. - 8.3 percent of the population - have diabetes. *Provided by University of California - Los Angeles*

http://www.physorg.com/news/2011-04-google-doc-scanning-app-android.html

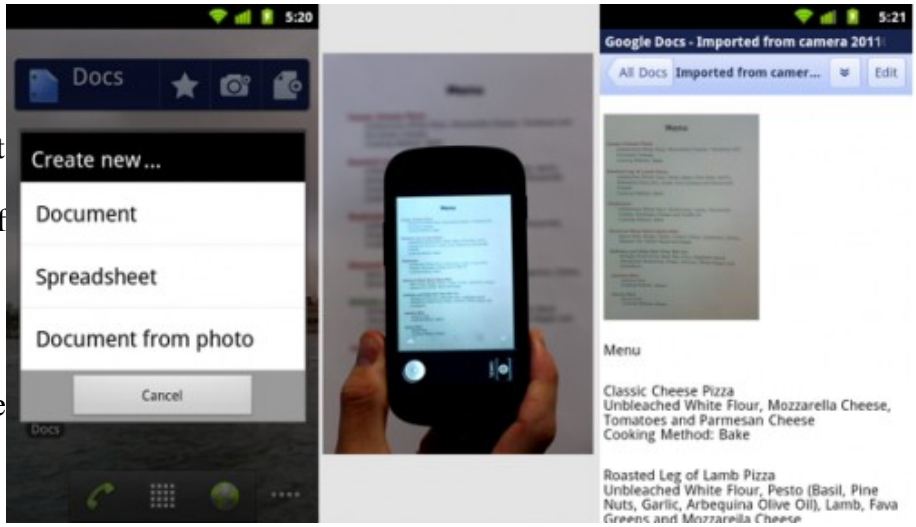
Google releases a doc scanning and editing app for Android

(PhysOrg.com) -- *One of the best ways to edit your documents on your tablet PC has been to use a web-based service like Google Docs*

Running Google Docs on an Android-based tablet lacks usability and has always been a mixed experience, depending on your Wi-Fi signal strength. Sometimes it worked well, and sometimes it did not.

Of course, for the business user sometimes is not really good enough. When you need the numbers from the quarterly spreadsheet right now having access to those numbers will be a big problem. When you need to look over the document that you have to review, spotty access is no good to you. What you need is an app that can help you to get more consistent, quality access to your documents for editing and sharing on the web.

Lucky for you, Google has released an app for just that purpose. On Wednesday, Google announced the launch of an official Google Docs app for Android. The app is able to convert photos of text into text documents for use in either Google Docs or in your web browser, so that you can edit the documents. This technology, which allows you to convert a photo of text into editable text is not only potentially useful for the office, but could be used for a variety of different pranks. Of course, how you choose to use it is of no concern to this reporter, but opportunities abound.



The app is available in the Android App Marketplace. Just be aware that the app will not work with human handwriting, special fonts, or non-English languages. Though, this may change at some point in the future.

http://www.physorg.com/news/2011-04-previously-unaccounted-mechanism-cell.html

Previously unaccounted mechanism proposed for cell phone radiation damage

(PhysOrg.com) -- *The long running debate on whether cell phones are capable of damaging human tissue and causing health problems received new fuel from a paper published at arXiv by theoretical biologist Bill Bruno from Los Alamos National Laboratory in New Mexico.*

Cell phones and the microwave photons they create have been looked at for some time as having the potential for causing damage and health issues to humans. One side shows evidence that cell signals have affected human behavior and health, while the other side says there is no epidemiological evidence and that microwave photons do not have enough energy to damage chemical bonds and biological tissue.

However, as Bruno points out in his paper, microwave photons can cause damage if the conditions are right. The main argument is that microwaves are not able to damage human tissue when the photon density in a cubic wavelength is less than one.

Bruno compares this to optical tweezers, which are able to manipulate and damage cells with the use of photons. Optical tweezers have large amounts of photons piled on each other creating a stronger force. It is this reasoning that Bruno believes that cell signals are capable of damaging human tissue because their photons per cubic wavelength are much greater than one.

Bruno has shown that the argument that microwaves cannot disrupt a chemical bond is no longer enough to say that cell phones are unable to damage human tissue. This new information will most definitely add more fuel to the cell phone debate. Bruno argues that the way current safe dosage limits are determined is not accurate because it does not take into account this tweezer-like notion into consideration.

More information: What does photon energy tell us about cellphone safety? arXiv:1104.5008v1 [q-bio.OT] http://arxiv.org/abs/1104.5008

Abstract

It has been argued that cellphones are safe because a single microwave photon does not have enough energy to break a chemical bond. We show that cellphone technology operates in the classical wave limit, not the single photon limit. Based on energy densities relative to thermal energy, we estimate thresholds at which effects might be expected. These seem to correspond somewhat with many experimental observations.

via Technology Review

http://www.bbc.co.uk/news/health-13215010

New EU regulations on herbal medicines come into force

By Dominic Hughes Health correspondent, BBC News

Herbal medicines New regulations mean many herbal remedies will no longer be available over the counter

New European Union rules come into force today banning hundreds of traditional herbal remedies. The EU law aims to protect consumers from possible damaging side-effects of over-the-counter herbal medicines.

For the first time, new regulations will allow only long-established and quality-controlled medicines to be sold. But both herbal remedy practitioners and manufacturers fear they could be forced out of business.

To date, the industry has been covered by the 1968 Medicines Act, drawn up when only a handful of herbal remedies were available and the number of herbal practitioners was very small. But surveys show that around a quarter of all adults in the UK have used a herbal medicine in the past two years, mostly bought over the counter in health food shops and pharmacies.

The regulations will cover widely used products such as echinacea, St John's Wort and valerian, as well as traditional Chinese and Indian medicines.

Traditional Herbal Remedy logo Herbal remedies that have been approved for sale under the new regulations will come with this logo

But safety concerns have focused on the powerful effects of some herbal remedies, as well as the way they interact with conventional drugs. For example, St John's Wort can interfere with the contraceptive pill, while ginkgo and ginseng are known to have a similar effect to the blood-thinning drug warfarin.

From now on only products that have been assessed by the Medicine and Healthcare products Regulatory Agency (MHRA) will be allowed to go on sale. Manufacturers will have to prove that their products have been made to strict standards and contain a consistent and clearly marked dose. And to count as a traditional medicine, products must have been in use for the past 30 years, including 15 years within the EU. They will also only be approved for minor ailments like coughs and colds, muscular aches and pains, or sleep problems.

Remedies already on sale will be allowed to stay on the shelves until they reach their expiry date.

Free from contamination

Richard Woodfield, head of herbal medicine policy at the MHRA, says so far there have been 211 applications, of which 105 have been granted registration. "Crucially, this EU directive and the registration scheme puts consumers in the driving seat so they can identify that a product meets assured standards on safety, quality and information about safe use. "Safety speaks for itself, but quality means, are they using the right part of the plant? Is it free from contamination? Is the claimed shelf life suitable? "Product information will include possible side effects and interactions with other drugs, but above all it must make very clear that it is based on traditional use."

And that is a key point for the Royal Pharmaceutical Society, which believes the new regime is a step forward in improving safety and quality.

But Prof Jayne Lawrence, chief science adviser to the society, says there are still some concerns about herbal products. "They certainly haven't been tested on the same basis as a conventional medicine and some of these

compounds are very potent. "Patients might not realise that in some cases they should not take other medicines with them, or if they're going for surgery they should tell their doctors they are taking these particular medicines because there may be complications. "So we're very concerned that patients appreciate they must be very careful when they take these medicines and, ideally, should talk to their doctor or pharmacist."

The manufacturers of herbal remedies have had seven years to prepare for the new rules after the European Directive on Traditional Herbal Medicinal Products was introduced in 2004.

Too onerous?

These regulations apply to over-the-counter sales, which form the bulk of herbal remedies sold in the UK.

But some manufacturers and herbal practitioners have expressed concern, arguing the new rules are too onerous for many small producers.

Michael McIntyre, chairman of the European Herbal and Traditional Medicines Practitioners Association, says there will be a significant impact on herbal medicine practitioners and their suppliers, but admits the rules do need bringing up to date. "Products that go on the market now will definitely do what it says on the bottle, while we didn't know how good they were in the past. "But registration is expensive so perhaps there may be fewer products on the market and a smaller range.

"It's difficult to argue that the market should stay as it is, without any regulation, but how many businesses will pack up and walk away? I can't say."

http://medicalxpress.com/news/2011-04-chemical-crude-oil-linked-congenital.html

Chemical found in crude oil linked to congenital heart disease

While it may be years before the health effects of the 2010 oil spill in the Gulf of Mexico are known, a new study shows that fetal exposure to a chemical found in crude oil is associated with an increased risk of congenital heart disease (CHD).

The study, to be presented Saturday, April 30, at the Pediatric Academic Societies (PAS) annual meeting in Denver, also showed that babies who had been exposed in utero to a chemical found in cleaning agents and spot removers were at increased risk of CHD.

Environmental causes of CHD have been suspected, and animal studies have suggested certain chemicals may cause CHD, a problem with the heart's structure and function due to abnormal heart development before birth. "Congenital heart disease is a major cause of childhood death and life-long health problems," said D. Gail McCarver, MD, FAAP, lead author of the study and professor of pediatrics at the Medical College of Wisconsin and Children's Research Institute, Milwaukee. "Thus, identifying risk factors contributing to CHD is important to public health."

Dr. McCarver and her colleagues sought to determine whether human fetal exposure to solvents is associated with increased risk for CHD. The researchers tested samples of meconium, or fetal stool, from 135 newborns with CHD and 432 newborns without CHD. Meconium has been used to assess fetal exposure to illicit drugs such as cocaine. Seventeen compounds were measured in meconium samples using methods that detect very low levels of chemicals. Additional data collected included race of the mothers and infants, family history for CHD, and maternal alcohol, tobacco, vitamin and drug use. Infants with chromosomal abnormalities known to be linked to CHD, and babies of diabetic mothers were excluded from the study.

Results showed that 82 percent of infants had evidence of intrauterine exposure to one or more of the solvents measured. Among white infants, but not black infants, fetal exposure to ethyl benzene was associated with a four-fold increased risk of CHD. In addition, exposure to trichloroethylene was associated with a two-fold increased risk for CHD among white infants and an eight-fold increased risk among black infants.

"This is the first report that exposure to ethyl benzene, a compound present in crude oil, was associated with CHD," Dr. McCarver said. Humans also can be exposed to ethyl benzene through inhalation of motor vehicle emissions, gasoline pump vapors and cigarette smoke. "The association with ethyl benzene exposure is concerning, particularly considering recent oil spills," she said. "However, additional confirmatory studies are needed."

The study also adds to existing concerns about trichloroethylene (TCE). "This is of particular importance because TCE is a commonly used degreasing agent, which also is present in many cleaners and spot removers. TCE also has been the most common chemical identified around hazardous waste sites," Dr. McCarver said.

"Limiting known maternal exposure to this compound during early pregnancy appears prudent, particularly among those at increased CHD risk," Dr. McCarver concluded.

More information: To view the abstract, go to http://www.abstrac ... PAS11L1_1736
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